Personal Hygiene Applied

By

JESSE FEIRING WILLIAMS, A.B., M.D.
Associate Professor of Physical Education, Teachers College, Columbia University

ILLUSTRATED

PHILADELPHIA AND LONDON
W. B. SAUNDERS COMPANY
1922

Reprinted October, 1922

MADE IN U. S. A.

PRESS OF
W. B. SAUNDERS COMPANY
PHILADELPHIA

TO MY WIFE

TEAM MATE IN THE GAME

TO LIVE MOST AND TO SERVE BEST

PREFACE

The aim of this book is to improve the quality of human life. It is evident from the title that this aim seeks its goal by means of hygiene, but it should be clear also that no mere recitation of informational hygiene can be justified if the aim is to be achieved. To improve human living one must not only set forth the rules of health but also one must bring them in contact with that deep and ever-flowing source of human action where ideals, ambitions, attitudes, prejudices, hopes, and aspirations are born. To find the scientific rule for health is not more important than to touch the mainspring to action that will give life and meaning to the rule discovered.

The interest in health today is very great. In proportion to its importance and in relation to past appreciations health is not overvalued. But we should be careful not to appraise it too highly as an isolated value. Oftentimes we make it too prominent as an end; then it protrudes too much and mars the whole of life. To recognize that it is of meaning and significance only in its relation to other values is tremendously important today. Three of the finest things in life—heroism, creative work, and child-bearing—are often injurious to health. To avoid battle for the right, or to forsake productive work, or to miss parenthood because of the toll in health that these things take twists and warps life and mixes values woefully. The sacrifice of health in personal, selfish, and unsocial ways can never receive sanction. Contrariwise, the scars from the "strenuous and dangerous activities of helping to create" a new rule of right and justice, "a new harmony or a new child" are symbols of the divine. Health is more than perfect digestion, more than perfect bodily functions. To find what more it is constitutes an important part of the problems of hygiene.

The first five chapters consider the various aspects of this problem—the meaning of health in terms of life. The treatment is not complete. No one recognizes their inadequacy more than the author. To write a philosophy of life in terms of aims and goals, and to tie such philosophy up with the immediate, thrusting appeals of the moment, as the problems in human living are revealed, is more than this can claim. Rather, I must be content to sketch certain points of view, to hazard a hope here and there, to suggest ideal guides, to inveigh against palpably false ones, and everywhere to emphasize the identity of hygiene with life and the necessity for knowledge to flow into action. Therefore, to insist that hygiene can never be, for life purposes, an academic subject to be learned merely, and to hold with real conviction that it is useful only as it is lived, have been controlling guides here.

The remaining chapters consider in a systematic way hygiene from its scientific side. The finest ideals in the world cannot prevail against an infected lung; science with her torch will always be needed to illumine the processes of life. For discussion purposes, however, the treatment has been systematic. This has its advantages, obviously. Its disadvantages, while indirect, are no less real. Life does not manifest itself in circulatory, nor in muscular, nor in nervous pathways alone. The unity of mind and body preclude that. It is always vain to force the living into set molds. "All the molds crack. They are too narrow, above all, too rigid, for what we try to put into them." To preserve the unity and harmony of life has been attempted throughout. Nevertheless, the disadvantage of such organization remains unless the reader sees beyond the boundary lines.

The book aims to be scientific and accurate according to the latest information available. It has tried to avoid propaganda, to convert, or to get people to follow a scheme. It has aimed to present facts in human experience, to establish science and intelligence as guides, and to replace superstition, cults, fads, tradition, and certain instinctive responses with truer counsellors. In this respect it is expressing a dominant mood in education today and takes its position courageously, asking that truth shall decide, let the results seem what they may.

This book is planned for college students. Not only to students of health does it seek to present its case but also to students of sociology, philosophy, and education. There are reciprocal values to be found in the touch with other fields. Hygiene has been in need of a sociologic point of view, a philosophic approach, and educational standards that would stimulate careful instruction and would deserve credit in university and college curricula. Education in special fields for other reasons needs to consider the problem of human health and biologic problems in living. "Health in Education and Education in Health" is a significant slogan.

It is hoped that this book may not be constricted to the school or college field. Physicians, teachers, nurses, social workers require a book which they may recommend to parents or patients in need of guidance for living. The emphasis on the mental and social aspects of health, as well as the physical, suggests its usefulness in facilitating social adjustments.

Health results from living in the proper way. It flows from life as a by-product of actions, responses, or conditions that are wholesome. So that whether in college or out, the problems of human living remain essentially the same: to adjust a rather primitive, biologic organism to a complex civilized society, and to shape society to provide for man's essential biologic and social needs. The view held for this problem of human adjustment is that one should first face the problems and then try to meet them squarely and honestly, paying whatever price is required. Therefore, I have spoken vigorously against the bankrupt methods that aim "to beat the game," to find a short cut, or to seek a royal road.

I am glad to acknowledge my indebtedness to students and colleagues for help in the preparation of this book.

The former have been stimulating questioners; the latter, the kindest and most helpful of critics. I wish to acknowledge here my indebtedness to Dr. T. D. Wood, a pioneer in the problems of health instruction. I bear to him the homage and respect worthy of a grateful student to a great teacher. To Professor H. C. Pearson, who has given many helpful suggestions, to Professors M. S. Rose and W. H. Eddy, who have proposed many good points in the chapter on nutrition, to Professor M. A. Bigelow and Dr. E. E. Foster, who have read the entire manuscript, giving a keen criticism of form and content, I am under deep obligation.

In particular, at this time and place, I desire to thank Professor William H. Kilpatrick who has guided me through two writings of the first five chapters. For his invaluable criticism I am greatly indebted.

Citations and quotations from numerous sources are indicated in the footnotes of the text. These references are suggestive of helpful material for further study along the lines indicated. For permission to quote I am greatly indebted to the publishers concerned. I wish to take this opportunity to acknowledge this permission granted and to express my appreciation of the courtesy extended by Abingdon Press, D. Appleton & Co., P. Blakiston's Son & Co., Curtis Brown, Ltd., The Century Co., Dodd, Mead & Co., Funk & Wagnalls, Henry Holt & Co., Houghton Mifflin & Co., J. B. Lippincott Co., John W. Luce & Co., The Macmillan Co., Princeton University Press, W. B. Saunders Co., Chas. Scribner's Sons, Seeley, Service & Co., Teacher's College, John Wiley & Sons, Williams & Wilkins Co., and William Wood & Co.

What I owe to others in these matters is very large. However, the errors, where they occur, are mine.

TEACHER S COLLEGE,
COLUMBIA UNIVERSITY,
NEW YORK CITY,
July, 1922.

JESSE FEIRING WILLIAMS.

CONTENTS

CHAPTER I

CHAPTER II

CHAPTER III

CHAPTER IV

CHAPTER V

CHAPTER VI

CHAPTER VII

CHAPTER VIII

CHAPTER XIII

CHAPTER XIV

PERSONAL HYGIENE APPLIED

CHAPTER I

THE MEANING OF HEALTH

A Definition of Health.—Health is defined in dictionary and encyclopedia as a condition of physical soundness, or as a condition in which the organism discharges its functions efficiently. The word "health" is derived from the Old English word *hælth*, the condition of being safe and sound. Today, in the minds of most people, health has this historic meaning and is considered merely as freedom from disease.

There is in this definition of health, as freedom from disease, no appreciation of the varying degrees of healthfulness among those usually classed as well, and no understanding of the heights that could be attained in human health and living if all the available means for improving health were employed. One need be only a casual observer to recognize that a great number of people are living below their best level of attainment. Many persons believe themselves healthy because they are not sick in bed, and this lack of appreciation of health as a quality of life prevents the realization of a greatly superior type of life. It is, perhaps, impossible to say how far any individual could progress in achieving a finer and higher level of living. It is not too much to say, however, that health, as an idea, should imply more than freedom from disease. Such broadening of the idea would bring not only increased health values but also desirable social values.

It is of value to think of health as that condition of the body that makes possible the highest enjoyment of life, the greatest constructive work, and that shows itself in the best service to the world. It involves keeping the body and mind at the highest levels, living at one's best and not being satisfied with mere absence from the hospital and sick room. This concept of health, moreover, parts company with that idea of health which takes it as an end of life. It refuses to consider as healthy the individual who employs a wonderful physical body for purely selfish and socially undesirable ends.

Such a doctrine as "health for health's sake" is entirely unsatisfactory. Health is not an end in itself except for the individual sick in bed, and then he desires only to free himself from his disease and "to get well."[1] "Health for health's sake" is similar to such sayings as "sport for sport's sake" and "art for art's sake." All of these sayings err in making an end of the subject. Sport is of value and should be pursued not for the sake of sport, but for the sake of the training of mind, body, and spirit that comes in contesting in a fine way with one's fellows. Art for the sake of art is mere superficiality and pose. Art is significant because it portrays in imperishable marble, canvas, music, or written word the finest emotions and thoughts of the human race. Health is of significance in proportion as it denotes a condition of the whole organism, expressing its functions in joyous play, satisfying work, and needed service to others.

Health may be defined, therefore, as *the quality of life that renders the individual fit to live most and to serve best.* The meaning of "to live most and to serve best" cannot be expressed readily. Such things can rarely be defined

[1] Cabot, R. C.: What Men Live By, Houghton Mifflin Co., Boston, 1914.

acceptably in words. To try to do so would be like an attempt to define the term "a good life." Phrases of this kind are to be defined best in terms of personality. The person is the definition of the term whenever the term includes the ideals and aspirations of the human heart. Roosevelt, in The Strenuous Life, Gulick, in The Efficient Life, and Pastor Wagner, in The Simple Life, set standards of living that have health implications, but neither Roosevelt, nor Gulick, nor Wagner defined the life that seemed to them so good. For some "to live most and to serve best" will mean one thing, for others it will mean something else. The world may well hope that more and more men will give to it a human and social meaning, a meaning founded in truth and full of good will to all.

Such a definition of health is broad, but it omits no aspect of life, nor does it include too much. It must be as wide as life, because life is more than digestion, circulation, or nerve response. The physical aspects of health must be interpreted along with the mental and the social. The accumulating evidence from hospitals, social service bureaus, and physicians themselves testifies to this unity of life. The causes of ill health and disease are social and mental as definitely, though not so frequently, as physical causes. Moreover, such definition asks that life be thought of as a whole. Physicians know that they may not speak of the health of the heart and omit other organs from consideration. Viewing life as a whole and not as made up of dissected parts does not mean neglect of the physical. Rather it demands even more clearly that physical vigor be considered fundamental. It only asks that body serve mind and spirit; that the "temple of the soul" be a servant, ready and trained to serve high causes and noble ends.

This broadening of the concept of *health* is justified by life. In the final analysis vigorous body and keen mind are of the highest value in proportion as they serve the highest causes. The test of body and mind is the test not of weight lifting nor of mental gymnastics, but of meeting the crises of life in such a way that a distinct advance has been made either for the individual or for society, or both. The ultimate test is the way in which health is used; it is the test of conduct, because in this test the physical and the psychical are subjected to the greatest pressure. The highest and best expressions of conduct will be seen when the sound body and the sound mind form the spring from which the action flows. This test is well illustrated by Paton[1] when he says, "Any person who is familiar with the most elementary laws governing human behavior recognizes that the chief test of a sound mind in a sound body is the ability to act in a crisis."

It is helpful to think of health as a quality of life capable of enrichment or deterioration. How fine a quality may be obtained by any individual is unknown, but the degree of health possible with rational knowledge, attention, and effort is considerably higher for every person. *Health as freedom from disease is a standard of mediocrity; health as a quality of life is a standard of inspiration and increasing achievement.*

The Definition Examined.—The definition of health as the *quality of life that renders the individual fit to live most and to serve best* has not hitherto enjoyed any wide acceptance. This is true for several reasons. In the first place, people are not well informed of the way health is secured and maintained. The home has not been prepared nor inclined to instruct in matters of health and the public schools have only recently been willing to accord hygiene a place in the curriculum. The ignorance of the people in matters of body structure and function has made easy the way for charlatans, quacks, and fakirs by clever advertising to sell their spurious health preparations and prescriptions. Indirectly flowing out of such a situation is a great amount of harm, misinformation, and false guides. One advertisement reads: "Eat what you want, drink manacea water and digest it." It should be noted that even if manacea were efficacious as a digesting water,

[1] From a letter to the New York Times, July 10, 1917.

the teaching of the advertisement is directly contrary to all that is important in personal hygiene. It may never be advisable for any person to eat what he wants; it frequently is very undesirable for him to do so.

In the second place, this definition of health is not widely accepted because people are so greatly interested in economic and social success that they are unduly willing to sacrifice health for the rewards of work. Many busy men are unwilling to practice hygiene because they say they have no time for it. Professional and business people generally trade too much of vitality for work in careless, inefficient, and wasteful ways. For some, service is such an inspiration that they literally wear themselves out in its pursuit. Service should never mean suicide, although there may be emergencies when service demands the sacrifice of life. One is only fit to serve, even as one is only fit to work, as one keeps oneself prepared to live most and to serve best.

And finally, this definition has no universal appeal because people lack a philosophy of life that would keep values in proper proportion, that would see straight, and that would link the part to the whole, the personal to the social. The vain effort to buy happiness and to buy recreation is expressive of the same fruitless belief—that personal health can be bought for a price. Public health is purchasable in the sense that sufficient money for adequate sanitation will control the transmission of communicable disease, but personal health cannot be bought by appropriations of money. It can only be possessed by spending time for the care of the body, by selling something of work for recreation, by giving of self in objective, disinterested work for others. It is important to remember that one always pays. To achieve vitality, strength, personal efficiency costs something that must be taken from work, from instinctive pleasures, or from indulgence of unwholesome habits. There is no way "to beat the game" of life. The stream of life will be rich, abundant, lasting in proportion as the sources which constantly nourish it are flowing. And these sources are neither magical nor mysterious. They belong to every man and, briefly, are, fresh air, food of proper kind and amount, wholesome exercise and recreation, proper habits of posture and care of the body, avoidance of alcohol and other poisons, and proper attitude of mind.

What Really Defines Health.—The examination of the definition proposed shows that health cannot be defined academically. No writer on hygiene can do more than indicate desirable guides and the path of his discussion. For most people health is defined by the ideas and ideals of the periods in which they live. The Athenian Greek subjected to the standards of harmony and beauty in Greek life, the Roman citizen in the grasp of militaristic virtues, the ascetic, a pale and pallid product of the monastic system, were all definitions of health in terms of the ideas and ideals of their times and places. Simon Stylites "rotted with the dew" because for him there was no inspiration in health and vitality. Wherever the monastic system and the scholastic philosophy touched life they withered it. The ideas and ideals of the time and place make the definitions of life.

Forces Defining Health Today.—The old ideas have little sanction today. The scientific and the historic studies have rewritten the story of human life. With new emphases, health has new meanings. The civilized nations are getting away from the ideas of asceticism with its contempt for the physical. We, in America, have never had the militaristic virtues, and the workings of beauty have been too little known. More characteristic of our age and land are the developing social conscience and the increasing sense of social responsibility.[1] This is no passing mood, but a tendency of deeper growth. It is hardly necessary to say that it is filled with rich possibilities for the improvement of life physically, mentally, and socially.

[1] King, H. C.: Rational Living, The Macmillan Co., New York, 1907, pp. 99–102.

The Influence of Leaders.—This sense of social responsibility is expressing itself through leaders, through organizations, and through the life of the people. It has given us great leaders to define health in terms of living, as it should be defined. The immortal Roosevelt with the out-of-doors upon him, the beloved Burroughs singing his songs to the accompaniment of nature's harmonies, have pointed out the way. Leaders and teachers everywhere are stressing in their lives and in their works social responsibility.

The movement for the conservation of our natural resources is a part of this mood; and the people are saying, "More precious than mines, or rivers, or forests is the health and vitality of the nation."[1] Fisher's "Report on National Vitality,"[2] the revelations of the Selective Service Act,[3] and lessons from the World War in many fields of life have stimulated a growing appreciation of the social significances of ill health with a better definition resulting. As illustrative of the power of these forces in our life today witness the report[4] of the commission for the study of secondary education of the National Education Association. This report, "The Cardinal Principles of Secondary Education," sets forth health as the first of seven objectives for secondary education. Educators have ceased talking of education only in intellectualistic terms and have begun to consider health as a cardinal principle of education.

The Influence of Organizations.—Numerous organizations have sprung into existence in response to this mood of social responsibility for health. Well-established agencies have become increasingly active. Child health has been particularly the concern of many recent move-

[1] Williams, J. F.: The Conservation of the Nation's Most Valuable Resources, Educational Review, November, 1918.

[2] Fisher, I.: Report on National Vitality, Bulletin 30, Government Printing Office, Washington.

[3] Final Report of the Provost Marshal General, Government Printing Office, Washington, 1920.

[4] Bulletin No. 35, 1918, Bureau of Education, Department of the Interior, Washington.

ments. The Child Health Organization, the National Tuberculosis Association, the Joint Committee of the American Medical Association and the National Education Association, and the National Child Health Council are doing splendid service in propaganda, teaching, and setting of standards, based upon careful study of conditions and needs. The older organizations, such as the Children's Bureau of the Department of Labor, the American Red Cross, the National Child Welfare Association, the Life Extension Institute, the American School Hygiene Association, the Elizabeth McCormick Memorial Fund, and other foundations, are co-operating in many programs for the conservation and improvement of human health. Boards of Health, State Departments of Health, and the United States Public Health Service are raising standards and thus helping to define and give meaning to health.

The Influence of the Life of the People.—But even more powerful than leaders and more extensive than the work of organizations is the influence of society itself as expressed in the actual life of its members. The customs and *mores* of the people are reaching higher levels. Much remains to be done, both in social and in personal effort, but there are, nevertheless, signs of an open trail to better health. The interest in play and recreation, the out-of-door and camping customs so recently developed, the improvement in dress, and the increasing education of children in hygiene are favorable signs, indeed. The hope that William James[1] expressed some years ago is being fulfilled: "I hope that here in America more and more the ideal of the well-trained and vigorous body will be maintained neck and neck with that of the well-trained and vigorous mind as the two co-equal halves of the higher education for men and women alike. The strength of the British Empire lies in the strength of character of the individual English man, taken all alone by himself, and

[1] James, William: Talks to Teachers on Psychology, H. Holt & Co., New York, 1916, p. 205.

that strength, I am persuaded, is perennially nourished and kept up by nothing so much as by the national worship, in which all classes meet, of athletic outdoor life and sport."

At one time intentional physical education in America was limited to the stilted and artificial exercise of the German and Swedish systems of gymnastics. These systems never really stirred the spirit of the people. Impregnated with the spirit of the older European institutions, they had little in common with our democracy and the social ideals shaping this nation. A militaristic ideal incorporated in the schools and taught from pulpit and platform might do for us what it did for Germany in the development of physically strong, docile minded individuals, but such an aim would run counter to the dominant trait of the American people and could only be achieved by the destruction of democracy and its institutions of freedom. This type of physical education has largely yielded to a better. In its place there has been a phenomenal growth in play and all forms of athletic sports and games. Not all the growth, sad to say, has been wholesome. The athlete has shown too frequently in competition, and especially in the professional field, the absence of those social and moral qualities of paramount importance today.[1]

The absence of the educational point of view in the management of school and college athletics and the emphasis on the professional, spectacular, and exhibitive elements are to be deplored. The activity of alumni primarily interested in "putting the college on the athletic map" has made questionable contributions.

This movement for play and physical activity, widespread though it is, is not yet everywhere appreciated and respected. In many respects the liberal arts colleges are still breathing the breath of scholasticism in the theory that guides their cultural education. The pressure of

[1] Williams, J. F.: The Education of the Emotions, Teachers College Record, May, 1920, pp. 201–216.

studies, the long hours demanded in laboratory and class room leave no choice for the youth to be anything else but anemic and physically weak. There is no comprehensive scheme in the minds of many who lead in educational matters to provide for that broad training of the body that results in characters of force, initiative, and nobleness. It should be remembered that the "bookworm" who neglects his physical needs is to be condemned equally with the athlete who neglects his mental growth. This neglect of the physical in education not only deprives the youth of opportunity for wholesome growth, but by failure to teach habits of exercise in purposive play and games it lays the foundation for further physical deterioration in adult life through inability to use and to enjoy the physical means of recreation.

To Live Most and to Serve Best.—Health as a quality of life is a challenge to all leaders, to all organizations, to all persons, everywhere, to interpret health in terms of service. The definition given at the beginning of this chapter claims recognition from all those who now seek merely the liberation of man from disease, from inefficiency, from physical weakness, and degeneracy. It asks that personal and social effort to improve health, to eradicate disease, to enrich the processes of life shall be directed constantly toward the purpose of life itself as that may be understood. Not health, but life itself; to live most and to serve best, this is the goal.

Cabot[1] is sounding the same note when he says: "Assuming that in everyone there is an infinite and restless desire to get into the life of the world—to share any and all life that is hot and urgent or cool and clear—we can tackle this infinite task in two ways:

"By trying to understand the universe in the samples of it which come to our ken, and to draw from these bits of knowledge which typifies and represents the whole. That is science.

[1] Cabot, R. C.: What Men Live By, Houghton Mifflin Co., Boston, 1914, pp. 84, 85.

"By trying to serve. When we try to serve the world (or to understand it) we touch what is divine. We get our dignity, our courage, our joy in work because of the greatness of the far-off end always in sight, always attainable, never attained. Service is one of the ways by which a tiny insect like one of us can get a purchase on the whole universe. If we find the job where we can be of use, we are hitched to the star of the world, and move with it."

CHAPTER II

THE HEALTH PROBLEM

The Nation's Vitality.—In the last few years there has been a great deal of interest in the conservation of our national resources. There have been sufficient reasons why we should conserve our national wealth, and a great many people have been interested in conserving forests, water power, and national mines. But there are many sources of national wealth. From a broad standpoint the greatest resource of the nation is the health of the people. The loss that accrues yearly in this part of our wealth is more dangerous and more terrible for the welfare of the nation than the loss that comes in the exploitation of our forests and mines.[1]

In the report on "National Vitality,"[2] elsewhere referred to, preventable sickness and preventable deaths have been estimated. Fisher states that about 42 per cent. of the deaths of persons in the United States could

[1] Williams, J. F.: The Conservation of the Most Valuable Resources of the Nation, Educational Review, November, 1918.

[2] Fisher, I.: Report on National Vitality, Bulletin No. 30, Government Printing Office, Washington.

be prevented or potsponed "if the knowledge now existing among well-informed men in the medical profession were actually applied in a reasonable way and to a reasonable extent."

That sickness and death are at time unnecessary and are preventable is well known. This fact, however, is based upon scientific preventive measures and in no way is allied with the mistaken view that ignores matter and denies disease. Contrariwise, it is the plainest matter of statistics and common sense observation that the nation's vitality is wasted by lack of application of the available preventable measures of science.

In terms of morbidity and mortality rates (see Table I, pp. 30, 31) the resources of the nation are squandered more recklessly, more continuously, and more surely in peace than in war. The peace losses are not so dramatic, but just as significant. We are inclined to speak of the tremendous loss of life in war, and we are horrified by such disasters as the Titanic, and the ones at Halifax and Mt. Pelee. Because of custom and traditional belief that babies die easily we have grown careless about the loss of life below the age of five (Fig. 1, p. 32). The significance of this loss in England has been pointed out by George Bernard Shaw in an address on the Nation's Vitality. He is quoted in part:

"If we take the number of babies conceived in the womb of the women of this nation and who ought to be born, we have 938,000. The number that succeeds in getting born is about 800,000. This is not a good beginning. It means that 138,000 have not sufficient vitality to get themselves born; it also means that the mothers were not properly fed and properly instructed. Of the 800,000 who do manage to enter the world, 100,000 die before they are one year old. This means dirty milk or no milk at all—slums, bad food, ignorance. We lose 100,000 before one year of age; we drop another 100,000 before the age of fifteen, just when they are becoming industrial producers and available for military service, and of the remainder who do grow up we find that another 100,000 have to be

TABLE I

Principal Causes of Death

Census Bureau's Summary of Mortality Statistics, 1920

Cause of death.	Number of deaths.		Rate per 100,000 population.		Percentage of total.	
	1919	1920[1]	1919	1920	1919	1920
All causes.	1,096,436	1,142,558	1287.4	1306.0	100.0	100.0
Organic diseases of the heart.	111,579	124,143	131.0	141.9	10.2	10.9
Pneumonia (all forms).....	105,213	120,108	123.5	137.3	9.6	10.5
Tuberculosis (all forms)....	106,985	99,916	125.6	114.2	9.8	8.7
Tuberculosis of the lungs[2].	94,772	88,195	111.3	100.8	8.6	7.7
Tuberculous meningitis...	5,175	4,895	6.1	5.6	0.5	0.4
Other forms of tuberculosis	7,038	6,826	8.3	7.8	0.6	0.6
Acute nephritis and Bright's disease...............	75,005	78,192	88.1	89.4	6.8	6.8
Cancer and other malignant tumors...............	68,551	72,931	80.5	83.4	6.3	6.4
Cerebral hemorrhage (apoplexy)...............	65,951	70,780	77.4	80.9	6.0	6.2
External causes (suicide and homicide excepted)....	61,268	62,492	71.9	71.4	5.6	5.5
Accidental falls..........	9,629	10,323	11.3	11.8	0.9	0.9
Automobile accidents and injuries...............	7,968	9,103	9.4	10.4	0.7	0.8
Burns (conflagrations excepted)...............	6,409	6,645	7.5	7.6	0.6	0.6
Railroad accidents and injuries...............	6,304	6,426	7.4	7.3	0.6	0.6
Accidental drowning.....	5,854	4,977	6.9	5.7	0.5	0.4
Accidental absorption of deleterious gases (conflagrations excepted)...	2,884	3,012	3.4	3.4	0.3	0.3
Accidental shooting......	2,350	2,262	2.8	2.6	0.2	0.2
Mine accidents and injuries...............	2,179	2,171	2.6	2.5	0.2	0.2
Machinery accidents and injuries...............	2,082	2,153	2.4	2.5	0.2	0.2
Street car accidents and injuries...............	1,916	1,746	2.2	2.0	0.2	0.2
Injuries by vehicles other than railroad cars, street cars, and automobiles..	1,970	1,698	2.3	1.9	0.2	0.1
Effects of heat other than burns...............	536	270	0.6	0.3	[3]	[3]
Other external causes....	11,187	11,706	13.1	13.4	1.0	1.0
Influenza................	84,113	62,097	98.8	71.0	7.7	5.4
Congenital debility and malformations...........	56,714	61,080	66.6	69.8	5.2	5.3
Diarrhea and enteritis (total)	47,044	47,605	55.2	54.4	4.3	4.2
Diarrhea and enteritis (under two years)........	37,635	38,514	44.2	44.0	3.4	3.4
Diarrhea and enteritis (over two years).......	9,409	9,091	11.0	10.4	0.9	0.8
Arterial diseases, atheroma, aneurysm, etc.........	18,976	19,977	22.3	22.8	1.7	1.7
Diabetes................	12,683	14,062	14.9	16.1	1.2	1.2
Diphtheria and croup......	12,551	13,395	14.7	15.3	1.1	1.2
Appendicitis and typhlitis..	10,029	11,702	11.8	13.4	0.9	1.0
Bronchitis................	10,913	11,609	12.8	13.3	1.0	1.0
Puerperal affections other than puerperal septicemia...............	9,538	10,976	11.2	12.5	0.9	1.0

PRINCIPAL CAUSES OF DEATH (*Continued*)

Cause of death.	Number of deaths.		Rate per 100,000 population.		Percentage of total.	
	1919	1920[1]	1919	1920	1919	1920
All causes.	1,096,436	1,142,558	1287.4	1306.0	100.0	100.0
Whooping-cough	4,714	10,968	5.5	12.5	0.4	1.0
Respiratory diseases other than pneumonia and bronchitis	8,865	10,120	10.4	11.6	0.8	0.9
Hernia and intestinal obstruction	8,853	9,314	10.4	10.6	0.8	0.8
Suicide (total)	9,732	8,959	11.4	10.2	0.9	0.8
By firearms	3,302	3,169	3.9	3.6	0.3	0.3
By hanging or strangulation	1,726	1,616	2.0	1.8	0.2	0.1
By poison	1,546	1,417	1.8	1.6	0.1	0.1
By asphyxia	1,275	1,124	1.5	1.3	0.1	0.1
By cutting or piercing instruments	695	640	0.8	0.7	0.1	0.1
By drowning	684	555	0.8	0.1	0.6	[3]
By jumping from high places	289	247	0.3	0.3	[3]	[3]
By crushing	100	97	0.1	0.1	[3]	[3]
Other suicides	115	94	0.1	0.1	[3]	[3]
Syphilis	7,347	7,969	8.6	9.1	0.7	0.7
Measles	3,296	7,712	3.9	8.8	0.3	0.7
Angina pectoris	6,538	7,571	7.7	8.6	0.6	0.7
Acute endocarditis	5,955	6,861	7.0	7.8	0.5	0.6
Typhoid fever	7,860	6,805	9.2	7.8	0.7	0.6
Cirrhosis of the liver	6,704	6,241	7.9	7.1	0.6	0.5
Homicide (total)	6,386	6,205	7.5	7.1	0.6	0.5
By firearms	4,567	4,477	5.4	5.1	0.4	0.4
By cutting or piercing instruments	687	645	0.8	0.7	0.1	0.1
By other means	1,132	1,083	1.3	1.2	0.1	0.1
Paralysis without specified cause	6,146	5,828	7.2	6.7	0.6	0.5
Puerperal septicemia	4,950	5,800	5.8	6.6	0.5	0.5
Meningitis	5,508	5,281	6.5	6.0	0.5	0.5
General paralysis of the insane	4,823	5,030	5.7	5.7	0.4	0.4
Anemia, chlorosis	4,149	4,787	4.9	5.5	0.4	0.4
Rheumatism	3,907	4,287	4.6	4.9	0.4	0.4
Scarlet fever	2,383	4,004	2.8	4.6	0.2	0.4
Dysentery	3,732	3,574	4.4	4.1	0.3	0.3
Malaria	3,275	3,136	3.8	3.6	0.3	0.3
Erysipelas	2,186	2,721	2.6	3.1	0.2	0.2
Pellagra	2,806	2,322	3.3	2.7	0.3	0.2
Smallpox	358	508	0.4	0.6	[3]	[3]
All other defined causes	103,247	109,985	121.2	125.7	9.4	9.6
Unknown and ill-defined causes	15,603	15,505	18.3	17.7	1.4	1.4

[1] The state of Nebraska with an estimated midyear population of 1,301,737 was admitted to the registration area in 1920.

[2] Includes acute miliary tuberculosis.

[3] Less than $\frac{1}{10}$ of 1 per cent.

Note: Total number of deaths and the death-rate in the death registration area of the continental United States in 1919 and 1920 by leading causes, together with the percentage which each cause contributed to the total.

rejected for military service because they are unfit; that is 57 per cent. destroyed in peace for the $2\frac{1}{2}$ per cent. destroyed (in one year) by the whole German army firing shot and shell at them."

Losses that Cannot Be Easily Stated.—By using statistics we can with fair accuracy determine the economic loss

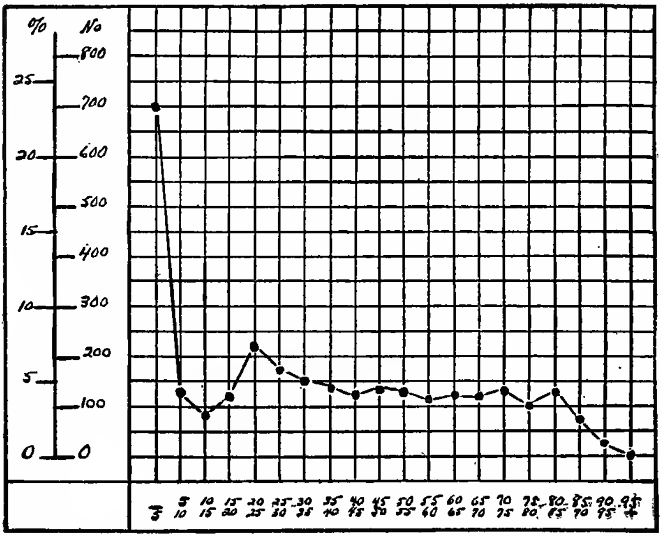


Fig. 1.—Mortality by age periods: 1. Early childhood dangerous to life. 2. After age of three the danger diminishes greatly until puberty. 3. Period of adolescence full of danger, showing increased rate at twenty-three years. 4. Beyond this rate remains nearly a straight line until old age. (From "The Duration of Life and Condition Associated with Longevity," by Alexander Graham Bell, Washington, D. C., 1918, p. 10.)

that comes from deaths and illness that are preventable. There are other losses, however, that are not so readily estimated. The losses in the purely personal, in the human sphere that show in the psychologic effect upon the mind and spirit are incomputable. These losses are in the accumulation of sorrow, in the depression that follows the breaking up a home long established. Indirectly flowing out of the losses of preventable sickness and death are a number of social problems. The close relation between sickness and inefficiency, between poverty and sickness is a correlation that has long been apparent to those who work in the field of the social agencies.

The very close correspondence existing between poverty and sickness is expressed by a recent report of the New York Association for Improving the Condition of the Poor. It shows that out of thousands of dollars spent in relieving destitute families, 96 per cent. was given to families who had to seek aid because of sickness or death in the family. The Charity Organization Society in a report[1] by the committee on the Prevention of Tuberculosis records the social study of 35 families suffering from tuberculosis. In one place the report says:

"Reclassifying these 35 families in an attempt to relate their economic dependency to their tuberculous condition, we find that:

"(*a*) Prior to tuberculous infection

Twenty-one families were apparently self-supporting;

Eight families were occasionally dependent;

Six families were chronic dependents.

"(*b*) After tuberculous infection

One family still apparently self-supporting (received sanitation outfit only).

Twenty-seven families received occasional relief.

Seven families were chronic dependents (*i. e.*, received some regular allowance, which was main support of family)."

From the Charity Organization report as well as from general facts of life it may be understood that there is a loss in dislocation of homes, in dependency, in human suffering not to be measured in economic values. Such

[1] Tuberculosis Families in Their Homes, p. 33. The Association of Tuberculosis Clinics and the Committee on the Prevention of Tuberculosis, Charity Organization Society, New York, 1916.

loss is no less real because it cannot be expressed in actual figures.

Estimated Losses.—Realizing that there are losses which cannot be computed, we yet may estimate the economic loss due to the death of persons from preventable causes.

After many balances, Fisher has arrived at a statement of the value of a human life as measured in dollars. The following gives these values:

At birth	$ 90.00
At 5 years	950.00
At 10 "	2000.00
At 20 "	4000.00
At 30 "	4100.00
At 40 "	2900.00
At 80 "	700.00
Average	$1700.00

Every year about 1,400,000 persons die in the continental United States,[1] and on Fisher's basis of preventability of 42 per cent. the loss in dollars would exceed $1,000,000,000. Just as we can estimate the loss that ensues when wages are not earned, so it should be possible to estimate with some degree of accuracy the economic loss due to sorrow, depression, inefficiency due to lack of physical vigor, and the other indirect losses associated with a condition of unfitness that is not usually classed as disease.

If we estimate the annual loss from deaths that are reasonably preventable to exceed $1,000,000,000, it does not seem extravagant to estimate that $5,000,000,000 would be representative of the loss that comes from persons not living at their best.

Revelations of the Selective Service Draft.—Recently the results of the draft examinations were available. The record indicates our national weakness. The Provost Marshal General's report shows the following:

[1] The Census Bureau's summary of the annual report on mortality statistics (pages 30, 31) shows 1,142,558 deaths as having occurred in 1920 within the death registration area of continental United States. The death registration area has an estimated population of 87,486,713, or 82.2 per cent., of the estimated population of the United States.

Total men called	3,082,945
Total examined by local boards	2,510,706
Total rejected by local boards for physical reasons	730,756
Percentage rejected of those examined	29.11

To this percentage of rejections by the local board should be added the rejections at the cantonments. The medical corps at the cantonments rejected from 2 to 11 per cent. of the men certified by the local boards. The total rejections must, therefore, be somewhere between 30.53 and 36.80 per cent.

If we applied Fisher's estimate of 42 per cent. preventability to those cases rejected by Draft Boards we should have over 300,000 additional men between the ages of twenty-one and thirty-one for service to the nation. The incompetence, the social maladjustments, the sickness, the early deaths in this 300,000 cannot all be measured. The blighting of hopes, the broken dreams of parents, of wives, the lowered vitality due to sorrows, disappointments, and failures cannot be measured. Putting the whole health problem on the economic[1] and social levels we find an imperative need not only to prevent sickness but also to improve the quality of life.

Factors in the Health Problem.—As we have seen, statistics show a great amount of preventable sickness, preventable deaths, lowered vitality, and general physical unfitness for life. Often the factors at work producing ill health appear hopelessly complex. Frequently a circle of unfortunate circumstances seem to inclose the individual, but in any analysis it will be found that individual health is the expression, on the one hand, of influences that started to act at the beginning of individual life, and, on the other, of influences that have acted upon the individual since that time. For discussion purposes these factors may be classified in three groups:

1. Hereditary influences (biologic);

[1] The political economist would make a more critical analysis of the worth of a human life than the one given here. Read Essays in Social Justice by T. N. Carver, Harvard University Press, 1916, pp. 173–202.

2. Conditions of the environment before birth and after (physical and social);

3. Reaction of the individual to environment (personal).

These factors are modifiable within certain limitations. They are also related. The way an individual responds to a situation is in part a matter of original nature and in part environment, but in a very real sense, also, it is a matter of education that has helped to form habits, that has favored certain attitudes, that has inspired ideals. This force of education gives direction to the response that is possible by nature and permitted by environment. The influence of these three factors will be considered separately.

Heredity as a Factor.—It is known that heredity contributes definitely to the vigor, vitality, or constitution of man. For example, it is known that certain races are more susceptible than others to certain diseases. In short, the germ-plasm of certain individuals contains factors that render those individuals more liable to early sickness and early death, or, as in other cases, to hardiness and longevity.

The force of heredity is indicated by Conklin[1]: "Furthermore, from its earliest to its latest stage of development it is one and the same organism; the egg is not one being and the embryo another, and the adult a third, but the egg of a human being is a human being in the one-celled stage of development, and the characteristics of the adult develop out of the egg and are not in some mysterious way grafted upon it or transmitted to it."

What the individual has at birth of vigor, of resistance to disease, of "constitution," is made up in largest part of what his parents gave him in the germ-plasm of which he is a development.

It is a very significant fact and to some persons rather discouraging that the individual is born into the world with certain capacities that mark the limits of his develop-

[1] Conklin, E. G.: Heredity and Environment, Princeton University Press, Princeton, New Jersey, 1917, p. 108.

ment. The biologic world is in essential agreement[1] that there is no transmission of characteristics that are acquired in the life of the individual, so that the child, with certain "chance" variations excepted, will receive from the parents only what the parents have to give in the germ-plasm which they receive from their parents.[2] It must be understood, however, that the development of any one person is conditioned by the environment into which that one comes, and one of good heredity may achieve less in real work and real success than one with heredity not so good, but placed in a better environment. Parents need to be concerned not only with the heredity they convey to their children but also with the sort of social and physical environment they prepare for them. Social and physical environment is often as valuable, and at times more significant, than the biologic inheritance. Health, strength, and vigor of the germ-plasm determine in a favorable environment the limit of individual achievement, but in an unfavorable environment the point reached is less than that which was possible according to the germinal promise. Society needs to be concerned not only with the biologic factors but also with the social and personal. For the individual all three are essential.

Environment as a **Factor.**—Health is an expression of the influence of heredity; it is also modified by environment. At times what appears as hereditary defect is really environmental. Many of the most serious obstacles to health are environmental. Such obstacles are more powerful as factors among the poor, although the economic influence in this respect is conditioned largely by ignorance.[3] Poverty and ignorance are inseparable

[1] Recent experiments indicate that some forces may be capable of producing inheritable defects. See Stockhard, C. R., and Papanicolaow, G. N., Amer. Nat., 150, 65, 144, 1916; Jour. Exper. Zoöl., vol. 26, No. 1, p. 119, 1918; Macdowell, E. C., and Vacari, E. M., Jour. Exper. Zoöl., 33, 209, 1921.

[2] McDougall, W.: Is America Safe for Democracy? Chas. Scribners Sons, New York, 1921.

[3] Metchnikoff, E.: The Prolongation of Life, pp. 39–84, G. P. Putnam's Sons, New York, 1908.

companions of disease, and when accompanied by defective heredity place formidable barriers in the way of fine living.

But unfavorable environment is seen not only among the poor. The environment may be unfavorable for the finest development of the individual even when the circumstances of life are otherwise fortunate. The "Poor Little Rich Girl" as a type represents the handicap under which the members of that class live. It is as difficult at times for a child of the Avenue to secure vigorous health as it is for the child of the steel mills; it is not so general because the latter situation is always productive of a lessened opportunity for development.

As common environmental obstacles to health we may note inadequate housing conditions, lack of opportunities for wholesome recreation, archaic factory and shop sanitation, prolonged hours of work, unprotected food and water supply of communities. All of these conditions may be corrected by legislation or otherwise regulated so as to leave no element injurious to health.

Certain aspects of the environment are largely or wholly beyond the reach of man. Such are climate, productivity of the soil, deposits of minerals, the plains or forests. They are not subject to legislation except in a regulatory way to prevent exploitation of valuable resources of the nation.

The Rôle of Legislation.—Society should provide the most acceptable environment possible. As regards housing, labor, recreation, food and water supply legislation is for this purpose a logical procedure. Laws may be passed and then enforced to secure abolition of tenements that are unsafe and unsanitary, to obtain opportunity for leisure and recreation, to prescribe the hours of labor, and to protect the food supply. Such legislation must be accompanied by education. Social welfare laws now on the statutes are less successful for their purposes today because relatively too little attention is given to educational propaganda. Education in the purpose and value of laws passed should accompany their application. Legal attack on all social problems without educational measures often results in disrespect for all law. Radical changes of custom may readily produce the sort of tyranny or lawlessness exhibited in Russia in the early months of the Soviet régime. Too much value should not be assigned legalistic measures for improvement of the environment. Certain socialistic groups in America, as elsewhere, are inclined to give too much weight to the potency of law or force in a human organization of man's environment. To write and pass laws in harmony with nature, to work with and not against nature's forces, involves an appreciation of life that esteems other things than the economic merely.

The Individual as a Factor.—How frequently or to what extent heredity is a handicap to health is not known. Nor has the full force of environment in controlling health been determined. The children of alcoholic, syphilitic, or tuberculous parents are presented at birth with health hazards. Homes in dark, damp places and work in insanitary trades and professions militate against vigorous health. Probably all of these environmental and heredity factors are infrequent risks compared to the more or less constant influence of the individual himself. As a factor in the health problem the individual and his response to all sorts of situations bulk large. Training, education—these are the great determining forces. That the personal factor is significant may be proved by the fact that the health problem is serious for many whose heredity and environment are both satisfactory. The finest heredity and the most favorable environment will not remove the health hazards for the following types:

1. One who believes that the body will care for itself in some way without giving it any special care or intelligent attention. One who understands that an automobile or a watch needs care and attention of a scientific and experienced kind, and yet gives no recognition to the claims of the human machine in this respect.

2. One who follows the promptings of instinct and lives on the plane of the lower animals. In matters of hunger, exercise, and sex this type is particularly prone to err in this regard. One who is often quite willing to attribute to man attributes of a higher being in all instances except hunger and sex. The failure to appreciate the rôle of intelligence in man in problems arising out of these instincts is in the main the cause for much of the gastric disturbances of the individual and the prevalence of venereal diseases in society.
3. One who fails to realize the high points that could be reached by living at his best. This type lacks ideals, fine standards, and habitual attitudes favoring wholesome forms of living.

Any one or all of these conditions may be existing in the life of any one individual, and yet all of them are modifiable by education and effort on the part of the individual.

The Necessity for Education.—The health problem will be solved only when education in all its power is brought to bear upon problems of human living. Legislation is helpless without its interpreting aid, and problems of heredity can be solved for man only by its sanctions. The social legislation of the day is ultimately dependent upon education for its success.

Opinion of society is expressing itself with reference to the marriage and propagation of the unfit in a very definite way. Appreciating the real danger to the health and vigor of the nation in the numerous children born of diseased and defective parents, society is attempting to make it difficult for those who are unfit to marry, or if married, to propagate their kind. The effort to control marriage is illustrated in the Eugenic Marriage Law of Wisconsin. This law is of insignificant value because it is easily and readily evaded, does not secure a blood test that would rule out syphilis, and is not accompanied by educational efforts to develop sanction for its provisions. Essentially, then, it is not worth a great deal because it has not quickened the citizens of the state to habits of response that would favor racial service and racial integrity above personal likes.

The sterilization law of various states is palliative, but justifiable, as striking at one side of the problem. It is worthwhile, but incomplete and partial. The positive educational factors upon which the law is drawn are neglected.

The efforts of society to provide for the repression of the unfit types and to promote finer and more desirable types must be built around the development of habits of control that will serve society.[1] There should be, unquestionably, among all people a stronger appreciation of the value of a strong biologic inheritance. This can be secured only by training and education in which certain social attitudes will be approved and the opposites disapproved. Such training and education of young people would make it impossible for strong types to "fall in love" with weak and wholly undesirable biologic types. Such training would not rule out love and romance, but would simply control through habitual attitudes the choices that would awaken love, just as habituation, the result of training with reference to races, makes it impossible in almost all cases for the white and negro to marry. There are from a biologic standpoint many marriages that are as catastrophic in their biologic effect as the marriage of white and negro may be socially. Such training of the young would make not only for health in the individual himself, but, in addition, would provide the basis for intelligent love in line with the principles of eugenics.

In A Connecticut Yankee in King Arthur's Court, the Queen, Morgan le Fay, responded to the Yankee's arguments against the murder of her page with the words,

"Crime!" she exclaimed. "How thou talkest! Crime, forsooth! Man, I am going to *pay* for him!"

"Oh, it was no use to waste sense on her. Training—training is everything; training is all there is *to* a person. We speak of nature; what we call by that misleading name is merely heredity and training. We have no thoughts of our own, no opinions of our own; they are transmitted to us, trained into us. All that is original in us, and therefore fairly creditable or discreditable to us, can be covered up and hidden by the point of a cambric needle, all the

[1] Anon.: The Glass of Fashion, G. P. Putnam's Sons, New York, 1921, pp. 137–166.

rest being atoms contributed by, and inherited from, a procession of ancestors that stretches back a billion years to the Adam-clan, or grasshopper, or monkey, from whom our race has been so tediously and ostentatiously and unprofitably developed."

The heredity and environment of Morgan le Fay probably were very defective, but her education had made it impossible for her to be other than what she was.

Lack of Education.—Much of the present need for public health work and many errors in personal hygiene are due to lack of education of a proper kind at the right time. It is a matter of common knowledge that often people resent the effort to improve living conditions. Organizations aiming at health values and providing health programs meet opposition in carrying out programs of health preservation. This opposition is less marked today than formerly, and it is reasonable to suppose that with more education in such matters it will cease to be a direct and active deterrent of health administration.

To this end the fact must be realized that the home and the members of the family are not laws unto themselves. The mother who sends a child to school when she knows he is not well will more and more receive the censure of the community, because in doing so she imperils the health of the other children in the school. Medical inspection in the schools to be reasonably successful must have the loyal co-operation of the parents of the school children. The education of the parent in proper attitudes toward society would help the parent to be as interested in preserving the health of the other children in the school as she is in expressing the maternal instinct for her own child. The infrequency of such response is a token of the lack of education in this regard.

The mother who is angry because the Medical Inspector advises that Johnny's teeth be filled, and the merchant who objects to the restriction of the Board of Health in withholding a license because his shop is insanitary, are individuals who lack a social education. Such individuals may be educated to avoid for themselves the causes of disease, but they are defective in social training. Their health is of some value in proportion as they are able to support themselves and cause no burden to the state, but as regards their ability to coöperate with society in advancing the best interests of all they are socially sick. The individual factor in health may completely overshadow the influence of heredity and environment. It is clear, therefore, that instruction in hygiene must be something more than stating the number of hours of sleep that man needs or the kind of clothes he should wear. Informational education is always necessary, but it must be made effective by habituation, proper attitudes, and ideals.

Health Rules Violated Because of Ignorance or Indifference.—At times young people violate health rules because of ignorance, and both young and old ignore health teaching at times because it conflicts with personal desires or with established habits. If ignorance alone were at the root of the trouble, we might expect great improvement in health status by an increase of health books in all schools and in every community. Those who work with young people in the hygiene field know that such a remedy, although helpful, would not be a complete success. Conferences with college students invariably show that they are acquainted with the knowledge of hygiene, but have no appreciation of its application to themselves. In an annual report (1917) by the Professor of Hygiene to the President of the University of Cincinnati there is the following statement: "Conferences with students have shown that while the individual frequently knows what is hygienic, he rarely makes the application to himself." Rules of health are helpful in proportion to their use. There must be habituation, and this can come only through training and education in which ideals have had a prominent part.

The Dynamic Force of an Ideal.—"To beat the Hun," "to win the war" caught the ear of a people awakened to the significance of a great drama in history. Catch phrases that adorned cheap posters they were, and yet expressive of a grim determination, fighting for lofty ideals. Out of the World War arose high idealistic motives that inspired many to become interested in personal health as an aspect of national service. During the war groups could be seen in more than one city cheerfully joining in a morning tramp to promote vigor, or following some special prescription dictated by a medical examination. Boy Scouts, Girl Scouts, and other young persons were similarly inspired. But the war did not last long enough to secure habituation in such modes of living.

Now the war is over! The great dramatic "hinterland" of "beating the Hun" is gone! Something else is needed to perpetuate and to carry on this spirit of service—an ideal that will give habitual attitudes on all problems of living, an ideal that will be above economic values or instinctive urges, an ideal that will secure maximum efficiency and achieve a level of performance above the commonplace! The answer to the health problem is concerned vitally, therefore, with a consideration of ideals and habits.

CHAPTER III

INTELLIGENCE AND IDEALS

Stages in Human Conduct.—The conduct of a man is determined by environment acting through various ways upon the original impulses, tendencies, or instincts of his nature. We may with profit distinguish, as McDougall[1] suggests, three levels of conduct, each of which represents successive stages to be traversed in turn. These stages are:

1. The stage of instinctive action in which original tendencies are expressed without modification, except that produced by the influence of pains or pleasures. Pain or pleasure in any situation is the determiner of conduct in this stage. The impulses to strike, to eat, to run away are expressed fully and completely if they give pleasure; they are inhibited if they give pain. This stage represents a maximum of nature acting and a minimum of nurture. It is found in most complete form among wild barbaric peoples.

2. The stage in which the tendency to instinctive

[1] McDougall, William: An Introduction to Social Psychology, John W. Luce & Co., Boston, 1918, Chapter VII.

action is modified by rewards or punishments. These rewards or punishments are usually administered by the social environment or, as in the case of certain religions, they may accrue after death. In this stage also the condemnation by society of individual action prevents the continuation of the act and tends to inhibit its initiation in the future. The control here is fear. Such control by society is necessary in the present state of the world. Values of significance to the group are thus protected and conserved from destruction by the instinctive action of the individual, oblivious of social welfare. Such control for the individual is entirely unsatisfactory, because when group judgment is not acting the individual is without sufficient guides. This stage is found not only in uncivilized society but also in recognized civilized states.

3. The stage in which conduct is controlled, modified, and directed by an ideal. Under the influence of ideals original tendencies to action are modified, strengthened, or weakened, so that the individual's conduct represents an expression of ideals. It is clear that such conduct will be called good, worthy, or right by society in proportion as the ideals serve high aims of social worth and significance. This stage is found among advanced members of civilized society.

Forces Determining Human Conduct.—The stages in human conduct show a progressive series leading from instinctive responses typical of the lower animals to the responses guided by ideals which are typical of the best in intelligent man. The problem of living finely and well, the particular problems of the health of man are expressions of the development of man in terms of these stages of human conduct. No adequate study of hygienic living can deal merely with hygienic rules because well-known hygienic rules are continually violated. Knowledge of the truth may still permit the dominance of instinct. To understand the forces determining human conduct lies at the very beginning of understanding the problems of living. Instinct and intellect together are shaping human conduct.

The Force of Instinct.—All men, apart from training, possess tendencies to respond in certain typical ways to certain typical situations. These tendencies to respond are inherent in the nature of man. Without training, this nature would appear to be a vastly different thing than most persons would imagine it to be. Thorndike,[1] in writing of the need of education, says, "If all human beings save newborn infants vanished to another planet, and if by a miracle the babies were kept alive for a score of years, preserving whatever knowledge and skill came from natural inner growth, and lacking only the influence of the educational activities of other men, they would at the age of twenty-one be a horde of animals." It is unquestionably true that any individual would be ashamed to be associated with the creature he himself would be by original nature alone. Man without the influence of training would show a truly barbaric type of conduct. The instincts of his original nature subjected to no modification would exhibit the cruelties, fears, and fightings of primitive man, and perhaps even of the lower animals themselves.

There is in every human action and in all human conduct the underlying impulse to primitive instinctive expression. For some persons the first stage, as described by McDougall, represents the extent of their development as members of human society. Moreover, it is doubtless fair to say that whenever human conduct is particularly selfish, personal, and unsocial, unmindful of the rights and needs of others, the original and less socially useful instinctive forces are having full play; and, conversely, that whenever human conduct shows a subjugation of the essentially selfish, instinctive tendencies to the needs of social life, the influence of training is uppermost and the instinct of man has succumbed to the intellect of man.

[1] Thorndike, E. L.: Education, p. 4, The Macmillan Co., New York, 1912.

The Force of Intellect.—Among barbaric peoples instinct dominates; among civilized peoples instinct is in continual warfare with intellect. In civilized society the child after birth is subjected to a variety of environmental factors, all varying expressions of man's intellect. Training (to include traditions, mores, etc.), education, nurture are the terms used to designate these factors. The quality and distribution of the environment determine the type of response seen in the members of society. The conduct of any one person is measured frequently in terms of his opportunities, other things being equal. To bring to bear upon the original tendencies influences that shall shape selfish conduct into unselfish conduct is the immediate aim of the social environment. To initiate such influences and to respond to such influences indicates the action of other than instinctive forces, in fact, indicates the operation of intellect.

The story of human development is a moving drama in which instinct and intellect with its ideals are the chief factors. Thorndike[1] describes the primacy of these ideals in the following passage:

"There is a warfare of man's ideals with his original tendencies, but his ideals themselves came at some time from original yearnings in some men. . . . Intelligence and reason are fit rulers of man's instincts just because they are of the same flesh and blood. They are not foreign conquerors, imposing a law that is better because it comes down from above. They are sons of the soil, as indigenous as hunger and thirst, chosen to rule because their laws mean the best harmony of all the instincts."

The Failure of Instinctive Guides.—Most of the original tendencies in man need the modifying influence of intelligence. Some instincts need to be strengthened, some directed into new channels for expression, and some that are of real worth to be curbed under certain conditions. The instinct of the mother to care for and to protect her

[1] Thorndike, E. L.: Educational Psychology, Vol. I, p. 311, Teachers College, Columbia University, New York, 1919.

child is a valuable instinct not only for the child but also for the race. But this instinct, while admirable in its intent, frequently results in disaster for the child. If the mother is ignorant of the cause of disease her original tendency may mean not protection for the child, but definite harm. The worthwhileness of an instinct is to be judged not by its intent, but by its results as measured in human life.

In general it seems clear that instinct alone is a failure in guiding human conduct. This is so for two reasons: the modern environment is vastly changed from the primitive in type, and the purely instinctive acts fail usually to appreciate the rights and needs of others.

The human environment has changed markedly, especially in the last two hundred years. It is becoming more and more complex and artificial, and provocative of unhealthful conditions in man. Instinct as a guide is lost in a crowded subway, in a modern restaurant, in apartment houses, in automobiles. The varied health problems that confront modern man require intelligence for their solution. This intelligence must show itself not only in the guidance of the individual through the maze of civilized forms but also in the formation by society of wise provisions for the welfare of all. Public health administration, medical inspection, scientific sanitation, instruction in personal and community hygiene, adequate opportunities and facilities for play and recreation represent an appreciable development of the intellect with reference to matters of health. Reliance on instinct to protect man from disease germs, to detect and cure disease, to properly care for waste and water supply, to know the proper way to live, or to develop adequately in an urban environment would be the height of folly. Instinct as a guide in modern civilized life is a failure because of the changed environment of man.

Instinct is a failure also because it does not appreciate the rights and needs of others. This is particularly true in manifestations of the sex instinct. This instinct, if left to itself, is primarily selfish, ruthless in its desire, unmindful of others. In lower animals under the conditions that existed in their development this instinct is useful, and thus directed by nature it is extremely serviceable to the species. The story of the sock-eye salmon in breeding season is an epic poem of self-sacrifice for the group. In man, however, this instinct if uncontrolled in the highly developed society of modern man is productive not only of disease and ill health but also of unhappiness and individual and social disaster.

Lower forms of life may be allowed to act on a purely instinctive plane, but it is becoming more and more impossible for man to be guided only by instincts, especially as these guides are in their effects so particularly personal and individual. This control of the instinctive impulses to action is the sort of thing that we may expect to come because of the evolution of the human being. The social and moral significance of such control is understood more and more by psychologists and sociologists. McDougall says, "While the lower forms of social conduct are the direct issue of the prompting of instinct, the higher forms of social conduct, which alone are usually regarded as moral, involve the voluntary control and regulation of the instinctive impulses."

Society must, therefore, by more authority in the regulations governing human actions provide that margin of safety that is not given by the thoughtless, the indifferent, and the mentally incapacitated. It must stimulate the development of intelligence as a guide, and must renounce, either as understood or as advocated, a theory of education that is based on instinctive response.

Intellect and Ideals.—To plan to live by intellect and not by instinct involves no negation of nature. Nature is expressing herself as well or better through intellect than through instinct. Thorndike[1] in enviable fashion says, "Intellect is of the same flesh and blood with all the in-

[1] Thorndike, E. L.: Educational Psychology, Vol. I, p. 310, Teachers College, Columbia University, New York, 1919.

stincts, a brother whose superiority lies in his power to appreciate, use, and save them all."

Not alone in man's ability to reason, use tools, and engage in constructive work is the intellect a mark of superiority over the lower animals but also by the ideals that arise as expressions of its activity. And the very ideals that guide and use the instincts for superior achievement in life arise out of the very matrix of man's intellectual life. To quote from Thorndike[1] again, "Its ideals are kith and kin of man's original hungers and thirsts and cravings. 'What are ideals about?' asks Santayana, with customary insight, 'what do they idealize except natural existence and human passions?' That would be a miserable and superfluous ideal that was nobody's ideal of nothing. The pertinence of ideals binds them to nature, and it is only the worst and flimsiest ideals, the ideals of a sick soul, that elude nature's limits, and belie her potentialities. Ideals are forerunners of nature's successes, not always followed, indeed, by their fulfilment, for nature is but nature, and has to feel her way; but they are an earnest, at least, of an achieved organization, an incipient accomplishment, that tends to maintain and root itself in the world."

Modern man and his barbaric brother differ in ideals or in the extent or range of their distribution. They differ in no other way essentially. But the very ideals that characterize the intellectual life of civilized man are useful for purposes of life only as they foster habitual attitudes, directing conduct. We do not have ideals to admire, or to talk about vainly, or to pray over. They are to modify conduct. In proportion as they help to form attitudes tending to lead to desirable responses are they significant.

Ideals are serviceable, then, according to the extent to which they direct action, especially as they foster habitual attitudes that lead to fine and noble responses. They are of relative value. An ideal of cleanliness for purposes of human society may not be worth as much as an ideal of

[1] Thorndike, E. L.: Loc. cit.

fair play. All men have ideals of a kind, but we recognize poverty or wealth in this sphere by the quality of the ideal that directs and controls. The usual socialistic doctrine with its philosophy of the belly gives scant recognition to ideals in comparison with economic factors as guides for living. In matters of health, economic values too frequently set the standard for hygiene. Thus, some persons will be interested in living hygienically because it is cheaper to keep well than to pay the expense involved in getting well, but such guidance is frequently ineffective because it is not capable of directing those who are willing to sacrifice health and to attain ends that are selfish and personal. This fact is well illustrated in the following experience:

A college student who was leaving college to enter a naval unit was recounting plans for the last night in a certain city. The plans involved drunkenness and vice in its most undesirable forms. I called to his attention the danger in loss of health through the debauchery of himself in alcohol and by the exposure to deadly venereal disease. His reply was characteristic of those whose conduct conforms to McDougall's first stage and who measure life in terms of economic values! "I'm willing to trade my health for the sake of these pleasures and entertainments." When I brought to his attention the obligation that he owed to the race for preserving the quality of health that he had so that he could pass it on at least preserved and if possible improved, he replied, "The race doesn't look after me, why should I be responsible to the race?" The problem was, then, not to give him scientific knowledge of hygiene, not to point out the economic loss due to venereal disease. He had the knowledge and he was willing to trade health for what he was inclined to call fun. The problem was to awaken in him a response to social values, to a spirit of chivalry toward not only women and men but also toward those who come after. Acutely it resolved itself into indicating the ways in which the race looked after him, and in arousing in him a sense of responsibility toward the race. He greatly needed ideals that would help to place him as an individual in the scheme of things.

The instinctive guide even when buttressed by economic supports may fail; it always fails in the crisis of life. McDougall[1] points out so clearly the fallacy in such control that it is worth while to quote him at length: "The regulation of conduct by the regard for the approval or disapproval of our fellowmen has certain limitations and drawbacks. In the first place the motives involved are fundamentally egoistic. Second, the approval or disapproval of our social circle cease to be effective sanctions of right conduct as soon as we can be quite sure that our lapse from the standard demanded of us will never be known to those in whose minds we habitually see ourselves reflected."

It is well known that the individual living on this low plane will not conform if there is no danger of being "found out." To remedy this defect many people have supplemented the sanction of public opinion with the theologic doctrine of an all-seeing eye—an omnipotent one who rewards and punishes. This doctrine is increasingly less potent today. For purposes of life we shall have to depend more and more upon ideals, and for purposes of health, *to live most and to serve best* may well satisfy the needs of health and the larger goals of life.

The problem of living finely is in part a problem of seeing straight, and seeing straight is nothing less than getting in touch and harmony with the great principles of law that rule the universe. One of these principles is the essential unity of life, and carries with it not only the inheritance of the past, but, for the individual, a real responsibility for future generations. This means ideals of a high order. To the intense individualist, to the selfish seeker of personal pleasures, and to certain types of socialists this principle means nothing.

[1] McDougall, W.: An Introduction to Social Psychology, John W. Luce Co., Boston, 1918, pp. 179–233.

It would have been helpful if I could have told my college student the story of Gloria Swann.[1] Gloria, a chorus girl, longed to be clever as she saw cleverness around her. After passing through a significant change of attitude toward life in which she sensed the relation of each individual to the race, she arrived at a great thought. One night she heard one of the girls of the chorus recounting a rather questionable experience of the evening before. It brought forth to Gloria's mind this contemplation: "Four thousand generations have kept the light burning for her, and now she's letting the wick go sooty like that."

The Problem of Health and Ideals.—It is important to emphasize the fact that the problems of hygienic living touch the whole life. Hygiene cannot be considered in water-tight compartments. The control of appetite, the development of habits, the selection of preferred forms of recreation are shaped by ideals. It is also important to emphasize that ideals must give rise to habitual attitudes. The way one responds today determines pretty largely the way one will respond tomorrow to the same situation, other things being equal. The power to show control in great moments is gained by the use of control in less significant times presenting like demands. Habitual response is the factor to reckon with. If the situation S, has been followed by response R, without annoyance, the bond S–R in the nervous system has been strengthened, and in the future S will readily give rise to R, other things being equal.[2]

Health habits are dependent upon this very law of neurone action, and ideals, in the service of health and fine living, must act by arousing a definite attitude toward definite specific problems. An ideal of health as a quality of life rendering the individual fit to live most and to serve best will foster attitudes serving the individual and the

[1] Weston, George: The Salt of the Earth, Saturday Evening Post, November 30, 1918.

[2] Thorndike, E. L.: Educational Psychology, Vol. I, Chap. XII, Teachers College, Columbia University, New York, 1919.

group. Both must be served. Abundant life and generous service are the hope of society. Alone either is worth very little.

A Social Ideal.—An ideal of social responsibility is the need of the times. Human conduct will be acceptable when the responsibility of the individual to society, to the past, and to the future for the whole of life has been met. Such an ideal of social responsibility is the need of education today. Communities and states and even the nation itself must reorganize education spiritually. This does not mean merely new attention to forms of worship, but it does mean emphasis on the religion of service for the common weal and a standard of social honor that puts the health and happiness of all first, and the individual needs or desires second. It is a question of attitude or mood in which we are taught.

Galsworthy[1] suggests the same thought when he says: "Now the sole hope that the future may be better than the past or present centers around the possibility of substituting for that bankrupt ideal (maximum production of wealth to the square mile) the ideal of the maximum production of health and happiness; for whatever the fashion of our speech and the complexion of our thought, this is not precisely the same thing."

Again he says, "If there be a saving way at all, it is obviously this: substitute health and happiness for wealth as a world ideal; and translate that new ideal into action by *education* from babyhood up."

An ideal of social responsibility must be a developed ideal, the result of education in the home and in the school. It is not instinctive, although it arises out of the same soil that provides the instincts. The evolution of the moral sense is essentially the carrying over from one generation to another of the modes of actions, the typical responses demanded by an organized society and con-

[1] Galsworthy, John: Where We Stand, Atlantic Monthly, February, 1920, p. 173.

sidered by one generation to be worth perpetuation in the succeeding one.[1]

In the lower animals there is no carrying over of moral codes and standards. Sacrifice of self for others, when it occurs, is an unconscious act; but in man such action, representing the finest expression of the moral sense, is conscious. Because man is conscious, a being of intellect, a fashioner of ideals, and because ideals are not inherited tendencies like the instincts, the teaching of ideals of social conduct is of tremendous importance for the welfare of the race, and is of more significance in race culture than mere legislative laws governing marriage, child bearing, and social behavior.

For the individual there is no essential conflict between what is good for the individual and what is good for the race. That program of living which is most wholesome for the individual is also most propitious for racial progeny.

An ideal of social responsibility strikes at the selfishness that leads to loss of health; it cuts right across the superficial and shallow in living and reaches down into the facts and truths of nature. In this sense it immeasurably enriches individual human life if values are not mixed. The woman who refuses to bear children because of some of the personal deprivations and losses that come has retained her maidenly figure perhaps; she has not missed the regular sessions of her club; she has not interrupted the round of parties, entertainments, and amusements; but she has lost in very vital ways by substituting a lapdog for the human offspring. Ultimately, therefore, the motive of social responsibility enriches life if one only sees straight. For the selfish, vain, and indolent, for the snob, feminist, and social parasite, the values that mean racial improvement, racial vigor, rich racial inheritance are not very appealing.

On the other hand, human culture, human improvement, hygienic and fine living will be guided by values

[1] Conn, H. W.: Social Inheritance and Social Evolution, Abingdon Press, New York, 1914, p. 77.

that root themselves in the nature of man as represented by the social evolution of the race. The growing social consciousness and sense of obligation to others that characterize man and mark him off from the lower animals is a fact of such importance that its full significance when applied to the problem of human culture has never been adequately emphasized. It is certain, however, that nothing very lasting will come out of the health movement so long as its appeal is selfish and directed merely at prevention of disease.[1] The spectacle of a nation having plenty of food and going without so that other nations could live was possible because of the great dramatic ideal presented by the World War. The continual dramatization in the schools of an ideal of race culture, of an ideal of social responsibility is a crying need of the times.

An Ideal of Social Responsibility Arises Out of the Nature of Life.—The ideal of social responsibility bears no false document of identity. It arises out of the very nature of life and human society. It serves faithfully the origin, development, and purpose of human life, because,

1. Each individual is a link in the entire chain of life,

2. Each individual is an heir to an inheritance of life, both biologic and social, and by the same token each individual is a trustee of the same goods for posterity, and therefore,

3. Each individual is responsible for the preservation of the quality of life received from ancestral stock and with other members of society, for the preservation of the social environment conducive to health and happiness. Moreover, this responsibility implies not only preservation of life and opportunities received, but whenever possible progressive improvement. Health as a quality of life challenges each individual to make that health finer, richer, more complete, and abundant; it challenges men and women to preserve wholesome opportunities for living and to make them increasingly more abundant and useful.

[1] Paton, S.: Human Behavior, pp. 160–212, Charles Scribner's Sons, New York, 1921.

To make clear the full implications of the above statements is a matter of importance.

Each Individual is a Link in the Chain of Life.—If we trace life back through the countless ages of the past we find one fundamental fact of nature. The impulse of life, of living matter represented in each individual, is an impulse forging for the period of that one's life a link in the chain of all life.[1] So numerous are the links and so varied the chain that one is inclined to consider one's life as the beginning and end of the life one represents. Such is not the case. The individual represents many forces that have worked in the lives of his ancestors, and in a way he represents a mosaic of them. If it is a beautiful mosaic, it is strongly incumbent upon him to preserve its lines and colors, and if possible to so care for this inheritance that it will be improved with age. Such an inheritance one should value more highly than the inheritance of a silver spoon in the family for generations, or a social position attained by chance and held with difficulty.

On the other hand, if the mosaic be cracked, here is an obligation indeed. It must not be injured more, and if possible the defect should be remedied. Such an inheritance may be improved by proper living; perchance, by proper marriage the defect may not be so marked in the next generation. In any case, in the field of human life, there is a wonderful laboratory for the performing of experiments in which there can be adequate controls, sufficient guidance, and definite records.

Each Individual is an Heir to the Inheritance of Life.—It is only a step from the appreciation of the fact that the individual is a link in the chain of life to the comprehension of the importance of this fact for a generation and a nation. We, citizens of these United States of America, today are laying the foundations for the life of those who shall live in our places and do the work we have been doing. We have been concerned recently with

[1] Bergson (Henri), in his Creative Evolution, expresses the thought given here. He elaborates and develops it in a most satisfying way.

keeping liberty alive in the world, with preserving the unity of this nation, with making "the world safe for democracy."

We have preserved our liberty and our unity, we have helped make the world safe for democracy, but it is also important that we assign to our heirs not only freedom from political slavery but also freedom from the ravages of disease; not only freedom from aggression by an arrogant military power but also freedom from insidious drains on our vitality.[1]

Responsibility for Life.—Acceptance of the biologic relatedness of men and women[2] and the inheritance of life possibilities lead logically to a standard of social responsibility. *To live most and to serve best* is to recognize this standard. But the sense of responsibility for others must not become a meddlesome habit of benevolent paternalism. The individual must achieve health and happiness; they are not to achieve him. The control by organized society should be exercised only to protect the majority in matters approved by the majority. Members of society who cannot respond to approved standards of living either must be helped to respond acceptably or made harmless to prevent the realization of effective living by others.

Autocratic principles in the service of others suffer in a modern world the fate of autocracy everywhere. But where control is clearly needed and clearly sanctioned, as in communicable diseases, purity of food and water-supply, sanitation of public places, care of excreta and garbage, there should be no half-hearted acceptance of the responsibility. Such administrative control should be accompanied by educational efforts to sanction and secure the gains for the group.

Ideals are not always immediately achieved. Woodrow

[1] Williams, J. F.: The Health Problem from a New Angle, Educational Review, January, 1920. McDougall, W.: Is America Safe for Democracy? Charles Scribner's Sons, New York, 1921.

[2] King, H. C.: Rational Living, The Macmillan Co., New York, 1914.

Wilson went to Versailles in 1918; the Washington Conference was held in 1921. To work toward ideal and intelligent controls that will overcome superstition, ignorance, and the unworthy instinctive impulses in man is the path to progress. But inability of any group to rise to the heights of idealism involved in the solution of a problem may make it necessary for the Federal Government to step in and protect the individual as an asset of the state. With the Government the holding of ideals is just as valuable as for the individual. It is important to state, however, that ideals exist for government in proportion as they serve to guide the people of a nation. We call this force that shapes laws and regulations public opinion. Public opinion is forceful, it is powerful, and yet it is so simple that when once the people of the nation find themselves holding with conviction an opinion, an ideal, in a very short time it is translated into law.

It is conceivable, therefore, that an ideal of social responsibility may become so forceful in individual lives, and a conviction concerning human duty may become so strong, that there will result not only improved personal living but also more effective sanitary control of disease, more thorough and complete health work in the schools, desirable improvements in housing laws and regulations, increased protection for workers in hazardous trades, and better methods for controlling the appalling death-rate of infants. Ideals should mean more and not less health; more and not less happiness.

An Ideal of Social Responsibility Serves All.—The ideal of social responsibility involves no real hardships, but it presents no royal road. It will always lead the way to new accomplishments, sometimes by new roads through unbroken ground, sometimes by connecting old pathways. It will doubtless help to correct some prevailing attitudes. For youth and for old age happiness is held in high esteem, and for some an ideal of responsibility to society smacks of all that is destructive of happiness as they know it. These foolish ones think of happiness in terms of dance halls, horse races, and lobster palaces. They spend their energy to produce wealth with the avowed purpose of buying amusement which they call happiness. They miss the subtle fact that happiness cannot be bought, that it cannot be conferred; that it must be earned, it must be won. Though they travel over the earth to find happiness, they will miss it unless they carry it with them in their hearts. Happiness, like health, flows from life as a by-product of activities that are worth while and satisfying.

But for both youth and old age an ideal of social responsibility may have real meaning. To the youth able biologically to preserve and to pass on to future generations desirable human qualities, such an ideal comes as a challenge that he may accept, knowing that he will need all that he possesses of fortitude and courage. To the one who has passed the meridian of life the appeal is concerned chiefly with the influence of living that is to be exerted and with the preservation of the best treasures of the social inheritance. Custom, tradition, the *mores* of the people are powerful forces determining largely the kind of response that posterity will give. Social inheritance is as important as the facts of organic heredity.[1]

For both, young and old, such an ideal will quicken and give meaning to life. Both may become interested in passing on an inheritance, biologic or social, that shall be a fulfilment of trusteeship. To bequeath to immediate or distant offspring biologic and social jewels is incomparably superior to the oft valued bequest of battered silver spoons, pewter plates, or old clocks.

The Significance of Social Pressure in Relation to Ideals.—Ideals vary. Some persons have many, some have none; and no one is compelled to hold any particular ideal and no one can force an ideal upon another. Ideals are achieved; they belong; they can never be legislated into being nor made to live by edict or pronouncement.

[1] Huntington, E.: Civilization and Climate, pp. 35–48, Yale University Press, New Haven, 1915.

And just because this is so we shall have need often to remind ourselves of this variability in human beings. In such fashion we shall want to reinterpret that hallowed phase of the Declaration of Independence that "All men are created free and equal." Now, the facts are just the opposite. Persons are not equal at all. They have varying capacities for growth and development. In a sense we are equal before the law, but to say that political equality alone is meant begs the question, since "I am just as good as you are" accurately depicts the common attitudes on equality. It ought to be quite clear that equality is not conferred nor provided by government. Equality, like so many precious things in life, must be won. The only test is that of worthy achievement.

Since ideals cannot be compelled, but must be won, since equality cannot be conferred, but must be achieved, since happiness cannot be bought, but must be earned, since all the worthwhile things of life come from living in the right way, it is important that society be careful to provide for each individual the most appropriate and best life opportunities possible. Such provision may require social pressure by the group.

In speaking of the aims of education—some might call them ideals—Thorndike[1] with characteristic clearness describes the way social pressure is commonly exerted. He writes:

"No one is compelled by any inner necessity to accept as his aim in education for himself or his fellow-men the improvement and satisfaction of human wants—the cultivation of a good will, impersonal pleasures, knowledge of things and men, habits of open-mindedness, and physical and mental efficiency, and only the best individuals do accept these aims. Fagin tried to debase Oliver's wants and to satisfy his own at the cost of everyone else's. Manufacturers may try to fit the children of a community to be nothing save efficient workmen. Baptists may plan

[1] Thorndike, E. L.: Education, p. 14, The Macmillan Co., New York, 1912.

their schools in utter defiance of Methodist and Presbyterian wants. A parent may count the satisfaction of his child's vanity above the satisfaction of a hundred other children's rights.

"Social pressure is required to prevent folly and injustice in education as elsewhere. Fagin can, if he likes, consider no wants save his own, but all men acting together can, if they like, hang him therefor. Parents may, if they like, consider no wants save their child's, but other families can have that child expelled from the school, or the parents from the community. Manufacturers can vote to take money from high schools for trade-schools, but others vote also. The state can suppress sectarian schools altogether if it thinks that an unfair discrimination among wants is made by them."

Ideals are essential for the realization of the best in life; they are, therefore, essential for all living. They are, in the intelligent life, well supported by truth, by the facts of life. They keep their feet on the ground. They do not confuse the *ought* and the *is*, but by using the materials of life they seek constantly to achieve higher levels.

CHAPTER IV

THE APPROACH FOR KNOWLEDGE OF HEALTH

The Science of Hygiene is Based on the Facts of Man's Nature.—In order to understand the kind of food best suited to man, the needs of the physical organism, the way in which the mind works, the manner in which bacteria and parasites grow in the body, it is necessary to know the kind of organism the human body is, its mode of development from lower forms of life, its origin from those forms, and the way in which environment has molded and controlled the development of the body. The science of hygiene must, therefore, be based upon the knowledge of the nature of the human organism if it is to be something more than tradition, custom, and superstition. It is interesting in this respect to remember that the beliefs of many peoples regarding the care of the body are not scientific, and in proportion as they are merely traditional they are of less value in producing hygienic living. Beliefs among the more ignorant negroes, the peasant Chinese, the wild tribes of Borneo and the Philippines instance the influence of superstition as a guide in living. The ignorant negro will give more credence to a superstitious belief, as a rule, than to a scientific viewpoint. This is due to the comparatively short period this race has been in contact with forces of education. It is interesting in this connection to note that negroes in college and university, representing as they do the highest types of their race, accept and practice as faithfully the dictates of science as the more socially favored white races.

The Biologic Basis of Life.—To understand man's nature it is essential to know the biologic basis of man's life, and the way in which he attained unto the kind of being he is today. The simplest and lowest forms of animal life are the Protozoa. These are single unicellular organisms and represent in structure the units of structure in the human body. As life evolved higher forms we see at a higher level the group of animals called the Cœlenterata, examples of which are hydras, sea-anemones, jelly-fishes, and coral animals. They are so-called because they are distinguished by having a cœlum, or body cavity, which serves as a digestive sac. Such tissues as nerve and muscle are not present, or very poorly developed, and the systems of circulation, respiration, and excretion are entirely absent, although the functions of these systems are carried on.

At a still higher level in the scale of development of life-forms emerges the type illustrated by the lower flat worms. Here for the first time appears muscular tissue in significant amount. The muscles are arranged in circular and longitudinal fashion around the trunk of the worm and serve for locomotion.

The appearance of the muscular system increased the range of locomotor activity for the animals so endowed; it made possible a richer environment; but it required marked specialization of the body cells. In proportion as the muscle cell gained ability to do specialized work it lost ability to care for all the processes that are required in living tissue.[1] This specialization of certain cells required that other cells take up the work of supplying the muscle cells with food and of removing the waste occasioned by their activity. Thus it is that special cells appeared to furnish the food and oxygen needed by the

[1] Bigelow, M. A. and A. N.: Introduction to Biology, The Macmillan Co., New York, 1913, Chap. II.

5

muscles, and other special cells took unto themselves the work of removing the waste. This is the beginning of the circulatory and excretory systems.

Professor Tyler[1] expresses this change when he says, "We must never forget that the development of the muscular system carried with it, or dragged after it, the development of our most important viscera, kidneys, lungs, heart, and blood-vessels and, as we shall see later, of the brain itself."

The contraction of muscle is dependent upon a stimulus that will cause it to act so that muscle cells required the addition to the very simple nervous system of corresponding nerve-fibers. The increased power of locomotion brought the animal into new environment and new situations, and from now on through fishes, reptiles, lower mammals, as the cat and dog, arboreal mammals, as the ape up to man, the whole history of the developing life is the history of an increase in complexity and function of the nervous system. The brain, as the final and most complex structure to develop, presents an organ of wonderful usefulness to man. It exercises control over the other centers of the nervous system and hence over all the parts of the body. Part of this control goes on without the knowledge of its action on our part and irrespective of our will in the matter. It is impossible to make the heart stop beating by thinking or to make the liver secrete bile by reading about it. This control over the vital organs of life is automatic and involuntary, and although we know conditions that would modify the type of reaction that occurs, we are limited greatly in an effort to guide the response. We have through the development of consciousness and the will a certain power over the muscles of the body and, in accordance with the way in which the organs of the body arose, we are able most effectively to reach their processes through the action of the skeletal muscles of the body.

[1] Tyler, J. M.: Growth and Education, Houghton Mifflin Co., Boston, 1907, p. 26.

The outline given here aims to be brief, and yet the facts are so important that they must be adequately stated. For this purpose we quote Tyler[1] again:

"The human body is composed of many distinct systems and organs, all indissolubly united in one organism, where 'every part is at once means and end to every other part.' The health and life of the whole organism may be disturbed or destroyed by the weakness of any one of these numerous parts. What we often call the lower organs, the viscera, are absolutely essential to life, and hence by far the most important. They are fundamental as well as essential. Anything which disturbs our digestion or the removal of waste equally disturbs the clearness and vigor of our thought. Every part must be of the highest possible efficiency. One great aim of education should be to 'make the weakest part as strong as the rest.' If there is to be no schism in the body the organs must be properly balanced in weight and power. Otherwise the overgrown part robs some other organ of its fair share of nutriment, and throws upon it burdens which it cannot bear. If any part is, for any reason, to be exposed to excessive strain, that part must be fortified and strengthened during its period of growth in early life. But every other part should be correspondingly strengthened to back it up in its emergency.

"It is hardly possible that in so complex a being as man all parts and organs should develop with equal rapidity at one and the same time. . . . We should expect to find that there is a special time for the rapid development of each organ. We should naturally expect that the more fundamental organs, like those of digestion, excretion, and respiration, will develop early to meet the needs of other growing parts, and that some will be held back to give time and opportunity for this important process.

"We cannot fail to notice the immense amount of time devoted by nature to the development of the muscular system. Why did she linger so long over it before going

[1] Tyler, J. M.: Loc. cit., p. 38.

on to the development of the brain, especially of the cortex, with its mental powers? Evidently it must be of far greater importance and have far larger latent capacities than we have usually supposed. The muscular system is the strategic center, so to speak, from and through which we can reach, exercise, and strengthen the intestines, lungs, kidneys, and all the organs essential to life, but which are beyond the direct control of the will. Hence the sturdy vigor of our ancestors and the dangers of a sedentary life.

"We have found that different portions of our muscular system have arisen at different ages, and that they grow younger as we go out from the trunk to the ends of the fingers and downward to the toes. The central and fundamental are older than the peripheral and accessory."

Professor Tyler describes how these muscles are controlled by nerve-centers, and explains that the centers in control of the muscles of the trunk are older, tougher, and have more endurance than those of the muscles of the extremities. To quote him[1] again:

"Therefore we are not surprised to find that the best physiologists insist upon the fullest possible development of these fundamental centers. They are the seats of endurance which enable us to hold out against the strain of modern life, especially in the hurry and fret of our great cities. They must be strengthened at all cost in the children of parents who show any signs of traces of nervous weakness, in all the children of the business and professional classes, and in those children who will later enter these lines of work. The high-strung American girl needs this preventive and developing treatment more than any other form or kind of education. No child can have too much of it, and in every case it is far better to have full enough than too little."

Evidence from Biology a Guide for Hygiene.—It is of very great importance to point out that the digestive system developed in relation to needs arising in the body,

[1] Tyler, J. M.: Loc. cit., p. 41.

chiefly the needs of the muscles. It used food that was altered little before digestion. However varied in kind the food was among different races of man, it nevertheless retained in all a prevailing coarseness and simplicity. Civilized man has changed both his physical life and the character of his food supply. It will never be possible for him, as he is constituted, to live an essentially vigorous life and digest his food with ease and efficiency, without a wholesome participation in physical activity and without the use of natural food. A good deal of discomfort and lack of appreciation of the problem of feeding the human man would be avoided if this simple principle were understood and acted upon. It is interesting to read what James[1] says regarding the development of a type of man that will not require a strong muscular system and will be free from adequately chewing coarse wholesome food. His description of this type follows:

"I recollect years ago reading a certain work by an American doctor on hygiene and the laws of life and the type of future humanity. I have forgotten its author's name and title, but I remember well an awful prophecy that it contained about the future of the muscular system. Human perfection, the writer said, means ability to cope with the environment; but the environment will more and more require mental power from us, and less and less will ask for brute strength. Wars will cease, machines will do all our heavy work, man will become more and more a mere director of nature's energies, and less and less an exerter of energy on his own account. So that if the *homo sapiens* of the future can only digest his food and think, what need will he have of well-developed muscles at all? And why, pursued the writer, should we not even now be satisfied with a more delicate and intellectual type of beauty than that which pleased our ancestors? Nay, I have heard a fanciful friend make a still further advance in this 'new-man' direction. With our future food, he

[1] James, W.: **Talks to Teachers on Psychology, H. Holt & Co., New York, 1918.**

says, itself prepared in liquid form from the chemical elements of the atmosphere, pepsinated or half-digested in advance, and sucked up through a glass tube from a tin can, what need shall we have of teeth or stomachs even? They may go along with our muscles or our physical courage, while, challenging even more and more our proper admiration, will grow the gigantic domes of our crania, arching over our spectacled eyes, and animating our flexible little lips to those floods of learned and ingenious talk which will constitute our most congenial occupation."

Contrariwise, the future of *homo sapiens* will depend neither upon his ability to do without exercise nor to subsist upon tablets of food elements, but rather upon his ability to harmonize the demands of his biologic nature with the requirements of civilized life.

Professor Snedden[1] has pointed out some of the significant changes in civilization that bring to the biologic organism serious demands on its adjustment capacity. He says that man

1. Early took on erect stature and ceased vegetarianism.
2. Disposed of hair and took on clothing.
3. Ranged the world and assembled many kinds of pathogenic bacteria.
4. Took to work which overtaxes eyes and nerves.
5. Developed much "sitting," thus encouraging insufficient use of torsal structure.
6. Developed concentrated and cooked foods, thus encouraging partial atrophy of teeth and jaw structure.
7. Developed means of artificial heat, thus reducing climatic stimuli.
8. Lives much under cover, thus reducing stimulating or chemical values of air breathed.
9. Has postponed marriage, thus imposing a period of severe sexual strain between sexual maturity and time of approved marriage.
10. Has developed routine toil instead of the intermittent work of the ancestors.
11. Has made of some men (formerly) and many women creatures of decoration rather than useful social functions.
12. Has substituted for the close concrete fears of the primitives the "long range" intellectualized apprehensions and solicitudes (worries) of provident life.

[1] Unpublished lecture delivered in Summer Session, Columbia University, 1921.

It is not important to agree with all of these suggested changes, but it is important to *understand* that modern life has thrown upon the biologic organism severe strains, and to understand further the fundamental needs for the preservation of the health and vigor of the body.

The Human Body and its Adjustment.—The biologic evidence indicates that man's evolution has brought an inheritance of structure and function that requires thoughtful care and attention by the individual and society to devise ways and means of meeting the artificial conditions imposed by civilization. The experience of man indicates everywhere that the fundamental biologic needs cannot be ignored. Fortunately, the increased interest in health today is helping to overcome some of these environmental handicaps. One may be the veriest tyro in hygiene and yet know of the efforts everywhere to combat the dangers that Snedden suggests. The interest in posture, the era of wholesome dress, the development of serums, the establishment of isolation measures, the play and recreation movement, the crusade against the sedentary life, the agitation for coarse, wholesome food, the open air and camping programs, the keen interest in and study of social hygiene, the emphasis on the importance of physical work, the recognition of athletics for men and women both, the development of instruction in mental hygiene—all attest to the appreciation of the problems presented by civilized life. It is most fortunate that these movements are adjustive, that they are based on biologic needs, and are not trying to develop a type of man like the one to which William James has referred. Many of the false standards of civilization with their emphasis on the maximum production of wealth will be changed. The biologic adjustment will be made easier with the advent of more rational attitudes.

The Human Body an Energy Mechanism.—The ability of the body to adjust itself to new situations as well as to function properly in old and familiar ones is related to its ability to release and use energy. The individual with abundant energy may not always meet the problems of living satisfactorily either from a personal or social viewpoint, but surplus energy is a necessity for the best volitional control and, hence, for rational action. Its release and expenditure determine largely man's ability to adjust to the various problems presented in complex modern life. The energy aspects of life are set forth clearly by Osborn[1]:

"So far as the creative power of energy is concerned, we are on sure ground! In physics energy controls matter and form; in physiology function controls the organ; in animal mechanics motion controls, and in a sense creates, the form of muscles and bones. In every instance some kind of energy or work precedes some kind of form, rendering it probable that energy also precedes and controls the evolution of life."

For a long time the body has been considered as an organism with ability to receive, store, and express energy. The manifestations of life in action have always appealed as energy manifestations, but the known and unknown chemical reactions going on in the body, while seemingly on an energy basis, have never been fully understood. The phenomena of growth and development have always been obscure even when we had information about hormones and the power of certain internal glands to control the metabolic changes going on in the body. It is extremely valuable to set forth the way in which this control is exercised. Obsorn says, "every physiochemical action and reaction concerned in the transformation, conservation, and dissipation of energy produces also, either as a direct result or as a by-product, a physiochemical agent of interaction which permeates and affects the organism as a whole or affects only some special part."

By an agent of interaction is meant a force connecting the force of action and reaction. It refers to what is going on between parts and is similar in type to the interaction

[1] Osborn, H. F.: The Origin and Evolution of Life, Charles Scribner's Sons, New York, 1919, pp. 10, 11.

between a driver and a driven horse by means of the reins. A nerve impulse in this sense is an interacting agent, since it connects the action of a distant nerve-cell with the response of a muscle in vigorous contraction. A hormone produced in cells in one part of the body and passing in the blood may affect the activity of cells far remote. Osborn[1] goes on to say:

> "Through such interaction the organism is made a unit and acts as one, because the activities of all its parts are correlated. Since it is known that many actions and reactions of the organism—such as those of general and localized growth of nutrition, of respiration—are co-ordinated with other actions and reactions through interaction, it is but a step to extend the principle and suppose that all actions and reactions are similarly co-ordinated; and that while there was an evolution of action and reaction there was also a corresponding evolution of interaction, for without this the organism would not evolve harmoniously."

To quote Osborn[2] again, "Evidence for such universality of the interaction principle has been accumulating rapidly of late, especially in experimental medicine and in experimental biology."

The experiments of Morgan and Goodale bear this out. Loeb,[3] in his recent book, Movements, Tropisms, and Animal Conduct, shows the evidence from the biologic laboratory. The actions of animals are determined by the influence bearing upon the many sensory receptors. The response to the stimulus is determined by the energy available. These facts mean for those who would live most and serve best that energy should be abundant at all times as a guarantee of the best adjustment, the best choice.

It should be noted further that the tissues and organs of the body are especially adapted to receive, store, or express energy. This characteristic is especially valuable, for it enables a balance and control to exist in the body without which there would be no harmony either in

[1] Osborn, H. F.: Loc. cit., p. 16.
[2] Ibid.
[3] Loeb, J.: Forced Movements, Tropisms, and Animal Conduct, J. B. Lippincott Co., Philadelphia, 1918.

development or in action. Osborn[1] again states this point in excellent phrase:

"All visible tissues, organs, and structures are seen to be the more or less simple or elaborate agents of the different modes of energy. One after another of the special groups of tissues and organs are created and co-ordinated—organs for the *capture* of energy from the inorganic environment and from the life environment, organs for the *storage* of energy, organs for the *transformation* of energy from the potential state into the states of motion and heat. Other agents of control are evolved to bring about a harmonious *balance* between the various organs and tissues in which energy is *released,* hastened or *accelerated,* slowed down or *retarded,* or actually arrested or *inhibited.*"

The method of energy manifestations is being gradually explained and understood. We are beginning to understand that all actions and reactions, dependent for their power upon energy, are co-ordinated; they control and modify the organism in accordance with the influence that the particular actions give. This gives us the scientific background for the teaching that our actions today determine in a very definite way the kind of response we will give tomorrow. This has been stated by Bergson[2] and some time ago by James. James says[3] in this connection:

"What he shall *become* is fixed by the conduct of this moment."

Energy plays an important part here, especially in all ethical situations. To quote James again:

"The ethical energy par excellence has to go farther and choose which interest out of several, equally coercive, shall become supreme."

Thus energy, abundant energy, lies at the very root of life. It fixes largely the choices made; it qualifies the vision. Only with abundant energy co-ordinating the body functions is the immediate thrusting appeal of the moment turned aside for the distant view, the higher goal.

The more recent studies in medicine, biology, physics,

[1] Osborn, H. F.: Loc. cit., p. 17.

[2] Bergson, H.: Creative Evolution, H. Holt & Co., New York, 1913, pp. 34, 35.

[3] James, W.: Psychology, H. Holt & Co., New York, vol. i, p. 228.

and chemistry indicate, therefore, that the human body is not to be thought of as an aggregation of cells and organs that act irrespective of the control afforded by an interacting mechanism, but rather should it be considered a unified whole, guided at times by a circulating substance in the blood, at other times by an impulse from nerve-cells. There may be other ways in which the control and balance of the body is maintained, but at present we are familiar only with these forms. The human body, like all bodies for that matter, is an energy mechanism. It acts without reference to its size and is, except in the case of some muscular actions, not dependent upon its size. The amount of released energy in the individual is dependent more upon the activity of his nerve tissue and the character of his internal secretions than upon his height or weight. The human body is dependent upon the same food sources for energy that serve the other animals, and the availability of these sources controls in large measure the amount and character of the energy expressed in the life of the individual.

Sources of Energy.—Ultimately the source of all energy for man is the sun, according to the theory of photosynthesis. Lavoisier and de Saussure laid the foundation of the understanding that the action of solar heat and light is a perpetual source of living energy. But for man it is perhaps equally important to recall the following conception of the cycle of elements that passes through plants and animals: The animal is sustained by the plant and the plant, in turn, is dependent upon the animal for the waste that forms the source of certain essentials in plant metabolism. The energy of the sun is captured by the plant through the chlorophyl and is stored in food.

The plant with chlorophyl is able through the action of the solar energy to form carbohydrates. In addition, fats and protein are manufactured in the plant and mineral compounds are absorbed from the soil. The chlorophyl action is very interesting. The leaves of the plant with chlorophyl in the presence of sunlight separate oxygen atoms from the carbon in the molecules of carbon dioxid (CO_2) and hydrogen atoms from the water (H_2O), storing up the energy of the hydrogen and carbon products in the carbohydrate substance of the plant.

In this way the starches and sugars of the plant deposit their stored energy in the tissues of the plant. Such energy is avilable for the animal and will be released to the animal by the addition of oxygen in the cells. This is an important fact, that the energy of food requires oxygen for its utilization and will be released when oxygen is brought in contact with it. It is thus seen that the energy of the sun transformed into the chemical potential energy of the elements, carbon, hydrogen, and nitrogen, is transmitted by the addition of oxygen in the animal into motion, heat, or functional activity of glands.

The sources of human energy, therefore, are the plants and oxygen. Other animals serve to yield food energy for man, but they, in turn, are dependent upon this same source. An understanding of simple plant physiology, therefore, frees us in part from the exigency of attributing to a mysterious power the phenomena of growth, development, and action.

But are there other sources of human energy than those involved in the chemical action and reaction that approximates the test-tube experiment, and are we left in a hopeless materialistic position if we are unable to attribute to a Supreme Power the actions of life and the phenomena of growth and development? In many ways we are immeasurably enriched, because we are not acting on supposition, but on fact as determined by experiment.[1] We have no need to postulate mysterious forces either to explain man's action or to interpret the record of his growth. The mechanisms[2] available in man and sensitive to the changing situations in life are capable of releasing energy at moments of great demand. Proper attitude

[1] Conklin makes an excellent statement of this view with reference to development of the body in Heredity and Environment, pp. 43–51.

[2] Cannon, W. B.: Bodily Changes in Pain, Hunger, Fear, and Rage, Appleton & Co., New York, 1916.

toward any situation will result in the proper response, and for this response the whole of life is prepared to act.

It is important to state, therefore, that we have no evidence that there is any force acting on the body to determine its response except as it acts by stimulating the varied mechanisms of the body. Thus any situation that produces a state which is called emotion also produces profound internal changes in the body which are a part of the response. The enormous strength exhibited by man under the influence of a situation provoking the external signs of fear or anger is not due to any force that has entered the body, but to a group of internal changes characterized by a free release of energy that was present in the body all the time.[1] A Supreme Power does not act by bringing some force into the body, but through our response to situations of stimulating character we may be aroused to release in any particular effort more than we habitually expend. Most people have little appreciation of the tremendous power they possess, and many people spend their whole life without at any time calling on those great energizing mechanisms which result in great achievement. A corollary of this is that most people never live up to the highest level of their best, and, as a rule, fail to appreciate what health, happiness, and love really are. We can hope for a great increase in effective living when more people bring into their lives the powerful and stimulating forces which enable them to release and transform energy that the body possesses into the doing of a really important work and the living of a really effective life. The strongest and most powerful forces in this respect are ideals of service. If the ideal of social responsibility really belongs to one, its value will be seen in real achievement.

The health of a man and his best welfare cannot be determined by a mechanical or materialistic test. In the working out of any scheme for the development of the best in the individual full appreciation must be given to

[1] Cannon, W. B.: Loc. cit.

those indirect factors that profoundly influence the conduct of the individual and always determine results in the final analysis. The human mechanism, while made up of organs and cells that receive their energy from the sun through the plants in the same way that cells in other animals receive their energy, is in man nevertheless subject to a different kind of control. It will be important to keep this point in mind because the solution of many of the problems of living is dependent upon an understanding of the emotional and psychic factors involved in health, and the power of intelligence in maintaining health. "What we wish to insist on is that man's intelligence is a fact, that it is immensely and in effect immeasurably superior to the intelligence of the lower animal, and that this intelligence can become the significant guiding factor in man's conduct."[1] The realization of the essential chemical character of man need never exclude an appreciation of the fact that this chemical character is one that is controlled by a nervous system that has given to us intelligence and ideals, both a promise of God in man.[2]

The Value of the Biologic View.—When it is recalled that exercise, food, air, rest, sleep, and bathing form a very large part of the subject matter of hygiene, we realize the value of looking at the body from a biologic point of view. The story of animal life must never be forgotten. The primitive cell, as represented in such an animal as the Protozoa, is able to move, to gather and digest food, to take in oxygen and expel the waste, to rest and keep itself free from the poisons that would most readily injure it. This organism combines in one cell all the functions that man must care for in different systems of the body, but man is just as dependent as this cell on the effective workings of these functions. This fact should never be forgotten. Unfortunately, it frequently is forgotten in the absorbing activities of the nervous system. But the

[1] Bergson, H.: Creative Evolution, Henry Holt & Co., New York, 1913, pp. 98–185.

[2] Thorndike, E. L.: Educational Psychology, Teachers College, New York, 1919, pp. 306–312.

nervous system itself is dependent upon these other processes for its very foundation and sanity, so that one can hardly hope to achieve any real and lasting success through the nervous system without caring in an intelligent way for the biologic basis of life.

Let there be no misunderstanding on this point. He who would have health must work for it. Wishing for it will not achieve it; ideals without intelligent effort are dead. It is not something that can be bought at the corner drug store or achieved by mental or spiritual processes. Health, strength, and vigor in any person is health, strength, and vigor of the vital organs of the body, including the nerve-centers of the cord, and it should be clear and compelling that this strength comes largely from the use of the muscles of the body, and especially the trunk muscles in youth. If we would lay the foundation for health, strength, and power we must run, jump, climb, swim, and engage in play and sports that have engrossed man since earliest times. One need expect no real results by five minutes of formal exercise in the bedroom on retiring or by deep breathing at an open window. The way to health is the path of wholesome activity. This implies something more than riding in street cars, eating prepared and predigested foods, breathing deeply for five minutes in twenty-four hours, and working over long periods without reasonable time for rest, recreation, and sleep.

There need be no essential conflict between the demands of health and the demands of the intellectual and moral life. If health is not thought of as an end, but only as a means for the accomplishment of worthwhile work in life, no conflict will arise. That life which may be called "good" will be physically wholesome, mentally keen and fervid, and morally sound.

To have health and not to use it in socially serviceable ways is, of course, morally wrong. The man or woman who refuses to use health and strength for the accomplishment of service to society has no justification today.

The two extremes are recognized here: the individual who fosters health for health's sake, and the one who loses his health in the effort to achieve a piece of work. Of the two courses, the latter is preferable. Professor Thorndike remarks in this connection:

"To some extent we barter our health for the other valuables—knowledge, skill, and habits of utility to the community. At present we probably sell too much of health, but it would be equally unwise to sacrifice everything for health. It is better to be a Socrates with a headache than a perfectly healthy pig. There must be a compromise."

The art of fine living consists of the greatest intellectual development and the most worthy social service possible, without loss of power to continue the race adequately, to enjoy life fully, and to be a real source of happiness to others.

The Test of Hygienic Knowledge.—The test of the usefulness of hygienic knowledge is to be found in its contribution to the art of fine living. A considerable amount of health advice and instruction has been made for individuals and provides no guide for all. Many persons learn some particular practice because a friend who was ill was advised by the physician to do thus and so. Any particular health advice must be made and upheld because it is of value not in healing the sick, but in keeping the well strong and happy, in preventing illness, and making the individual more efficient and useful. The test of its value is not is it good for the sick, but is it rational and scientific for the well. The treatment of the convalescent is not the treatment of the vigorous man of affairs or the healthy teamster who may by hygiene become more vigorous and more strong.

Hygienic or health knowledge must apply to the whole of man. It is to be criticized as a system if it is effective only in neurasthenic states. The use of faith cures, or spinal adjustments, or the practice of abstaining from the use of meat, or the carrying of an onion in the hair for relief of headache, are partial, limited, and incomplete procedures. They may have special application in special cases. But confusion of special measures with systems must not be made. The few trees must never be taken for a forest; the few swallows, for a summer. The hygienic procedure that purports to possess universal characters must be viewed with suspicion. The life of man in his adjustment to the strains of modern life, in his hopes and aspirations, in his work, play, recreation, indeed, in his love and worship, is not to be guided by mystic formulæ, nor to be saved by special methods. Hygiene is to be tested by its contribution to the whole of life.

CHAPTER V

SCIENCE AND ATTITUDES

The Dual Aspect.—The problem of personal hygiene is a problem that involves science which provides us with the accurate knowledge of the way in which to care for the body, and habitual attitudes which use this scientific knowledge in the service of ideals.

The laws of health are given by science. They come from the food laboratory, biology laboratory, health departments, statistical bureaus, university departments of hygiene, organizations such as the Public Health Association, Anti-Tuberculosis League, American Medical Association, and State and Federal bureaus, such as the United States Public Health Bureau and State Departments of Health. These health departments and bureaus for hygienic living test out the traditional and customary modes of living and serve as effective and authoritative sources for the determination of the values of any particular hygienic practice. The laws of health, if they are to serve as good guides, must be accurate and scientific, and at no time can they depend upon superstition and hearsay. A certain number of people believe that rheumatism may be avoided by carrying in the pocket a red kidney bean. Such belief is probably founded upon the single experience of one man who carried a bean in his pocket and never had rheumatism. It is unnecessary to say how fallacious such reasoning is, and yet in more subtle and confusing arguments there is need to hold to the general tenets of scientific proof[1] of the value of any particular procedure. One of the responsibilities of the educated person is to refrain from being moved by superstition. Wisdom expresses itself in many ways; one way is by the use of scientific guides as distinguished from the occult, mysterious, and superstitious. "Education is the vaccination that confers immunity, but it does not always take."

The laws of health are given by science; the practice of them is a matter of habit in which ideals and attitudes have shared largely. For the best results in education health habits should never be automatic except in the routine care of the body. For meeting the complex, widely varying problems of human adjustment, the only safeguard is ideals of living that shall foster and strengthen desirable attitudes. The most scientific theory of correct living, made automatic, might succeed in an artificial environment, but for life in the present world it needs constant correction by intelligence and constant motivation by ideals.

Science and Health.—It is contended here that the laws of health are given by science, and the science invoked here is that of the laboratory, the health departments, and the life of the world. In contrast to this view is the conception of health as held by a group that claims to recognize science and to base its guides upon the teachings of Christ. The religious character of their belief acts as a deterrent to criticism, but the health implications are so

[1] Dunlap, K.: Mysticism, Freudianism, and Scientific Psychology, pp. 112–130, C. V. Mosby Co., St. Louis, 1920.

prominent that the position of the Christian Scientist should be examined.

The Position of the Christian Scientist.—The Christian Scientist negates all science of health as we know science in physics, chemistry, engineering, and biology, and puts in its place a claim, an insistence that there is no such thing as body and, consequently, no such thing as disease. The realities of bacteria, the toxicity of toxins, the destruction of poisons have no place in his thought because for him they are non-existent. He ignores them. His attitude is similar to that of the ostrich in hiding from sight by poking its head in the sand. How can people who have made no study of the sciences of pathology, bacteriology, and the history of disease form intelligent opinions regarding the cause, the symptoms, the diagnosis, and treatment of disease! Their "science" consists in denying the existence of disease through a type of glorified suggestion, and, having no capacity for scientific study of cases or real investigations of causes and treatments, they are totally unable to speak with any authority regarding disease.

Their followers and enthusiasts are, in the main, those who have been "cured" of imaginary afflictions. They present no body of thought that is helpful in stating either the science or the ideals that should help science in serving manhood and womanhood. Moreover, in the neurotic cases, where results are secured, the individual is influenced by a hocus pocus instead of being guided by the psychologic truths that would rationalize life for him.

In noting that Christian Science cures certain cases students of hygiene frequently ask, "If Christian Science gets results in some cases, why is it not a good thing for society?" Aside from other reasons for its disapproval, it should be noted that any system, scheme, or program that relies upon hocus pocus, upon fancy rather than fact, upon crude credence rather than truth, should not appeal to one interested in living intelligently. The curing of neurasthenics by mysticism is not increasing the intelligent processes of the human race.

The position of the Christian Scientist is, therefore, one of irrationality, a position not supported by science, and totally unacceptable for purposes of an intelligent life.

The Christian Scientist Not Prepared to Judge.—The devotees of Christian Science, as of other well-wishing systems, are not prepared to judge of health or disease, primarily because they know so little about them. Starting from assumptions contrary to fact, they reach fanciful conclusions in the health field in precisely the same way that they arrive at convictions in other fields. In a masterly discussion of values in human life Royce[1] in his chapter on optimism, pessimism, and the moral order examines the philosophy of this group. As a moral and religious teacher Professor Royce is interested in studying Christian Science and other pseudo-optimistic doctrines with reference to their spiritual implications. He says many things that help to explain the mental twist of these people:

> "Extremely characteristic of the mood of such religious optimism is in many minds a dread of the natural order as science knows it. Your optimist of this type, if he devotes himself to political theorizing, has a peculiarly violent dislike for economic facts. To his mind there are no evils in society except competition and poverty, which will both cease as soon as we by chance fall to loving one another and to owning the property of the nation in common. Crime is not a result of anything deep in human nature; selfishness is a mere incident of a defective social system. With fewer hours of labor we should have many times the spirituality we now have. Sin is not only mere ignorance; it is something still more limited; it is mere ignorance of the proper theory of the functions of government. . . . Evil being an illusion, the spiritual powers being in complete ownership of the entire world, there is no reason why any day the scene of our sorrow should not be entirely transformed. In the hope of such transformation the faithful wait and trust. Meanwhile they expect little help from mere science, which once for all deals with the world of mind and of sense in a lower sphere."

Professor Royce goes on to make plain that such doctrine is not truly spiritual at all, nor does it represent a genuine idealism.

[1] Royce, J.: The Spirit of Modern Philosophy, Houghton Mifflin Co., Boston, 1892, p. 446.

In a remarkable book Jastrow[1] has sensed this peculiar position of the Christian Scientist and indicts the public for enormous credulity. He says in part:

"To complete the collection of types of credulity, we should have an instance in which a system of interpretation of facts—not a mere narrative—in itself startling and contradictory to ordinary experience, gains wide-spread credence, and that in spite of pronounced inconsistency with verifiable observation and common sense. These conditions are remarkably well satisfied by the recent promulgation of the doctrines of Christian Science. Even in this field of intellectual effort the land of the free and the home of the brave has contributed an article worthy to compete with the foreign product. Eagle-like this system spreads its wings and soars free from the bonds of sense or earth-bound realities, free from human logic and the errors of mortal mind, free from the material impediments which nature has inconsiderately set in our paths, free to make things so by thinking them so, free to set method, learning, and experience at naught. And surely it calls for courage of no common order to resist the seductive appeals of eye and ear, to sail steadily on heedless of the calls of sirens of rationality, convinced at the outset that things cannot be as they are, and refusing the nod of recognition to the plebian idols of the ills of flesh. It is not necessary in this connection to recount the beliefs of this system; it is sufficient to point out that when thousands of intelligent persons give practical adherence to, and enroll themselves under the banner of one who teaches that a bunion would be an adequate cause of insanity, if only we held the same belief about the bunion as we do about congestion of the brain; that smallpox is contagious by reason of the same agencies as make weeping or yawning contagious; that fear may be reflected in the body as fractured bones, just as shame is seen rising to the cheek; that anatomy and physiology and hygiene are the husbandmen of sickness and disease, while the reading of a text-book of Christian Science is equally effective in producing health; that when a healthy horse takes cold without his blanket it is on account of the poor creature's knowledge of physiology—then such persons can hardly complain if they are cited as instances of modern credulity."

The Christian Scientist Ignores Facts.—The history or course of a disease is known by the records of its occurrence, its morbidity rate, its mortality, and its complications. The influence of any new method of treatment may be determined by statistical study of the death-rate. The death-rate is subject to the same kind of scientific testing as the birth-rate, immigration, or any other process in

[1] Jastrow, J.: The Psychology of Conviction, Houghton Mifflin Co., Boston, 1918.

which the facts are gathered. The use of antitoxin for the treatment of diphtheria has been one of the triumphs of scientific medicine. It is the peculiar mind of the Christian Scientist that can ignore the following table[1] giving the number of deaths per 10,000 of population before and after the use of antitoxin:

DEATH-RATE FROM DIPHTHERIA AND CROUP PER 10,000 POPULATION

City.	Before antitoxin.	After antitoxin.											
	1887-1893	1896-1899	1900-1905	1906-1910	1911	1912	1913	1914	1915	1916	1917	1918	1919
Denver.....	12.9	1.7	2.9	2.3	1.6	0.5	0.8	0.4	0.3	0.1	0.8	1.1	1.0
New York. .	14.5	6.3	5.1	3.8	2.6	2.2	2.6	2.9	2.4	1.9	2.1	2.3	2.2
Philadelphia	11.9	9.6	4.0	3.3	3.1	2.3	2.1	1.9	1.8	2.2	2.5	2.1	2.4
Chicago....	13.1	5.0	2.8	2.3	3.8	4.1	4.1	3.2	2.7	3.1	4.7	2.7	2.2

In the above cities the effect of the antitoxin treatment upon municipal mortality figures has been directly proportionate to the extent to which the health departments have believed in its efficacy and encouraged its use by furnishing it free to the poor and sending their own inspectors to administer it. From 1896 to 1899 the rate in Philadelphia was not greatly affected, due to an opposition to its use on the part of the health authorities. After its use was extended the rate fell, and in the years from 1900 to 1919 Philadelphia compares favorably with the other cities in the list.

What is true for diphtheria and antitoxin is more strikingly shown in the results from typhoid inoculation. The value of inoculation against typhoid is strikingly shown by a comparison of the cases of and deaths from typhoid in the United States Army before and after com-

[1] Data for the table taken from Holt, Diseases of Infancy and Childhood, p. 1002, Report of the New York City Health Department for the years 1900–1920, and figures supplied by the Department of Commerce, Bureau of the Census, Washington, D. C.

pulsory inoculation. The following, given by Major Lyster, covers the period from 1908 to 1914:

VACCINATION AGAINST TYPHOID IN THE UNITED STATES ARMY

Year.	Number of persons vaccinated.	Number receiving three doses.	Cases of typhoid.	Army mean strength.
1908*	0	0	239	74,692
1909*	830	621	282	84,077
1910*	16,093	11,932	198	81,434
1911*	27,720	25,779	70	82,802
1912†	40,057	all	27	88,478
1913†	25,086	all	4	90,752
1914†	35,902	all	7	92,877

* Voluntary inoculation. † Compulsory inoculation.

Since 1912 the cases 27, 4, 7 were, with few exceptions, in men who were not inoculated for some reason or other, or who had contracted the disease before enlistment.

TYPHOID MORBIDITY AND MORTALITY RATES IN UNITED STATES ARMY, 1903–1912

Years.	Death-rate per 1000.		Admission rates per 1000.
1903	.28		5.82
1904	.27		3.62
1905	.30		3.57
1906	.28		5.66
1907	.19		3.53
1908	.23		2.94
1909	.28		3.03
1910	.16		2.32
1911	.11		.81
1912	.03		.31

Havard[1] shows the value of inoculation in compiling the admission and death-rate for typhoid for the years 1903-

[1] Havard, V.: Manual of Military Hygiene, Wm. Wood & Co., New York, 1917, pp. 36, 37.

1912. It should be noted that the large number of men voluntarily submitting to inoculation accounts for the low rate in 1910 and 1911, immediately before it became compulsory.

Havard,[1] in commenting on the value of inoculation against typhoid, says:

> "During the four years 1909–1912 no deaths occurred among vaccinated soldiers in the United States."

Woodhull,[2] in commenting on typhoid in the Civil and Spanish-American wars, says:

> "According to statistics used by Major F. F. Russell (Military Surgeon June, 1909) the Federal army alone had more than 80,000 cases of typhoid fever in the war for the Union. During five months in the Spanish War (Official Board on Typhoid Fever) we had 20,738 cases and 1580 deaths among 107,973 officers and men in camps within the United States, or 19.26 per cent. sufferers from the disease."

The American Army in the World War had compulsory inoculation. Making allowances for failures in technic or in organization, it is to be noted that from September 1, 1917 to May 2, 1919 there were 213 deaths from typhoid in an army with a mean strength for that period of 2,121,958

Additional evidence is available in comparison of the camp at Jacksonville in 1898 (Spanish-American War) and the camp at San Antonio in 1912 (mobilization on the Texas Border).

At Jacksonville before typhoid inoculation there were 10,759 soldiers, 2000 cases, 248 deaths; at San Antonio, with compulsory vaccination, there were 12,801 soldiers, 2 cases, no deaths. It is an interesting and instructive fact that in the Spanish-American War 243 soldiers died of wounds and 1580 perished of typhoid fever (Fig. 2).

In the light of such evidence it is, indeed, surprising how apparently intelligent persons will oppose and carry

[1] Harvard, V.: Loc. cit.

[2] Woodhull, A. A.: Military Hygiene for Officers of the Line, John Wiley & Sons, New York, 1909, p. 308.

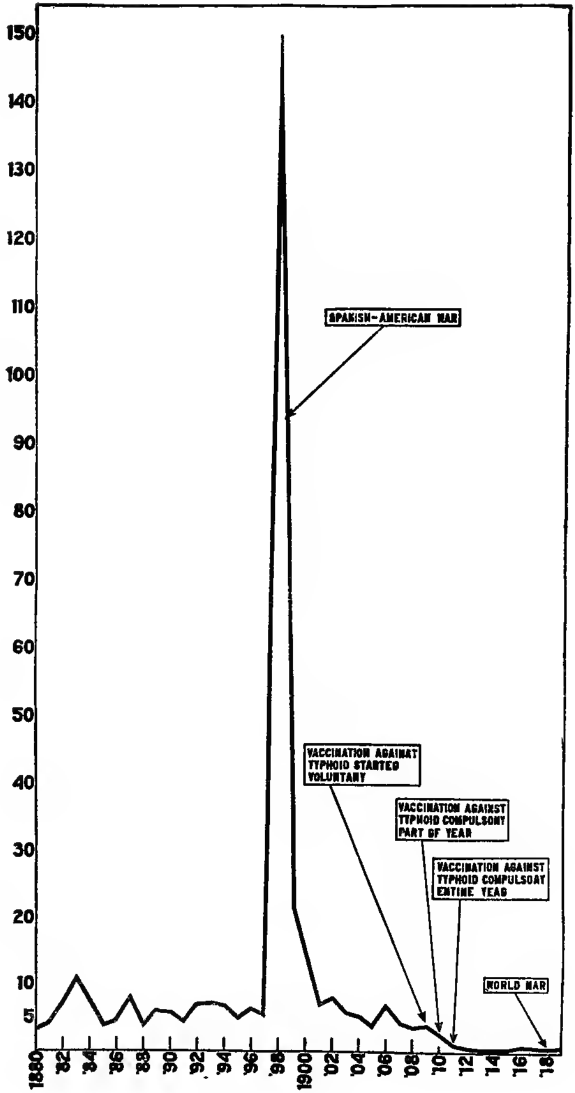

150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
5
1880
'82
'84
'86
'88
'90
'92
'94
'96
'98
1900
'02
'04
'06
'08
'10
'12
'14
'16
'18
SPANISH-AMERICAN WAR
VACCINATION AGAINST TYPHOID STARTED VOLUNTARY
VACCINATION AGAINST TYPHOID COMPULSORY PART OF YEAR
VACCINATION AGAINST TYPHOID COMPULSORY ENTIRE YEAR
WORLD WAR

Fig. 2.

on obstruction propaganda in order to retard scientific disease prevention. Comparison of smallpox and typhoid in the three wars should be illuminating on this point.

The following figures given by the Office of the Surgeon General, War Department,[1] show a vivid comparison for typhoid in three wars:

DEATHS FROM DISEASE IN THREE AMERICAN WARS

Disease.	Number of deaths that occurred in World War, September 1, 1917 to May 2, 1919. Average strength approximately 2,121,958.	Number of deaths that would have occurred during the period September 1, 1917 to May 2, 1919 if the Civil War death-rate had prevailed (July 1, 1861 to June 30, 1865).	Number of deaths that would have occurred during the period September 1, 1917 to May 2, 1919 if the Spanish-American War rate had prevailed (May 1 to September 30, 1898).
Typhoid fever....	213	48,978	65,292
Smallpox..	5	9,135	36

The intelligent person will not ignore such facts when dealing with matters so vital to health and happiness. Obscuration of history, belief in fantastic claims, and theories incapable of demonstration will be ignored by the rational mind.

The Danger from Christian Science.—The teaching and practice of Christian Science is dangerous to society because it ignores the transmissibility of disease, and hence subjects the community to cases that should be isolated.

All the work in the public health field today emphasizes the danger to others that comes from contact with mild cases. We have only recently appreciated the significance of "walking typhoid" as presenting a condition in which the

[1] From a letter by Colonel W. P. Chamberlain, M. C., December 2, 1921, File S. G. O. 710 (Typhoid).

Fig. 2.—Typhoid fever. Annual admission rates per 1000 of white enlisted men of the United States Army for the years 1880 to 1919 inclusive. (By courtesy of the War Department, Office of the Surgeon General.)

individual had the disease in such mild form that he was not aware of the infection and yet was capable of infecting others. Many of the communicable diseases have mild forms, and so when they fall into the hands of certain quacks and irregular systems of healing marvelous cures are reported by invoking a divining rod or ruling out error or other ridiculous methods. Not infrequently individuals recover from infections without medical attention. The explanation of this fact is so well given by Chapin[1] that his own words are quoted:

"The scientific physician does not pretend to cure maladies by drugs and medicines. Nature performs the cure. All diseases are self-limited and end in complete or partial recovery or in death. By understanding the natural history of disease, however, the physician aids nature at a critical point in her struggles. This may be accomplished in many ways. He may assist in the elimination of rapidly collecting poisons, or in sustaining a failing heart or relieving a congested lung. By many similar actions the physician daily saves lives that would otherwise be lost. Needless death and disability are frequently avoided by the art of the scientific physician. It is in imaginary, functional, or quickly limited diseases that the patient may get along well without any special treatment. Unfortunately, the mental healer does not always attend this kind. Imaginary cancers disappear, but the real ones persist, with the hopeful time of early removal irrevocably gone. Incipient tuberculosis and many other diseases, in the early and curable stage, are allowed to become chronic and hopeless. The real diseases eventually get into the hands of the physician, but often too late to save health or life. Here is where the tragedy comes in."

It is important to understand the danger to the health of the nation that lies in the propaganda of the Christian Scientist. The danger is real and insidious because it operates under the guise of religion, on the one hand, and a healing cult on the other. It reaches not only those who have imaginary disease but also those who are sufferers from serious organic disturbance. Christian Scientist practioners are not capable of diagnosing or treating disease because of their lack of training and their false assumptions. In this connection Chapin[2] says:

[1] Chapin, H. D.: Health First, The Century Co., New York, 1917, p. 217.
[2] Ibid., pp. 214, 215.

"How can people, who confessedly have not made a scientific study of the pathology and natural history of disease, give reliable reports as to the results of any or no treatment? Many of them deny the real existence of the very disease they pretend to cope with so successfully. Every thinking person must realize that reports and statistics of ordinary or miraculous cures from such a source cannot stand real investigation. Yet such statements sometimes influence people who are accustomed to verify claims when positively made. When these assertions are coupled with generalities that sound elevated and pious, the unthinking may be impressed.

"Even scarlet fever may be treated by high thought and lofty utterances. Those who have scientifically studied this malady are constantly looking for its insidious, severe, and permanent complications. Some cases, however, as we all know, are mild in type and need no special medical treatment except careful watching for complications and an avoidance of the spread of infection to others. The only way to detect these complications is by careful examinations of the vital organs liable to be affected by the poisons of the disease. The various healers are not competent to do this; therefore the eventual results are unknown. . . . How many cases of infectious disease . . . "passed on" or are now passing through life with crippling and avoidable complications, no one will ever know. Neither will it ever come to light how many cases of scarlet fever and similar dangerous infections have been spread to others by this sort of treatment. Here lies the most serious social aspect of this question to the community."

Social Responsibility and Christian Science.—Typical of the operation of Christian Science in such a serious disease as diphtheria is the case of a child in New Jersey who received only "absent" treatment. An editorial in the Journal of the American Medical Association reviews this case with reference to the question involved.[1] It is worth reading in this connection:

"A New Jersey salesman, who claims to have been a member of the 'Christian Science' faith for three years, was recently found guilty of manslaughter because he had permitted his nine-year-old daughter, who was suffering from diphtheria, to die without medical treatment. The little girl was given 'treatment'—'absent' and otherwise—by a professional 'Christian Science' practitioner. The man was fined $1000 and costs. The judge, in imposing sentence, is reported to have said:

" '*In the light of present-day science, which is the result of many years of progressive experiment and demonstration, no one is justified in neglecting the use of such agencies as have been shown to be efficient in the treatment of malignant and contagious diseases, and this is*

[1] Jour. Amer. Med. Assoc., May 22, 1920.

especially true where one is charged with responsibility over the life of another, and particularly of a child of tender years, who has no option but to rely on the common sense and good judgment of its natural protector.' [1]

"The verdict has brought to light, as such verdicts are likely to do, the loose thinking that characterizes so many of the so-called intellectuals of today. Well-meaning people, who deny that they are followers of Mrs. Eddy, have written to the newspapers denouncing the verdict and declaring that it is little less than a crime that a man should be punished for following the dictates of his conscience. The main point stressed by such people seems to be that as children occasionally die of diphtheria under medical treatment, there is no reason for getting excited when a child dies under 'Christian Science' treatment. The argument, of course, is fallacious. The efficacy of the modern scientific medical treatment of diphtheria is not a matter of theory, belief, or conscience—it is a matter of fact. Its efficacy is as demonstrable as is the efficacy of the Westinghouse air-brake. The parent or guardian who fails to give his child or ward the benefit of modern medical treatment for diphtheria becomes as culpable as a railroad would be if it failed to equip its passenger trains with air-brakes. Sometimes, it is true, the air-brake fails to avert a fatality; but that is not the fault of the brake, nor is it any argument for its abolition.

"If an adult in his own right mind wishes to be treated by 'Christian Science' or any other unscientific methods, there can be no objection, provided the disease from which he is suffering may not, through such treatment, become a menace to the community. Children of tender years, however, should not be sacrificed to the distorted views of those who are supposed to be their protectors.

"Religious beliefs should be respected, and, in general, they are respected. Where, however, religious beliefs conflict with the general welfare, such beliefs must give way. Presumably, the Mormons were sincere in their belief in polygamy; that particular tenet of their religion, however, had to give way to the more enlightened belief of the rest of the community. The Dukhobors that migrated to Canada were undoubtedly sincere in their belief that they should go nude, and the practice of this belief was undoubtedly less a menace to the community than are some of the bizarre views held by 'Christian Scientists' regarding the cause and treatment of disease. Nevertheless, the Dukhobors had to put on clothes. It is conceivable that we might have transplanted to this country some of the religious beliefs of India, but it is doubtful whether public opinion in the United States would ever look with equanimity on Sutteeism, even though the widows might declare that being burned on the funeral pyres of their deceased husbands was a matter of their own personal belief and was none of the concern of the general public. Only a few weeks ago a man in Chicago shot his son with the avowed intention of killing the boy because he feared the lad was acquiring bad habits and he wished to save the boy's soul. We have not yet noticed any letters of indigna-

[1] Italics are mine.—J. F. W.

tion protesting against the man's arrest. Possibly this is because he represents a minority. Should such beliefs ever reach the dignity of a religious cult with money and well-organized publicity machinery behind it, there would doubtless be found many to defend the killing of minors for the purpose of 'saving' them."

The Kind of Disease that Christian Science Cures.—The cures of Christian Science are the cures of imaginary diseases that develop readily in people with unstable nervous systems. The psychiatrist, the nerve specialist, and often the "family doctor" succeed with the same types.

In the course of routine and daily work physicians and surgeons of the medical profession are performing wonderful cures, operations, and diagnoses.

"An interesting though not unique case is described in a recent bulletin sent out by the Federal Board for Vocational Education. Among the blinded ex-service men was a negro who seemed to be blind in both eyes. Neither eye could perceive five fingers at any distance. He had faint light perception and there was hope of sight restoration in one eye. The man was about to be assigned to a workshop for the blind when a physician managed to persuade him that he was not blind. The report of the case reads: He was suffering from psychoneurosis hysteria giving rise to marked blepharospasm[1] and photophobia[2] and amaurosis.[3] All physical findings negative. Treatments by suggestion completely cleared up all symptoms and I discharged this man cured.

"This case is not referred to because it is unique in medicine, for, as physicians know, it is not. Had the man regained his sight, however, while under 'Christian Science' treatment or while having his vertebræ pushed by a chiropractor, what a to-do would have been made of it. The case would have become a classic in the annals of

[1] Blepharospasm—spasm of the circular muscles of the eyelids.—J. F. W.

[2] Photophobia—fear of light.—J. F. W.

[3] Amaurosis—blindness of the retinal or optic nerve type.—J. F. W.

the cult. As it is, the incident would never have reached the public eye had it not been for the bulletin of the vocational educational board."[1]

A Recent Arrival.—The violation of fundamental hygienic rules of living causes a variety of disturbances in health, so that many people are continually below par. They think badly, they feel badly, and then they act badly. Such persons, when uninformed, offer a splendid field for the charlatan and the fraud.

One of the recent cults, claiming to treat disturbed bodily states as well as disease itself, is known as chiropractic. Its exponents are called chiropractors.

What is Chiropractic?—Just what chiropractic is remains a mystery. It is a method of spinal manipulation, but aside from that it is unknown in science. Pamphlets of the chiropractors contain statements concerning bodily physiology that are unproved, speculative, and, to say the least—novel.

Recently an interesting attempt to define chiropractic appeared in a bill presented to the New Jersey Legislature, in an Act to Regulate the Practice of Chiropractic. The opening paragraph of the act follows:

> "Definition of Chiropractic: The term chiropractic when used in this act shall be construed to mean and be the name given to the study and application of a universal philosophy of biology, theology, theosophy, health, disease, death, the science of the cause of disease and art of permitting the restoration of the triune relationships between all attributes necessary to normal composite forms, to harmonious quantities and qualities by placing in juxtaposition the abnormal concrete positions of definite mechanical portions with each other by hand, thus correcting all subluxations of the articulations of the spinal column, for the purpose of permitting the recreation of all normal cyclic currents through nerves that were formerly not permitted to be transmitted, through impingement, but have now assumed their normal size and capacity for conduction as they emanate through intervertebral foramina—the expressions of which were formerly lacking—named disease."

Surely the author of the act would have no difficulty in explaining the Einstein theory of relativity.

[1] Jour. Amer. Med. Assoc., March 27, 1920, p. 890.

Chiropractic will remain a debatable subject, even to chiropractors, until scientific standards and tests are applied to it. It may grow by advertising methods, it may record "cures" by adjustment of subluxations, but it will remain a claim and a cult until it meets satisfactorily the sort of tests that intelligent men everywhere make to cause and effect questions.[1]

When chiropractic can prove that all disease is due to "subluxations of the spinal column," then failure in any one case will not be condemned. However, the report of the New York Times (December 12, 1921, p. 6) of the death of David Lebish after two days' treatment by a chiropractor should give concern. Especially since the autopsy showed that the boy died of a *ruptured* appendix following the "adjustments" of the chiropractor.

The character of a chiropractor's training, the extent of education, and even an index of intelligence are given by the following statement published (at advertising rates) by a chiropractor of Waukesha, Wisconsin. In giving the pathology of gall-stones and kidney stones he says:

> "Gall-stones are due to an excessive amount of heat in the gall-bladder which crystallizes the calcareous material in the bile and forms stones. This excessive heat results from the loss of calorific or heat control of nerves due to nerve pressure in the middle dorsal vertebral region. Adjustment of the causative subluxation restores the condition to normal. Renal stones are caused in the kidneys in the same manner."

Now, unfortunately, the public is so ill-informed on anatomy and physiology that it cannot always judge intelligently. But any layman might well ask, "How would an 'adjustment' remove stones already formed? If excessive heat causes the stones, would removal of pressure on heat nerves destroy the stones by freezing them?" To get laymen to ask thoughtful questions on matters of personal and public health is very important for the welfare of man. Intelligent questions in this field are not

[1] See a series of six articles in Leslie's Weekly, beginning January 7, 1922, on Chiro-quack-tic, by Severance Johnson.

impossible if sufficient time and attention are given to instruction in the schools in physiology and in hygiene.

What is Osteopathy?—Osteopathy is defined[1] as "A system of treatment based on the theory that diseases are chiefly due to deranged mechanism of the bones, nerves, blood-vessels, and other tissues, and can be remedied by manipulation of these parts." Osteopathy[2] emphasizes the tendency of the human body "to remain in a state of health" and claims that the "fundamental predisposing cause of disease" is disturbance of normal nutritive processes. It further claims that "a prominent cause of disturbed nutrition is anatomic malposition of the various parts of the body," and, moreover, that such malpositions "are frequently capable of correction by manual procedures." "Osteopathic thinkers protest against the hasty adoption of surgical measures" in surgery, which is considered "a branch of osteopathy."

It would seem that osteopathy could advance its position in the professional and scientific world if it could present a series of clinical cases of malaria (diagnosed by demonstration of the Plasmodium malariæ in the blood), of syphilis (diagnosed by the Wassermann test made in an accepted laboratory), and of diphtheria (diagnosed by demonstration of Klebs-Löffler bacilli) cured by manipulations. It should be noted that osteopathy in its insistence on anatomic malposition as a cause of disease presents a limited truth. A misplaced uterus, kidney or stomach, a spinal curvature or postural deformity may lead to disturbed nutrition, pain, and frequently to disturbance of function. But these facts and conditions are recognized by the scientific physician. The extensive development of physiotherapy in hospitals and private practice is based upon this recognition of physical causes in disease and physical means of treatment. Such recognition should not blind one to the protean forms in

[1] Webster's New International Dictionary.

[2] Announcement of the College of Osteopathic Physicians and Surgeons (Los Angeles, California, 1921).

which disease appears. Truth and fact should be accepted whether they fit the theory or not. Tubercular meningitis may disrupt osteopathic theory, but it is a fact of life.

The tirade against overzealousness in surgical practice cannot justify osteopathy as a means of treatment of disease. To operate too soon or too often is quite as bad as to operate too late or too infrequently. *Surgical judgment is a human quality;* it does not belong to any school of healing.

Osteopathy is to be judged, even as chiropractic, Christian Science, or medicine, by the provisions made for training of its students, by the scholastic standards maintained, by the scientific character of its work, and finally, by the ethical standards of the profession.

Life to most persons is too precious to be lost needlessly. The osteopath treating with manipulations an ignorant person suffering from diphtheria when antitoxin is available, or "adjusting" for syphilis when arsphenamin is known, assumes a responsibility that cannot easily be discharged.

The question every patient should ask is: Does my physician use every known and scientific means available to diagnose my condition and treat myself? Or is his mind shackled by an unproved theory, an untenable hypothesis? The sufferer from headache as well as the sufferer from cancer should wish to have such questions answered satisfactorily.

The Call of the Occult.—It is difficult to educate people to ask such questions. Men in all stages of development have been believers in spirits, and from time to time have brought forward evidence to support their belief. The witch riding a broom and the modern "Patience Worth" all spring from the same source and are equally irrational. Tap the stream of life where you will, the same kind of belief in the mystical that leads men to expect cancer cures from healing mental rays will spring forth. Probably no phase of this belief in spirit-agency is more persistent than the medical. Health for such persons is the *summum* *bonum*, and they will reject scientific evidence and procedure acceptable in other fields and in other problems, to partake of Eddyism, New Thought, a magic regulator, mysterious patent medicines, and other palpable frauds. "One could write a history of the human mind in terms of the cures that people underwent and the reasons offered for the cults. One could start with humors and temperaments, and wind through exorcism, laying on of hands, mesmerism, clairvoyance, and Christian Science, and with any number of side excursions to delay one's progress. Spiritualist healers who in a trance state prescribe harmless drugs at hurtful prices are by no means obsolete."

Believers in the occult and mysterious are often sincere, but their sincerity is no cloak that will hide the classification into which they must come. They represent clinical types that are well marked and fairly differentiated. The scientific man from his point of vantage "sees the ensemble of a forest in what to the wanderers in the jungle of human nature is only a tangle of trees." That individuals of scientific training, work, and accomplishments at times get lost is no reflection on their background—the immediacy of a great sorrow, which one is unprepared to meet, may produce a mirage of the mysterious and occult.

For the ignorant person formulæ with mystical signs and procedures will always be helpful in banishing fear and in controlling subconscious forces. But any intelligent plan for life looks to a scheme of things in which Socrates' advice, "Know thyself," is a guide to go by. The quarrel with the mystical, mysterious, and occult is precisely this: it dethrones reason and intelligence and seeks a solution by hocus pocus. The intelligent man or woman planning for life cannot be satisfied to trust his or her "all" to anything that smacks of charms or laying on of hands. The occult calls to the weak and foolish; for the strong, science will ever be the guide. Its truths, no matter how painful, how difficult to bear, requiring adjustments, no matter how long deferred, will have meaning for these.

Scientific and Humanistic Principles Confused.—The faith that men have in programs, procedures, and results in some fields may be rational, but in other fields with similar controls, it becomes topsy-turvy and rejects the bases that should compel action. There are recognizable these variations from rational belief in the actions of a considerable number of antivivisectionists, antivaccinationists, conscientious objectors, and others who oppose any program by society in which they must co-operate. A keen analysis of such attitudes would diagnose the condition as one of a psychosis.

These individuals are as careless of truth and scientific accuracy as they are of the falsity of their position. Throughout the war the "anti" press printed dispatches charging that our army surgeons, in order that the manufacturers of serums might grow rich, were murdering our soldiers by wholesale under pretense of giving them protection from typhoid.

In April, 1918 a circular issued by the National Antivivisectionist Federation asserted that inoculation of American soldiers was causing thousands of deaths in the army cantonments. The circular, as reported by the New York Times,[1] contained the following statement:

"Thousands of deaths deliberately inflicted upon our soldiers and sailors have passed the scandal line. It has become a tragedy."[2]

A reporter from the New York Times interviewed Mrs. David Belais, vice-president of the National Antivivisectionist Federation, and the following is reported in the New York Times[3]:

> "She said last night that Mrs. Henderson, who signed the circular declaring that 'thousands of deaths deliberately inflicted upon our soldiers and sailors have passed the scandal line,' lived at Wayland, Massachusetts, and that the circular was sent out with the approval of the officers of the society, although they took no official action upon it.

[1] The New York Times, April 9, 1918. The Federation reports this circular out of print (March, 1922).

[2] Ibid. [3] Ibid.

"Mrs. Belais was most reluctant to answer when asked repeatedly whether she or the organization had any evidence whatsoever that 'thousands,' hundreds, or tens had died as the result of inoculation. She finally said that she had received letters telling of men in the service who had been made 'very ill' through inoculation, but admitted that she had no evidence of any sort that any considerable number of them had died. Pressed to tell if she had evidence that even one had died, Mrs. Belais said that the letters were confidential and that she could not disclose their contents.

"She deplored the use of the word 'deliberately' in the circular, saying: 'Of course the society doesn't believe they kill them on purpose. It is an abstract belief with me,' Mrs. Belais added, 'that the practice is dangerous and unjustifiable.'

"Asked about the alarm the society's statement might cause among families of soldiers, she said:

"'I hope it does create great alarm, because I think there should be a great cry against forcing people to submit their bodies to such treatment.'"

The achievements of scientific medicine have ever been humane. The decrease in the death-rate from typhoid, diphtheria, and smallpox has meant the saving of human life. Science seeks knowledge of the truth for the service of mankind.

The antivivisection efforts during the war were particularly typical of the mixed values that guide these deluded humanitarians. Their suit to prevent the Red Cross from using funds for animal experimentation was characteristic of their appreciation of relative values. Jastrow,[1] in speaking of this incident, says:

"To state that vivisection has brought no benefit to mankind, in face of the overpowering evidence to the contrary, shows the utter blindness to evidence of a convinced sentimental prejudice; to urge that prejudice at this time and thus to cripple the humanitarian efforts that redeem the awful calamaties of war shows the complete disregard of humane considerations to which unreason may lead. In the face of this instance of bigoted opinion, the strictures above applied to it seem criminally lenient. Like the delusions of the insane—to which such fanaticism is allied—the distinction between innocent and dangerous beliefs is most treacherous. Society cannot afford an attitude of tolerance; the menace of extreme conviction is too serious."

[1] Jastrow, J.: The Psychology of Conviction, Houghton Mifflin Co., Boston, 1918.

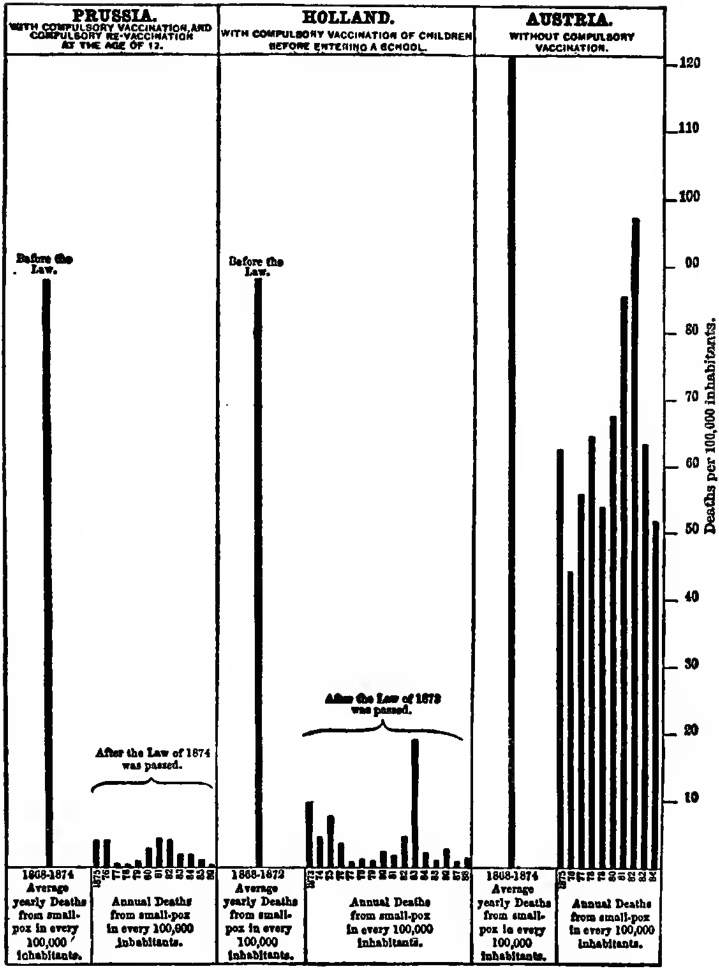


Fig. 3.—Table showing value of vaccination (Carsten).

Facts and Superstition.—Scientific medicine collects, distributes for observation, study, and criticism the facts upon which it bases its procedure. The laboratory is open for inspection; the methods of obscuration are not used.

The value of antitoxin in diphtheria and the efficacy of typhoid inoculation have been stated. The determination of truth does not, unfortunately, lead automatically to the rejection of superstition by all people.

The history of smallpox ought to have meaning and does show significance to the intelligent mind. Before smallpox vaccination was discovered the epidemics of smallpox that swept Europe were more devastating to life than the influenza epidemic of 1918 and 1919 in the United States. It is important to note in this connection the value of vaccination as shown by countries having compulsory vaccination and those not having it (Fig. 3).

In contradistinction to the available records of scientific medicine are the wild newspaper propaganda of that noisy group calling themselves antivivisectionists, antivaccinationists, and naturopath "physicians." In spite of fact, in defiance of truth, there exist emotional and irrational exponents of fanciful theories of disease and health. Superstition, custom, belief—these are the fetishes they worship. On questions of health they belong mentally with the group of natives in South India, described by Dr. Manley,[1] as they were attempting to drive the "Demon Smallpox" from the village of Ongole:

> "The tom-toms beat all night and this morning the streets are fairly covered with chicken feathers. For black smallpox has taken the city and must be driven out. The priests have told the people to kill chickens and strew their feathers in the streets so they will catch the eye of Polerimah, the plague demon, and distract her attention. The tom-toms throbbing in the air will either frighten her or please her so much that she will forget to jump down the throats of any careless mortals whom she might find with mouths opened in speaking, or with lips parted, or sleeping with uncovered faces. Yes! the goddess Polerimah is angry with the people.
>
> "In the very heart of the bazar, our native servants told us, we should find Polerimah in all her glory. . . . But instead I saw only a squat little figure, no more than a foot tall, made of black mud and covered with tinsel. She was soaked with lemon-colored water which dripped off her shoulders into a widely spreading puddle round her feet.
>
> "'Why so much wetness?' I asked with an amused smile.

[1] From a letter by Dr. Manley to the Journal of the American Medical Association.

"'They must keep her cool,' answered our guide with great dignity. 'If she gets warm she gets mad. So they have built this temple of reeds to protect her from the sun, and every few minutes the priests pour saffron tinted water over her. Whatever happens she must be kept cool.'

* * * * * * * * * * *

"'Now what will they do?' we asked.

"'They are arranging to escort the goddess out of town,' said our guide. 'They have done everything they could to appease her anger and make her happy; and now they are going to carry her out of town while she is in a happy frame of mind, and throw her in the ocean.'

"The procession was formed. First came the priest carrying on his head a basket in which were the bull's entrails, crowned by his head, holding in his hideous grinning mouth the bone of his front foreleg. Behind him came the goddess, carried on the head of another priest. And as the throng proceeded down the street, people by the wayside wrung the necks of chickens and threw the headless bloody bodies over the people's heads toward the image. The horns blew, the tom-toms throbbed, and the people yelled themselves hoarse, waving their reeds in the air. What is the priest screaming?

"'Yell, brother, yell! Let confusion reign! Let not the terrible Polerimah suspect our fell designs, and fall upon us before we are safely rid of her!'

"Following in the wake of the procession I came up to a young mother who was hurrying along dragging a tiny child by the hand. The little girl was staggering, her bare body was a mass of scars, her eyes heavy and dull with the intoxication of the dread disease. The child's mother cried out to Polerimah to have mercy. As her wails mingled with the shrieks of thousands the procession passed down the crooked, dusty road and out of sight.

"Tonight, out there in the dark somewhere, many young mothers are sitting in black despair, because in spite of all their sacrifices to the demon, the lives of their babies stricken with the fearful plague are surely ebbing away."

Patent Medicines and Fear.—Of the many ignoble characteristics of the "patent medicine" business none is more despicable than its appeal to fear. The business thrives on fear and seeks by its advertising to create fear. An epidemic of disease is the occasion for new nostrums to appear claiming to prevent or cure the disease in question, and for old ones to set up new claims in harmony with the needs of the moment. The exploitation of the New Orleans public at the time of the yellow fever epidemic, the pamphleteering of the New York public at the time of the meningitis epidemic, the blatant advertising in 1918 and 1919 during the influenza epidemic, and the unwarranted claims made for sprays and gargles during the epidemic of infantile paralysis bear witness to this appeal to fear. But epidemics are not necessary for their fear campaigns. The onset of winter is a sign for increased activity for the exploiters of pills, emulsions, syrups, and decoctions. If the winter is severe they will

FEDERAL FOOD & DRUGS ACT

HERE ARE ITS POWERS AND LIMITATIONS REGARDING THE SALE OF "PATENT MEDICINES"

IT APPLIES ONLY TO PRODUCTS THAT ARE MADE IN ONE STATE AND SOLD IN ANOTHER (INTERSTATE COMMERCE).

IT PROHIBITS "FALSE OR MISLEADING" STATEMENTS (IN OR ON THE TRADE PACKAGE ONLY) REGARDING COMPOSITION AND SOURCE OF ORIGIN.

IT PROHIBITS "FALSE AND FRAUDULENT" STATEMENTS (IN OR ON THE TRADE PACKAGE ONLY) REGARDING CURATIVE EFFECTS.

IT REQUIRES THE MANUFACTURERS TO DECLARE (IN OR ON THE TRADE PACKAGE ONLY) THE PRESENCE AND AMOUNT, IN THEIR NOSTRUMS, OF ALCOHOL, MORPHIN, OPIUM, COCAIN, HEROIN, EUCAIN, CHLOROFORM, CANNABIS INDICA, CHLORAL HYDRATE AND ACETANILID AND THEIR DERIVATIVES.

IT DOES NOT APPLY TO PRODUCTS THAT ARE SOLD IN THE SAME STATE AS THAT IN WHICH THEY ARE MADE (INTRASTATE COMMERCE).

IT DOES NOT PROHIBIT FALSE OR MISLEADING STATEMENTS IN NEWSPAPER ADVERTISEMENTS, CIRCULARS, WINDOW DISPLAYS, ETC.

IT DOES NOT PROHIBIT ANY KIND OF A LIE REGARDING CURATIVE EFFECTS IF THAT LIE IS TOLD ELSEWHERE THAN IN OR ON THE TRADE PACKAGE!

IT DOES NOT REQUIRE "PATENT MEDICINE" MAKERS TO DECLARE EVEN THE PRESENCE OF SUCH DEADLY POISONS AS PRUSSIC ACID, CARBOLIC ACID, ARSENIC, STRYCHNIN—NOR ANY OF SCORES OF OTHER DANGEROUS DRUGS!

Fig. 4.—The limitations of the Federal Food and Drugs Act are more significant than the powers. (By courtesy of the American Medical Association.)

protect against exposure and cold; if the winter is mild they will protect against changing temperatures!

There have been many exposures[1] of the frauds perpetrated by the "patent medicine" business. Samuel Hopkins Adams in the New York Tribune has conducted exposés showing the sordidness and inherent worthlessness

[1] The question is sometimes asked by students, "Why are 'patent medicines' permitted to make such extravagant claims?" The weakness of the Pure Food and Drugs Act is shown in Fig. 4.

of many of the most widely advertised quacks. Accurate and scientific information may be had on practically every nostrum on the market in the two splendid volumes of Nostrums and Quackery, published by the American Medical Association, 535 N. Dearborn Street, Chicago, Illinois.

The Challenge of Scientific Medicine.—Scientific medicine is based upon the study of the normal structure and function of the human body and the variations of that normal, called disease. In disease the cause, course, complications, and outcome of diseased processes together with the results of treatment must be determined. There is no acceptance in modern medical practice of speculation for accurate observation; that as a procedure was discarded over a century ago. Careful observation of phenomena, exact interpretation and measurement of signs, complete history of the course of disease, are the fundamentals of medical practice. Every year diseases are yielding to the painstaking efforts of practitioners, research workers, and experts. Many problems have been solved; many remain to be solved. There are still diseases that cannot with absolute correctness be diagnosed. Scientific medicine is frank, free from taint of hypocrisy, fraud, and charlatanism.

The great advance in medical science, outside the field of surgery, has been the use of the biologic sciences upon which must always rest the tests in diagnosis and the rationale of therapy. Why presumably rational people will permit a chiropractor to treat for a condition undiagnosed, or a Christian Scientist to give treatments while ignoring the pictures the *x*-ray will show, are to be explained in terms of Goddard's "levels of intelligence." The intelligent man cannot choose the superstitious when the scientific is available.

Examples of the Methods of Scientific Medicine.—As an illustration of the procedure available in diagnostic clinics, accessible to most physicians, in hospitals and free clinics, the following scientific examinations are used today for the determination of the state and condition of body fluids, cavities, and structures:

I. Examination of the condition of the stomach:
1. Ewald test-meal.
2. Tests for the digestive ferments; complete gastric analysis.
3. Fractional determination of gastric contents (Rehfuss).
4. String test (Einhorn).
5. Examination of duodenal contents.
6. Motility of gastro-intestinal tract.
7. Roentgenologic examination of the entire digestive tract, both fluoroscopic and radiographic.
8. Complete stool examination, including microscopic and chemical tests for blood and toxic substances.

II. Examination of the condition of lungs and bronchi:
1. Fluoroscopic and radiographic examinations of lungs and chest contents.
2. Bacteriologic and microscopic examination of the sputum.
3. Tuberculosis complement-fixation test.
4. Von Pirquet test.
5. Sensitization tests for asthma and hay-fever.
6. Bronchoscopy.

III. Examination of the condition of the heart and blood:
1. Fluoroscopic and radiographic examination of the heart, aorta, and mediastinal structures.
2. Determination of blood-pressure, systolic and diastolic.
3. Electrocardiographic examination.
4. Microscopic blood tests, giving complete cell count, including red cell, white cell, and differential count.
5. Hemoglobin determination.
6. Wassermann test.
7. Coagulation tests.
8. Iso-agglutination test for transfusion.
9. Blood-cultures.
10. Examination for blood-sugar, uric acid, urea, cholesterin, creatinin, chlorids.

IV. Examination of the condition of the ear, nose, throat, and sinuses:
1. Transillumination of sinuses.
2. x-Ray of sinuses.
3. Esophagoscopy.
4. Laryngoscopic examination.
5. Tests for hearing with labyrinthine examination.
6. Bárány chair tests.

V. Examination of the condition of the genito-urinary tract:
1. Urethral endoscopic examination.
2. Cystoscopic examination.
3. Ureteral catheterization.
4. Roentgenologic examination of kidneys, ureters, and bladder.
5. Renal function test (phenolphthalein).
6. Urine analysis from one or both kidneys.
7. Examination for gonococci, tubercle bacilli.
8. Smears.
9. Examination for spirochetes by dark-field illumination.
10. Gonorrhea complement-fixation test.

VI. Examination of the condition of the rectum and sigmoid colon:
1. Procto-sigmoido-colonoscopic examination.
2. Roentgenologic examination of bismuth enema.

VII. Examination of the condition of the nervous system:
1. Complete neurologic examination, including tests of reflexes, co-ordination, and association tests.
2. Spinal puncture with examination of the spinal fluid in
   (*a*) Wassermann test.
   (*b*) Cytology.
   (*c*) Globulin test.
   (*d*) Cultural examination.
3. Roentgenologic examination of spine and cranium.

VIII. Examination of the condition of the endocrin system:
1. Carbohydrate tolerance test.
2. Roentgenologic examination of sella turcica and thymus gland.
3. Goetsch therapeutic test.

IX. Examination of the condition of special parts by *x*-ray:
1. Teeth for pus sacs.
2. Joint conditions.
3. Bone conditions—especially for fractures.
4. Examination of the consistency of swellings.

X. There are other special tests, such as the great number of skin tests for protein sensitization, total non-protein nitrogen test of urine, Widal test used in typhoid fever diagnosis, seminal fluid test, Lange's colloidal gold test, microscopic tests of the histology and pathology of tissue, type differentiation of the pneumococcus, and milk examination (human).

These examinations, I to X inclusive, are essentially laboratory tests. In addition, the use that scientific medicine makes of personal and family history, inspection, palpation, percussion, ausculation, and mensuration in the physical examination, is very great. With the aid given by laboratory findings the personal observation of the physician himself is corrected or verified.

The presence or absence of disease can only be determined by scientific methods. It is not possible that a clairvoyant, mind-reader, or Christian Scientist can tell whether or not the human body is diseased any more successfully than a blacksmith can determine whether or not a Swiss watch is in need of attention. Both groups are able to detect whether or not the organism is performing its function, but neither the Christian Scientist nor the blacksmith, the chiropractor, nor the wheelwright can determine what is the cause of the disturbance or the proper method to pursue to correct the condition. In these particular cases the only rational procedure is to secure the services of a properly experienced watchmaker in the case of the watch, and a properly experienced physician in the case of the human body.

That procedure is rational which bases its principles of action upon the demonstrated facts of living processes. Instruments of precision, such as the microscope, the *x*-ray, the chemical laboratory, and the technic of the scientific method, bring to the study of man, both in health and in disease, a record that can be proved by others working with like care and precision.

Man, the Organism.—It is important to remember that to some the doctrine of the Christian Scientist represents the reaction against the materialism in so much of our life today. Physicians as well as laymen need to remember that man is a unit of mind and body, and that it is fallacious to think of him in his reactions and expressions as purely physical or purely mental. Moreover, the factors that enter into the production of health must be completely evaluated. The psychical must be considered as well as the physical. This does not mean that one is to treat typhoid by mental rays and spiritual light, but it does mean that in the whole life of man he who would attain health, and he who would restore health, must know the forces that affect personality in its spiritual aspirations and be able to recognize the demands of the mind and soul as well as those of the stomach and the intestines. There is an element of truth in most of the systems that attempt either to teach health or restore health, but the mistake of the credulous lies in accepting as a guidance for the whole of life a lantern, when an arc light is available. It should be remembered, therefore, that science cannot neglect the mind of the individual in dealing with the body (the physician must treat the patient and not the disease); the mental healers in ridiculous fashion neglect the body and its nature.

This influence of the mind over the body is one of the most admirable relations, and yet in the hands of charlatans, pseudoscientists, and others this fact is used with pernicious results. It is known that persons suffering from hopeless maladies are especially susceptible to the suggestion that comes from any new treatment with glowing promises. This psychic element in cancer, for example, has been well described by Weil:

> "It is indeed very remarkable that a patient that has been consigned to death as a victim of a hopeless malady should regain his spirits and his appetite, when he is again confronted with the hope of a cure and of the eradication of his disease. It is a phenomenon well known to every student of the disease that a large proportion of cases responds in just this manner to any treatment that is offered them. Osler has described a case of cancer of the stomach in which the mere visit to a consultant of sanguine temperament, though poor judgment, whose assurance to the patient that there was no possibility of cancer, resulted in a disappearance of all symptoms and a gain of 18 pounds in weight. It is this psychic influence which has occasionally deluded the honest student of cancer cure, and which has also so generously played into the hands of the dishonest."

The science of health includes not only the physical but also the mental. As a science it has definite and accurate provisions for the attainment of health. The laws must be obeyed. They demand application in the lives of men and women and are most serviceable when guided by ideals and made a part of life by habituation. A life that is guided by the highest ideals in applying the scientific knowledge of the laws of health is the best illustration of artistic living.

To live most and to serve best may with more success be achieved in this combination of ideals with science than in any other way.

The following chapters will present the essential laws of hygiene and conditions for health; the hygienic facts will be of service in so far as they are used.

CHAPTER VI

HYGIENE OF THE MUSCULAR AND SKELETAL SYSTEMS

I. Place of Movement in Human Development.
II. Significance of Movement and Consciousness.
III. Habits of Muscular Activity Characteristic of Different Stages of Human Development.
IV. Beneficial Effects of Rational Exercise:
  General Effects.
V. Injurious Effects of the Sedentary Life:
  1. The Heart.
  2. The Lungs.
  3. The Muscles.
VI. Adaptation of Exercise:
  1. To Age—Exercise for Adults.
  2. Adaptation to Sex.
  3. Adaptation to Occupation.
  4. Adaptation to Climate.
  5. Adaptation to the Individual.
VII. Relative Value of Different Activities:
  1. Play, Games, Sports, and Athletics.
  2. Dancing.
  3. Formal Gymnastics and Calisthenics.
  4. Setting-up Drill.
VIII. Habits of Exercise.
IX. All the Factors in Health Important.

HYGIENE OF THE SKELETON

I. The Matter of Posture:
  1. Value of Good Posture.
  2. Four Important Positions.
II. Prevention of Common Skeletal Deformities:
  1. Curvature of the Spine.
  2. Shoulder Braces.
  3. Weak, Deformed, and Flat-feet.
III. Causes of Foot Weakness and Deformity.
IV. Points of a Good Shoe.
V. Flat-feet.
VI. Exercise for Weak or Fallen Arches.
VII. Perils of Maturity.

HYGIENE OF THE MUSCULAR SYSTEM

Place of Movement in Human Development.—We have seen that the simpler forms of life were concerned almost entirely with the processes of getting food and reproducing their kind. In the very simple types these functions were carried on without any directive force. Food came mainly from the surrounding media and was taken in by a process of absorption. Reproduction as a process was very simple. It consisted in the adult dividing and producing two where there was only one before.

The lowest worm-like animals gave apparently the first appearance of a muscular system and there followed soon after this a skeleton. Mollusks developed an external covering which limited locomotion, and it was not until the bony parts became elaborated as an internal skeleton that locomotion as seen in mammals came into prominence. The vertebral skeleton opened up tremendous possibilities because great masses of muscles could thus be used, and, in addition, there came increased opportunity for the nervous system in a rapidly changing environment. It is very important for us to learn this fact of evolution and development, because in our own training of the human being we should aline our methods with the methods used by nature in developing man and thus work in harmony with nature's laws. The increased efficiency of the nervous system that followed the increased power of the organs of locomotion means for us today that we should emphasize and develop the muscles and skeleton before we attempt any serious training of the nervous system. Moreover, we can expect the nervous system to work most effectively if the muscular system is well organized and in good condition, and if the skeletal system is in such posture as to maintain proper functioning. It is an interesting and important fact that the attitude of the mind and the functioning of the brain are controlled and modified by the position of the body as a whole and by its several parts; and the use of the nervous system, as pointed out by

James,[1] to insure that every sensory stimulus shall result in a muscular or motor response suited to the emergency, shows the mutual reliance of these two systems upon each other.

Significance of Movement and Consciousness.—It is very interesting that the story of development of higher forms of life in the animal and plant kingdoms associates, in general, in the former, consciousness and movement, and in the latter, unconsciousness and immobility.[2] For the animal a muscular system made movement possible and locomotion gave opportunity for new and changing situations. The stimulation of the sensory part of the nervous system was tremendous and called forth increased neural activity. Consciousness has in evolution, therefore, been associated very definitely with movement.

It is significant in this connection to note that modern psychology is affirming this biologic fact in its statement that sensation is never complete until the centrally initiated impulse is expressed outward in a motor way and is returned with the significance of the act rounding out the circle and completing the circuit.

Moreover, the meaning of motor training must be viewed in this newer light. The training of the hand in kinesthetic sense, the training of trunk and legs, means an awakening of consciouness with reference to the physical world that is extremely valuable.

In contrast with this interesting development in the animal world there should be noted the characteristic immobility of the higher plants and its accompanying unconsciousness.

Consciousness and movement have been associated in evolution; consciousness and movement are to be associated now because of the history of man. This means definitely—does it not?—that intelligence will not develop

[1] James, William: Psychology, Henry Holt & Co., New York, 1900, pp. 370–372.

[2] There are some exceptions, notably the Drosera (Sundews) and the Dionæa (Venus' fly-trap).

fully in the sedentary and immobile individual. The brain has evolved concomitantly with vigorous activity of the muscular system.[1] This does not mean that one can hope to attain brilliance of intellect by gaining increasing power to lift heavy dumbbells. Mental power is gained and conserved by an intelligent care and provision for the physical activities of the body. The law of mental growth follows closely the law of physical growth.

Habits of Muscular Activity Characteristic of Different Stages of Human Development.—The muscular movements of the newborn babe are very limited in type and in amplitude, and as they increase in number and range up to adolescence, there is one characteristic manifestation. The movements of the child are large movements and the control over the trunk is more accurate and comes earlier than the control over hands and feet. The reason for this is to be found in the order of development of these muscles. The first muscles to appear in animal life were the muscles of the trunk; muscles of the upper and lower extremities came much later. The trunk muscles are, therefore, older, and in each individual of the race of man they develop first and are followed by the muscles that accomplish fine co-ordinations. Moreover, it will be recalled that the vital organs of life developed in correlation with the trunk muscles. This fact has tremendous connotation in ordering our lives with reference to the development of strong vital organs.

After adolescence the increased power of the individual to perform fine co-ordinations with the hand goes along with the increased power to co-ördinate the activities of the brain. The changes that have come in man's civilized

[1] Beyer, H. G.: American Physical Education Review, June, 1900, p. 149; June, 1901, p. 181. Report of the Royal Commission on Secondary Education, 1905, London. Hastings, W. W.: American Physical Education Review, March, 1900, p. 53. Porter, W. T.: Transactions of the Academy of Science of St. Louis, 1893 and 1894. Christopher, W. S.: Annual Report of the Board of Education of Chicago, 1898–1899.

environment require the use of the smaller muscles of the body. These changes threaten his vitality because they eliminate very largely the fundamental muscles that are so important in maintaining the health and strength of the circulatory, respiratory, digestive, excretory, and nervous systems. Moreover, these changes have added to the ease with which man can obtain a livelihood because of the ever-increasing use of machinery requiring only the pushing of a button for operation. In short, the life of man in the factory and even to some extent on the farm is more and more becoming what it has been for the clerk for many years—a sedentary life. Such alterations in the life of man bring advantages in many ways, but unless their limitations are understood and controlled both by the individual and the community the result will be definitely a loss of vitality to the nation. We can never put the nation back to spinning-wheels for the women and flails for the men.

Since the life of many civilized men is and will be in the future a life in work of sedentary type, effort should be made to understand this fact and then to work out types of activity that will provide the margin of motor activity that man requires to maintain his own health and that of the race. Professor Hetherington[1] has outlined in valuable form (Table II, page 118) what is needed from five to eighteen years.

After twenty years of age an hour should be given daily to motor recreation involving the use of the large muscles of the body. Anything less than that for most individuals will result in physical deterioration. We are unable to state the ideal degree of muscular development needed by man in different avocations. Theoretically, the lawyer, the doctor, the merchant require a less vigorous musculature than the farmer, mechanic, or day laborer. In reality, this may not be true when viewed in terms of

[1] Hetherington, Clark W.: American Physical Education Review, May, 1917; University of California Publications, vol. v, No. 2, July 30, 1914.

TABLE II

DISTRIBUTION OF ACTIVITIES BY AGE PERIODS:

Age	Total Average Waking Hours	Big Muscle	Manual	Linguistic	Automatic	Doing Nothing
0–1	....	....	....	....	....	..
1	9–½	....	....	....	....	..
2	10–½	....	....	....	....	..
3	11–½	....	2	....	2	?–
4	12	....	2	....	2–¼	?
5	12–½	4–½	2–¼	2–½	2–½	?
6	12–¾	4–¾	2–¾	2–½	2–½	?
7	13	5	3–½	2+	2–¼	?
8	13–½	5–½	3–¼	2–¼	2	?+
9	13–¾	6	3–¾	2+	2	?
10	14–	6	3–½	2–¼	2+	?
11	14–	5–$\frac{2}{8}$	3–½	2–½	2	?
12	14+	5	4	3	2	?
13	14–½+	4–½	4	3–¼	2–¼	?
14	15	4+	4–½	3–¾	2–½	?+
15	15–½	4–	4–¾	4	2–¾	?
16	15–¾	3–½	4–¾	4–½	2–¾	?
17	16–	3+	4–¾	4–¾	3–	?
18	16	2–½	5–½	5–	3	?
19	16	2	5–¾	5	3	?
20	16	2	5–½	5–½	3	?

The school years, from 5 to 16, are the strategic years for growth and development. The child requires muscle activities from four to six hours in this period. (By courtesy of Clark W. Hetherington.)

fullest health and most satisfying happiness. Certainly, all men require a minimum physical development which would enable them to participate with pleasure in many forms of motor recreation. The narrow view that conceives man as giving all to vocation and only a pittance to recreation for "exercise" constricts the range and scope of human happiness.

This minimum physical development should provide for all:

1. Strength of trunk muscles to maintain an upright posture and to prevent any ptosis of vital organs.
2. Strength of back and leg and feet muscles to produce:
    (*a*) Ease and elasticity of gait.
    (*b*) Power for walking, running, and jumping.
3. Strength of arm and shoulder muscles sufficient to swing with reasonable skill a golf club, axe or racquet, to throw a ball, to row a boat or to paddle

a canoe, to pull a rope, to control a horse, and to swim. Strength and skill should be sufficient to permit one to enjoy and to take satisfaction in such activities.

Such a minimum, though generally stated, would provide power for enjoyable motor activity. It would insure against the ptoses of adult life. It would tend to maintain at normal the vital organs of the body.[1]

Beneficial Effects of Rational Exercise.—By rational exercise is meant exercise that is suited to the individual's need. What is desirable activity for one person may be unwholesome for another. Suitability of exercise is determined by the following:

1. The exercise for general effects should be natural. Through a long evolution man has developed a physical body in response to certain activities and needs. This body so developed will function best if exercised in movements similar in type to the activities that produced the body of man. Walking, running, jumping, lifting, throwing, striking, hanging, and climbing are natural types.
2. The exercise for special effects may be artificial, that is, designed to produce particular muscle action without reference to evolutionary prototypes. Thus, special corrective exercises for feet, spine, abdomen, chest, back, or other part of the body may be needed.
3. Whether natural or artificial, rational exercise will not produce soreness or stiffness. The idea that an exercise must hurt in order to be effective is similar to the idea that a medicine must have a disagreeable taste and an unpleasant odor in order to be potent. That exercise is most scientific which produces increasing amounts of fatigue substances, causing increased resistance to fatigue, but at no time resulting in soreness and stiffness.

[1] Friedman, H. M.: Muscular Development, etc., Journal American Medical Association, March 9, 1912, pp. 685–690.

With these brief reservations in mind the beneficial effects of rational exercise may be stated. They are:

1. Increased circulation through the part (as in special corrective work) or through the entire body. This circulatory activity carries food to the tissues, removes waste, distributes the endocrin secretions, and equalizes the water and heat content of the body.
2. Increased respiration that gives increased oxygenation of the blood, increased elimination of carbon dioxid, and increased oxygen supply to the tissues. These values are dependent upon body activity and do not flow from the respiratory movement itself.
3. Increased elimination of waste through kidneys, lungs, intestines, and, to some extent, skin.
4. Increased metabolic changes. Digestion is improved, assimilation accelerated, and nutrition in general heightened.
5. Increased neural activity, resulting in part from the increased circulation and elimination, and in part from the awakened kinesthetic senses.

General Effects.—In vigorous activity there is an increase in the force and rate of the heart, the respirations are increased in depth and frequency, perspiration becomes more marked, and more waste is eliminated. There is in this heightened activity of the body systems a more or less complete change in the liquids of the body. Combustion of chemical compounds in the cells releases new energy; old accumulations of waste are removed and all the mechanisms for action are put in tune. Even reflective states are assisted by exercise, although if carried to the point of fatigue, mental activity afterward is slowed down. The scientific use of exercise involves the selection of forms and the extent of action that will favor best the particular somatic result desired. The teacher or leader of physical education must be awake to all the possibilities here, and not prescribe exercise without careful determination not only of the individual's condition but also of the program and duties and responsibilities that are to be met after the exercise is finished.

Exercise stimulates growth.[1] Numerous observations confirm this statement. For the growing child this is essential. Contrariwise, overindulgence in athletic sport may so deplete the body of vitality that growth is retarded. Some of the most significant illustrations in the high school confirm this, notably overtrained athletes.

Exercise is most popularly known for its development of muscles. More significant is its power to develop the organs of the vital systems. In this achievement, exercise stands alone as the only agent. It must be remembered, though, that only certain types of exercise achieve this result: types involving the use of the fundamental muscles. German and Swedish gymnastics and other formal systems that seek certain postural, localized, and static effects are not valuable in this sense, though for special conditions they may have a certain limited use.

The body should be as sacred as a temple. Too often bodies are mere shells, wrecks that serve to house minds that have developed enormous receptive power, but minds lacking in power of initiative, wanting in force, direction, and enthusiasm. Persons of such unfortunate equipment do not have that quality of health that would enable them to live most and to serve best.

Injurious Effects of the Sedentary Life.—A life of sedentary living brings with it some real dangers to the vital organs of life. It must be remembered that for the best functioning of the whole man the physical and the psychical must be provided for, not only because a fuller life can be lived in that way but also because without the physical the very basis of the psychic is lost. It is not unusual to see an individual unduly neglectful of his physical life so that he can advance in his vocation.

[1] Hall, G. S.: Adolescence, D. Appleton & Co., New York, 1911, pp. 1–237.

More of health is traded for the rewards of sedentary work than is biologically desirable.

The Heart.—One of the first organs to feel the loss in strength is the heart. It must be remembered that the heart is strengthened by the exercise of the skeletal muscles of the body.[1] The only way in which a weak heart is to be made strong is by gradual and increasing amounts of physical work of the skeletal muscles. The college or high school boy or girl who seeks to escape the activities of the physical education program because his or her heart is weak and irregular is foregoing the only means of obtaining a strong and regular heart. The persons who are unable to run a city block or climb a hill because of palpitation of the heart muscle, are the ones who are handicapped not only as regards this particular type of activity but also by the deficiency of the circulation to the entire body for twenty-four hours out of each day. The number of people who are just below par because of heart weakness experience inefficiency and debility as compared with efficiency and strength. Instances may readily be cited of individuals who have done and are doing fine and excellent work with impaired hearts. The evidence is not complete. Its consummation would tell of breakdowns under extra heavy pressure, of times of lowered power, and of an almost constant fear that by "overdoing" a break would come. The surest and best way to condition oneself for the doing of a high type of work is to make sure so far as possible of a strong and efficient heart and circulatory system.

The Lungs.—Other organs that feel the loss of active exercise are the lungs. The function of the lungs, in part, is to bring oxygen into the blood in response to the needs of the body. During increased activity, when great amounts of oxygen are needed, the lungs respond by frequent and deep respirations. The venous blood in the lung capillaries is exposed to air of a high oxygen content.

[1] Tyler, G. M.: Growth and Education, Houghton Mifflin Co., Boston, 1907, Chap. II.

There is no provision for the storing up in the lungs or in the body of oxygen for some future needs of the body. Oxygen burns (oxidizes) food materials as soon as it reaches the cells. Persons who live sluggish lives use the lungs relatively little because natural respiratory activity is automatically controlled by the needs of the body. This defect cannot be overcome by such a makeshift as "breathing exercises," because oxygen is only delivered to the cells in accordance with their needs. The only rational way to provide adequate oxygenation for the cellular materials of the body is by engaging in big muscle activity that results in deeper breathing without any control or direction on the part of the performer.

The Muscles.—As might be expected, the muscles of the body suffer in a direct way from the lack of activity. This is of little importance for health purposes as regards the muscles of the face; it is supremely important as regards the muscles of the trunk. The abdominal muscles play an important part in the maintenance of an upright posture and a slackness and weakness of these muscles results in a weak standing position. A weak posture shows an exceedingly unattractive body, and, in addition, has serious effect upon the position and functioning of the abdominal organs.

Adaptation of Exercise.—Exercise should be adapted to age, sex, occupation, climate, and the individual himself.

To Age.—In speaking of exercises for infants, Holt[1] says:

> "This is no less important in infancy than in later childhood. An infant gets his exercise in the lusty cry which follows the cool sponge of the bath, in kicking his legs about, waving his arms, etc. By these means pulmonary expansion and muscular development are increased and the general nutrition promoted. An infant's clothing should be such as not to interfere with his exercise. Confinement of the legs should not be permitted. In hospital practice I have often had a chance to observe the bad results which follow when very young infants are allowed to lie in the cribs nearly all

[1] Holt, L. E.: Diseases of Infancy and Childhood, D. Appleton & Co., New York, 1911, p. 7.

the time. Little by little the vital processes flag, the cry becomes feeble, the weight is first stationary, then there is a steady loss. The appetite fails so that food is at first taken without relish, then at times altogether refused; later vomiting ensues and other symptoms of indigestion. This in many cases is the beginning of a steady downward course which goes on until a condition of hopeless marasmus is reached. . . . Infants who are old enough to creep or stand usually take sufficient exercise unless they are restrained. At this age they should be allowed to do what they are eager to do. Every facility should be afforded for using their muscles. Exercise may be encouraged by placing upon the floor in a warm room a mattress or a thick "comfortable," and allowing the infant to roll and tumble upon it at will. A large bed may answer the same purpose."

In the recommendations of Holt may be seen the principles which may effectively govern all children in the matter of exercise. There should not be undue restraint. The young child will run and play like all the young of animal life if it is not interfered with by certain conventions and social burdens placed upon the child by a thoughtless parent. The child who walks in the park with a nurse in order to advertise the social position of the parents, or is not permitted to play because of the danger of soiling kid gloves or fine dresses, is in serious danger. Such a child needs to be saved from his parents. It should be remembered that the child of the wealthy suffers just as severely, if not so frequently, as the child of the poor man from lack of nourishment of the body cells. The difference is that the rich child has plenty of opportunity for food, but lacks the capacity for digestion and assimilation; the poor child could digest and assimilate if adequate food were available.

In speaking of exercise for older children Dr. Holt[1] says:

"In older children every form of outdoor exercise should be encouraged—ball, tennis and all running games, horseback riding, the bicycle, tricycle, swimming, coasting, and skating. Up to the eleventh year no difference need be made in the exercise of the two sexes. Companionship is a necessity. Children brought up alone are at a great disadvantage in this respect, and are not likely to get as much exercise as they require. The amount of exercise allowed

[1] Holt, L. E.: Loc. cit., pp. 7, 8.

delicate children should be regulated with some degree of care. It may be carried to the point of moderate muscular fatigue, but never to muscular exhaustion. The latter is particularly likely to be the case in competitive games.

"Exercise should have reference to the symmetrical development of the whole body. In prescribing it the specific needs of the individual child should be considered. By carefully regulated exercises very much may be done to check such deformities as round shoulders and slight lateral curvatures of the spine, and also to develop narrow chests and feeble thoracic muscles. For purposes like these gymnastics are exceedingly valuable to supplement out-of-door exercise, but they can never take their place."

It is important to point out here that Dr. Holt is speaking of the child with physical defect when he recommends symmetric development. There is no reason to believe that he means the symmetry in body development that was sought so earnestly a few years ago by specialists in anthropometry. The child that is allowed to participate in all vigorous games will develop symmetrically enough to satisfy all except those who make symmetry a fetish to be worshiped.

During the period of adolescence, when the body is growing rapidly and the vital organs are embarrassed to keep up the supply of energy for the rapidly growing body, it is important not to carry the exercise to extreme lengths. It should be remembered that in children the one quality that should not be tested is endurance. Many instances are on record of high school athletes being "burned out" by too intensive participation in scholastic sport. Exercise should be used to build strength and power in the youth, not to waste them.

Exercise for Adults.—Adults in general suffer from lack of exercise. The vocational interests of the majority of men and practically all women tend to center in sedentary activity. The adult has not carried on his interest in motor activities because of two defects in his training:

1. The formal calisthenic training of school days offered no satisfying states and hence no habituation to exercise that would make for continuance after school days.

2. The athletic games and sports learned in school were so highly organized and required such expensive and elaborate equipment that they were not pursued.

That exercise is most serviceable for adults that uses the large muscles of the body in forms of activity which are pleasant, enjoyable, producing satisfaction, and that lead to habits of exercise. The most favorable forms to secure this state of affairs are swimming, hiking, camping with its varied activities, golf, tennis, skating, and coasting. To these should be added horseback riding, hunting, fishing, and gardening.

After thirty years of age the adult may engage in activities requiring moderate endurance; he is less well adapted for speed effort. He is beginning to lose his elasticity and should never be tested in severe competition, although golf, swimming, hiking, and skating may be pursued to their limits.

The perils of middle age are a gradual deterioration of muscle power with sagging of structures, notably the abdominal organs, that gradually lose their ability to function properly. These perils are to be overcome by daily physical activity. There is no short cut; no easy way out.

Adaptation to Sex.—There should not be any marked distinction in the type of exercise of the boy and girl up to and including the eleventh year. After that the change made should be in line with the teaching of biology as regards the difference in the sex characters and physical make-up dependent upon those characters. At one time the girl was regarded as a being unsuited for play and physical training. The Victorian period of English literature shows us a girl who was interested chiefly in being unwell and ministered to as a weak sister. In America this type of girl is occasionally seen, but there is a healthy indication of more interest on the part of the girl and her parents in securing a vigorous foundation for the girl as well as the boy. It should be kept clearly in mind that both the girl and the boy are dependent equally upon the muscular system for the proper development and functioning of the vital organs of life. In both, the heart, the lungs, the digestive organs, and the nervous system must all rely upon the activity of the muscular system for efficient functioning.

The boy and girl both need vigorous exercise, but there are some fundamental differences between the body of the boy and that of the girl which determine the kind and extent of the activity to be followed. In the first place, the skeletal framework of the girl presents some important differences. The bones are lighter. The pelvis is much broader, which gives to the thigh bones a marked obliquity. The width of the pelvis interferes with the running ability of the girl; in all movements of the lower extremities, either in walking or running, there is a lateral sway of the pelvis; and the extent of this oscillation determines the speed of the individual in getting over the ground. Because of this one factor of body construction the girl is unable to run as fast or as far as the boy. It is this sort of biologic evidence that one must understand and respect, because one will not approve for the girl the kind of tasks held up to the boy. There are some people who feel that the girl should attempt to do the same physical feats of which the boy is capable. Such theory is distinctly contrary to the teaching of nature, and if one desires to progress one must remember to act in harmony with nature's laws and not contrary to them. It should be stated, therefore, that it is important to develop standards of performance of the girl that will be her standards. Girls should not seek to do the events in which the boys excel because they are boys' events, but rather they should try to excel in performances belonging peculiarly to women. There is no feeling here that girls are inferior to boys; it is meant that girls are different. There is need to provide for girls types of activity that are suited to their needs, on the one hand, and in harmony with their powers on the other.

The following activities[1] are classified for mature and immature girls:

For Mature Girls

1. Condemned:
   Broad jump.
   High jump (in competition).
   Pole vaulting.
2. Doubtful:
   High jump.
   Running more than 100 yards in competition.
   Weight throwing.
3. Safe:
   Archery.
   Ball throwing.
   Basketball (women's rules).
   Climbing.
   Coasting.
   Dancing.
   Field hockey.
   Golf.
   Horseback riding (cross and side saddle).
   Indoor baseball.
   Low hurdles (not in competition).
   Paddling.
   Rowing.
   Running (not in competition).
   Skating.
   Skiing.
   Snowshoeing.
   Swimming.
   Tennis.
   Walking.
4. Especially beneficial and suitable:
   Dancing.
   Paddling.
   Rowing.
   Running.
   Swimming.
   Walking.

For Immature Girls

1. Condemned:
   Pole vaulting.
   Running more than 100 yards.
   Weight throwing.
2. Doubtful:
   Basket ball.
   Field hockey.
3. Safe:
   Archery.
   Ball throwing.
   Broad and high jump (not in competition).
   Climbing.
   Dancing.
   Horseback riding (cross saddle).
   Low hurdles.
   Paddling.
   Rowing.
   Running (not in intense competition).
   Skating.
   Swimming.
   Tennis.
   Walking.
4. Especially beneficial and suitable:
   Climbing.
   Dancing.
   Jumping (in moderation).
   Running (in moderation).
   Skating.
   Swimming.
   Walking.

5. Best loved, most commonly practised, and with greatest primitive appeal: Dancing (greatest unanimity of opinion in this answer).

[1] From Healthful Schools, by Ayres, Williams and Wood, Houghton Mifflin and Co., Boston, 1916.

Adaptation to Occupation.—When it is recalled that exercise is of value because of its effects upon the vital processes of life, it will be clear that the exercise necessary for health will vary in accordance with the activity of the person. The ditch digger at the end of a day's work does not need activity that will strengthen his heart and induce perspiration. He may, however, need activity of a kind that will have an exhilarating effect upon his nervous system. The clerk in a store engaged in sitting behind a counter and selling buttons does require effective stimulation of the lungs, heart, and skeletal muscles, and especially out of doors. In thinking of the adaptation of exercise to occupation it is important to remember that health is something more than the ability to eat and sleep. Health of the muscles and heart is important, but health of the nervous system must not be neglected. Exercise that is distasteful or uninteresting is not only of small value, but it may be positively injurious. For students in college as well as pupils in school, for clerks in stores as well as workers in the factory, the selection of exercise must be made on a basis of the person's occupation, and thus supply the margin of activity necessary to keep the entire body healthy and strong, a ready and willing servant of the mind. What this margin shall be varies with the vocation. But for all there is a minimum which will provide for strength and vigor of the vital organs and will keep the muscles in sufficient tone and strength to secure pleasure and satisfaction from motor activity. The individual with weak and flabby muscles cannot *enjoy* physical activity. The importance of joy in physical activity cannot be overestimated.

Adaptation to Climate.—Climate rather naturally makes its own adaptation of the individual in the matter of exercise. Persons who live for any length of time in the South gradually develop a distaste for exertion of a physical kind.[1] In the North there is quite naturally an

[1] Huntington, E.: Civilization and Climate, Yale University Press, 1915, Chap. III.

inclination even in winter for vigorous outdoor life. Nature should be followed here. The winter time is the most important time to carry on outdoor activities. Vigorous walking, outdoor games, skating, coasting—these are the things to do. It is because of the limitations imposed by the weather that people live such unhygienic lives in the winter. For many it is a period of semi-hibernation. Because of this, and the resulting accumulation of waste materials, so many feel the need of a "tonic" in the spring. It is important to state here that the best tonic in the spring, especially after an inactive winter, is out-of-door exercise with a rather careful limitation of the diet. This point will be taken up later in more detail.

Adaptation to the Individual.—It may be stated that all persons without serious disease need the general effects of daily exercise. These may be secured by walking (not strolling aimlessly, but walking a distance of 2 miles in at least thirty minutes), hiking, swimming, playing games such as golf, tennis, baseball, handball, and other sports.

The cardiac patient may need restricted and graduated work; the tuberculous person may need absolute rest. Such cases need the care and advice that a skilled physician can give.

Relative Value of Different Activities.—Not all exercise is wholesome. Some varieties are more desirable than others. The advocates of certain "systems" propose that it is only necessary to follow their method to secure health and happiness, if not life eternal itself. The virtue of their systems is likely to be greater the more they satisfy the needs of man as revealed by man's nature and development. On the contrary, many claim virtue because of certain "special" exercises which the founders "discovered." A consideration of the relative value of types is therefore important.

Play, Games, Sports, and Athletics.—Play forms seen in games, athletics, and aquatic and land sports afford the best type of exercise. They are the best for man because they are identical with or similar to the forms used by man in evolving from lower forms to his present position in the biologic scale. Man's body works best when exercised in movements very like the movements that produced his body. These activities as types, contrasted with calisthenics, are so much more satisfying because of the interest and mental exhilaration that comes in play forms.

Dancing.—Folk and natural dances are excellent forms of exercise. Women are finding great satisfaction also in certain rhythmic forms that have advanced beyond the old esthetic technic.

Social dancing is wholesome exercise, natural in the form of movement, and physiologically valuable exercise if practised in a sanitary environment. Unfortunately, the late hours, the bad ventilation that so often accompany the social dance introduce factors that need to be controlled.

From another standpoint the modern social dance is open to serious criticism because it is frequently licentious, and often immoral, and tends by its indirect influences to a lowering of standards and to a debasing of fine human relationships. The social dance involves fundamentally the romantic position; it is often erotic in character. Hence it should be controlled by the finest and most accepted standards that will help boys and girls to fine forms of expression.

The young man or young woman who is interested in living most and in serving best ought to be concerned not only with the possession of splendid purpose but also in the expression of the finest and best in personality. It is not possible to "jazz" through an evening, cheek to cheek, body close to body, without arousing emotions and impulses that are biologic, natural and worthwhile, but emotions and impulses so strong and impelling that they lead frequently to undesirable, unsocial, and immoral forms of expression.

Formal Gymnastics and Calisthenics.—Exercises of this type are less valuable than games, sports, and athletics.

They are useful in special cases to correct special defects. Their application to life is so limited that lengthy discussion is unnecessary.

Setting-up Drill.—It ought to be possible for all persons to live in such a way that the activities of work or the activities of play provided all that was essential in physiologic results to keep the muscles in tone, the heart strong, and the different organic systems in good condition. There is here, as elsewhere in human life, considerable difference between the *ought* and the *is*. We are confronted with the fact that a very large number of people, especially professional and business men and women, follow pursuits that are strictly sedentary, and not conducive, under present social organization, to adequate participation in motor recreation. For these persons a setting-up drill taken every morning before the bath will be of real value in assisting to maintain the body in good physical condition. The following description of the exercises appeared first in the Teachers College Record which has kindly given permission to reproduce in part the author's original article:

"In presenting a series of setting-up exercises it is important to emphasize certain limitations. It does not represent a complete system of physical education, nor may it be considered in all cases to provide everything that is necessary to maintain health. At best it is only a substitute for more wholesome exercise out-of-doors in the form of games and recreative sports. The following points, therefore, should be noted:

1. There is no short cut, no royal road, no easy way to health. The development and preservation of physical vigor require intelligent care of the body and scrupulous regard for the laws of health. One cannot with safety and assurance contract a few muscles, breathe deeply a few times, and obtain organic strength. In addition to exercise other factors must be considered, such as a healthful attitude of mind, the choice of proper recreation, the intelligent selection of food, the adjustment of work and play, and the care of the body functions. All are as important as exercise. It ought to be unnecessary to say that one cannot misuse the mind and body, and then breathe a few times, take a pill, and remain vigorous.

2. Health exercises as a rule have been devised to produce effects which could be felt by the person taking them. The idea that an exercise must be *felt* in order to be valuable is similar to the idea that medicine must have a nasty taste and a mysterious color in

order to be potent. On the contrary, the most desirable sort of physical training will not produce soreness and will in no way strain the muscles.

3. Exercises usually offered to the public are based upon the artificial and unnatural movements of the Swedish or German systems. It should be appreciated more generally that the movements which man has made in developing from the lower forms of life into the human being that he now is are more suited to his needs than movements which are wholly unrelated to his phylogenetic inheritance.

4. Many of the exercises often proposed are distinctly harmful. For example, the human being should not bend the trunk backward (except in corrective gymnastics where the support is controlled), and breathing exercises which have no relation to physiologic needs of the body are often injurious.

The exercises that follow are natural movements; hence they are offered with the belief that they will be of some value to the sedentary worker in school or office. They will serve to provide some activity of a *natural* kind, and should be supplemented with as much wholesome out-of-door exercise as is necessary to provide that "margin of motor activity" essential to individual health.

They do not represent a complete system of body building. They are not devised to meet the play requirement of children nor the reactive needs of adults. They will set up the body, but they will not restore a damaged heart, nor bring strength to a paralyzed muscle. They will help, however, in securing good posture; but they will not cure a crooked back nor remove fat from the abdomen and deposit it on the shoulders.

These exercises should be performed on arising in the morning and should be followed by the morning bath. They are devised to produce wholesome effects upon circulation and respiration, and they will aid digestion and elimination. Since they are devised to secure an uplift of the body in all the movements, the accent should be upward. In addition, the trunk muscles are vigorously worked and the correct use of the foot is favored.

The necessity of supplementing these movements with out-of-door exercises must again be emphasized. Such activities as walking, hiking, tennis, swimming, coasting, skating, horseback riding, canoeing, golf, dancing, athletic sports and games are suggested, but the extent of participation in them must be determined by the needs, capacities, and limitations of the individual.

The following description should be carefully noted and the pictures studied in learning the exercises.

Standing (Fig. 5)

The standing exercise (Fig. 5) is used to help in achieving a good standing posture. Much of the posture work in the schools is bad on account of the rigid and unnatural position attained. The body is too frequently put into such a posture that the relation of parts prevents quick and controlled action. One should seek to attain in standing an erect position without rigidity, thus insuring healthful functioning of abdominal organs, proper use of joints, and efficient use of the musculature of the body.

EXERCISE:

Stand with the feet parallel to each other and 6 to 8 inches apart. Place one foot (either one) 3 to 4 inches in front of the

Fig. 6.

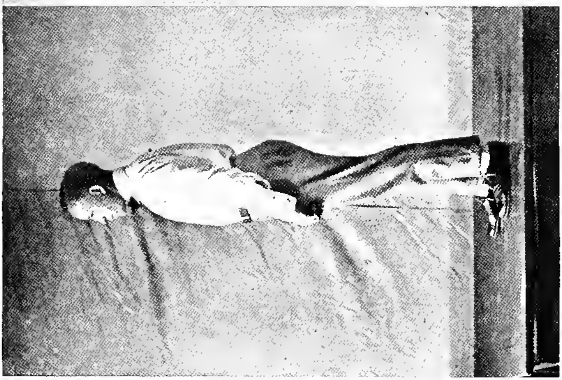


Fig. 5.

other. Have weight on both feet disposed to their outer edges. This position of the feet produces balance, pivot, and control. Push the trunk upward and lift the abdominal wall upward. Retain a feeling of relaxation in the shoulders, but secure a sensation of extension and lengthening of the body without contracting or tensing the muscles (Fig. 5).

Guides in Performance:

1. Avoid rigidity.
2. Secure straightening of the spine, but keep the shoulder muscles relaxed.
3. Keep the weight off the heels.
4. Pull the abdominal wall upward and keep the lower half of the abdominal wall constantly flattened.

Command:

For individual performance of the exercises no commands are required. Directions are given, however, for use in group instruction where commands are necessary.

The commands have two parts separated by a pause. The length of the pause should vary according to the needs of the group and the exercise. The first part of the command is preparatory; the second is executive. These parts should be spoken in such a way as to convey in the voice the manner of action expected.

The command for this exercise is: *Class—Stand!*

Stretching (Figs. 5 and 6)

This is a natural movement that straightens the spine, lifts the chest, and overcomes the sagging of the abdominal muscles so commonly seen in adults.

Exercise:

On the command *One!* push the arms easily upward and rise on the toes as far as possible. Reach up as far as possible as if trying to get an object from a high place (Fig. 6).

On *Two!* let the arms sink and the heels touch the floor, but retain as long as possible the sensation of extension (Fig. 5). Do not let the body droop. The development of the proper muscle sensation is important.

Guides in Performance:

1. Avoid tenseness and rigidity.
2. Do not bend backward.
3. Avoid angular movement of the arms. Do not swing them up; push them up.
4. Perform with a feeling of relaxation rather than contraction.
5. Repeat the movement ten times. (In the beginning, two or three times is sufficient for all the movements which are to be repeated.)
6. Do not execute the movement rhythmically, for in rhythmical exercises it is more difficult to get the correct form at the end of the movement. The form in this movement is important.

Command:

1. *Ready for Stretching—Stand!* (Take the position in Fig. 5.)
2. *Stretching—One!* (Fig. 6) *Two!* (Fig. 5).

Throwing (Figs. 7 and 8)

This is a natural movement used by man in throwing a ball at an object. In learning movements that involve complex co-ordinations, do not think of the "end" of the movement, but keep clearly in mind the "means" to that end. Follow closely the directions for arm, leg, and trunk movement, and the co-ordination will come.

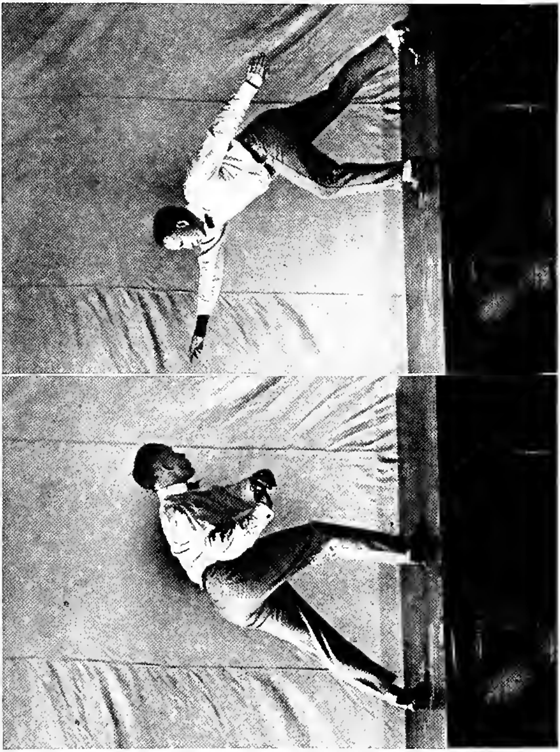


Fig. 8.

Fig. 7.

This movement is a powerful trunk exercise. It uses the back and side muscles and brings into play the large muscles of both arms and both legs.

The first part of the movement (Fig. 7) corresponds to the second part (Fig. 8) in position of trunk and legs. If the arms in Fig. 7 were placed in the position shown in Fig. 8, the similarity in the two parts of the movement would be instantly apparent.

EXERCISE:

Stand with feet about 24 inches apart and with the left foot about 6 inches in front of the right. On *One!* clasp hands lightly, waist high as shown in Fig. 7, shift weight to the right foot, bend the right knee, draw both hands to the right, twist the trunk to the right, and turn the head to the right. The left leg is straight and relaxed and the left heel is off the floor. The trunk is inclined forward (Fig. 7).

On *Two!* throw with the right hand, twisting the trunk sharply to the left. The left knee is bent and the right knee is straight with the heel off the floor. Notice that the body forms a straight line from head to right heel (Fig. 8). The weight has been transferred to the left leg. The right arm is forward and the left arm back (Fig. 8). The force of the throw turns the body in Fig. 8 a greater distance than in Fig. 7, and so the left foot is turned in the direction of the throw.

GUIDES IN PERFORMANCE:

1. Avoid angles and sharp tensions in the movement.
2. Make all movements flowing, smooth, and harmonious.
3. Avoid conscious contractions. Do not try to contract the muscles. Perform the movement and the muscles will contract to carry out your desires.
4. Repeat the exercise ten times. At first separate it into two parts. After it is learned make it continuous, and change from the position in Fig. 7 to that in Fig. 8 and back to the position in Fig. 7 without interruption.
5. After strength and power are developed, the movement may be performed rhythmically twenty times.

COMMAND:

1. *Ready for Throwing—Stand!* (Stand with feet about 24 inches apart and with the left foot about 6 inches in front of the right.)
2. *Throwing—One! Two!*
3. To command the rhythmical throwing, set the rhythm that is desired. Then command, *Throwing in Rhythm—Begin!* Count 1, 2, 1, 2, to mark the rhythm.
4. To halt the group, command, *Class—Halt!* inserted in the series of 1, 2.
5. *Class—Stand!* Standing position as given in Standing exercise is taken.

LIFTING (Figs. 9, 10, and 11)

This is a natural movement used in lifting an object from one side of the body to the other, or from a low level to a higher one. It is an exercise of the back and legs and may be made very vigorous by reaching low and lifting high.

The movement as given has two phases: low lifting and high lifting.

Exercise of Low Lifting:

On command *One!* bend the right knee and reach with arms to the right of the right foot about 12 inches from the floor (Fig. 9). The left leg is straight, the back is flat, and the movement occurs in the hip- and knee-joints. On *Two!* transfer the weight to the left foot and lift the object secured in command *One!* to the left

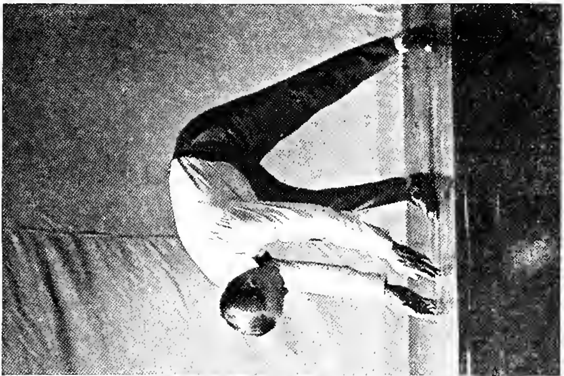


Fig. 10.

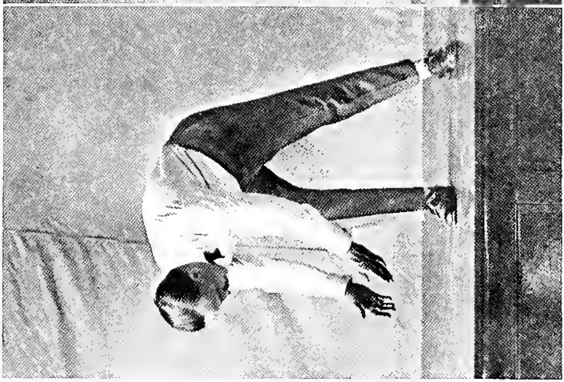


Fig. 9.

and into the same relative position as in Fig. 9. Then the left knee will be bent, the right leg straight, and the arms will be to the left of the left foot about 12 inches from the floor.

Exercise of High Lifting:

On *One!* assume the position as shown in Fig. 10. The hands reach the floor and there is greater bending in the right knee and hip joints. The back remains flat and the left leg is essentially in the same position as shown in Fig. 9.

On *Two!* lift the object to the left and place it high above the head (Fig. 11). Vigorous muscular extension should occur in this part of the movement while the weight is being shifted to the left foot and the right leg is relaxed with the right heel off the ground.

Fig. 11.

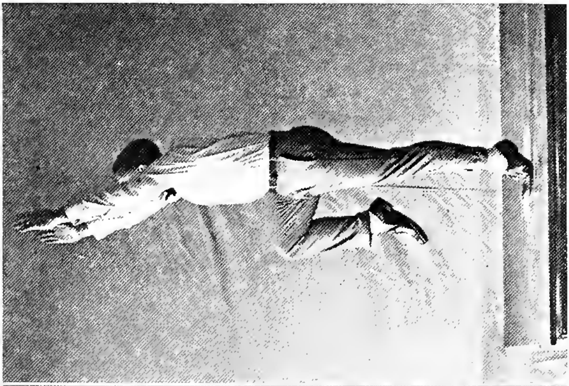


Fig. 12

Guides in Performance:

1. Avoid tenseness in the movement, seek smoothness and constantly adjust the body in the different parts of the exercise by comparing the movement with the illustration.
2. Secure uplift of the body in the high lifting and get the complete extension that would come in placing a box on a high shelf. (In Fig. 11 the upward pull of the trunk is indicated in the vertical folds of the shirt.)
3. Repeat each lift ten times.

Command.

1. *Ready for Lifting—Stand!* (Stand with feet 24 to 28 inches apart, parallel and with the weight disposed to their outer edges.)
2. *Low Lifting—One! Two!*
3. *High Lifting—One! Two!* Start the high lifting part of the time on the left and part of the time on the right.

Climbing (Figs. 5 and 12)

Climbing has always played a prominent part in the history of man. Our arboreal ancestors excelled in it and our children today at an early age seek to recapitulate their racial history in the same action. This movement is a powerful exercise for the legs and secures strong contraction of the abdominal muscles. As shown in Fig. 12, it represents reaching upward and grasping an object, as a limb of a tree or ladder rung and pulling up one leg to obtain support preparatory to pushing up the body. The arm movement is identical with the Stretching exercise.

Exercise:

On *One!* reach upward with the arms, raise the right knee forward and push the body upward on the ball of the left foot. Secure vigorous stretching upward. This is to be the accented part of the movement (Fig. 12). On *Two!* return to standing position (Fig. 5).

Guides in Performance:

1. Be careful not to droop on *Two!* Keep the erect position as shown in Fig. 5.
2. Accent the count *One!*
3. The movement may be performed rhythmically, but the rhythm should be slow and the accent always on the upward movement.

Command:

1. *Ready for Climbing—Stand!* (Fig. 5).
2. *Climbing—One!* (Fig. 12) *Two!* (Fig. 5).

Walking (Figs. 5 and 13)

The walking movement represents a natural exercise performed with movement of the opposite arm and leg. The act should be executed with the feet parallel and with the weight on their outer edges. The illustration (Fig. 13) exaggerates the natural movement in some of its phases, but should be practised as shown (Fig. 13) to secure the freedom in walking that is desired. Walking can be something more than a means of progression. Smooth arm movement and vigorous leg action will bring exhilaration into an act that is frequently rendered difficult by improper habits and clothing.

Exercise:

On *One!* raise the left knee forward and swing the right arm forward. The body remains poised on the ball of the right foot (Fig. 13). On *Two!* reverse the position of arms and legs.

GUIDES IN PERFORMANCE:

1. Keep the accent upward.
2. In walking avoid the pounding of the heels on the floor. The heels strike first always, but the accent of the movement should be upward and forward, never downward.
3. This movement is not to be confused with the aimless strolling that is seen so frequently.
4. The rhythmical and continuous walk is used as soon as the idea of the arm and leg movement is comprehended.


Fig. 11


Fig. 13

COMMAND:

1. *Ready for Walking—Stand!* (Fig. 5).
2. *Walking—One!* (Fig. 13) *Two!* (Fig. 13).
3. *Walking in Rhythm—Begin!* See directions for commanding a rhythmical exercise in Throwing.

Running (Figs. 5 and 14)

This is a natural exercise performed on the balls of the feet with vigorous thrusting upward of the knees and free and vigorous swinging of the arms (Fig. 14). It will be noticed that the right arm is forward when the left knee is forward. This opposition in walking and running is a fundamental compensation in the movement of the body to secure proper balance, direction, and control. This exercise vigorously stimulates the circulatory and respiratory systems, and will aid in improving all the functions of the organs supplying the body with energy. It should be possible for one to run and enjoy the movement (Fig. 14).

Exercise:

On *One!* swing the right arm forward and thrust the left knee upward and forward at the same time pushing the body upward on the ball of the right foot.

On *Two!* reverse the position of the arms and legs and push the body up on the ball of the left foot.

Guides in Performance:

1. Run a few times at first. After power and enduranee are developed, the run should be eontinued for several minutes.
2. Aeeent the upward movement. Do not strike the floor hard on the down stroke.
3. After the co-ordination is learned, the run should be executed in rhythm.

Command:

1. *Ready for Running—Stand!* (Fig. 5).
2. *Running—One!* (Fig. 14) *Two!* (Fig. 14).
3. *Running in Rhythm—Begin!* See direetions for rhythmical movements in Throwing.

Jumping (Figs. 15 and 16)

To clear an obstaele or grasp an objeet above one's standing reaeh one resorts to jumping. This is therefore a natural movement and it should be performed naturally. The first part of the movement (Fig. 15) uses the muscles of the entire body, and in the second part (Fig. 16) the body is thrown into the air by the vigorous eontraction of leg, baek, and arm muscles. In the continuous jump the landing position, shown in Fig. 15, serves as the start for the next jump. At first the movement should be practised without the jump.

Exercise:

On *One!* bend the knee- and hip-joints and ineline the body forward (Fig. 5). Swing the arms downward and backward elevating the heels slightly. Note that the trunk is inelined and not held in the upright and unnatural position sought in some gymnastic systems. On *Two!* swing arms forward and upward, and spring into the air (Fig. 16). The landing follows as a result of the movement and should assume the position shown in Fig. 15.

GUIDES IN PERFORMANCE:

1. Before trying the jump the movement of preparation (Fig. 15) should be practised until the muscles are strong enough to jump without straining them.

Fig. 16.

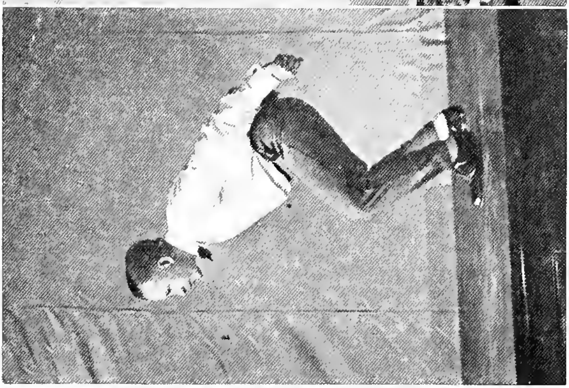


Fig. 15.

2. At first only make one jump (Fig. 16). Land with the knees bent and the heels off the ground.

3. Secure lightness in the movement and avoid landing heavily.

4. After the strength of the legs has been developed, continuous jumping should be performed. Gradually increase the number of jumps from one to five or six.

COMMAND:

1. *Preparation for Jumping—One!* (Fig. 15) *Two!* (Fig. 5). This movement should be performed six to ten times each day until the muscles are strong enough to make the jump.

2. *Jumping—One!* (Fig. 15) *Two!* (Fig. 16) *Three!* (Fig. 5). On completing the jump, the body assumes the position shown in Fig. 15 and then comes into the standing position shown in Fig. 5.

3. *Jumping in Series—One!* (Fig. 15) *Jump!* (Fig. 16) *Jump! Jump!*

The command *Jump!* is used as soon as the landing is made and is repeated as often as desired. At first not more than two jumps in series should be made; later a series of six and in some cases more may be used.

Habits of Exercise.—It is well known that one cannot build up in school days a store of health that will last for the rest of life. The star football player in college deteriorates rapidly after school days unless he continues his physical activity in some form.

College men and women ought to develop during school days a skill in and love for some sport, game, or physical activity which they will follow after school days are over. Activities lending themselves to such habituation are swimming, tennis, handball, and walking. To enjoy a "hike," to get out in the open spaces, to hunt, to fish, to ride horseback, to row a boat, to chop wood, to play golf, to grow things in the garden are health-producing activities. Habituation to physical activity is one of the goals that should be set not only for every college man and woman, but for all persons in the formative periods of school life.

All the Factors in Health Important.—In any health-building program care must be taken not to attribute to exercise more than belongs to it. In focusing on exercise there is a danger of neglecting other important health measures without which the greatest health cannot be attained. There are many individuals who live physically active lives, but who are lacking in vitality and vigor.

Other important considerations in a health-building program are care of the body as regards bathing, eating, sleeping, eliminating, dressing, and forms of recreation. There must be also appreciated in this connection the influence of mental states on physical health. Without stating at this time the psychology of related mental and physical states it should be noted that mental reactions to situations are important modifiers of organic processes.

We need, therefore, in the statement of the health needs of the individual something more than playgrounds, gymnasia, and turnverein. We need the first two certainly, but in co-operation with these we need more hygiene in the schools, better sanitation in the schools, more opportunity for wholesome recreation for adults, and less transmission of communicable diseases[1]; we need instruction in the schools that will not only enable the child to develop into an industrially or professionally intelligent man or woman but also a chance for that child to develop the characteristics that will make him or her a good parent. It is coming to be appreciated that home economics may be very valuable for the training of the girl; it is to be recognized that certain phases of the conduct and organization of the home may very well be given to boys. Both boys and girls need instruction in the home training and care of children. It is rather interesting that babies have been born into civilized homes for several years, and in that time a certain body of information has been developed with reference to the training of children. Nevertheless, we allow young people to be educated in the schools and marry and bear children without giving them any scientific knowledge that would enable them to do the best that was possible for them to do. Of course, innumerable clinics are provided in the large cities for the curing of infants after they have disease, but the intelligent and wise thing to do would be to instruct prospective parents at a time when they could be taught with some chance of preventing and correcting the intolerable conditions that at present prevail in the care and training of children.

[1] Annual Report of the United States Interdepartmental Social Hygiene Board. Reprint, activities 1919–1912, June 30, 1921, Washington, D. C.

A broad view of the health of the individual will include much more than exercise in a program that aims to achieve fineness in living and in service. It is the limited view that produces the queer anomalies seen at times in large cities when members of athletic club or turnverein will go to the gymnasium to engage in exercises ostensibly for the purpose of health, and will go out from the place and violate all the laws of health. There is need for an understanding of all the factors that enter into the production of health, and such conviction concerning human duty that the knowledge will be translated into effective action.

HYGIENE OF THE SKELETON

The Matter of Posture.—The bones of the skeleton are for the purpose of protection to certain parts of the body, for points of attachment for muscles, and for support to organs and structures. In order that the child develop in the proper way it is necessary that the bones of the skeleton retain the shape and position in the body which will enable them to perform these functions. There is great importance, therefore, in the maintenance of the correct position of the bony parts of the body. This is of immense significance especially in childhood because the period of childhood determines the shape and position of the body in adult life. Correct posture modifies body movement and conditions the development of the vital organs, so that it should be sought at all times. It is very much worth while to acquire correct motor habits, on the one hand, and strong and sound organs on the other.

The correct upright position of the body does not call for an erectness that is sometimes asked for in gymnastics. It calls for an erectness in which the general line of the body is straight, the head poised on top of the chest, and not projecting forth at an angle like a gargoyle on the cathedral Notre Dame, the abdomen flat and contracted, and the weight placed so that the body can be moved readily in any direction.

Correct posture of the body *cannot be defined* adequately. A definition is incapable of expressing all that must be sought in the body from head to foot, but one can acquire appreciation of what is desirable by being guided by the best in living and art forms that express in good posture, elevated, optimistic, and happy states of mind. Such a form as the Winged Victory shows good posture. The reason for its excellence lies in the thought back of the motor expression.

Posture is an expression of the mental and physical state; also, posture may modify and control mental states. It is possible by assuming an erect posture, by giving an appearance and expression of joyfulness, cheer and optimism, to replace a depressing mood with the opposite emotional state. The cultivation of a happy, cheerful, optimistic nature more readily achieves results when efforts are also made to walk with an elastic, springy step, to hold the head erect and the abdomen flat.

Individuals taking too little exercise are not infrequently equipped with such weak muscles that it is impossible for the parts of the body to be held in their proper position. Too frequently college girls and other young women who have neglected their physical training and games present bodies so miserably weak that the effort to stand erect is muscularly so fatiguing that the upright position is never held in an habitual way. These weak sisters try to cover their infirm and ineffective bodies by masking it behind a pose or a slouch that may happen at the time to be in style; but only the thoughtless are fooled. Such posture is essentially the posture of a frail body. It represents a body that is unable to do the work and meet the responsibilities that come with adult life, with marriage, and motherhood. Such girls, instead of possessing an attraction, unfortunately own a body that is relatively less able to express and receive happiness, to work and achieve results, to serve and receive service.

Value of Good Posture.—Although it is exceedingly difficult to define good posture, it is not at all difficult to realize the advantage of a posture in which the parts of the body at mechanical advantage and the body as a whole are responsive to the needs of the environment. The values flowing from such a posture are several:

1. *Hygienic value:* The erect, straight, vibrant body has its organs properly suspended so that bodily functions are more complete and perfect.
2. *Economic value:* Good posture pays. It speaks of the spirit within the body. The young man or woman seeking a business position portrays his or her mental energy and alertness by the way he or she stands and walks.
3. *Social value:* Despite the influence of pernicious and silly styles, it may be said that personal attractiveness is more properly measured by a splendid carriage of the body rather than by a "debutante slouch."
4. *Spiritual value:* The spirit is uplifted with a physical uplift of the trunk. The glory of the rising sun is never seen by one walking with protruding head and abdomen and flat-feet.

Four Important Positions.—There are four positions of the body that are important because of their influence on health and happiness. Sitting, lying, standing, and walking are such common postures that they influence greatly bodily activity. If correctly performed, the influence is good; if done badly, the result is inefficiency and frequently ill health.

We sit more than our ancestors did. Much sitting has caused weakness of trunk muscles, and much bad sitting has resulted in abnormalities of the trunk itself. One should sit in a chair so that the trunk is straight. Bending the body forward should occur at the hip-joint. To prevent bad trunk position it is helpful to sit far back in the chair. Chairs that are too high or too deep prevent proper sitting.

In reclining, relaxation of all muscles should occur. Complete relaxation is not possible in lying on the back.

It is generally agreed that lying on the right side[1] (or partially on the face) is more desirable than lying on the back, because it favors muscular relaxation and makes less pressure on the heart.

Standing is very tiresome and fatigues one more than walking. This is due to the slowing of the circulation in the legs. This fatigue cannot be overcome except by activity, but it can be lessened by a posture which facilitates the blood flow. The body should be balanced on the balls of the feet with the weight on the outer side. Keeping the weight poised and the abdominal muscles flat will assist the return of venous blood as well as contributing markedly to general well being.

It has been said that walking is a lost art. It is true that people walk less frequently today than formerly, but the growing interest in walking is a most hopeful sign for health. In walking the weight should be carried on the outer side of the feet, and the feet should be used in a parallel position so that the toe will point directly forward. Toeing out and throwing the weight on the inner side of the foot are productive of arch trouble.

But in addition to these mechanical points in walking it is important to note that the way we walk depends very largely upon the way we think and feel. That drab seriousness that clothes so many of us with its colorless mantle affects even our walk. Cabot,[2] with wonderful spirit, writes:

> "What is this melancholy and crestfallen line of persons, whom I see moving along Beacon Street or Commonwealth Avenue toward the heart of the city, a little before 9, in the crisp and frosty morning. So mechanical and spiritless is their gait as they plod along that one might fancy them members of the sad, exploited proletariat, crushed by overwork, exhausted by want of sleep. In fact, they are prosperous bankers and lawyers on their way to business, and the only trouble with them is that they have just lapsed into being

[1] Other factors, such as lighting, ventilation, or noise, may more readily determine whether the sleeping position shall be right or left side. Other things being equal, the right side is preferable.

[2] Cabot, R. C.: What Men Live By, Houghton Mifflin Co., Boston, 1914, p. 93.

serious and serious only. It has never occurred to them that walking could be anything better than a means of sober progression. Poetry in walking? Don't suggest that to practical men. They'll think you a dangerous character."

Prevention of Common Skeletal Deformities.—The skeleton may develop deformities due to improper posture, lack of sufficient food of the proper kind, unusual loads imposed upon the bony parts, either as severe strain in occupation or as increased weight, sequels of disease, or the actual process of a destructive disease itself. The common deformities relate to the spine and to the feet.

Curvature of the Spine.—There are two main types of abnormal curvature of the spine: one from front to back; the other from side to side. The former results in round shoulders (kyphosis) or hollow back (lordosis); the latter in lateral curvature (scoliosis) of a mild or severe grade.

Round shoulders and hollow back are largely the result of poor posture in work and play, incorrect adjustments of the parts of the body. They can be corrected by proper exercises and the will to overcome faulty habits.

Lateral curvature frequently follows infantile paralysis, and the mild cases of this disease probably provide a large number of the scolioses seen. Other causes which have been suggested are carrying of books on one arm, standing on one foot, and writing at a desk of improper height. Curvatures of a postural kind can readily be corrected by corrective gymnastics if the individual is interested to overcome the defect; those resulting from disease are more difficult to control.

Shoulder Braces.—Many parents are led to suppose that shoulder braces are effective means for correction of round shoulders. This is absolutely wrong. The wearing of braces is distinctly harmful in that they do the work that the back muscles should do, and hence allow these muscles to become still weaker and less effective agents of body control. In the growing period of childhood postural deformities more frequently occur. They should receive attention at that time. This should be in the form of corrective exercises prescribed by physician or medical gymnast who knows the problem. It is very important to select some one whose personality will arouse and hold the interest of the child in striving to overcome the defective condition.

Weak, Deformed, and Flat-feet.—The normal human foot is constructed of bones arranged in such fashion that a long arch is made on the inner aspect of the foot, and a transverse one in the region of the ball of the foot. These arches are sustained by ligaments of the foot and by muscles of the foot and leg. The entire mechanical structure of the foot indicates its use to be as follows:

1. The foot in action should be placed on the ground with the line of direction parallel to the line of movement. The toes should point forward then, and neither be turned outward nor inward.
2. The weight of the body should be carried forward from the heel to the ball of the foot with its disposition always to the outer part of the foot.
3. In walking the heel should strike the ground first, and the weight then be transferred to the toes. Every step should produce elevation of the body on the ball of the foot.

Causes of Foot Weakness and Deformity.—The cause of most foot troubles is improper shoes. Shoes too narrow, too short, of improper lines, with high heels, are especially condemned. Many young people permit the shoes salesman to make the foot fit the shoe. The principle to be applied is that the shoe must fit the foot.

Points of a Good Shoe.—The style today may be high tops or low oxfords, ties or buttons, military heel, or the extreme French. These are incidental and meaningless for those who see straight and refuse to get their values mixed. The thoughtless, the careless, the vain will run after the baubles of style and be handicapped in action and in freedom of movement. Others, seeing real values, will look for the following in choosing a shoe:

1. An approximately straight inner line from heel to toe. Some feet show an inflare and some an outflare. There are shoes to fit these types. Most feet show a straight inner line and, as a rule, the straight line test for shoes should be applied.
2. Front part of the shoe shall be as broad as the foot for which it is designed.
3. The heel shall not be over $1\frac{1}{4}$ inches high and shall be as broad on its wearing surface as the human heel.
4. The shoe should fit snugly around the arch and instep of the foot and loosely over the toes.
5. Patent leather shoes should not be chosen because they do not allow free ventilation of the feet.

Rubber heels are distinctly valuable for city wear. The human body developed its structure and functions with reference to an agricultural type of life. While adjustments may be going on in the body fitting it to city conditions, such as hard floors and pavements, it is nevertheless good hygiene to use an appliance such as the rubber heel to relieve the body of jar as much as possible. The relief of fatigue and the increased sense of elasticity are values significant enough to warrant the use of rubber heels.

Flat-feet.—Many causes may contribute to produce flat-foot. This unfortunate condition should have the care of an expert in such matters. Modification in occupation, reduction of weight, change in manner of walking, use of orthopedic shoes—all may be necessary to effect a cure.

Exercises for Weak or Fallen Arches.—If the long arch of the foot is weak, if pain is beginning, the following procedure is important:

1. Examine the shoe to see if it is at fault. If so, correct.
2. Note whether an increase in weight has occurred. If so, reduce.
3. If occupation involves standing for long periods, try to adjust by sitting at work and begin walking every day.

4. In walking note as follows:
   (*a*) Keep weight always on outer side of foot.
   (*b*) Keep feet parallel in walking. Do not turn feet outward.
   (*c*) Let the heel hit the ground first and then transfer the weight forward along the outer edge of foot to the ball.
   (*d*) Push off strongly with the toes and do not let the leg swing entirely from the hip.
5. Practice daily the following exercises:
   (*a*) Lie on the back and flex and extend the ankles as far as possible, laying most stress on the flexion. (Bring toes up toward knees.)
   (*b*) With the ankle flexed as far as possible practice bending the toes down toward the sole of the foot in an effort to grasp the sole.
   (*c*) Sit on a chair or edge of the bed and try grasping and holding a lead pencil with the toes.
   (*d*) With the legs extended and together try to turn the foot inward so as to see the sole of the foot.
   (*e*) Practice these exercises every evening before going to bed. Begin first with a ten-minute period and increase to thirty minutes if not fatigued.

If the arch condition is not corrected by the above procedure, see an orthopedic surgeon at once.

Disturbance in the arch in the front part of the foot requires a pad for support. This should be supplied by an orthopedic surgeon.

Perils of Maturity.—The joints and ligaments of the body suffer from two deficiencies in mature years:

1. Increase in body weight without a corresponding increase in supporting strength.
2. Decrease in tone of the ligaments due to general loss in body tone accompanying the sedentary life.

These conditions are to be combated by keeping the weight at the desired average for the height, and by improvement of strength and tonicity of ligaments by exercise, outdoor air, rest, and recreation. To maintain the body at a level of efficiency that will make possible the best work and the largest happiness requires expenditure of time in care of the body and its use in motor activities. To give this time from vocation is often difficult; to achieve efficiency in any other way is impossible.

CHAPTER VII

HYGIENE OF NUTRITION

I. Sources of Energy.
II. Digestion, Assimilation, and Nutrition.
III. Basal Metabolism.
IV. Caloric Values of Different Articles of Food.
V. Classification of Food:
   1. Food to Yield Energy:
      (*a*) Carbohydrates.
      (*b*) Fats.
   2. Food to Build Tissue.
   3. Composition of Vegetable and Animal Proteins.
   4. Food to Regulate Body Processes.
VI. How Vitamins Affect Nutrition and Growth.
VII. Foods and Vitamins.
VIII. Destruction of Vitamins:
   1. The Story of Vitamin A.
   2. The Story of Vitamin B.
   3. The Story of Vitamin C.
IX. Mineral Salts as a Dietary Essential.
X. Composition of the Body in Terms of its Elements.
XI. The Role of Mineral Salts in Food.
XII. The Mineral Salts and Body Reaction.
XIII. The Hygiene of Nutrition:
   1. Wise Choice of Food:
      (*a*) Food Values and Body Needs.
      (*b*) Food Digestibility.
      (*c*) Food Poisons.
   2. Correct Eating.
   3. Regular Evacuation.
XIV. Causes of Indigestion.
XV. Fads and Fallacies in Diet:
   1. Vegetarianism.
   2. Hot Water Fad.
   3. Raw Food Fad.
   4. No-breakfast Fad.
   5. Sour Milk Fad.
XVI. Food Adulteration.
XVII. Alcohol:
   1. Alcohol and Length of Life.
   2. Alcohol and Efficiency.
XVIII. Coffee, Cocoa, Tea.

Sources of Energy.—The sources of human energy were discussed in Chapter IV. Ultimately, we say that energy comes from food. Sherman[1] says: "The activities on which the life of the body depends involve a continuous expenditure of energy and the constant exchange of material." This continuous expenditure of energy is dependent upon food taken into the body, and this food serves not only to provide the known chemical compounds which directly release energy but also it provides substances serving to stimulate and promote growth and to regulate body processes. Health, as evidenced in activity or in growth of the body, is seen to be dependent upon not merely chemical compounds that will produce upon digestion so many heat units. Normal growth, normal work, and power of normal reproduction will be seen to be due to other substances in food that do not yield calories, but serve as regulators, organizers, and stimulators of bodily activity. The old emphasis upon the caloric yield has been broadened to include other important factors in determining man's dietary. The chief functions of food then are, as Sherman[2] suggests, "(1) To yield energy, (2) to build tissue, (3) to regulate body processes."

Digestion, Assimilation, and Nutrition.—The rough masses of food are made available for use in the body by a physiochemic change produced when food is brought in contact with various juices of the alimentary tract. By this change chemical units are separated out to be used in growth of the organism, in the maintenance of the life activities, and repair of parts. These units are taken up by the tissues; they are assimilated into the cells where they will serve. The final result is good nutrition of the organism if sufficient energy has been supplied for action and if a normal body has been secured through a proper supply of building and regulating material.

Basal Metabolism.—The foods taken into the body are the source then of energy either for action or for tissue

[1] Sherman, H. C.: Chemistry of Food and Nutrition, The Macmillan Co., New York, 1920, p. xi. [2] Ibid.

building. They are made available for release of energy by a series of chemical changes that occur in digestion and later in assimilation in the tissues. Chemical changes occur when energy substances are burned in the body. In these chemical changes, known as metabolism, there is always a production of heat, sometimes apparently as a by-product of the change itself, and again as the chief end or aim of the process. At all events, heat is constantly being produced in the human body, and as energy in its simple form we may think of energy release as heat production. It has long been known that the production of heat in the body varied with many factors, but in recent years efforts have been directed to determine what is normal heat production, so that a standard would be available by which abnormalities could be judged. The heat production of an individual has been called its basal metabolism. The basal metabolism is controlled by the activity of the organs, muscles, and blood, and in part by body weight and body surface area. There is some relationship between body weight and body area, but protoplasmic activity of body cells is more significant in explaining basal metabolism. The heat produced by the body is an indication of the metabolic activity of the tissues. DuBois has shown that the basal metabolism of boys is 25 per cent. greater than that of adults. His figures follow:

BASAL METABOLISM OF BOYS, MEN AND WOMEN

Subjects.	Age in years.	Calories per hour per square meter.	
		Meeh.	DuBois (height-weight).
Boys	12–13	45.7	49.9
Men	20–50	34.7	39.7
Women	20–50	32.3	36.9
Men	50–60	30.8	35.2
Women	50–60	28.7	32.7
Men	77–83	....	35.1

This table shows that boys before adolescence have a high rate of metabolism,[1] that men have a higher rate than women, and that with advancing age the furnace fires cool down and oxidation is no longer so intense.

Heat is lost from the body by conduction and radiation; by evaporation of water from lungs and skin; and by warming the food ingested and the air breathed. The loss by conduction and radiation and by evaporation are the significant losses. Individuals inadequately clothed for cold weather require that the body burn its food at an increased rate to keep up its basal metabolism. The observation by Lavoisier on this point has been abundantly confirmed.

Caloric Values of Different Articles of Food.—When food is burned in the body heat is produced. The ability of the food to produce heat renders it valuable to the body, and hence food is measured in terms of its heat-producing power. This is called its caloric value, or its power to produce units of heat in the body.

The caloric[2] value of food-stuffs has meant very little to most persons because the gram is usually chosen as the unit of measurement. Tables of common articles of diet giving the caloric value, protein, fat and carbohydrate values, in relation to well-known units of service, such as slice, teaspoonful, tablespoonful, etc., can be found in some of the technical books on dietetics. The most serviceable in this respect is "Feeding the Family," by Mary S. Rose. Another excellent little book is "Food Values," by Edwin Locke.

Classification of Food.—Foods vary widely in their chemical composition. They also vary, therefore, in the service they give to the animal economy. It has been customary to classify food in terms of the food elements in different varieties of food, but the newer knowledge of

[1] Lack of appreciation of the fact that children in the "growing years" have a high basal metabolism is the cause of much undernutrition.

[2]
1 gram of protein yields	4 calories.
1 gram of fat yields	9 calories.
1 gram of carbohydrate yields	4 calories.

nutrition has emphasized certain food factors that are essential for maintenance and growth. A functional classification is to be preferred because of this fact, and also because of the hygienic implications involved. We shall discuss food, therefore, with respect to:

1. Its power to yield energy.
2. Its power to build tissue.
3. Its power to regulate body processes.

It should be noted that some examples of food combine all of these characteristics. Thus, milk and eggs possess the above powers. Good human milk alone is entirely adequate for infants. Many different foods are both yielders of energy and builders of tissue. Many possess the power to regulate body processes. Combinations are essential to secure the three values in the proper proportion.

Food to Yield Energy.—Foods contain three classes of chemical compounds known as carbohydrates, fats, and proteins. The first two are in daily life the main sources of energy. These compounds are widely distributed in food supplies.[1] Meats contain both fats and proteins; eggs have nearly equal amounts of fats and proteins; milk yields carbohydrates, fats, and proteins in almost equal amounts; most cereals contain all three and never less than two (fat insignificant in amount); most nuts are rich in protein and fat; and vegetables with few exceptions contain all three, with the carbohydrates in largest amount. The food-stuffs economical for energy are the carbohydrates and fats.

(*a*) *Carbohydrates.*—The carbohydrates include the simple sugars and the starches that by digestive processes are changed into sugars. After digestion the sugars are taken

[1] There are no special system foods. The nervous system is dependent upon the same food sources for its energy that supply the other systems of the body. The term "brain food" or "nerve food" is a misnomer. (See Fig. 17.) Sanatogen has been advertised extensively as a "nerve food and tonic." It is not so regarded among scientific people.

by the circulation to the liver, where they are stored in the form of glycogen. As sugar is needed in the body the supply in the liver is drawn upon, and thus in the hours between meals carbohydrate is always available for energy.

The combustion of carbohydrates may follow one of several possible courses, but it leads eventually to carbon dioxid and water. The rate of combustion depends upon the activity of the body. Oxygen is necessary for this

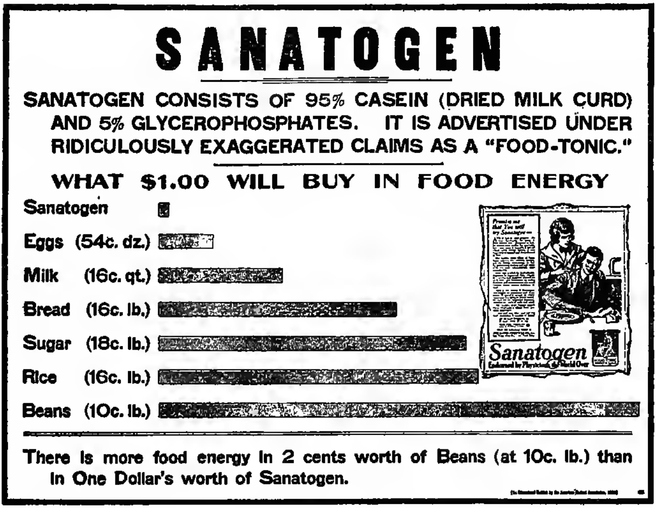


Fig. 17.—Energy is obtained more surely from wholesome food than from special patented preparations. (By courtesy of the American Medical Association.)

combustion, and unless some unusual condition impede, the supply of oxygen will be maintained sufficient for body needs. If the carbohydrate is abundant, it may result in the saving of fat for the time, so that the fat of the diet will be stored in the body tissues.

It is well known also that fat may be formed from carbohydrate. Numerous experiments have demonstrated this fact. The evidence of a practical kind is given by those people of overweight proportions who partake freely of carbohydrate foods, such as potatoes, candy, cereals, and bread.

(*b*) *Fats.*—The fats are widely distributed in nature and occur in both the animal and vegetable kingdoms. They are represented in milk, cream, butter, nuts, olive oil, and other vegetable oils. After digestion of food containing fats the end-products of the change pass into the circulation and thence into the tissues. They may be burned at once to produce energy, stored as glycogen for use as fuel at a later time, or bound in chemical combination to produce tissue fat. Some of the fat enters into combination with proteins, phosphorus, and other substances to form complex compounds (*e. g.*, lecithin) found especially in the nervous system.

For the liberation of energy fat is burned and yields finally carbon dioxid and water. This energy production is high. While 1 gram of carbohydrate yields about 4 calories, 1 gram of fat yields about 9. We recognize, therefore, that fat is a food of high fuel value and useful primarily as a source of energy.

Food to Build Tissue.—Proteins are of importance chiefly as tissue builders and are the only available source of nitrogen. They are found in animal and plant tissues. More complex in chemical structure than the carbohydrates and fats, they have at last yielded to scientific methods, so that their terminal digestion units, called amino-acids, are well known. Not all proteins are alike in the amino-acids yielded, and the amino-acids themselves vary greatly in their ability to build tissue. Osborn, McCollum, and others have shown that certain proteins obtained from wheat (gliadin), rye (gliadin), pea (legumin), barley (hordein), maize (zein), and kidney bean (phaseolin) may maintain life, but are not sufficient to promote growth. The growth proteins of value are from milk (casein), hemp seed (edestin), wheat (glutein), maize (glutelin), and squash seed (globulin). Such experiments would indicate the importance for growing children of milk, whole wheat, and unprocessed corn, to mention the foods in the above group commonly used.

The relative value of meat and vegetable proteins for growth and life processes in general has not been finally determined. Certain results have been secured by careful feeding experiments, but more remains to be done before a final statement can be made. The animal proteins, if milk and eggs are included, and of course they should be, are distinctly superior as sources of nitrogen for the body.

The proteins of vegetables as they occur in the ordinary diet are not so easily digested and utilized as the meat proteins. For growth purposes McCollum[1] says: "These (muscle tissue proteins) are distinctly better than those of the seeds with which investigations have been conducted." Sherman[2] notes: "Hoobler has shown that milk is the best form of food protein for the production of human milk and the protection of the body protein of the nursing mother."

Protein is the only food containing nitrogen and nitrogen is essential for life. The body is continually using nitrogen in its metabolic activities, and the amount used can be determined by measuring the amount of nitrogen in the waste eliminated. If the nitrogen of the food and the nitrogen of body waste are determined, it is possible to compute the nitrogen intake and output. If the output exceeds the intake, it means that the body is burning its own protein to supply its needs. By reducing the intake to the minimum where output and intake balance we reach a point of equilibrium known in chemistry as "nitrogen equilibrium." It has been held that meat proteins were more usable in the body. Burton-Opitz[3] states that, to secure nitrogen equilibrium, "we need 30 grams of the proteins of meat, 31 grams of the proteins of milk, 54 grams of the proteins of beans, 76 grams of the proteins of bread, 102 grams of the proteins of corn." On

[1] McCollum, E. V.: Newer Knowledge of Nutrition, The Macmillan Co., New York, p. 77.

[2] Sherman, H. C.: Loc. cit., p. 226.

[3] Burton-Opitz, R.: Text-book of Physiology, W. B. Saunders Co., Philadelphia, 1920, p. 1057.

the other hand, Sherman[1] has shown recently that nitrogen equilibrium can be maintained on a diet of cereal grains of 35 to 45 grams of protein per man of 70 kilograms per day. "An allowance of 1 gram of protein per kilogram of body weight per day provides a margin of safety of from 50 to 100 per cent. above the minimum actually required to maintain equilibrium." For palatability's sake meat protein is superior to vegetable protein, but for health's sake it is probably wise counsel to say that the protein allowance per day should not exceed 100 grams, and that meat in contributing to that maximum should not be used more often than once a day.

The diet in Germany during the war failed miserably in maintaining health and was inadequate for work of physical or mental kind. Lusk[2] reports a table presented by Rubner showing the rationed foods as planned and as actually provided:

German Diet During the World War

	As planned:			As actually provided:		
	Amount.	Protein, grams.	Calories.	Amount, grams.	Protein, grams.	Calories.
Bread............	271.0 gm.	17.2	688	271.0	17.2	688
Pōtatoes..........	710.0 gm.	14.9	710	357.0	7.5	341
Butter and margarine..........	18.0 gm.	....	140	11.4	....	89
Milk............	200.0 c.c.	6.8	111			
Meat............	70.0 gm.	10.7	158	36.0	4.5	78
Eggs (per piece)...	0.3 gm.	4.2	53	0.07	1.0	13
Sugar...........	32.0 gm.	....	125	26.0	....	104
Cereals...........	....	....	....	9.8	0.9	31
Totals..........	....	53.8	1985	....	31.1	1344

[1] Sherman, H. C.: The Protein Requirement of Maintenance in Man, Proceedings National Academy Sciences, pp. 38–40, January, 1920.

[2] Lusk, Graham: Physiological Effect of Undernutrition, Physiological Reviews, October, 1921, pp. 523–552.

"The exclusion of animal foods from the diet made it monotonous, and for many it was not better than the fare of prisoners sixty or seventy years before." Moreover, as Lusk later says, "The mixed diet of peace time showed a loss of 10 per cent. of nitrogen, while the coarse vegetarian war diet showed that 20 or even 50[1] per cent. of the nitrogen of the diet could not be absorbed."

The present evidence would seem to indicate the value of animal proteins for growing children. For adults, when growth is not important, the proteins must be judged not as to *source*, but as to *composition.*

Composition of Vegetable and Animal Proteins.—Although there is conflicting evidence and opinion as regards the relative value of animal and vegetable protein, there is general agreement that the *sources* differ markedly in *composition.* This difference lies chiefly in the amount of nucleoprotein available. This is of importance because nucleoprotein is the source of the purin bases, complex products of protein metabolism, and substances directly related to the production of gout and probably related to the efficiency and health of the kidneys.

In writing of the purins Rose[2] says: "These purins are not nutritious, but are gradually transformed in the body to uric acid, to be carried off as waste in the urine. Persons inclined to gout have difficulty in getting rid of uric acid, and the more meat they eat, the more uric acid tends to accumulate in the system, circulating in the blood and depositing in the joints. If protein is taken in moderation and chiefly from eggs, milk, cheese, bread, and nuts, which contain no purins, dangers of this difficulty may be avoided. . . . For

[1] This would apparently lower the protein intake below 16 grams. War diets in some areas of Germany under observation by American officers showed a total calorie yield of 1200 to 2000. This lowering of the protein intake and the caloric value of the diet was not incompatible with life because the basal metabolism was probably reduced. But there was noticed a very great susceptibility to infections. Patients in hospitals and welfare institutions died in great numbers.

[2] Rose, M. S.: Feeding the Family, The Macmillan Co., New York, 1919, p. 68.

persons of indoor sedentary life a very liberal use of meat is certainly undesirable. Even athletes, for whom meat was once thought especially necessary, have demonstrated the possibility of reducing their daily consumption to one-sixth the amount which the training table previously provided, with an actual increase in their capacity for endurance."

The following foods are practically purin free: milk, eggs, cheese, sugars, breadstuffs made with white flour, fruits, nuts, rice, potatoes, all root vegetables, most green vegetables (spinach and asparagus excepted), fats, and oils. The foods of high purin are: sweetbreads, kidney, roe, liver, and sardines. Those fairly high in purin are: beef, veal, mutton, pork, chicken, turkey, goose and other game, fish (cod excepted), spinach, asparagus, peas, and beans.

Food to Regulate Body Processes.—Mendel and Osborn[1] reported their results on feeding different proteins. They showed that rats require for normal growth certain of the 17 amino-acids which are the structural units of all proteins. Now, no matter what combination of foods they used, the animals failed to grow unless there were present in the diet two things: "one present in butter-fat and absent in lard; another present in milk, but which was not protein, fat, carbohydrate, or mineral. These x and y of Mendel's experiments were noted in papers published simultaneously with Funk's announcement of Vitamin in 1911."[2] McCollum, working along similar lines, gave the names "fat-soluble A" and "water-soluble B" to these substances. Lately a third substance has been discovered, water-soluble C. The three types are usually designated by physiologic chemists as vitamin A, B, and C.

How Vitamins Affect Nutrition and Growth.—Numerous experiments by Osborn, Mendel, Funk, Vedder, Takaki, McCollum, and his co-workers definitely prove that

[1] Mendel and Osborn: Feeding Experiments with Isolated Food Substances, Carnegie Institute, Washington, Publication No. 156.
[2] Sherman, H. C.: Loc. cit., p. 226.

nutrition and growth are profoundly affected by the vitamins of food. Not only do specific diseases develop if the vitamins are absent, but malnutrition of all grades occurs when the vitamins are not in sufficient amount. Scurvy and beriberi have lately been termed deficiency diseases because of being caused by a diet deficient in vitamin, C in the former and B in the latter. McCollum[1] gives numerous illustrations of the damage done by a diet in which the vitamin element is deficient. Eddy[2] says that rickets which were formerly considered to be due to a lack of calcium salts has been stated by McCollum to be due to a deficiency of any two of four factors—quality of protein, mineral salts, fat-soluble A, and water-soluble B. Marasmus has shown some evidence of connection with the A and B vitamins and scurvy has been linked with the C vitamin. It should be noted that while the vitamin content is extremely important in the diets of growing children, it is to be noted that adults will secure all the vitamin they require from the usual mixed diet. Ordinary fresh foods are the simplest, cheapest, and richest sources of vitamins. The commercialization of the interest in vitamins would lead persons to believe that vitamin tablets, yeast, and other preparations are essential to health.

Foods and Vitamins.—The following (Table III), adapted from Eddy,[3] gives the vitamin factor present in different foods used by man:

[1] McCollum, E. V.: Loc. cit., entire book; McCollum and Davis, Journal Biological Chemistry, 1915, vol. 23, 231; McCollum, Simonds, and Pitz, American Journal Physiology, 1916, vol. 41, 333, 361; McCollum, Journal American Medical Association, May 12, 1917, pp. 1579–1586.

[2] Eddy, W. H.: Vitamines and Babies, Teachers College Record, p. 103, March, 1920.

[3] Eddy, W. H.: The Vitamin Manual, Williams and Wilkins Co., Baltimore, 1921, pp. 59–61.

TABLE III

Relative Amounts of Vitamins in Food-stuffs

Food-stuffs.	"A."	"B."	"C."
Meats:			
Beef heart	+	+	?
Brains	++	+++	+?
Codfish	+	+	?
Fish roe	+	++	?
Herring	++	++	?
Kidney	++	++	
Lean muscle	0	0	+?
Liver	+	+	+?
Pancreas	0	+++	
Thymus (sweetbreads)	0	0	0
Vegetables:			
Cabbage, fresh	+++	+++	++++
Carrots	+++	+++	++
Cauliflower	++	+++	++
Celery	?	+++	?
Chard	+++	++	?
Lettuce	++	++	++++
Onions	?	+++	+++
Parsnips	++	+++	
Peas, fresh	+	++	+++
Potatoes	0	+++	++
Potatoes, sweet	+++	++	?
Spinach	+++	+++	+++
Cereals:			
Barley	+	+++	?
Bread (white)	......	+?	
Bread (whole meal)	+	+++	?
Maize (corn)	+ yellow 0 white	+++	?
Oats	+	+++	0
Rice, polished	0	0	0
Rice (whole grain)	+	+++	0
Other seeds:			
Beans, kidney	......	+++	
Beans, navy	....	+++	0
Peanuts	+	++	
Peas, dry	+?	++	0
Fruits:			
Apples	......	++	++
Bananas	?	+	++
Grapefruit	......	+++	+++

Food-stuffs.	"A."	"B."	"C."
Fruits (Continued).			
Grape juice	......	+	+
Grapes	0	+	+
Lemons	......	+++	++++
Limes	......	++	++
Oranges	......	+++	++++
Pears	......	++	++
Raisins	......	+	+
Tomatoes	++	+++	++++
Oils and fats:			
Beef fat	+	0	0
Butter	++++	0	0
Codliver oil	++++	0	0
Corn oil	0	0	0
Egg yolk fat	++++	0	0
Lard	0?	0	0
Oleo, animal	+	0	0
Oleo, vegetable	0	0	0
Olive oil	0	0	0
Nuts:			
Almonds	+	+++	
Brazil nut	......	+++	
Cocoanut	++	+++	
English walnuts	......	+++	
Filbert	......	+++	
Dairy products:			
Butter	++++	0	0
Cheese	++	+	?
Condensed milk	++	+	0
Cream	+++	+	?
Eggs	++++	++	0
Milk, powder (skimmed)	+	+++	+?
Milk, powder (whole)	+++	+++	+?
Milk, whole	+++	+++	++
Miscellaneous:			
Honey	......	++	0
Yeast, brewers'	0	++++	0
Yeast cakes	0	++	0

Destruction of Vitamins.—Since most foods reach the table changed in form from that of their natural state, either through cooking, canning, pasteurization, or other chemical or physical method, it is important to know to what extent vitamin is changed or lost by such procedures.

The Story of Vitamin A.—The "A" vitamin is affected as follows: Eddy[1] says, "Heat alone is of very limited effect, but where sources are heated in the presence of oxygen, destruction of the vitamin may be very rapid. . . . Cooking of vegetables will not, as a rule, result in appreciable destruction of this factor. . . . The many lard substitutes now in use must in general be considered 'A' vitamin free regardless of the content of the 'A' in the fats from which they are derived, unless they have been made by blending instead of hydrogenation."

The question of heating the vitamin has not been settled because the factors vary markedly. Sherman, MacLeod, and Kramer state that "dry heating at a temperature of 100° C. with free access of air only very slowly destroyed fat-soluble vitamin." They go on to say: "The results thus far obtained emphasize the importance of taking full account of the time as well as the temperature of heating, and of the initial concentration of vitamin in the food as well as the opportunity for previous storage of the vitamin by the test animal."

The Story of Vitamin B.—The vitamin B will not be appreciably affected in ordinary cooking temperatures if alkali is not used. Therefore, the canning or preserving of food by the addition of bicarbonate of soda at the time of preparation is detrimental to the B vitamin. The use of soda in the cooking of vegetables "to soften the vegetable and accelerate the cooking" is destructive of vitamin B.

The Story of Vitamin C.—The C vitamin is more sensititve than A or B. "Temperatures above 50° C.," says Eddy,[2] "are usually destructive, although the time factor is extremely important as well as the reaction. Hess, for example, has found that the temperature used to pasteurize milk continued for some time is more destructive

[1] Eddy, W. H.: The Vitamin Manual, Williams & Wilkins Co., Baltimore, 1921, pp. 63, 64.
[2] Ibid., p. 68.

to vitamin than boiling water temperature continued for only a few minutes. The extent to which orange juice and tomato juice resist high temperatures indicates the protective action of acids to be considerable."

The cooking of cabbage destroys about 90 per cent. of its vitamin C. If acid or alkali is added to vegetables in cooking, most of the vitamin is lost.

Dehydration of vegetables destroys, in most instances, the C vitamin. Hess[1] suggests that dehydration was "the greatest cause of scurvy in the Central Empires" during the World War.

Young fresh vegetables contain more C vitamin than old ones. These considerations all indicate the need for man to secure fresh natural food products so far as possible; to avoid those that have been treated chemically and in other ways. As regards milk, it is unquestionably better to use pasteurized milk in which the vitamin A has been decreased and to make up this deficiency in other foods, than to court tuberculosis and dysentery by the use of raw milk. It is probably utopian to ever expect that city children may receive, generally, clean raw milk. The care of milch cows and the gathering of milk present openings in our public health armor that are best cared for by pasteurization.

Mineral Salts as a Dietary Essential.—The mineral salts occupy a very important place in the dietary. They are not burned to produce heat, but they do help to build tissue and in regulating body processes. They are to be considered as a constituent of food of prime importance. Thus Sherman,[2] in speaking of "mineral metabolism" and the functions of salts, says that they serve in three ways:

"(1) As bone constituents, giving rigidity and relative permanence to the skeletal tissues.

"(2) As essential elements of the organic compounds which are the chief solid constituents of the soft tissues (muscles, blood-cells, etc.).

[1] Hess, A. F.: Newer Aspects of Some Nutritional Disorders, Journal American Medical Association, March 12, 1921.

[2] Sherman, H. C.: Loc. cit., p. 236.

"(3) As soluble salts (electrolytes) held in solution in the fluids of the body, giving these fluids their characteristic influence upon the elasticity and irritability of muscle and nerve, supplying the material for the acidity or alkilinity of the digestive juices and other secretions, and yet maintaining the neutrality or slight alkalescence of the internal fluids as well as their osmotic pressure and solvent power."

Composition of the Body in Terms of its Elements.—Sherman[1] gives the elementary composition of the human body as follows:

	Per cent.
Oxygen, about	65
Carbon, about	18
Hydrogen, about	10
Nitrogen, about	3
Calcium, about	2
Phosphorus, about	1
Potassium, about	0.35
Sulphur, about	0.25
Sodium, about	0.15
Chlorin, about	0.15
Magnesium, about	0.05
Iron, about	0.004
Iodin	Very minute quantities
Fluorin	Very minute quantities
Silicon	Very minute quantities

The Rôle of Mineral Salts in Food.—The presence or absence of salts essential to body metabolism is an important matter. The correct understanding of the possibility of foods supplying these essentials will help to correct the rather prevalent notion that these valuable ingredients are only to be secured by taking "patent medicines," extravagantly advertised and claiming unwarranted values.

Carbon, hydrogen, and oxygen are always found in the three food-stuffs, so that these elements are abundant. Available nitrogen is found only in protein, and this explains why health cannot be maintained on a diet of only carbohydrates and fats.

Sodium, potassium, and magnesium are supplied in sufficient amounts in food without any care in the selection for this purpose. The amount of sodium chlorid added to

[1] Sherman, H. C.: Loc. cit., p. 234.

food is much more than sufficient for the body needs; potassium and magnesium are fairly abundant in meat (muscle) and in vegetables, so that an ordinary mixed diet with some roughage will contain sufficient amounts of these substances. Calcium, relatively large in the salt content of the body, is quite irregularly distributed among staple food articles. Milk, however, contains it in abundance, and if sufficient milk is used this element will be provided adequately. The calcium needs of the body must be provided, especially in infancy and childhood and during pregnancy. Lusk[1] emphasizes the importance of calcium during pregnancy, especially during the last ten weeks. Sherman,[2] in speaking of the requirements, says, ". . . It would seem that the food of a family should furnish at least 0.67 gram of calcium or 0.9 to 1.0 gram of calcium oxid per man per day." And later he[3] says, "Apparently the American dietary is more often deficient in calcium than in any other element; certainly more attention should be paid to the choice of such foods as will increase the calcium content of the dietary. The use of more milk and vegetables with less meat and sugar will accomplish this and usually improve the diet in other directions as well." It is important at this point to remember that McCollum says that milk and leaf vegetables will correct the dietary deficiencies of other foods in respect to vitamins. The importance of milk as an article of food is seen to be very great. The most practical means of securing an adequate calcium supply is to use milk freely.

It is important to note that the "milling" of grain removes a large amount of calcium. White flour, polished rice, and new process cornmeal are very poor in calcium. The fruits and vegetables are quite rich in calcium, especially prunes, oranges, carrots, and cabbage. The sulphur content will be adequately provided if the protein supply is sufficient. The sulphur needs are about 1 gram

[1] Lusk, G.: The Science of Nutrition, W. B. Saunders, 3d edition, 1919, pp. 389, 390.

[2] Sherman, H. C.: Loc. cit., p. 267.

[3] Ibid., p. 268.

per day, and if about 100 grams of protein are used adequate sulphur will be secured.

On the other hand, phosphorus may not be found in sufficient amount in dietaries, and since, like calcium, it represents an important part of the body structure, there should be care to avoid a deficiency. Phosphorus is present in the human body chiefly in bones, milk, brain, nerve, and sexual tissue. and is essential in all body cells. The phosphorus requirement is given by Sherman[1] as "1.44 grams (3.30 grams P_2O_5) corresponding to a 'protein standard' of 75 grams." The evidence from many sources[2] indicates that organic phosphorus compounds are of no more value as food than are the inorganic phosphates. This evidence is significant because of its bearing upon the blatant claim of manufacturers who offer organic phosphates in patent medicines as "tonics, restorers, and strengtheners." Food should be chosen that would provide this necessary element. (See Table IV.[2])

White flour is very poor as a source of phosphorus because milling has removed the salt which is deposited in the outer shell of the kernel.

The significance of an adequate phosphorus content of the blood is very great in children and especially in the first years of life. Occurrence of a depleted phosphorus content in the blood of a young child almost always means rickets.[3] The phosphorus content of our food supply should not be treated lightly. The teaching of health workers everywhere in educating parents to the full meaning of proper food for the baby and growing child is being constantly revised. It will be increasingly important

[1] Sherman, H. C.: Loc. cit., p. 255.

[2] Forbes and Keith: Ohio Agricultural Experiment Station Technical Bulletin, No. 5, p. 357. McCollum, Halper and Drescher, Journal Biological Chemistry 1912, p. 219. Marshall, Journal American Medical Association 1915, p. 573. Sherman, Nettler, and Sinclair, United States Department of Agriculture, Office Experiment Station Bulletin 227, 1910.

[3] Howland, J., and Kramer B.: American Journal Diseases of Children, August, 1921. Jones, M. R., and Nye, L. L., Journal Biological Chemistry, July, 1921. Von Meysenburg, L., and McCann, G. F., Journal Biological Chemistry, August, 1921.

that it emphasize not only food values but also the quality of the food consumed.

TABLE IV

AMOUNTS OF PHOSPHORUS AND CALCIUM IN 100-CALORIE PORTIONS OF SOME COMMON FOOD MATERIALS

Food material.	Measures of portion.	Phosphoric acid, grams.	Calcium oxid, grams.
Buttermilk	1⅛ cups	0.61	0.415
Codfish, fresh	5 ounces (uncooked)	0.60	
Celery	4 cups 1¼-inch pieces	0.54	0.54
Spinach	2½ cups (cooked)	0.54	0.37
Haddock, fresh	5 ounces (uncooked)	0.50	
Lettuce	2 large heads	0.47	
Cauliflower	½ medium head	0.45	0.55
Beef, lean	2¼ ounces (uncooked)	0.42	0.009
Cheese, cottage	5½ tablespoonfuls	0.40	
Asparagus	20 stalks	0.39	
Cheese, hard	1⅛-inch cube	0.329	0.25
Beans, dried	⅛ cup (uncooked)	0.326	0.063
Milk	⅝ cup	0.303	0.239
Rhubarb	4 cups 1-inch pieces	0.30	
Turnips	2 cups ½-inch cubes	0.292	
Beans, string	2¼ cups 1-inch pieces	0.284	0.177
Cabbage	5 cups (shredded)	0.28	0.214
Egg yolk	2 yolks	0.27	
Tomatoes	1¾ cups (cooked)	0.257	0.087
Peas, dried	2 tablespoonfuls (uncooked)	0.25	
Eggs	1⅓ eggs	0.24	0.06
Onions	3 to 4 medium	0.24	0.12
Peas, fresh	¾ cup	0.24	
Oatmeal	1 cup (cooked)	0.216	0.03
Corn, green	½ cup	0.21	
Bread, graham	2 slices	0.19	
Raspberries	1⅛ cups	0.18	
Potatoes	1 medium	0.166	0.019
Peanuts	2 dozen singles	0.16	
Carrots	3 to 4 medium	....	0.168
Blackberries	1½ cups	....	0.13
Strawberries	1⅓ cups	....	0.13
Figs	1½ large	....	0.089
Lemon juice	1 cup	....	0.083
Beets	2 to 4 medium	....	0.06
Peas, fresh	1 cup	....	0.032
Raisins	¼ cup	....	0.02
Prunes	4 to 5 prunes	....	0.02

Table IV, modified from Rose,[1] gives the amount of calcium and phosphorus in 100-calorie portions of some common food materials.

The iron content of the human body is small, but its importance is very great. The loss of iron from the blood results in a condition known as anemia, also chlorosis. Sherman sets[2] as the desirable standard "15 milligrams of food iron per man per day." Woman during pregnancy and at the menstrual period would require more, perhaps about 18 milligrams. Table V, from Rose,[3] gives the iron content in grams of food rich in iron:

TABLE V

AMOUNTS OF IRON IN 100-CALORIE PORTIONS OF SOME COMMON FOOD MATERIALS

Food material.	Measures of portion.	Iron, grams.
Spinach	2½ cups (cooked)	0.0133
Beans, string	2¼ cups 1-inch pieces	0.0038
Cabbage	5 cups (shredded)	0.0035
Beef, lean	2¼ ounces (uncooked)	0.0032
Celery	4 cups ¼-inch pieces	0.0027
Egg yolk	2 yolks	0.0023
Strawberries	1⅓ cups	0.0023
Beans, dried	⅛ cup (uncooked)	0.0020
Eggs	1⅓ eggs	0.0019
Tomatoes	1¾ cups (cooked)	0.0017
Carrots	3 to 4 medium	0.0016
Peas, dried	2 tablespoonfuls (uncooked)	0.0015
Potatoes	1 medium	0.0015
Beets	2 to 4 medium	0.0013
Turnips	2 cups ½-inch cubes	0.0013
Bread, graham	2 slices	0.0013
Grapes	1 large bunch	0.0013
Onions	3 to 4 medium	0.0011
Raisins	¼ cup	0.0010
Figs	1½ large	0.0010
Oatmeal	1 cup cooked	0.0009
Prunes	4 to 5 prunes	0.0009
Milk	⅝ cup	0.00034
Bread, white	2 slices	0.0003

[1] Rose, M. S.: Feeding the Family, The Macmillan Co., New York, 1919, pp. 22, 24, 25.
[2] Sherman, H. C.: Loc. cit., p. 299.
[3] Rose, M. S.: Loc. cit., p. 23.

Sherman sets 15 milligrams of food iron per day as a minimum. The above portions give the iron content in grams. Fifteen milligrams expressed in grams would be 0.015 gram. It follows, therefore, that the minimum would be satisfied by providing adequate portions of the above.

In order to supply sufficient iron foods should be selected with some consideration of the amounts of iron present. Iron is especially available in meat, milk, eggs, whole wheat flour, spinach, and beans. A diet containing green vegetables liberally, whole wheat bread, fruits, and some meat will supply sufficient iron.

"Does man need medicinal iron?" has often been asked. Numerous laboratory experiments extending since 1854 provides today the opinion that food will provide all that is needed of iron compounds for the body. It has been claimed that in anemia inorganic iron may act as a stimulus to the body, but recent experiments by Whipple and Robscheit[1] do not indicate any such effects. The best medical opinion holds that hemoglobin (the iron compound of the blood) is derived from the organic iron compounds of the food. The justification for patent medicine preparations of iron is lacking; intelligent and rational procedure in anemia and chlorosis[2] would be to provide adequate iron in the diet, to secure outdoor exercise, and remove any of the causes favoring the disease. The eating of highly "milled" flours and predigested and refined food substances does not make for adequate iron metabolism in the body.

A recent addition to the "eat more" campaigns heralds the value of raisins as purveyors of iron. It may be seriously questioned if one should eat large amounts of raisins because of the large amount of indigestible material they contain. The claim for iron content is an exceedingly brave one in view of the data in Table V. (See also Fig.

[1] Whipple, G. H., and Robscheit, F. S.: Iron and Arsenic as Influencing Blood Regeneration, etc., Archives of Internal Medicine, May, 1921, vol. 27, p. 591.

[2] There is some evidence that medicinal iron is useful in chlorosis. But even here the management is more important than the medicine.

18.) Thus $1\frac{1}{2}$ figs give as much and one medium-sized potato gives more iron than $\frac{1}{4}$ cup of raisins. For health purposes $2\frac{1}{2}$ cups of milk or a half-dozen prunes would be more desirable than raisins, no matter how attractive the box in which they were sold.

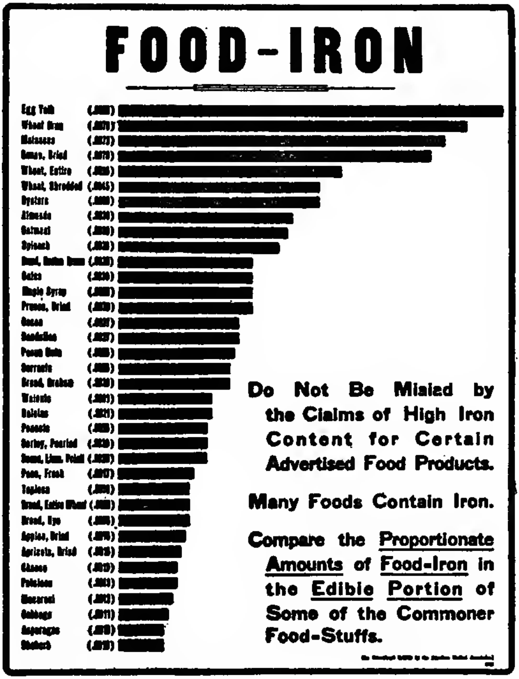


Fig. 18.—This table is based on the ash constituents of food in percentage of the edible portion. (By courtesy of the American Medical Association.)

The Mineral Salts and Body Reaction.—The blood and body fluids show alkaline to litmus, but the hydroxyl ions are not appreciably in excess of the hydrogen ions, and for practical purposes they may be called neutral. The normal metabolic changes in growth and action produce acids which must be neutralized in order to keep the blood and body fluids in the proper condition. The source of the power to develop neutrality lies in the food of the diet and especially in the carbonates, phosphates, ammonia, and proteins. Sherman,[1] in speaking of the experiments of Blatherwick, says, ". . . foods which have a preponderance of base-forming elements lead to the formation of a urine which is less acid, both as regards hydrogen ion concentration and titration acidity, while the ammonia content of the urine is diminished and the carbon dioxid tension of the alveolar air, indicative of reserve alkalinity, is increased."

The foods containing base-forming elements are chiefly milk, vegetables, and fruits. It has been previously noted that these foods are also valuable, especially for their salts of calcium and iron, and for their vitamins.

The Hygiene of Nutrition.—By voluntary act it is quite impossible to control intestinal peristalsis, to direct the flow of bile, or to favor the absorption of digested food elements from the alimentary canal. The hygiene of nutrition, however, is not dependent upon such control. All that is essential in the nourishment of the body and in the economy of processes relates to factors that are controllable. They may be stated to be: to choose food wisely; to eat correctly, and to evacuate regularly.

Wise Choice of Food.—Choosing food wisely involves a knowledge of the functions of food, its power to build tissue, to yield energy, and to regulate body processes. In addition, food values in terms of calories and with reference to man's needs, food digestibility, and food poisons are important matters to consider in the choice of food. The functions of food have been presented. There remain the caloric values and the body's need, food digestibility, and idiosyncrasies of people toward different foods.

(*a*) *Food Values and Body Needs.*—Lusk[2] says, "One can say that in the United States there is no protein, or

[1] Sherman, H. C.: Loc. cit., p. 281.
[2] Lusk, G.: Journal American Medical Association, June 22, 1915, p. 171.

salt, or vitamin deficiency in the habitual diet, and there is plenty of roughage in the form of cabbage, sauerkraut, and other vegetable foods available to him who desires it." Sherman,[1] however, in analyzing 150 American dietaries, says with reference to the iron content, "Apparently, therefore, the typical American dietary does not contain any such surplus of iron as would justify the practice of leaving the supply of this element entirely to chance."

Experts differ on these points. The rational procedure in such a situation is for the individual with adequate knowledge to make sure that the best available is selected. This means frequently not eating more food, but choosing wisely less food. For although the past tendency has been to set standards for diets, it should be noted that it is quite impossible to plan a single diet that will be adequate for all. At best certain principles may be stated:

The protein and energy factors of the diet should be modified in accordance with the needs of the organism as regards growth, work, and body weight. Thus Atwater[2] recommends:

Standards for	Protein, grams.	Fuel values, calories.
Man at hard muscular work	150	4150
Man at moderately active muscular work	125	3400
Man at sedentary or woman with moderately active work	100	2700
Man without muscular exercise or woman at light moderate work	90	2450

While European experts place the protein requirement higher, the tendency of chemists in America has been to constantly set a lower standard. Chittenden[3] in particular has set the standard much lower, and holds that 50 grams a day is sufficient for body needs. From a survey of

[1] Sherman, H. C.: Loc. cit., p. 303.

[2] Atwater: United States Department of Agriculture, Farmers Bulletin No. 142, 15th Annual Report Agricultural Experiment Station, Storrs, Connecticut, 1903.

[3] Chittenden: Physiological Economy in Nutrition, pp. 51, 127.

numerous experiments Sherman[1] reports, "the apparent protein requirements as indicated by the data of individual experiments ranges between the extremes of 20 and 79.2 grams, averaging 49.2 grams of protein per man of 70 kilograms per day. Thus the average falls well within the range of Chittenden's estimate" (see Lusk's report on German diets, p. 163). Sherman[2] found that nitrogen equilibrium was maintained with protein of 35 to 45 grams from cereal grains. Providing a margin of safety, 70 to 80 grams of protein would seem adequate.

The energy requirements are related to the work of the body. To maintain the body weight the fuel value of the food must be sufficient for the needs of the body. If fat is deposited, more fuel has been taken in than can be burned; hence the excess is stored. Fuel value of children's dietaries should always be liberal to provide for great muscular activity and marked growth. Sherman[3] gives the energy requirements of different ages as follows:

Under 1 year	45 calories per pound	(about 900 calories)
1– 2 years	45–40 calories per pound	(about 1000–1100 calories)
2– 5 years	40–36 calories per pound	(about 1100–1500 calories)
6– 9 years	36–32 calories per pound	(about 1600–1900 calories)
10–13 years	34–27 calories per pound	(about 2000–2700 calories)
14–17 years	30–32 calories per pound	(about 2500–3400 calories)
18–25 years	25–18 calories per pound	(about 3400–3800 calories)
30 years	2750 calories for man of 152 pounds	
40 years	2500 calories for man of 154 pounds	
60 years	2300 calories for man of 150 pounds	
70 years	2000 calories for man of 134 pounds	
80 years	1750 calories for man of 139 pounds	

The above figures indicate that during the period of growth a great increase in fuel is necessary; that a young person, fourteen to seventeen years, may need more fuel than one thirty years of age; and that as age increases the fuel requirement decreases. Age is not a valuable indication alone. Work done with reference to age is the best guide. The "man of the house" living a sedentary

[1] Sherman, H. C.: Loc. cit., p. 220.

[2] Sherman, H. C.: Proceedings National Academy of Sciences, January, 1920, pp. 38–40.

[3] Sherman, H. C.: Loc. cit., p. 196.

life may require less than the young boy only twelve years of age.

It will thus be seen that while it is possible to calculate from tables the caloric value of the diet for different individuals, it is unsafe to set absolute standards. In addition to caloric needs the child should correspond in weight with the members of the age-height group in which he falls; the adult needs to adjust diet to weight and also to work. The danger of the child being malnourished and of the adult being too well nourished is so important that tables (Table VI) are given to indicate what the weight should be for different individuals.

(*b*) *Food Digestibility.*—It is not possible to be guided in the choice of food only by the caloric yield any more than by its salt or vitamin content. All the factors are important. Thus certain foods are easy and others difficult to digest; while for some persons foods may be entirely unsuited, and to others entirely unwholesome. This problem of feeding the human being is one that requires care, attention, and reasonable intelligence.

The digestibility of foods has been expressed in terms of coefficients of digestibility, by which is indicated the percentage of the food available for men as determined by the relation between the constituents of the food consumed and the corresponding constituent of the waste material from the alimentary tract. Atwater has computed the coefficients of digestibility of the main classes of food on a simple mixed diet as follows:

PERCENTAGE DIGESTIBILITY OF FOOD

Food.	Protein, per cent.	Fat, per cent.	Carbohydrates, per cent.
Animal foods	97	95	98
Cereals and breadstuffs	85	90	98
Dried legumes	78	90	97
Vegetables	83	90	95
Fruits	85	90	90
Total of average mixed diet	92	95	98

TABLE VI

HEIGHT AND WEIGHT TABLES

BOYS

Height Inches	5 Yrs	6 Yrs	7 Yrs	8 Yrs	9 Yrs	10 Yrs	11 Yrs.	12 Yrs.	13 Yrs.	14 Yrs.	15 Yrs.	16 Yrs.	17 Yrs.	18 Yrs.
39	36	36	37											
40	37	38	39											
41	39	40	41											
42	41	42	43	44										
43	43	44	45	46										
44	45	46	46	47										
45	47	47	48	48	49									
46	48	49	50	50	51									
47	....	51	52	52	53	54								
48	....	53	54	56	55	56	57							
49	....	55	56	57	58	58	59							
50	....	....	58	59	60	60	61	62						
51	....	....	60	61	62	63	64	65						
52	....	....	62	63	64	65	67	68						
53	....	....	....	66	67	68	69	70	71					
54	....	....	....	69	70	71	72	73	74					
55	....	....	....	....	73	74	75	76	77	78				
56	....	....	....	....	77	78	79	80	81	82				
57	....	....	....	....	....	81	82	83	84	85	86			
58	....	....	....	....	....	84	85	86	87	88	90	91		
59	....	....	....	....	....	87	88	89	90	92	94	95	97	
60	....	....	....	....	....	91	92	93	94	97	99	101	102	
61	....	....	....	....	....	....	95	97	99	102	104	106	108	110
62	....	....	....	....	....	....	100	102	104	106	109	111	113	116
63	....	....	....	....	....	....	105	107	109	111	114	115	117	119
64	....	....	....	....	....	....	......	113	115	117	118	119	120	122
65	....	....	....	....	....	....	......	......	120	122	123	124	125	126
66	....	....	....	....	....	....	......	......	125	126	127	128	129	130
67	....	....	....	....	....	....	......	......	130	131	132	133	134	135
68	....	....	....	....	....	....	......	......	134	135	136	137	138	139
69	....	....	....	....	....	....	......	......	138	139	140	141	142	143
70	....	....	....	....	....	....	......	......	......	142	144	145	146	147
71	....	....	....	....	....	....	......	......	......	147	149	150	151	152
72	....	....	....	....	....	....	......	......	......	152	154	155	156	157

MEN

Height	19 Yrs.	20 Yrs.	21-22 Yrs.	23-24 Yrs.	25-26 Yrs.	30-34 Yrs.	35-39 Yrs.	40-44 Yrs.	45-49 Yrs.	50-54 Yrs.	55-59 Yrs.
5 ft..........	107	110	114	118	122	126	128	131	133	134	135
5 ft. 1 in.....	112	115	116	121	124	128	130	133	135	136	137
5 ft. 2 in.....	117	120	122	124	126	130	132	135	137	138	139
5 ft. 3 in.....	121	124	126	128	129	133	135	138	140	141	142
5 ft. 4 in.....	124	127	129	131	133	136	138	141	143	144	145
5 ft. 5 in.....	128	130	132	134	137	140	142	145	147	148	149
5 ft. 6 in.....	132	133	136	138	141	144	146	149	151	152	153
5 ft. 7 in.....	136	137	140	142	145	148	150	153	155	156	158
5 ft. 8 in.....	140	141	143	146	149	152	155	158	160	161	163
5 ft. 9 in.....	144	145	147	150	153	156	160	163	165	166	168
5 ft. 10 in.....	148	149	151	154	157	161	165	168	170	171	173
5 ft. 11 in.....	153	154	156	159	162	166	170	174	176	177	178
6 ft..........	158	160	162	165	167	172	176	180	182	183	184
6 ft. 1 in.....	163	165	167	170	173	178	182	186	188	190	191
6 ft. 2 in.....	168	170	173	176	176	184	189	193	195	197	198
6 ft. 3 in.....	173	175	178	181	184	190	195	200	202	204	205
6 ft. 4 in.....	178	180	183	186	189	196	201	206	209	211	212
6 ft. 5 in.....	183	185	188	191	194	201	207	212	215	217	219

To determine the weight for a given height and age, trace the height line to the proper age column. (By courtesy of Dr. Thomas D. Wood.)

TABLE VI
HEIGHT AND WEIGHT TABLES

GIRLS

Height Inches	5 Yrs	6 Yrs	7 Yrs	8 Yrs	9 Yrs	10 Yrs	11 Yrs.	12 Yrs.	13 Yrs.	14 Yrs.	15 Yrs.	16 Yrs.	17 Yrs.	18 Yrs.
39	34	36	36											
40	36	37	38											
41	38	39	40											
42	40	41	42	43										
43	42	42	43	44										
44	44	45	45	46										
45	46	47	47	48	49									
46	48	48	49	50	51									
47	....	49	50	51	52	53								
48	....	51	62	53	54	55	56							
49	....	53	54	55	56	57	58							
50	....	....	66	57	58	59	60	61						
51	....	....	59	60	61	62	63	64						
52	....	....	62	63	64	65	66	67						
53	....	....	....	66	67	68	68	66	70					
54	....	....	....	68	69	70	71	72	73					
55	....	....	....	....	72	73	74	75	76	77				
56	....	....	....	....	76	77	78	79	80	81				
57	....	....	....	....	....	81	82	83	84	85	86			
58	....	....	....	....	....	85	86	87	88	89	90	91		
59	....	....	....	....	....	86	90	91	93	94	95	96	98	
60	....	....	....	....	....	....	94	95	97	99	100	102	104	106
61	....	....	....	....	....	....	99	101	102	104	106	108	109	111
62	....	....	....	....	....	....	104	106	107	109	111	113	114	115
63	....	....	....	....	....	....	109	111	112	113	115	117	118	119
64	....	....	....	....	....	....	......	115	117	118	116	120	121	122
65	....	....	....	....	....	....	......	117	119	120	122	123	124	125
66	....	....	....	....	....	....	......	119	121	122	124	126	127	128
67	....	....	....	....	....	....	......	......	124	126	127	128	126	130
68	....	....	....	....	....	....	......	......	126	128	130	132	133	134
69	....	....	....	....	....	....	......	......	129	131	133	135	136	137
70	....	....	....	....	....	....	......	......	......	134	136	138	139	140
71	....	....	....	....	....	....	......	......	......	138	140	142	143	144
72	....	....	....	....	....	....	......	......	......	......	145	147	148	149

WOMEN

Height	19 Yrs.	20 Yrs.	21-22 Yrs.	23-24 Yrs.	25-29 Yrs.	30-34 Yrs.	35-39 Yrs.	40-44 Yrs.	45-49 Yrs.	50-54 Yrs.	Yrs.
4 ft. 10 in.....	98	102	106	110	113	116	119	123	126	129	......
4 ft. 11 in.....	103	107	109	112	115	118	121	125	128	131	......
5 ft...........	109	112	113	115	117	120	123	127	130	133	......
5 ft. 1 in.....	113	115	116	118	119	122	125	126	132	135	......
5 ft. 2 in.....	116	118	119	120	121	124	127	132	135	138	......
5 ft. 3 in.....	120	121	122	123	124	127	130	136	138	141	......
5 ft. 4 in.....	123	124	125	126	128	131	134	138	141	144	......
5 ft. 5 in.....	126	127	128	129	131	134	138	142	145	148	......
5 ft. 6 in.....	129	130	131	133	135	138	142	146	149	152	......
5 ft. 7 in.....	131	133	135	137	139	142	146	150	153	166	......
5 ft. 8 in.....	135	137	139	141	143	146	150	154	157	161	......
5 ft. 9 in.....	138	140	142	145	147	150	154	158	161	165	......
5 ft. 10 in.....	141	143	145	148	151	154	157	161	164	169	......
5 ft. 11 in.....	145	147	149	151	154	157	160	164	168	173	......
6 ft...........	150	152	154	156	156	161	163	167	171	176	......

To determine the weight for a given height and age, trace the height line to the proper age column. (By courtesy of Dr. Thomas D. Wood.)

Digestibility of food should not be confused with ease of digestion nor rapidity of digestion. Food that stays a long time in the stomach is said to be difficult of digestion, but this refers only to rate of digestion and not to the yield of the food elements finally. There seems to be little relation between ease or rapidity of digestion and the percentage or coefficient of digestibility of food. There is a difference, however, in foods as regards the length of time given to gastric digestion. Sherman[1] states the following concerning the movement of food materials through the stomach:

"Ordinarily, when each is fed separately, protein food stays longer in the stomach than carbohydrate, fat longer than protein, and mixtures of fat and protein leave the stomach more slowly than either alone. This is probably because fat tends to retard both the motility of the stomach and the secretion of the acid gastric juice. In general, the softer or more fluid the fat, the more rapidly it will leave the stomach; also emulsified fats tend to pass on more promptly than fat of the same kind taken in larger masses."

Hawk[2] and his associates have conducted a series of experiments on gastric digestion. Some of the conclusions of this work are given below:

Whole boiled, creamed, mashed (with and without milk and butter), baked (with and without butter), potato salad, French, German and plain fried potatoes, and potato chips "left the stomach in moderate time or one and a half to two and a half hours for rapid type individuals and two to three and a half hours for the slow type. Fried potatoes left the stomach as rapidly as potatoes prepared in other ways. Sweet potatoes remained longer in the stomach than white potatoes cooked in the same ways."

Pickled red beets left the stomach more rapidly than

[1] Sherman, H. C.: Loc. cit., p. 87.

[2] Hawk, P. B., and associates: The Gastric Response to Foods, American Journal of Physiology, vol. 51, No. 2, March 1, 1920, pp. 332–349.

boiled red beets, although the latter left in one to two hours. Carrots, parsnips, and turnips, boiled, left the stomach in one and a half to three hours.

"In general, raw vegetables low in protein, as carrots, celery, tomatoes, cabbage, lettuce, and cucumber, leave the stomach rapidly—and without great change."

In studying the effect of water, tea, coffee, and cocoa upon digestion in the stomach the following conclusions were made by Hawk[1] and his associates:

"Evacuation of the stomach was not appreciably delayed by the drinking of 1 liter of cold water, cold or hot tea, hot coffee, either plain, with cream, or cream and sugar. The addition of sugar alone to coffee delayed evacuation.

"Cocoa in 1 liter quantities markedly delayed evacuation."

Results from the study[2] of candies show: "Candies depress secretion and delay evacuation in proportion to their sugar content and the amount of them ingested. This tendency is influenced, however, by flavoring substances, and particularly by added food ingredients, such as milk, eggs, or chocolate, which stimulate gastric secretion. "Candies should be eaten not before but after meals. Hard candies which must be sucked are preferable to cream candies for children."

A study of the digestion in the stomach of puddings, pies, and cakes gives an average time for puddings of two hours; pies, two hours and twenty-four minutes; cakes, three hours. Pies were digested more rapidly than cakes. "The addition of 50 grams of ice-cream to a small piece of pie did not increase the burden of the stomach to any marked extent."

(*c*) *Food Poisons.*—Food that is for others entirely

[1] Hawk, P. B., and associates: Gastric Response to Foods, American Journal of Physiology, vol. 52, No. 1, May, 1920, pp. 28–53.

[2] Ibid., vol. 53, No. 1, August, 1921, pp. 65–88.

wholesome becomes for some persons a distinct poison. That means that those persons have an idiosyncrasy for that particular food. Many people develop fads and fears as regards certain foods, but a real food idiosyncrasy may exist. Such reaction to food is called sensitization. Sensitization to certain proteins is the most usual form observed.

It is not so easy to explain the way in which sensitization to food occurs, but the fact of being sensitive is well known.[1] Supposedly, the child is given too much of a new food, which he has not as yet developed a capacity to handle. There results a susceptibility which renders the individual unable to care for that kind of food subsequently. The phenomenon of sensitization is also known to exist in certain disturbances of the respiratory tract, *e. g.*, certain forms of hay-fever are known to be related to definite flower or vegetable proteins.

In medicine it is known that foreign proteins injected into the blood may render the individual very sensitive to the particular protein injected. This sometimes occurs in the administration of antitoxin.

Correct Eating.—The eating of food has become today a complex matter. It is not sufficient to provide for proper energy needs, vitamins, and salts; to eat in such fashion that digestion will be as thorough, rapid, and orderly as possible is very desirable. It is, therefore, important to note those conditions that are associated with the hygiene of eating.

1. Environment.

   The quiet, clean, attractive dining place is a boon to good eating. To avoid noisy, dirty places should be the first thought in selecting a place to eat. The dining-room should tend to produce repose, quiet, freedom from hurry and rush. It is an expression of an overwrought nervous system to desire an eating place where the din of jazz rhythms vies with the

[1] Longcope, W. T.: Protein Hypersensitiveness, Journal American Medical Association, November 12, 1921, p. 1535.

screeching voices to be heard above the rattle and crashing of dishes and cabaret singers. Digestion is aided by an atmosphere of quiet and calm.

In a study of the psychic influences on digestion of food, Hawk[1] and his associates found as follows: "Mixed meals consisting of nourishing ingredients, but very unpleasantly prepared and served, gave rise in the case of a phlegmatic individual to no distinct delay, . . . a more susceptible individual showed a slight delay.

"Chinese preserved eggs, unpalatable to our subjects in appearance, odor, taste, and belief in their unwholesome character led to delayed acid response and evacuation."

2. Condition of the individual.

One should come to the table rested. If fatiguing work has been performed before mealtime, the hygienic plan would provide a period of rest before eating.

Moreover, the mind and spirits of the individual should be cheerful and happy. Hawk reports that anxiety and mental strain markedly delay gastric digestion. The importance of avoiding emotional states associated with worry is nowhere more pronounced than in connection with this subject. If depressing emotional conditions do control, it is best not to eat at that time. One should replace such states with a brave, cheerful attitude and the digestive tract will be ready to do its work. Nervous indigestion is a sympton of bad mental hygiene.

3. The technic of eating.

If one comes to a dining-room that is quiet and attractive, and is himself free from fatigue and from depressing emotional states, one might eat almost any food in usual amounts, either rapidly or slowly,

[1] Hawk, P. B., and associates: Gastric Response to Foods, American Journal of Physiology, vol. 52, No. 1, May, 1920, pp. 1–11.

without experiencing any difficulty in digestion. All may not be so indiscreet, however. Nor is it wise for any one to so indulge his gastronomic instincts. Reason must guide here. The secret in eating then, is:

1. To eat slowly. It has been claimed that we should chew each morsel of food thirty times. It is surely a waste of energy to count our jaw movements and unwise to concentrate our attention too much on the process of eating. Food should be enjoyed. The environment free from rush and hurry will help us automatically to chew food more—to eat slowly.
2. Not to wash food down the esophagus with drink. If the food is well chewed this will not be necessary. It is not unhygienic to drink water at mealtimes if no food is in the mouth at the time of drinking. Ice-water should not be used. Milk that is cold should be drunk very slowly.

   Hawk found that cold water did not appreciably delay digestion if taken during the meal. The practice of drinking cold water at the beginning is to be condemned. Many people coming to the table hungry and thirsty commit a hygienic sin here. The blood-vessels of the stomach are dilated and the blood-supply is abundant; the gastric glands are exceedingly active in preparation for the food about to be eaten—when suddenly a dash of cold water is thrown into the stomach, constricting the vessels and checking secretion. One should always eat some warm food before drinking cold water at meals.
3. Do not overeat. To stop before completely satisfied is good dietary advice. This means often foregoing the attractive dessert, or omitting the second helping of the favorite dish. A good

plan is to take very small helpings. Eating slowly will help to eat less; one is satisfied with less when that taken is chewed thoroughly.

Regular Evacuation.—The hygiene of nutrition has been grouped around the wise choice of food, correct eating, and regular evacuation of the bowels, because all these factors are closely related. The best food correctly eaten will not nourish if waste material is not removed. Here is indicated the essential interdependence between all parts of the body. No one part can live to itself alone. All must function properly. Loss of efficiency in one part affects all. More will be said upon this subject in Chapter X; it is enough at this time to indicate its importance and connection.

Causes of Indigestion.—Frequently indigestion occurs because food is improperly cooked, but, as indicated above, there are other factors. These may be grouped together as the causes of indigestion:

1. Improper foods. This may refer to the choice of the food or to the combination chosen.
2. Improper cooking of the food. Food to be cooked should be cooked thoroughly, especially vegetables, breads, and pastries.
3. Food idiosyncrasies. Examples are oysters, shellfish, fish, buckwheat cakes, strawberries, and chocolate.
4. Physical fatigue. If tired, one should rest before eating or eat very lightly (better not eat at all).
5. Worry and depressing emotional states.
6. Rapid eating. Important to avoid places that are noisy. Freedom from a sense of hurry is essential to correct eating.
7. Drinking cold water before eating warm food at mealtime.
8. Overeating. Large amounts of food may affect only slightly the coefficient of digestibility, but they do retard the ease and rapidity of digestion. Snyder found, however, that protein was 7 per cent. and

fat 6 per cent. more completely absorbed in medium amounts of oatmeal and milk when he compared medium and large amounts of this ration.

9. Constipation. Lack of evacuation of the bowels is frequently a cause of improper digestion of food.
10. Defective teeth. This cause may act by not permitting thorough mastication; it also may be effective through the disturbance of the condition of the stomach due to the presence of pus material from the teeth.[1]
11. Various diseases. Indigestion may be a sign of appendicitis. When the indigestion is prolonged it may be a sign of gastric ulcer, and in an elderly person, of cancer of the stomach.

Fads and Fallacies in Diet.—The individual who chooses food thoughtfully and on a logical plan needs all the facts available. Most food fads represent partial truths. They are so usual and commonplace that to account for their occurrence would be to write the story of human superstition. Several of the most common will be discussed.

Vegetarianism.—At times extremists of this fad take a position of protest against the eating of animal flesh because of a philosophy that is opposed to the taking of animal life. In this position they may be accused of sentimentalism or what you will, but essentially the one defect of these people on this question is that they are not intellectually honest. If honest they would have to live upon air alone. They are entirely willing to eat plants which have life. If their philosophic and biologic education were as comprehensive as their sophistry they would appreciate the common origin of plant and animal life, and the essential integrity of the *l'elan vital* of Bergson, in both animals and plants. However, they must live, and since they are not philosophic, nor intellectually honest,

[1] It has not been determined whether the gastric disturbance results from the swallowing of pus or from infection through the circulation, or from both.

they continue to choose eggs, milk, and cheese to supplement their vegetarian diet of nuts, cereals, and vegetables.

Those who take the vegetarian rôle because of a belief in the superior value of a non-meat diet have many arguments that are interesting and worth investigating. Some members of this group object to eating lamb, beef, or pork because they believe that such foods are not wholesome. Some say that all animals are diseased, that many sick animals are killed for food, that serious disease often follows eating animal food. These are partial statements and are untrue. Some flesh is unwholesome (*e.g.*, trichinosis is a serious disease at times); meat inspection should rule out the killing of sick animals just as it should eliminate rotten fruit and vegetables from the markets. In general, it is effective.

The question of the relative superiority of animal or vegetable protein needs scientific information. The following facts have been established by investigators and experience:

1. The protein of animal food is more completely utilized by the body than the protein of fruits, vegetables, dried legumes, cereals, or breadstuffs. The coefficient of digestibility for animal food is 97 per cent.; for the vegetarian group it varies from 78 to 85 per cent. This difference is 12 to 19 per cent. If one requires 100 grams of protein daily, it is necessary to eat from 112 to 119 grams of vegetarian protein to secure the same amount that is available from 100 grams of animal food.
2. The body needs animal protein. This may be largely supplied from milk and eggs.
3. The superior palatability of meat proteins is generally recognized.
4. Racial superiority may be definitely related to food habits. It may be suggested that this has some influence in the development to dominant positions in the world of those races that are meat eating as contrasted with the vegetarian groups. Sher-

man, however, refers to these races as "not meat-eating but cow-keeping races."

5. It should be noted, however, that it is a mistake to eat too much meat. The limit is to be placed at "meat once a day only." Excessive eating of meat leaves a waste of protein that is not only economically bad but also undesirable because of the strain upon kidneys[1] which must remove the end-products of protein metabolism. The purins are more abundant in meat.
6. Pork is the least desirable of all meat. It is difficult to digest. It should always be thoroughly cooked to kill the trichina, if perchance the parasite is present. Beef is valuable for its iron content as well as protein. Lamb is tasty and easily digested. Fowl and fish are very desirable forms of flesh food. Lobster and scallops are quite difficult to digest because of the toughness of the muscle.

There are probably few strict vegetarians. In reality, those who pose as such are "no meat" advocates. They eat animal foods, such as milk, cheese, and butter; otherwise they could not stay well.

Hot Water Fad.—This fad is especially vicious. Hot water before breakfast is helpful as a therapeutic measure for some persons, but its general use for all is not indicated. The ease with which people accept vague but rather plausible proposals for water therapy speaks vehemently of the sort of instruction given in physiology in the schools. Internal bathing by a patented cascade, hot water before meals, "water internally, externally, and eternally"—these are but catch phrases of a fad that is unscientific and pernicious.

Raw Food Fad.—The raw food fad has some justification in proportion as it represents a reaction against bad cooking. Improperly cooked vegetables are more difficult

[1] Recent evidence of the influence of high protein diet on kidney irritation is given by Squier, T. L., and Newburgh, L. H.: Renal Irritation in Man from High Protein Diet, Archives of Internal Medicine, July, 1921.

to digest than raw vegetables because the stomach will attempt to digest the former, but ignores and passes on the latter. As a fad it is without scientific basis.

It has been generally held that fried foods are difficult to digest, but Hawk found no appreciable difference in time for digestion of fried potatoes as compared with potatoes cooked in other ways. In general, fat stays a long time in the stomach. If the food is fried in deep fat or prevented by other methods from taking up much fat, fried food is just as wholesome as other kinds.

There is a real health danger, especially from typhoid fever, in eating certain uncooked foods (*e. g.*, lettuce, celery, and water-cress) that have been grown in soil contaminated with sewage. Such uncooked food should be washed carefully in many changes of water, because the source is not usually known.

No-breakfast Fad.—It is not uncommon to find young people, especially girls, developing the no-breakfast fad. It should be stated that the body needs food in the morning to draw on for energy used in the day's activities. The body needs are often cared for by these individuals in two large meals. This is unwholesome, and it is more desirable to distribute food eaten over three meals rather than two. These individuals often show an aversion to milk and eggs. It should be remembered that they may like custards, creamed soups, oyster milk stews, eggnogs, and other food dishes in which milk and eggs are used. An egg is an egg, whether in a custard or in the chicken house; it will serve the nutritive needs of the body, so far as we know, as well in custard form as it will when boiled, or poached, or scrambled. The same can be said for milk.

Sour Milk Fad.—The use of sour milk as a food was very popular some years ago due to the values assigned by Metchnikoff[1] to the change of the bacterial flora of the intestine produced by sour milk. This procedure has been very useful in the treatment of certain cases of intestinal

[1] Metchnikoff, E.: The Prolongation of Life, G. P. Putnam's Sons, New York, 1908.

intoxication, but as a guide for the normal person it offers nothing. Sour milk as a food is useful because it has the same constituents as sweet milk.

Food Adulteration.—Before the passage of the Pure Food and Drug Act about 50 per cent. of the food sold in the United States was adulterated. The act defines adulteration to be:

1. If any substance has been packed or mixed with it to reduce or lower or injuriously affect its quality or strength.
2. If any substance has been substituted wholly or in part for the article.
3. If any valuable constituent of the article has been wholly or in part abstracted.
4. If it is mixed, colored, powdered, coated, or stained in any manner whereby damage or inferiority is concealed.
5. If it contains any poisonous or other added deleterious ingredient which may render such article injurious to health.
6. If it consists in whole or in part of a filthy, decomposed, or putrid animal or vegetable substance or any portion of an animal unfit for food, whether manufactured or not, or if it is the product of a diseased animal or one that has died otherwise than by slaughter.

The purpose of this act in terms of the definition of adulteration is to protect the public in two ways:

1. To insure the delivery of the article labeled. Thus, an article labeled *honey* should contain honey and not glucose, a common adulterant.
2. To prevent the use of deleterious substances. Thus, it is important that bacteria or parasites be absent and that injurious drugs have not been used to cover up decomposition.

It is important to note the purpose of this act and help in carrying out its provisions. Two points should be kept in mind:

1. Labels are frequently used which enable the manufacturer to be within the law, although in spirit he is frankly violating it.

Fig. 19.—Note the legal education of the above firm between 1905 and 1917, as evidenced by the labels. (By courtesy of the American Medical Association.)

(*a*) Most patent medicines depend for their success upon the presence of alcohol in the mixture. The amount of alcohol present must be stated, and it is—in small letters in an inconspicuous place (Fig. 19).

(b) Jellies, jams, and catsups are frequently adulterated and the adulterant indicated in small type. For the first two it is usually glucose; for the last, benzoate of soda.

2. It is not necessary to use chemicals to preserve or can fresh wholesome food. Food, therefore, that has been treated, indicates that the food was not in a fresh state. We do not know whether the minute amount of the chemical used is injurious or not, but we do know that food in need of a preservative is not wholesome food.

The following table, arranged from Broadhurst's[1] tabulation, gives the common adulteration in foods:

Food substances.	*Adulterant.*	*Remarks.*
Candy	Clay or "terra alba"	
Cheese	Lard, bean meal, potato, bread	
Chocolate	Cocoa butter subtracted	
Cocoa	Starch, clay, brick dust	
Cocoa or chocolate	Cocoa shells	
Coffee	Cereals, acorns, date pits, red slate	
Coffee (specials)	Caffein extracted	
Condensed milk	Cane-sugar added to replace fats subtracted	Less suitable for infants.
Cream	Gelatin	
Figs	Worms and their wastes	
Flour	Talc, gypsum, alum, nitrogen peroxid	Poisonous nitrogen compounds do not prevent passing as "first grade."
Gum-drops	Paraffin	
Honey	Glucose with pollen	Pollen is found in bee-collected honey.
Jellies	Turnips, squash	
Meat	Chemicals, such as saltpeter	To bring back red color to prevent caking.

[1] Broadhurst, J.: Personal and Community Hygiene, J. B. Lippincott Co., Philadelphia, 1918, pp. 34, 35.

Food substances.	*Adulterant.*	*Remarks.*
Meat extracts	Plant extracts	Though cheaper, some plant extracts (*i. e.*, yeast) add valuable vitamins, yet they are considered adulterants unless properly labeled.
Milk	Formaldehyd	To defer souring.
Milk (whole)	Skimmed milk	
Molasses	Glucose	Lightens colors to higher grade appearance.
Nuts and fruit	Whitened by sulphur fumes	Injurious sulphur compounds retained by fruits and kernels.
Oleomargarin	Coloring	Sold as butter. Very wholesome. Legal restrictions now tend to keep up the price of both butter and its substitutes.
Olive oil	Corn oil, cottonseed oil	
Oysters	Fattened in water containing sewage	
Peas (green)	Colored by copper sulphate	
Salt (table)	Starch	
Sausage	Cereals	
Sugar (cane)	Saccharin	A coal-tar product.
Sugar (maple)	Glucose	Sweet, but lacking in food value.
Tea	Once-used tea leaves	

Alcohol, a distinct protoplasmic poison, has been defended in recent years because of its food value. There is little educational propaganda today on the food or health values of alcohol—such were shattered long ago. The advocates of the use of alcohol have based their claims not on scientific truths, but rather on political "rights." Personal liberty has been invoked as the shibboleth of bootleggers, brewers, distillers, and all those who make money out of the trade. The old selfish reasons are again presented, whereas the Prohibition amendment was passed not to save man from himself, but to protect society. In the same way and after the same fashion that cocain, opium, morphin, and other narcotics are controlled, so alcohol has capitulated to an ideal of social responsibility. This ideal is to be kept alive and intelligent by constant contact with the scientific facts, so that it may always be an intelligent idealism. To present these facts, even in condensed form, is important.

Alcohol and Length of Life.—Evidence from insurance and benevolent associations accumulates to the effect that the steady use of alcohol increases mortality. This is true for even moderate users. The "light wines and beer" advocates are without scientific and statistical evidence to support their plea of "harmlessness." Steady but moderate drinkers show a group mortality of 86 per cent. in excess of the average.[1]

Alcohol and Efficiency.—Experimental evidence of scientific and acceptable kinds shows that alcohol temporarily impairs memory, temporarily decreases the efficiency of workers, and resistance to disease. It has marked effect on bodily functions. This is especially to be noted in the circulatory and nervous systems. It increases the pulse-rate, but not the force of the heart, and, acting as a depressant, which it really is, it lowers blood-pressure. The classical work by Dodge and Benedict[2] shows the impairment of neuromuscular acts and gives the scientific background for the experience of employers as to its cause of accidents in industry.

The experiments of Stockhard[3] add a further indictment of its use as a beverage. They show an injury of male germ cells by alcohol to such a degree that offspring are distinctly impaired. In this instance also the laboratory has brought support to the opinion of numerous social

[1] Fisher, I., and Fisk, E. L.: How to Live, Funk and Wagnalls, 1921, p. 307. An extensive bibliography on alcohol is given in this book, pp. 333–338.

[2] Dodge, R., and Benedict, F. G.: The Psychological Effects of Alcohol, The Carnegie Institution of Washington, 1916.

[3] Stockhard, C. R.: The Effect on the Offspring of Intoxicating the Male Parent and the Transmission of the Defect to Subsequent Generations, American Naturalist, 1913, xlvii, p. 641; American Naturalist, 1916, l, pp. 65–88.

workers who have seen the effects of alcoholism in parent and child.

Numerous studies[1] bear out all the reasons advanced for national prohibition and challenge those interested in national as well as personal health and vitality to accord to prohibition the same intelligent support that is to be given to laws controlling or prohibiting traffic in drugs, women, or children.

Coffee, Cocoa, and Tea.—The use of coffee, cocoa, and tea is so general that a dogmatic statement is antagonistic to many persons, and the views concerning the effects of such use so conflicting that a final statement at this time is impossible. It is probably always true that whenever statements vary widely the truth lies at some intermediate point. As regards coffee, it is unquestionably true that to some persons coffee is a poison, causing toxic eye conditions, disordered digestion, and nervous disturbances. On the other hand, some persons drink it without any deleterious effects that are noticeable. The same may be said for tea and cocoa. It is unwise to say that coffee or tea will harm no one. It is foolish to condemn for all. The path of health in this instance must be determined by each seeker of a larger and more abundant life.

Some studies have been made. Lusk[2] notes: "Schumburg finds that coffee and tea have no recuperative power over the muscles of a fatigued organism, except when taken with other foods. Hillsten, exercising before breakfast, finds that the effect of taking tea is almost negligible" (in increasing muscle power). Again he[3] says: "When theophyllin, caffein and theobromin, the methylated purins found in tea, coffee, and cocoa, are ingested it has been stated that they are not oxidized to uric acid, but that they increase the purin bases in the urine. However, Levinthal and Stanley Benedict have found the uric acid

[1] See the bibliography in How to Live, by Fisher and Fisk, pp. 333–338.

[2] Lusk, G.: The Science of Nutrition, W. B. Saunders Co., Philadelphia, 1919, p. 325.

[3] Ibid., p. 502.

elimination to increase in man after the ingestion of 1 to 1.5 gram of caffein daily."

More recent investigations than those cited by Lusk indicate a certain effect on digestion that is more in harmony with experience than anything that has been stated heretofore empirically. Hawk[1] and his associates in a series of excellent studies on the gastric response to food studied the effect of tea, coffee, and cocoa (see page 185).

While not markedly interfering with digestion, tea and coffee did not aid the process. Cocoa distinctly retarded evacuation and the development of normal acid conditions. It should be noted that fluids ingested were taken with a uniform meal.

[1] Hawk, P. B., and associates: Gastric Response to Foods, XI; The Influence of Tea, Coffee, and Cocoa upon Digestion, American Journal of Physiology, vol. lii, No. 1, May, 1920.

CHAPTER VIII

HYGIENE OF THE RESPIRATORY SYSTEM

The Essentials of Respiration.—One of the interesting aspects of the study of low forms of animal life is respiration. The very simple one-celled animals breathe without a special respiratory apparatus. In studying such forms it is determined that oxygen from the air passes directly through the cell membrane of the animal and carbon dioxid passes out. This records the primary fact that is noticed in respiration in man: oxygen of the air is taken up in the lungs and carbon dioxid is given out. This truth is made clear by a comparison of the composition of air, both inspired (outdoor) and expired:

	Nitrogen.	Oxygen.	Carbon dioxid.
Inspired air..............	79	20	0.04
Expired air..............	79	16	4

The essential fact, then, in human breathing is the bringing of air into the lungs so that oxygen may be taken from it and carbon dioxid given to it.

This knowledge of the use made of oxygen of the air and of the need of the body for the vital gas has been known for a long time, but usually it has been interpreted erroneously with reference to ventilation studies. Carbon dioxid for many years has been considered the dangerous element in bad air. Dr. Chaumont set the standard in this respect in 1875 at 6 volumes per 10,000 as the limit of vitiation. In America many of the states have laws that require schoolrooms to be so ventilated that not more than 6 parts of carbon dioxid in 10,000 shall be allowed. For many years this was the accepted standard, but by many ventilation experiments it has been shown that CO_2 may be increased to 12 volumes without deleterious effects. Furthermore, it has been demonstrated that from a health standpoint the physical conditions of the air are usually more important than the chemical, and that control of air moisture, temperature, and motion are generally more to be desired than control of the chemical conditions as represented by CO_2. For some time the "badness" of inside air was attributed to an organic poison. Weichart claimed to have isolated an organic substance which was responsible, but his experiments have not been confirmed. On the contrary, the evidence indicates that vitiated air is produced by other factors. From the studies of Hill, Flügge, and more recently of the New York State Commission on Ventilation,[1] it has been demonstrated that the "badness" in air in ordinary

[1] New York State Commission on Ventilation, Some Results of the First Year's Work, American Journal Public Health, vol. 5, No. 2.

buildings is not due to an organic poison, nor to excessive amounts of carbon dioxid, but rather to:

1. Improper temperature, usually too high a temperature.
2. Improper humidity.
3. Lack of air movement.

On this point the New York State Commission on Ventilation[1] says: "The following tentative conclusions seem, however, to be indicated by the experiments of the first year as outlined above:

"1. A very high room temperature, such as 86° F. with 80 per cent. relative humidity, produces slight, but distinct elevation of body temperature, an increase in the reclining heart rate, an increase in the excess of standing over reclining heart rate, a very slight lowering of systolic blood-pressure, and a marked fall in the Crampton value.[2]

"2. A moderately high room temperature, 75° F. with 50 per cent. relative humidity, has all the effects noted above, although, of course, in less degree than the extreme temperature condition.

"3. Even the extreme room temperature of 86° F. with 80 per cent. relative humidity shows no effect upon rate of respiration, dead space in the lungs, acidosis of the blood, dissociation of oxyhemoglobin, respiratory quotient, rate of heat production, rate of digestion, carbohydrate or protein metabolism, concentration of the urine, and skin sensitivity.

"4. The power to do either mental or physical work, measured by the quantity and quality of the product by subjects doing their utmost, is not at all diminished by a room temperature of 86° F. with 80 per cent. relative humidity.

[1] Loc. cit.

[2] Crampton value: This refers to a test of heart rate and blood-pressure reaction described in Transactions, Fourth International Congress on School Hygiene, vol. v, p. 555.

"5. On the other hand, the inclination to do physical work, and the inclination to do mental work are diminished by sufficiently high room temperatures. So far as physical work is concerned our tests show a decrease in actual work performed, when the subject had a choice between working or not working, of 15 per cent. under the 75° F. condition and 37 per cent. under the 86° F. condition as compared in each case with 68° F.

"6. Stagnant air at the same temperature as fresh air, even when it contains 20 or more parts of carbon dioxid and all the organic and other substances in the breathed air of occupied rooms, has, so far, shown no effect on any of the physiologic responses listed above under 1 and 3, nor on the power or inclination to do physical or mental work nor on the sensations of comfort of the subjects breathing it.

"7. On the other hand, the appetite for food of subjects exposed to such stagnant air may be slightly reduced.

"8. These experiments seem to indicate that overheated rooms are not only uncomfortable, but produce well-marked effects upon the heat-regulating and circulatory systems of the body, and materially reduce the inclination of occupants to do physical work. The most important effects of 'bad air' are due to its high temperature, and the effects of even a slightly elevated room temperature, such as 75° F., are sufficiently clear and important to warrant careful precautions against overheating.

"9. The chemical changes in the breathed air of occupied rooms are of comparatively minor importance, although the substances present in such air may exert a slight decrease in the appetite for food."

While the work of the Commission is unfinished and the studies on air movement and humidity are not completed, it seems from present information available that the results of these studies will emphasize the importance of the physical factors in ventilation.

Desirable Temperature—Proper Methods of Heating.—The desirable temperature for indoor air is 68° F. It should never go below 66° nor above 70° F. The relation of temperature to humidity and its effect upon health has been stated above. Huntington[1] shows that temperature influences work done.

Every school room and every home should possess a thermometer and a definite effort should be made to keep the temperature constant and at the proper elevation.

When rooms are heated by stoves this is nearly impossible. It is difficult with hot air furnaces. The best methods of heating are with hot water or steam.

A Valuable Experiment.—A great deal of money has been spent devising elaborate methods of ventilation. Fan, plenum, exhaust, and combination systems guarantee to provide so many cubic feet of air per minute. Devices for humidifying the air and automatically regulating the temperature have been added. All of these mechanical methods of ventilation have yet to prove their value in the face of the following experiment:

The Bureau of Child Hygiene,[2] Department of Health, New York City, conducted in 1916 and 1917 an experiment to determine the relationship between the health of school children and the methods of ventilation in classrooms. The number of children under observation in 1916 was 2541, and in 1916–17 the number was 2992. The number of class rooms in the first series studied was 58; in the second, 76. Other important controls, such as age, locality, nationality, and season, were in evidence. Obviously here was an experiment of scientific merit.

[1] Huntington, E.: Civilization and Climate, pp. 89–110, Yale University Press, New Haven, 1915.

[2] Baker, S. J.: Classroom Ventilation and Respiratory Diseases Among School Children, American Journal Public Health, January, 1918, pp. 19–26.

"It was decided that three types of ventilation should form the basis of the study:

Type A.

"These were the so-called cold, open-window classrooms, ventilated by natural means. It was desirable to have the temperature kept at 50° F. This, however, was found to be impossible owing to variations in the weather, and it therefore ranged from 50 to 60 degrees and occasionally higher.

Type B.

"These were moderate temperature classrooms, kept between 60° and 70° F., averaging about 68° F. Ventilation was wholly by open windows. Some rooms had gravity exhaust ducts, while others did not. Window deflectors were used in only one room in the 1916 study, while in the 1916-17 study window deflectors were installed and used in all rooms.

Type C.

"These rooms were of the same moderate temperature as Type B, that is, averaging 68° F. Ventilation of the classrooms was by the plenum, fan system installed in the buildings, the windows in these classrooms being kept closed."

Physicians and nurses conducted the experiment during the winter and fall and late spring for a total period of five months. The following results are immensely valuable for those interested in health values in ventilation.

It was found that in Type C classrooms the *rate of absences* from respiratory disease was 32 per cent. higher than in Type B classrooms and 40 per cent. higher than in Type A.

It was also found that in Type C classrooms the *rate of respiratory disease* occurring among pupils in *attendance* was 98 per cent. higher than in Type B classrooms and 70 per cent. higher than in Type A.

Mechanical methods of ventilation in the buildings studied[1] must be charged, therefore, as favorable to the development in the winter, fall, and spring of respiratory diseases severe enough to keep children from school to

[1] The experiment should be repeated in other places, under different ventilation conditions. It should be noted that generally the mechanical system of ventilation is administered more easily than the open window system.

an extent of from 32 to 40 per cent. more than natural ventilation, and of respiratory diseases not severe enough to keep from school, to an extent of from 70 to 98 per cent. more than natural ventilation by means of open windows.

Equable Temperature.—Equable temperature is very desirable. Sharp variations in temperature tax the heat-regulating system of the body, and frequently cause disturbances of the gastro-intestinal tract. With many persons a sense of bodily well being is very dependent upon an even temperature. In this country southern Florida and southern California afford the best illustrations of equable climate. The effect of atmospheric conditions upon fatigue and efficiency has been studied by Winslow,[1] and his results show the need for careful regulation of indoor temperature. A comparison of infant mortality and temperature changes in Chicago from 1907 to 1912 is shown in Fig. 20. Ward[2] mentions the following characteristics in climate as desirable for health: Frequent moderate weather changes, fairly marked annual and diurnal variation in temperature, reasonable amount of cold during part of the year, variety in amount of cloudiness, rainfall sufficient for grass and crops. He would advise that extremes be avoided.

Proper Humidity and Means to Secure It.—Water is always present in the atmosphere. While outdoor air varies greatly in its water content in different places and at different times of the year and day, the variation between the amount of water vapor in indoor air and outdoor air constitutes a prominent factor in the unwholesomeness of indoor air. The absolute amount of water present in indoor air is not the entire statement in this connection, but the amount of moisture that can still be taken up at the prevailing temperature. Build-

[1] Winslow, C. E. A.: The Effect of Atmospheric Conditions upon Fatigue and Efficiency, American Journal of Public Health, October, 1917, pp. 827–834.

[2] Ward, R. D.: Climate and Health, Scientific Monthly, April, 1921, p. 355.

Infant Mortality and Temperature

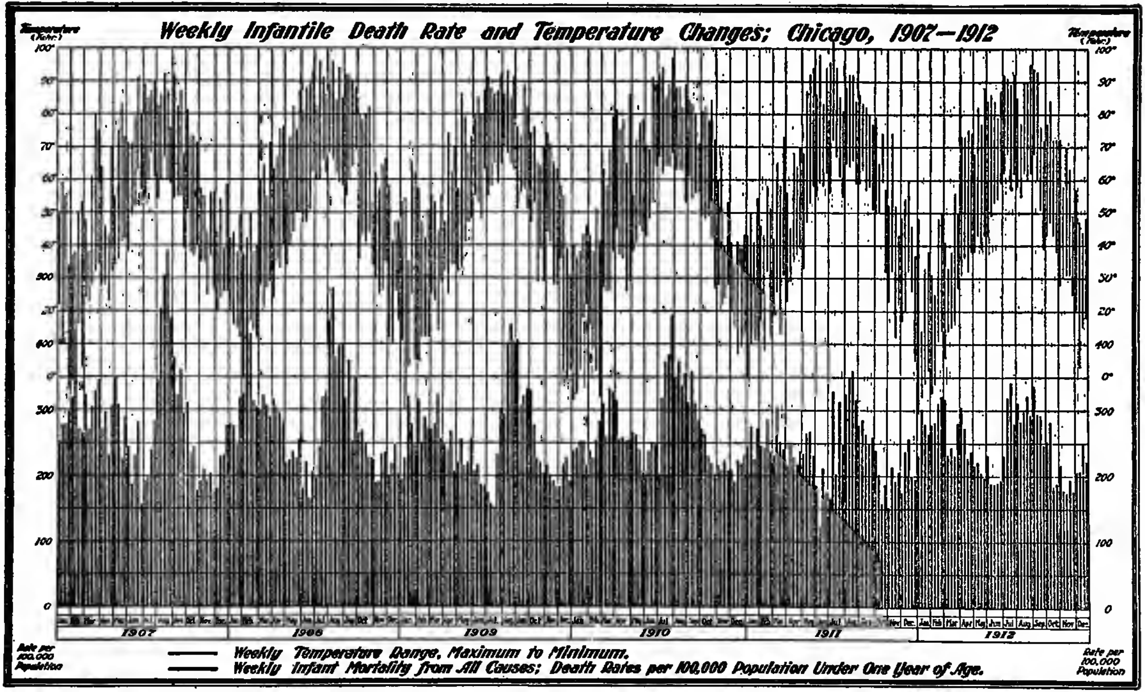


Fig. 20.—A comparison of infant mortality and temperature changes. (By courtesy of The Prudential Insurance Company of America.)

ings ventilated by open windows present little or no difficulty because the outdoor humidity usually controls, and no essential value is achieved by attempting to secure indoor conditions different from outdoor. The problem is chiefly one related to artificial systems of ventilation, as in schools, and in a certain extent in modern homes, where little or no attention is given to ventilation by means of windows.

The desirable humidity is often stated to be 60 per cent. (relative). This does not provide against the danger of excessive temperature with the resulting dryness of the air. The relative humidity may remain at 60 per cent. and the air may be able to take up considerable water vapor, as indicated by the following table from Rosenau[1]:

Relation of Humidity and Temperature

Temperature (C.).	Relative humidity, per cent.	Absolute humidity, grams per cubic meter.	Grams of vapor that can still be taken up.
—20°	60	0.638	0.426
—10°	60	1.380	0.920
0°	60	2.924	1.950
10°	60	5.623	3.749
20°	60	10.298	6.866
30°	60	18.083	12.056

Note: To reduce degrees Centigrade to degrees Fahrenheit multiply by $\frac{9}{5}$ and add 32 degrees.

The unwholesomeness of most indoor air with reference to its water content lies in its excessive dryness. With the temperature correct, this danger may be lessened, and it can be said that air at a temperature of 68° F. and a relative humidity of 60 per cent. will usually be satisfactory.

There is no method for determination of relative humidity that will be found practicable in the home, because it involves the use of an instrument that requires

[1] Rosenau, M. J.: Preventive Medicine and Hygiene, D. Appleton & Co., New York, 1913, p. 608.

adjustment, reading, and interpretation by means of a table. Therefore, the guide is to be a sense guide, dependent upon an interpretation of dryness of the mucous membranes, especially that of the nose.

In the school accurate determination may be made and records kept, and the procedure may be made not only contributory to general sanitary improvement but also helpful in training in methods of hygiene. For this purpose the sling psychrometer is used.

Excessive dryness in the air may be combated by:

1. Open window ventilation.
2. Liberal use of potted plants in the room.
3. Pans of water placed, where it will evaporate, under or on radiators for steam and hot-water heating, and in furnace chambers for hot air.

Excessive dryness of the air causes absorption of water from the body, especially from the mucous membranes. Man's body is about 58.5 per cent. water, so that the water loss in this way may well be a serious matter. The loss of moisture from exposed membranes interferes with their normal functioning.

Effect of Wind on Metabolism.—Wind and humidity have pronounced influences on metabolism. Wolpert's experiment as quoted by Lusk[1] gave the following results:

INFLUENCE OF WIND ON METABOLISM IN MAN

Temperature (C.).	Calm.	Wind—1 meter per second.	Wind—8 meters per second.
	Grams CO_2 per hour.	Grams CO_2 per hour.	Grams CO_2 per hour.
2°	29.8		
10°–15°	25.1	28.3	30.0
15°–20°	24.1		30.1
20°–25°	25.0		28.0
25°–30°	25.3	22.2	24.4
30°–35°	23.7		21.6
35°–40°	21.2	22.2	22.1

[1] Lusk, G.: The Science of Nutrition, W. B. Saunders Co., Philadelphia, 1919, p. 146.

Thus it would appear that the metabolism would be more marked with a breeze moving about 15 miles an hour (8 meters per second) at a temperature of 59° to 63° F. than with a temperature of 35° F. in a calm. The scientific basis for many hygienic practices in clothing the body is given in this experiment. The body is easily chilled in a wind due to loss of body heat by rapid evaporation.

Effect of Humidity on Metabolism.—The work of Wolpert was conducted on a thin man clad in summer clothes. Rubner, working with a fat man wearing clothes, obtains, according to Lusk,[1] the following results:

INFLUENCE OF TEMPERATURE AND HUMIDITY ON THE METABOLISM OF A FAT MAN

Temperature.	Humidity, 30 per cent.		Humidity, 60 per cent.	
	CO_2 in grams per hour.	H_2O evaporated per hour.	CO_2 in grams per hour.	H_2O evaporated per hour.
20°	33.7	56	30.7	17
28°–30°	36.9*	134	44.5‡	170 319 sweat
36°–37°	42.6†	204 149 sweat	46.7§	186 2559 sweat

* Body temperature rose 0.1 degree.
† Body temperature rose 0.0 "
‡ Body temperature rose 0.4 "
§ Body temperature rose 0.9 "

Note:
20° C. = 68° F.
28–30° C. = 82– 91° F.
36–37° C. = 97–100° F.

On a hot, humid day the heat lost from the body is by evaporation of water. This is retarded by the humidity. Humidity by preventing the evaporation of perspiration on a hot day results in depression of the body. This is due to the exhaustive elimination of perspiration which by non-evaporation is prevented from cooling the body. If the temperature is moderate the heat loss may take place through radiation and conduction, so that perspira-

[1] Lusk, G.: Loc. cit., p. 147.

tion is not so excessive. Lusk[1] comments upon this effect of humidity and temperature as follows:

"It is also interesting to note that prostrations from the heat occur in New York with 66 per cent. humidity and a temperature of 31.5° C.[2] (2.30 P. M., August 24, 1905)."

Air Movement and Means to Secure It.—It has been found that many of the ill effects of bad ventilation can be avoided by keeping the air of the room in motion. Hill, in England, and Flügge, in Germany, demonstrated that air movement was an essential element in well-ventilated rooms. In still air the body becomes surrounded by a jacket of warm moist air which produces the familiar symptoms of a vitiated air, even with the CO_2 content well below 6 volumes.

Movement of air in rooms is very desirable and should be secured. This may most readily be accomplished by opening windows. Many persons do not know how to open windows. If the room seems badly ventilated, some one who doesn't know how may open the windows widely so that those near the windows are suddenly chilled. It usually happens that some one in the group near the windows replies by tightly closing them. Both err. To secure air movement the windows should be opened a small space only and preferably at top and bottom, but top at least.

Air movement may be supplemented by an electric fan.

The fear that some persons have for drafts is very real, but it is often a developed fear, dependent upon coddling of the body, and should be overcome by proper dressing and bathing. Air in movement sufficient to prevent unpleasant and unhealthful effects may be secured without injury to health. The rate of movement in relation to our perception as given by Rosenau[3] is as follows:

[1] Lusk, G.: Loc. cit., p. 148. [2] About 89° F.

[3] Rosenau, M. J.: Preventive Medicine and Hygiene, D. Appleton & Co., New York, 1913, p. 603; ibid., p. 626.

Air moving at 1.5 foot per second—1.0 mile per hour—imperceptible;
Air moving at 2.5 feet per second—1.7 mile per hour—barely perceptible;
Air moving at 3.5 feet per second—2.3 miles per hour—draft.

The term "draft" is relative. To some persons a blowing wind is not recognized as a draft; to others the slightest air movement is a strong draft.

Control of Dust and Dirt.—Dust is a normal constituent of the atmosphere and it serves a very useful purpose as a focus for water vapor precipitation, as a disperser of the sun's rays with decrease in the transparency of the air. Dust particles are derived from the earth, carbon particles in smoke, volcanoes, salt from sea spray, interplanetary particles, mineral dust from certain occupations, and organic dust, such as, "epithelial scales, seed, spores, bacteria, pollen, plant cells, fluff of various kinds, bites of insects, starch, pus-cells, algæ, rotifers, fragments of hair, feathers, and bits of tissue, fibers of cotton, etc."[1]

The dust of great danger from a health viewpoint is mineral dust from trades. The dust from the earth, smoke, or refuse heaps is unpleasant, but mineral dust is distinctly injurious.

Influence of Mineral Dust in Air on Health.—The dust from mineral sources is injurious when present in large amount and when, as is usually the case, the particles are sharp and cutting, thus serving to irritate body tissues. Thus in coal mining, iron and steel trades, stone cutting, and other dusty trades the dust is present in large amounts and is extremely irritating. The lungs are the chief organs to suffer and so definite is the injury to the lungs that the affection resulting is named according to the cause of the disease. Thus, *anthracosis* is caused by coal dust; *siderosis*, by iron or steel dust, and *silicosis*, by stone dust.

[1] Rosenau, M. J.: Preventive Medicine and Hygiene, D. Appleton & Co., New York, 1913, p. 603; ibid., p. 626.

Kober and Hanson[1] have shown that the effect of dust and fumes on the upper air passages may be marked. "Dr. Collis, after examining thousands of grinders and granite cutters and others exposed to inhalation of dust in Sheffield, Aberdeen, and elsewhere, found, as a rule, that the lining membrane in the interior of the nose for a distance of $\frac{3}{4}$ inch was smooth, dry, and pale colored; the mucous membrane behind this was red and inflamed and generally covered with dust, while the back of the pharynx and pillars of the fauces were tolerant of the touch of the spatula used to depress the tongue, having lost their sensitiveness."

Bacteria in Air.—Bacteria in outdoor air do not constitute a very serious danger, and, in fact, do not have the importance that people usually attach to the matter. Bacteria do not multiply in the air, and most of them soon die, especially when exposed to sunshine. It may be safely said, therefore, that bacteria coming in the air directly from another person in the liquid spray from coughs or sneezes are very dangerous, but if they are not received directly from another person, the danger is very small indeed. The expired air is practically free from bacteria. In coughing, sneezing, talking, or other forced respiratory movements, however, the expired air contains bacteria. This indicates how droplet infection occurs.

The air has been considered in former times to be a prolific source of disease. Malaria (bad air) and other diseases, such as typhoid fever, yellow fever, and rheumatism, were supposed at one time to be communicated by the air. The knowledge of these diseases today rules out entirely, however, air as a factor in causation. The advances in epidemiology show that bacteria in outdoor air are usually harmless; in crowded places, such as street cars, schoolrooms, and other closed and

[1] Kober, G. M., and Hanson, W. C.: Diseases of Occupation and Vocational Hygiene, P. Blakiston's Son & Co., Philadelphia, 1916, p. 297.

poorly ventilated places, where human beings come in close contact, the danger of disease transmission is very real. The process, however, is that of direct contact by means of a droplet or spray of infection from the nose or mouth of another person.

The Value of Sunlight.—The value of sunlight in the modern treatment of tuberculosis and rickets[1] illustrates the saying of Pliny, the elder, who wrote "Sol est remediorum maximum." The sun is the greatest cure for many things. Its value in the maintenance of general health is less appreciated than it should be. Part of the splendid effects of an out-of-door life is due to the sunshine. The ancients appreciated this fact more than we moderns do, as shown by the helioses of the Greeks, and the solaria of the Romans.

Civilized man in the temperate zone by taking on clothing, by living so much indoors, protects himself unduly from the sun's rays. On exposure to strong sunshine he shows a marked susceptibility to sunlight. A careful and gradual exposure in the summertime would generally result in improved function of the skin, increased nutritive changes, enrichment of the blood, particularly the hemoglobin content, and improved nerve action. In the tropics man suffers from the excessive sunlight. Woodruff[2] names excessive sunlight as the cause of backwardness in these regions. One unaccustomed to sunlight should avoid prolonged exposure at first. Sunburn, headache, sleeplessness, and other signs of discomfort following exposures to the sun indicate too sudden or too prolonged periods. City persons on vacations in the country frequently err in this regard. Gradually increasing the amount of body surface exposed

[1] Hess, A. F.: Experimental Rickets in Rats, Journal of Biological Chemistry, January, 1922, p. 77. McCollum, E. V.: Is There More Than One Kind of Rickets? American Journal of Diseases of Children, February, 1922, p. 91.

[2] Woodruff, C. W.: The Effect of Tropical Light on White Men. Clark, J. H.: The Physiological Action of Light, Physiological Reviews, April, 1922, pp. 277–309.

and the time spent in the sunshine will bring valuable results, if unfavorable signs are recognized and acted upon accordingly.

Nature's Plan for Respiration—the Respiratory Tract.—The general plan provides that air be taken in through the nose, where dust and dirt are in part removed and the air properly warmed before passing on through the trachea (windpipe) to the lungs. Nature in all mechanisms of the body provides a margin of safety, and that principle is seen in the provision that air may be breathed in through the mouth. This is an emergency entrance, however, and is not adapted either in general structure or function for respiration. Nose breathing alone is justifiable and should be practised. Obstructions in the nose in the forms of adenoids, growths, or deformities should be removed to secure the free passage so essential for proper breathing and vigorous health.

The Muscular Mechanism for Respiration.—Nature has provided a muscular mechanism by which man may increase the size of the chest cavity and allow air to rush in. This mechanism allows for an increase from side to side, from back to front, and from top to bottom. Faddists, singers with special "systems," and fake "professors of physical culture" at times advocate irrational and wholly unscientific methods for using the chest cavity.

One extreme method of breathing is known as "abdominal." This method consists in pronounced use of the diaphragm without the use of the intercostal muscles. The natural method of respiration is one that calls into action both diaphragm and intercostal mechanisms in which the greatest expansion comes in the lower chest and epigastrium. It has been asserted that the corseted mature woman breathes with a costal type of respiration, but that there is no fundamental difference between the natural respiration of man and woman has been well demonstrated. Children show, as a rule, an abdominal type, but this type is lost in the pubertal changes that come with adolescence, due to the increase in muscular power and a change from the protuberant abdomen to the flat type.

Automatic Control.—The rate and frequency of respiration is controlled by a group of nerve cells, the respiratory center in the medulla, acting in response to changes in the blood. True it is that we can *voluntarily* breathe deeper and faster, but clearly also, whether we do or not *voluntarily* is not related to the physiologic requirements of the body. When running or engaged in feats of speed, strength, or endurance the act of respiration goes on without conscious direction, and because of this essential automaticity, satisfying, as it does, the needs of the body, an attempt of the voluntary or conscious kind is unnecessary and unhygienic. Certainly at no time or place does any individual know how fast or how deep he must breathe to eliminate the carbon dioxid produced by activity. The respiratory center does know, however, and if uninterrupted it will under all normal conditions carry out its demands and fulfil its physiologic obligations.

The Matter of Breathing Exercises.—There is probably less clear thinking among physical educators on the subject of breathing exercises than on any other aspect of body training. Hall,[1] who marches in the procession with those who give prominence to play and games as contrasted with formal gymnastics, makes the following absurd statement:

"Deep breathing, however caused, no doubt acts against auto-intoxication, gives increased power to resist disease, is the root of endurance under effort, and is of great and hitherto unsuspected importance in determining the level or intensity of life, one of the chief variables with which the rate and completeness of normal oxidation of the blood is correlated."

The above statement may well mean that respiratory gymnastics in one's room before an open window, as

[1] Hall, G. S.: Adolescence, D. Appleton & Co., New York, 1904, p. 102.

is customary with those who pursue this fad, will determine "the level or intensity of life" to the advantage that "auto-intoxication" is done away with and "endurance" is strengthened at the root. President Hall has such a keen appreciation of the biologic values in life that it is disconcerting to find him expressing such opinion.

It is important to point out that breathing exercises in the home or following a period of gymnastics are unscientific and not physiologic for the following reasons:

1. Oxygen cannot be stored up in the body. The passage of oxygen from the air-chambers of the lungs to the blood and thence to the tissue is dependent upon the need of the body cells for oxygen. If physical activity is increased, oxygen is required, and hence respiration is increased in rate and depth. Burton-Opitz[1] says in this connection:

> "The relation between the quantities of O absorbed and CO_2 liberated during a given period of time is designated as the respiratory quotient.
>
> "The rate and depth of the respiratory movements do not appreciably change the relationship of the O and CO_2.
>
> "The general arrangement of the intracellular material constitutes the principal factor in the determination of the manner in which the dysoxidizable food-stuffs combine with oxygen. On this account there is imparted to the oxidations definite specificity and a limit is set to them in conformity with the requirements of the different tissues. *Consequently, the magnitude of the oxidation is regulated by the tissue itself and not by the amount of oxygen actually available.*"

There is abundant physiologic evidence to show that the arterial blood is in a state of almost complete saturation and that this normal state is possible with an oxygen tension of little more than 30 mm. Hg., although the normal tension is at least 100 mm. Hg. In short, that natural respiration amply safeguards the needs of the tissues. Moreover, as Burton-Opitz says:

> "But even if this gas (oxygen) is supplied in pure form so that its pressure is increased five times, namely, from 152 mm. Hg. to 760

[1] Burton-Opitz, R.: A Text-book of Physiology, W. B. Saunders Co., Philadelphia, 1920, pp. 507, 511, 514, 516, 517.

m.m. Hg., no considerable variation in the consumption of oxygen and output of carbon dioxid results."

2. By respiratory exercises the proportion of oxygen to carbon dioxid in the lungs and blood can be temporarily increased, but only at the expense of the physiologic equilibrium of the body. An illustration of this disturbance may be seen by breathing deeply and rapidly for one or two minutes. The nausea, headache, disturbance in vision, and other sensory manifestations indicate the unhygienic effect of the procedure. Henderson's[1] experiments in this field have been especially valuable in confirming this view.

   Investigators have observed that spasms and muscular twitchings may follow voluntary overbreathing. It may cause symptoms of tetany, the factor being alkalosis, due to reducing the amount of the blood carbon dioxid, and making the blood more alkaline than normal.

3. The voluntary taking of oxygen regardless of the needs of the body is unphysiologic and irrational. The quantity of oxygen taken up by the cell is conditioned by the needs of the cell. Pflüger's[2] work on the combustion of living material showed that. Barcroft[3] has sustained his position. The respiratory center provided by nature to regulate the oxygen supply in accordance with the body needs is a better guide than any voluntary, arbitrary, and empiric method. No individual at any time knows how much oxygen is needed.

[1] Henderson, Y., and associates: The Influence of Forced Breathing Upon the Circulation, The Journal of Pharmacology and Experimental Therapeutics, April, 1918. The Time that the Breath Can Be Held as an Index for Acidosis, Journal American Medical Association, July 25, 1914. Haggard, H. W., and Henderson, Y.: How Oxygen Deficiency Lowers the Blood Alkali, Journal of Biological Chemistry, vol. xliii, No. 1, 1920.

[2] Pflüger: Ueber die physiologische Verbrennung in den lebendigen Organismen, Pflüger's Arch., x, p. 350, 1875.

[3] Barcroft: The Respiratory Function of the Blood, Cambridge University Press, London, 1914, p. 73.

4. The use of breathing exercises following a gymnastic lesson is unscientific[1] and should be discontinued. No teacher can tell the respiratory needs of any one pupil; how futile to set a respiratory rate for 40 children when there is not sufficient knowledge to guide intelligently, and when respiratory needs vary tremendously in different individuals.
5. The use of breathing exercises to increase the size of the lungs and chest, unless used for corrective or therapeutic purposes in individual and prescribed-for cases, is unscientific and dangerous. Lung development should be an expression of increased respiratory need and should follow as a response of the respiratory mechanism to the need for oxygen by the tissues of the body. It would be as irrational to develop a large heart out of proportion to the rest of the body as it is to develop large lungs without reference to body needs.
6. The belief that breathing exercises and large lungs were inimical to the development of pulmonary tuberculosis is unfounded in fact. Tuberculosis is related directly to personal habits, sanitation, and sources of contagion. There is no characteristic tuberculous chest except in the chronic stages of the disease.
7. Since tuberculosis develops most frequently in the apex, the less frequently used portion of the lungs, it would seem to be dangerous to develop a very large lung and thus produce a larger area not used continually.[2] A lung that is related

[1] Burton-Opitz has unpublished data clearly showing that the tidal air is greater under conditions of maximum respirations with the arms hanging easily at the sides than with the arm movements usually employed in breathing exercises.

[2] Sewall, H., and Swezey, S.: American Review of Tuberculosis, September, 1921, p. 547. Beasley, T. J.: Journal American Medical Association, February, 25, 1922, p. 579.

to the habits of exercise, life, and needs of the individual is a better mechanical instrument than one much larger in size and power and unrelated to the physiologic body requirements. In the latter case it is reasonable to suppose that such a lung would be more susceptible to disease because of the larger unused area.

8. The evils aimed at in breathing exercises are to be corrected by physical exercise that will not only produce increased respiratory action and gaseous interchange, but also will give additional hygienic effect.

Health of the Respiratory System.—Health of the lungs and respiratory tract is dependent upon many factors. The general health of the body, digestion, circulation, and elimination are important factors. The air breathed, the condition of the nose and throat, and the matter of exercise in the open air are important. Specific directions for avoiding tuberculosis will be given later, but aside from this infection, and for the maintenance of good condition in the pulmonary system, the following points are to be noted:

1. Nose breathing is essential. The nares are constructed to warm cold air and to screen out from the air dust and germs. If necessary, surgery should be employed to free the nares from adenoids, spurs, growths, and other obstructions.
2. Cold bathing is invaluable to keep the tone of the body and especially the tone of the mucous membranes of the respiratory tract in good condition. Numberless persons have freed themselves from "colds" by a faithful habit of the morning cold bath.
3. The best exercise for lung development is running for boys, and dancing for girls in the open air. La Grange recommends skipping for girls. Swimming, mountain climbing, hiking, and outdoor games are more important than any respiratory gymnastics ever devised.

4. In the prevention of colds the following should be noted in addition to cold bathing:

   (1) Sufficient sleep in well ventilated room. If body is well protected by bed clothing, there should be no fear of drafts. A direct draft upon the head is undesirable.
   (2) Avoid close, poorly ventilated rooms, and especially those with high temperature.
   (3) Avoid chilling the body. Keep the body warm when riding or sitting quiet. When walking or exercising there is no danger; the mistakes are made when resting following the activity.
   (4) Keep the general health at the best and highest level possible.

Colds.—Colds are very common health disturbances and because they are not liable to cause immediate death they are regarded by many people as of no great importance. Hutchinson suggests, however, that a person's age is not dependent upon the number of years that have passed over one's head, but upon the number of colds that have passed through one's head. The best medical opinion supports the view that colds, however minor may be their temporary effect, are of enough importance to warrant serious painstaking care to avoid contracting them.

Colds are caused by bacteria which at times attack the body in great force and cause marked disturbance, with temperature, loss of appetite, and general feeling of disability, or at times causing only a slight indisposition for a day or two. The latter condition is probably responsible for the phrase: "Oh, I only have a cold."

The variability in the severity of the condition is due to a variation in two factors: the virulence or number of invading bacteria and the resistence of the body to the infection. The virulence or number of bacteria is increased at times when there is an epidemic of colds. At such times only the best resistance will prevail against the infection. Therefore, it is always wise to avoid a person who has a cold, and to isolate one's self when one has a cold. The protection against the bacteria then is by avoiding contact with those who are infected, and by increasing or by maintaining body resistance.

The matter of resistance is of considerable importance. We may understand the problem better by noting that there is a dual aspect to the subject: resistance of local parts, such as nose, throat, and accessory structures, and resistance of the body in general.

Many persons are susceptible to colds because of abnormality in the nose or throat. The common forms are adenoids, enlarged tonsils, and nasal obstruction. Nasal obstruction may be due to growths, to nasal injuries and septal deformities, or to abnormal development of the teeth and palate in childhood. Adenoid growth and tonsils are frequently the cause of colds in children. All of these abnormalities increase the liability to colds, and, in addition, render it more likely that serious involvement of accessory structures will occur. Thus, middle-ear disease, sinus trouble, and even the dreaded mastoid infection may result. To increase the resistance of local parts by having abnormalities corrected is the reasonable thing to do.

If local parts are in good condition a cold can result only if the invading bacteria overcome the general defenses of the body. General defense is known as general resistance also. It is upon personal hygiene that resistance is largely dependent. Chilling the body, getting the feet wet, dietary indiscretions, constipation, overwork, loss of sleep, and other matters may lower the resistance sufficiently to allow infection to occur. These causes may need special attention.

Experiments upon animals show that chilling and overeating do diminish the body's resistance to infection. Rabbits which have been chilled subsequent to inoculation with cold-producing bacteria show a higher rate of mortality from the disease than animals similarly inoculated, but not chilled. The old belief that drafts cause colds is justified in this sense that they will congest the mucous membranes and render the individual more susceptible. This point needs examination though, because by rational health habits the skin may be trained to adjust readily to all the usual variations in air movement and temperature. This training is important. Cold baths for those who can take them is the most important single procedure for skin training. Those not able to take the cold bath should wash the neck and face with cold water every morning and splash some cold water over the chest.

Getting the feet wet should be avoided whenever possible. If it cannot be avoided, the changing of shoes and stockings as soon as possible is, of course, imperative. Standing out-of-doors in cold weather may result in chilling of the body even though warmly clothed. To avoid this one should—if to be out-of-doors is essential at that time—continuously contract the body muscles. Rising on the toes, shifting the weight, contracting arm and back muscles will be found efficacious.

Dietary indiscretions and constipation lower the resistance to colds. Overeating is to be avoided for this as well as for other good reasons. Constipation is to be combated, of course, with every proper food, and other natural means, such as exercise, plenty of water, and regularity in evacuation. If these do not suffice to correct the condition, a physician should be consulted.

Avoidance of overwork and loss of sleep are important for this as well as for other good reasons.

Shall a nasal douche be used? Are vaccines valuable in preventing or treating colds? What home remedies are recommended? These are common questions from those who suffer from colds. In general, nasal douches are not advisable. They should be used only on prescription. The snuffing of solutions into the nose is dangerous, and may lead to middle-ear infection. For the same reason care in blowing the nose should be taken by closing one side completely and blowing through the other, allowing the front opening to be unobstructed.

Vaccines have been recommended for sufferers from continual colds, and in some cases the results have been good. The procedure is not well enough established to give it general approval.

The home treatment of a cold is, briefly: stimulate the bowels by a laxative, preferably a salt, such as magnesium sulphate or citrate of magnesia, and go to bed, keeping the body warm. Ventilate the room thoroughly. A hot foot bath for fifteen to twenty minutes is good treatment, but the danger of catching cold after emerging from the body bath is so great that, if used, it should be supervised carefully.

If one has over 100 degrees of temperature a physician should be called. The onset of other and more serious diseases is marked at times by the symptoms of an ordinary cold.

After a cold has passed one should not take on work too early. Put the load on gradually. Learn from one experience, and by improving the living routine make succeeding infections, if not impossible, at least, exceedingly difficult.

Tonsils.—The tonsils are glands placed on either side of the opening from the mouth into the pharynx. In childhood they probably serve to protect the individual against respiratory diseases, but if normal they disappear soon after puberty. As a matter of fact, the prime purpose of the tonsils has never been determined. If the tonsils become diseased, then the question is, not what function do they have, but rather, how serious is the infection, and what will happen if they are not removed. There are many old-fashioned beliefs about the tonsils, but they must give way before the clearly proved evidence of tonsil complicity in heart and rheumatism affections.

The entrance for the organisms causing valvular disease of the heart or rheumatism is via the tonsils in many cases. This evidence has been available from clinical experience; it has been corroborated by laboratory findings. The case is complete. Diseased tonsils are dangerous to health!

The present-day operative procedure for the removal of infected tonsils is correct. It is important to have a skilled surgeon perform the operation. There is no danger to be feared if the operation is in the hands of a skilled performer. The removal of the tonsils enlarges the throat-mouth cavity and increases the volume and resonance of the voice.

Children have large tonsils. These glands decrease in size with age. If not infected they will become very small. The size of the tonsils is not an indication for removal unless they cause obstruction. Real signs of disease and infection will be sought by the reputable and skilled surgeon before advising removal (see Chapter XIV).

Adenoids.—At the opening of the nasal cavities into the upper part of the pharynx there occurs in children a growth of lymphoid tissue, called adenoids. This growth may become so extensive as to cause interference with nasal breathing, obstruction of the eustachian tube orifice, and hence interference with hearing. The tonsils are to be removed not because they are large, but because they are diseased; the adenoids are rarely diseased, but are dangerous to health because of enlargement. The effects of adenoids are diminished physical activity, lack of energy, vigor and vitality, and malnutrition. They constitute a serious health handicap for the child. In addition, by causing mouth breathing, they produce a lack of proper development of the bones of the nose, cheek, and jaws. The operation is simple, not dangerous, and should be advised and followed if indicated.

The Joint Committee on Health Problems in Education[1] gives the following structural, functional, and general effects of adenoids:

[1] Joint Committee on Health Problems in Education of the National Council of Education, National Education Association and the Council on Health, American Medical Association. Health Essentials for Rural School Children, second edition, 1921.

(*a*) Structural effects:
1. High arched palate.
2. Narrowing of upper jaw.
3. Deformity of chest, resulting from obstructed and imperfect breathing, shown by lateral depression of front of chest and prominent sternum (breast bone).
4. Disturbed development of teeth and vocal organs.
5. Large tonsils in one-third of cases.

(*b*) Functional disturbances:
1. Mental:
    (*a*) Disturbance in function of brain resulting in *aprosechia nasalis*, that is, difficulty in forming an idea of anything new; stupidity; difficulty in retaining ideas; weakness of memory; inability to turn thought on a definite subject; lack of power of attention.
    (*b*) Irritability, depression, and often disorderly conduct.
2. Deafness.
3. Defects in sense of smell and taste.
4. Defects in voice (nasal voice).
5. Chronic rhinopharyngeal catarrh, shown by a persistent nasal discharge. This is often one of the first symptoms. In very young children it is manifested by snuffles.
6. Obstruction of air passages resulting in breathing disturbances, manifested by open mouth and great restlessness at night, the child being forced to assume various attitudes, such as sleeping on face, in order to breathe better.
7. Reflex:
    (*a*) Catarrhal spasm of larynx, or croup.
    (*b*) Headache.
    (*c*) Intractable cough and hoarseness.
    (*d*) Bronchial asthma.
    (*e*) Enuresis (incontinence of urine).

(*c*) General effects:
1. Malnutrition and anemia.
2. Underdevelopment, physical and mental.
3. Predisposition to otitis media (middle-ear disease), laryngitis, colds of a remittant nature; increased susceptibility to disease infections, such as tuberculosis, diphtheria, scarlet fever, etc.

Hygiene of the Voice.—Proper use and care of the voice are very important. A pleasing voice is an asset of real worth to a person. Children develop the voice according to the voices heard most often. The influence of parents and teachers upon voice formation in the child is more powerful than any other factor in determining the quality of the voice. The child that hears harsh, coarse speech will develop like vocal qualities, and the child hearing soft resonant tones will speak softly and resonantly if not prevented by defects in the nose or throat, or by disturbances due to poor co-ordination in speech control. Adenoids, tonsils, abnormalities of the palate, obstruction in the nose are the common causes of poor vocal sounds. These conditions must be remedied before improvement in speech is to be expected. After abnormalities are corrected speech training may be necessary to develop new co-ordinations and to re-educate the muscles of the throat.

Training of the voice may be accomplished either by teachers of oral expression or by teachers of singing. Both forms of training are valuable if good methods are followed. The methods of teaching the use of the voice are indeed numerous. No principles can be stated that will serve effectively in choosing proper teachers; results alone can determine.

The care of the voice is more important to professional singers and speakers, but for all persons the voice is so useful, so much a part of living, that certain rules of hygiene should be noted and followed.

The voice responds to general bodily states. Weakness and muscular flabbiness cannot support a good voice. The voice takes on the quality of the body in general as regards its health. A person in poor health will suffer with fatigue of the voice, and under use there will develop inflammatory conditions, leading frequently to repeated colds in the larynx, called laryngitis. The voice during an attack of laryngitis must not be used more than is absolutely necessary. Singing at such times is especially harmful. Perfect rest for the voice is the best form of treatment for laryngitis.

A frequent cause of poor vocal production is poor posture. A relaxed, drooping position of the trunk and head allows the larynx to sink and results in poor tones. The basis for good sound production is an erect posture with the abdomen well supported by muscular contraction and the chest carried high. A strained position is not desired, but one of erectness and balance.

Smoking causes irritation and thickening of the mucous membrane of the throat and may result in a chronic cough. Improper voice placement may so strain the cords that the singing voice is entirely lost. The efforts of altos to sing soprano, and of baritones to sing tenor lead logically to disaster. The voice must be used properly to serve adequately.

Tuberculosis.—A variety of disease processes may develop in the respiratory system. Bronchitis, pneumonia, pleurisy, empyema, and others are all important. Some of these will be discussed briefly in Chapter XIII. Pulmonary tuberculosis is so prevalent and its effects are so disastrous at times, that it is important to describe the disease at length, its mode of transmission, its prevention, and its treatment.

Tuberculosis is an infection caused by the *Bacillus tuberculosis.* This bacterium may attack almost any organ in the body. There may be tuberculosis of the lungs, liver, spleen, intestines, kidney, bones, brain, and other structures. In children it is more commonly seen in bone and gland infection; in adults it is more frequent in the lungs.

The cold blooded animals are rarely affected. It does not affect birds, and rarely horses, sheep, goats, cats, and dogs. It is a common disease among cattle, and its wide-spread prevalence among milch cows accounts in part for many cases of the bovine type in man.

In man the disease is one of the most serious from an economic and social point of view. It is estimated that one-seventh of all deaths in England and one-ninth of all deaths in the United States are due to the disease.

Cause of the Disease.—The disease is caused by a minute bacterium that is able to grow and develop in the body under favorable conditions. Two things are necessary: the organisms, and a condition favorable to their growth and development. In this respect it is helpful to think of these essentials in the light of Osler's famous analogy, and consider the nature of the seeds (bacteria) and the soil (the human host).

The Seeds.—The bacteria are scattered widely among human habitations. The two chief sources are: The expectoration of persons with advanced disease of the lungs, and the milk of tuberculous cows.

There are other sources probably derived from the former. Scores of experiments have demonstrated the presence of bacilli in samples of dust from public buildings, streets, railway coaches, traction cars, etc. These bacilli are so ubiquitous that in cities, at least, few individuals pass a week without coming in contact with them and affording an opportunity for their lodgment in the respiratory passages. From the street the bacilli may be brought into the house on the shoes, the skirts of women, the hair of cats and dogs, and in the dust of the air. The tubercle bacilli of the bovine type are usually distributed by the milk of tuberculous cows. Park has shown that from 6 to 10 per cent. of the deaths in children with tuberculosis was of the bovine type, thus indicating the supreme importance of using for dairy purposes only those cows that are tuberculin tested and shown to be free from tuberculosis.

The Soil.—It is a very interesting and highly instructive fact that approximately 90 per cent. of all people are at some time infected with the tubercle bacillus. This is instructive especially because a very much smaller percentage die of the disease. The health of the body, *i. e.*, resistance to disease, is a prominent factor in the case. Osler's[1] famous analogy of the Parable of the Sower is interesting:

"Some seeds fell by the wayside and the fowls of the air came and devoured them up." These are the tubercle bacilli scattered widely over the human environment, the majority of which die. "Some fell upon stony places."

[1] Osler, W.: The Principles and Practice of Medicine, D. Appleton & Co., New York, 1912, p. 157.

These are the ones that find lodgment in many persons, but they do not develop because "they have no root." "Some fell among thorns and the thorns sprang up and choked them." This represents the bacilli that find suitable body soil for growth, but the thorns, representing the protecting forces of the body, get the better of the struggle.

"But others fell on good ground and sprang up and bore fruit an hundred fold." This is the group that produces one-ninth of all deaths in the United States, and that costs about $200,000,000 annually; that brings sorrow and suffering to thousands and ruins the plans and purposes of many lives. To know what makes the soil favorable for the development of the seeds is very important.

Predisposing Factors.—1. *Environment.*—It is true that one can acquire a predisposition to the disease. Dwellers in the cities in dark alleys and tenement houses, workers in cellars and ill-ventilated rooms, and persons addicted to drink are very prone to the disease. Dr. Trudeau demonstrated the effect of environment when he showed that rabbits, inoculated with tubercle bacilli, if confined in a dark, damp place, without sunlight and fresh air, rapidly succumbed, while others inoculated in the same way, but allowed to run wild, recovered or showed very slight lesions. In this connection it is instructive to note that occupants of prisons, asylums, and poor-houses, and large unsanitary factories respond like Trudeau's rabbits in the cellar. Environment is a factor of first-rate importance, and the social and economic conditions creating unfavorable environment are at the crux of the problem. The kind of people most likely to get tuberculosis are those whose environment is favorable for the bacillus.

An important factor in environment is occupation. The work one does is restricted to place and surroundings. Hence the death-rate from tuberculosis, classed by occupation, is significant of the influence in the environment of the work done and conditions of labor. Table VII, giving deaths from tuberculosis per 1000 deaths from all causes, prepared by Oldright and presented by Terman,[1] is instructive:

TABLE VII

DEATHS FROM TUBERCULOSIS BY OCCUPATION AND PLACE

	Baltimore.	D. C.	New York.	Brooklyn.	Philadelphia.	Boston.	Average of the cities.
Printers and pressmen	429	342	437	370	377	430	398
Female teachers in schools	452	395	272	336	441	477	396
Stonecutters	432	333	398	423	261	496	391
Dressmakers and seamstresses	396	386	385	350	405	388	385
Saloon keepers and bartenders	213	305	296	295	223	276	268
Policemen, watchmen, detectives	183	187	190	169	161	113	167
Farmers, planters, overseers	141	175	207	128	103	83	139
Lawyers	119	125	102	236	139	96	130
Physicians and surgeons	204	103	120	113	135	90	128
Clergymen	138	120	153	91	140	83	121

The influence of occupation on the development of tuberculosis is indicated in two statistical charts (Figs. 21, 22) presented by the Prudential Life Insurance Company of America.

2. *Heredity.*—It was very common some years ago to hear of the importance of heredity in the acquirement of tuberculosis. Today there is no general acceptance at all that tuberculosis is inherited biologically; the term "tendency" is used to indicate that children of tuberculous parents are more likely to acquire the disease, because there is an inherited weakness or susceptibility. There is considerable reason for believing the "tendency" theory. It is true that children of tuberculous parents are often weak and malnourished, but the important thing to remember is that these children inherit tuber-

[1] Terman, L. M.: The Teacher's Health, Houghton Mifflin Co., Boston, 1913, pp. 24, 25.

culous parents, that they come into a home where tuberculosis is active. In short, heredity in this disease is of

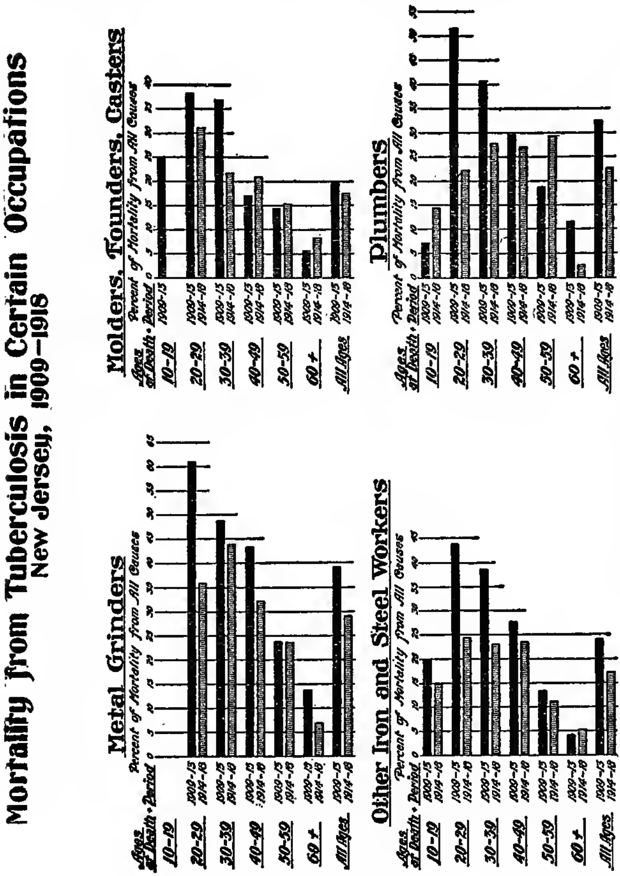


Fig. 21.—Proportionate mortality from tuberculosis of the lungs, by ages, in certain occupations. (By courtesy of The Prudential Insurance Company of America.)

very little importance; environment, on the contrary, is exceedingly significant.

3. *Race.*—That individuals may inherit a weakness to the disease is well illustrated by the fact of racial

susceptibility. Negroes are very prone to the disease (Fig. 23), and the American Indian since his civilization has succumbed in large numbers. The Irish are very susceptible; the Jews very resistant.[1]

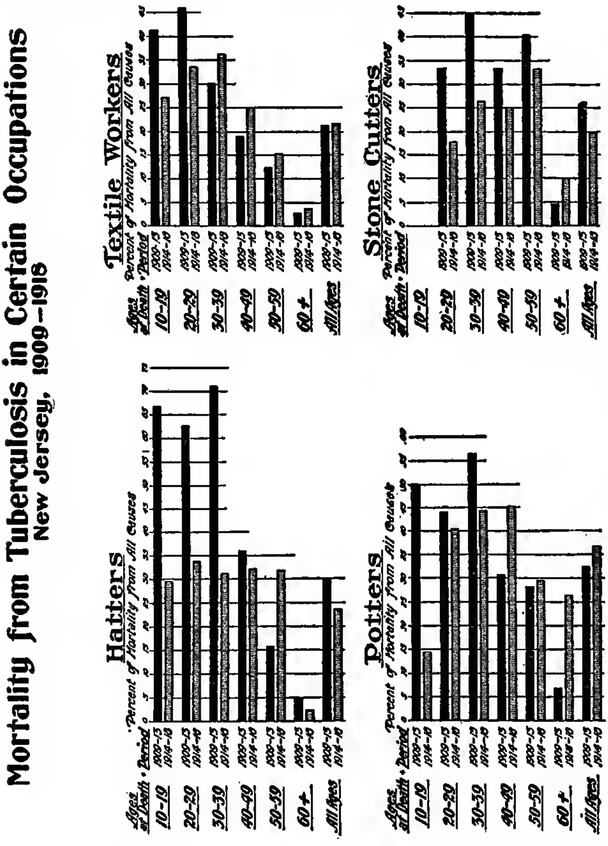


Fig. 22.—Proportionate mortality from tuberculosis of the lungs, by ages, in certain occupations. (By courtesy of The Prudential Insurance Company of America.)

4. *Sex.*—Women have a lower mortality than men (Fig. 23). The cause is not known.

[1] Dublin, L. I.: Scientific Monthly, January, 1922, pp. 94–104.

5. *Habits of Life.*—Aside from environmental factors, such as light, air, and general surroundings, there are

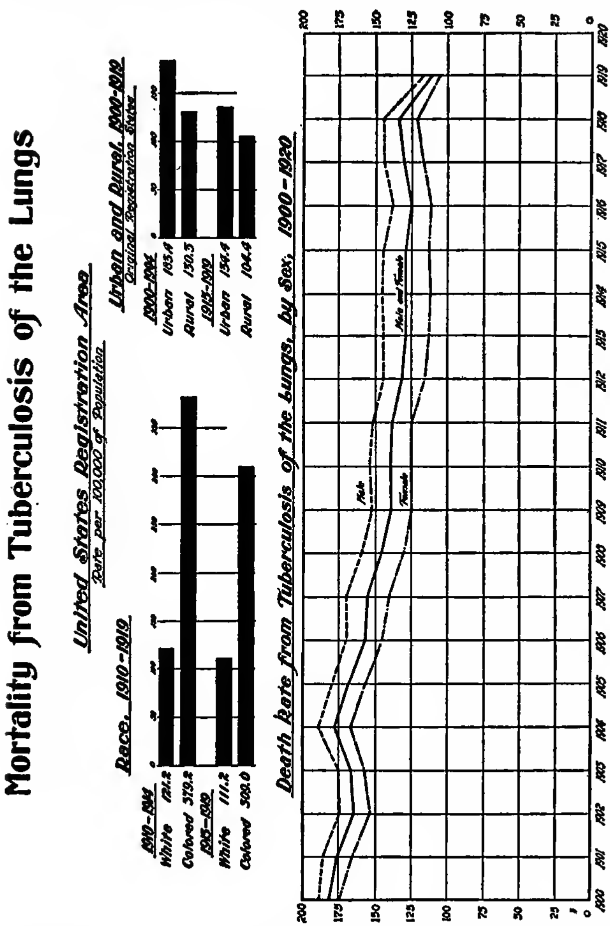


Fig. 23.—Mortality from tuberculosis of the lungs for white and colored races, urban and rural districts, male and female persons. (By courtesy of The Prudential Insurance Co. of America.)

personal factors that tend to make the soil favorable for the development of tuberculosis. These may be briefly summarized under several headings:

(a) *Overwork.*—Fatigue of the body resulting from too long hours of labor or lack of sufficient rest, reduces bodily resistance and favors the development of tuberculosis.
(b) *Improper Food.*—Malnutrition with the resulting devitalization of the body presents an unusual danger in this connection. This is especially true for children who eat insufficient eggs, milk, green vegetables, and meat.
(c) *Lack of Outdoor Air and Exercise.*—It has often been shown that outdoor air and exercise have direct effect upon the production of hemoglobin and increase of leukocytes in the blood. The general wholesome effect upon all the functions of the body is well known; the lack of these factors leaves the body weak and ineffectual and offers a ready soil for tuberculosis.

Prevention.—The problem of prevention is twofold—personal and social. It relates, on the one hand, to adequate care of the personal health, and on the other to intelligent social effort to provide sanitary conditions for others. This disease in relation to health illustrates in a striking way that hygiene can never be an academic or cultural subject. It is only of significance and meaning as it is lived. It illustrates also that as regards attitudes, the one fostering a sense of social responsibility is of the first and foremost importance even for those who are selfish, primitive, and instinctive.

1. *Personal Prevention.*—The problem here is keeping one's health at the highest possible level. For one with the tendency or exposed directly to the disease, this is of paramount importance. This means prevention of fatigue, eating proper food, securing adequate hours and conditions of sleep, and avoidance of insanitary conditions of work in factory or home.

2. *Social Prevention.*—Clearly this measure is the more important, and if achieved with reasonable success it will accomplish for all what a personal program could not hope to secure alone. There must be at least six parts to this program:

1. Education of the public, and especially the tuberculous, in the nature, course, prevention, and treatment of the disease.
2. Legislation that places tuberculosis on the list of reportable diseases.

3. Improvement of the housing conditions of the poor and of the working conditions in all industries not satisfactory.
4. State or municipal legislation and control relating to the milk supply, food supply; cleanliness of streets, sleeping cars, and public places; enforcement of the ordinances against spitting.
5. Adequate hospital and sanatorium facilities to care for those who have the disease.
6. Prevention of other diseases especially predisposing, such as, in children:
   (*a*) Measles, which is frequently followed by pulmonary tuberculosis, and
   (*b*) Whooping-cough, which predisposes to tuberculosis.

Treatment.—It is very instructive in connection with this disease that nature provides a cure frequently, if the individual will early return to the course that nature asks of all who wish to live well. The treatment is not by medicines, but by

1. Outdoor air and sunshine, and
2. Nourishing food.

The importance of early recognition is very great. It can be said with considerable assurance that early cases will recover (Fig. 24) if given the above treatment. Late cases are often hopeless. There should be keen appreciation of the value of medical examination of school children, workmen, and college students everywhere.

The question of treatment cannot be dismissed without vigorous warning against the unscientific cults, the blatant charlatans who scream their cures, and the futility of Christian Science, chiropractic, osteopathy, and spiritualism in this disease.

Vaccines[1] are used at times in the treatment of the disease. They are likely to be of greatest value when used by a specialist experienced in the use of tuberculin. The von Pirquet test is a diagnostic test of value in children under four years of age, and of relatively less value with increasing age. The Calmette test for the diagnosis of tuberculosis is not to be used; and it would

[1] Vaccine therapy is not used so frequently today because of the liability to anaphylaxis (developed sensitivity to foreign proteins).

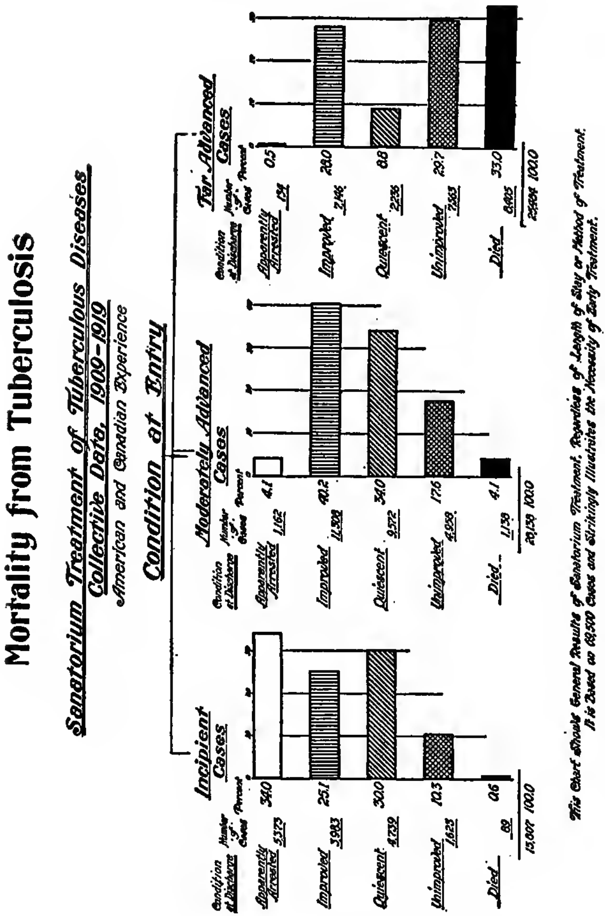


Fig. 24.—The value of early diagnosis and proper early treatment of tuberculosis. (By courtesy of The Prudential Insurance Company of America.)

be strange to find a modern physician using it as a diagnostic test.

CHAPTER IX

HYGIENE OF THE CIRCULATORY SYSTEM

I. The Importance of the Circulation:
  1. The Increase in Circulatory Disease.
  2. Plan of the Circulation.

II. The Blood:
  1. Red Blood-cells.
  2. White Blood-cells.
  3. Plasma:
    (*a*) Water.
    (*b*) Gases.
    (*c*) Food-stuffs—carbohydrates—fat—protein.
    (*d*) Salts of the blood:
      1. Special considerations.
      2. Use of mineral waters.
    (*e*) Protective substances.
    (*f*) Hormones.
    (*g*) Waste substances.

III. The Vessels:
  1. The Arteries.
  2. The Veins.
  3. Varicose Veins.

IV. The Heart:
  1. Injury to the Valves.
  2. Injury to the Muscles.

V. The Convalescent Heart.

VI. The Influence of Poisons Upon the Heart.

VII. The Influence of Tobacco:
  1. A Need for Accuracy.
  2. General Effects of Tobacco.
  3. The Effects of Tobacco Upon Youth.
  4. Tobacco and the Sexes.

The Importance of the Circulation.—The circulation of the blood through the body is important because the blood serves to carry to the tissues of the body oxygen from the lungs and food-stuffs from the digestive tract[1];

[1] Burton-Opitz has shown that an amount of blood equal to the entire amount in the body of a dog traverses the liver every three minutes, Quarterly Journal of Experimental Physiology, 1912, p. 189.

it carries waste and excess water to the organs of elimination; it assists in the regulation of temperature; and, finally, it is the medium for the transmission of the internal secretions from the ductless glands.

From this statement it follows that the keeping of a good circulation is a most important affair for every one. This is not generally recognized. The deaths from heart disease are apparently on the increase. At the present time the number of deaths from heart disease exceeds the deaths from tuberculosis. The Census Bureau reports for 1920 in the registration area the following: Organic heart disease, 124,143; tuberculosis (all forms), 99,916. The Association for the Prevention and Relief of Heart Disease reports the following facts: "There are now not less than 20,000 children in the public schools of New York City already handicapped by permanently damaged hearts. At Bellevue Hospital alone last year there were treated 1413 patients from the advanced stages of heart disease.

"10,682 deaths in New York City in 1916 were attributed directly to organic diseases of the heart, a number greater than either tuberculosis or cancer.

"Deaths caused by organic heart disease	10,682
Deaths caused by tuberculosis (all forms)	9,622
Deaths caused by cancer	4,702"

The economic loss due to impaired circulation is very great. In addition, children with a handicap of heart disease present a serious problem for parents, the school, and society in general. To prevent heart disease and to maintain a high level of circulatory efficiency are important goals.

The Increase in Circulatory Disease.—We have become accustomed to think of the seriousness of tuberculosis and cancer; the preceding figures make heart disease appear truly significant. These figures are part of a general fact borne out by statistics, namely, that in the United States there has been since 1890 a steady increase in mortality from diseases of the heart, blood-vessels, and kidneys. These three are so often found associated that clinicians use the term "cardiovascular-renal disease." By better child care, by improved sanitation, and other public health measures the mortality from the communicable diseases, especially in youth, has been decreased, but the number of persons dying in early adult life is increasing. This increase in deaths due to circulatory or kidney disease suggests serious questions concerning the vitality of the people and their habits of living.

Now while the mortality from this cause is increasing in the United States, the expectation of life in the same adult periods is more favorable in England, Wales, Prussia, Sweden, and other European countries. The meaning and significance of this increase in the chronic degenerative diseases has been brought out by the Life Extension Institute, Inc., and the cause for this increase expressed by Fisher and Fisk.[1]

The chief factors in causing chronic diseases are the following:

Causes of Chronic Disease, Premature Breakdown, and Premature Death

Heredity.	Mental inactivity.
Infections.	Physical inactivity.
Poisons.	Too much food.
Mental strain.	Too little food.
Physical strain.	Badly balanced diet.

Accidents, injury.

A knowledge of these causes plainly points the way to their control.

Plan of the Circulation.—To watch the circulating blood in the web of a frog's foot, to see the contracting heart of a man in a fluoroscopic picture, to watch the clotting of blood and the separation of the plasma are wonderful glimpses of Nature's marvelous provision

[1] Fisher, I., and Fisk, E. L.: How to Live, Funk & Wagnalls Co., New York., 1921, p. 393.

for life processes. The study of the circulation in a book is a prosaic affair compared to the ebb and flow of its tide in the human body.

A rather helpful analogy may be drawn between the circulation of the blood and the water-supply system of a large city. A water system is made up of powerful pumps, water mains, and the water. The body circulation is composed of a powerful pump, the heart; mains that are adjustable in size, the blood-vessels[1]; and a liquid, the blood. For purposes of discussion the system will be presented under three headings—the blood, the vessels, and the pump.

The Blood.—One-twentieth of the weight of the body is blood. If an individual weighs 140 pounds, 7 of the 140 are blood. One may lose one-fourth of the blood and live, but the loss of one-third is usually fatal, unless immediate transfusion is performed.

The discussion of this chapter will follow the outline of the composition of the blood as given in Table VIII, and will conclude with the heart and vessels.

Red Blood-cells.—The red cells (red corpuscles) of the blood are small, circular, disk-shaped bodies. The diameter of one is 7.7 micra (1 micron = 0.001 mm.); it would take about 25,000 micra to make 1 inch. There are 5,000,000 red cells in every cubic centimeter of blood for man, and 4,500,000 for woman. These cells are important because of a very vital function they perform in carrying oxygen to the tissues from the lungs. They are able to do this by virtue of having in their cell bodies a substance, hemoglobin, which has the property of combining chemically with the oxygen as it passes through the lungs, thus forming oxyhemoglobin. In this form all the oxygen, except a small amount in solution in the

[1] Only the smaller arteries are adjustable. The veins and large arteries do not change their lumen, neither do the lymph-vessels. The inclusion of the lymph circulation in the circulation of the blood is desirable for purposes of this discussion. It is not illogical to do so, although the flow of lymph from the tissues to the heart is in special lymph-vessels (lymphatics).

TABLE VIII

COMPOSITION OF THE BLOOD

- BLOOD
  - Cells
    - Red Blood-cells
    - White Blood-cells
      - Leukocytes
      - Lymphocytes
    - Platelets
  - Plasma
    - Water
    - Gases
      - Oxygen
      - Carbon dioxid
      - Nitrogen
    - Food-stuffs
      - Carbohydrates—Glucose
      - Fat—Fatty acids
      - Protein
        - Serum albumin
        - Serum globulin
        - Fibrinogen
    - Salts
      - Chlorids, Carbonates, Sulphates, Phosphates, Silicates
      - of
        - Calcium
        - Sodium
        - Magnesium
        - Potassium
        - Iron
    - Protective substances
      - Opsonins
      - Agglutinins
      - Bacteriolysins
    - Autacoids—Internal secretions from ductless glands.
    - Waste substances
      - urea
      - uric acid
      - creatin
      - xanthin
      - hypoxanthin
      - quannin
      - adenin
      - carnin

plasma, is carried to the tissues and is given up to the cells of the body when needed. There is no mechanism for storing the oxygen in the body, and as soon as the oxygen leaves the red cell it is used in the oxidation of some food element.

The hemoglobin of the red cell is extremely important. If it is inadequate in amount in the body a condition known as anemia develops. Anemia may result from a decrease in the percentage of hemoglobin in each cell or by a reduction in the total amount in the blood through a diminution in the number of cells. In the one case the cells are usual in number, but contain less than the normal percentage of hemoglobin in each cell; in the other the hemoglobin may be normal in amount in each cell, but the number of cells is reduced, and hence the total amount of hemoglobin in the blood is lessened. Anemia is a very common condition, especially in young and growing girls, and it is, therefore, important to determine its causes and prevent its occurrence.

Dr. Cabot[1] gives the causes of anemia as follows:

(*a*) Hemorrhage—gastric, hemorrhoidal, traumatic, puerperal.
(*b*) Malaria, more rarely sepsis or other infections.
(*c*) Malignant disease (cancer).
(*d*) Chronic suppurations (old sores with discharge).
(*e*) Chronic glomerulonephritis (Bright's disease).
(*f*) Cirrhosis of the liver (inflammation and destruction of normal liver cells).
(*g*) Poisons, especially lead.
(*h*) Chronic dysentery.
(*i*) Intestinal parasites.

The explanations in parentheses are mine.—J. F. W.

Now the causes of anemia are well known. In any effort to correct anemia and secure good blood the first step must be to remove the cause of the disturbance. This cannot be done by giving iron or a similar blood "remedy" unless the source of the trouble is removed, *e. g.*, cancer, malaria, intestinal parasites, etc.

It is interesting that Dr. Cabot does not include the cause that is so commonly thought of by the layman, namely, lack of exercise, fresh air, and good food. In speaking of this point Dr. Cabot says, "It is important to remember that insufficient food or even starvation does not produce anemia,[2] and so far as we know no form of bad hygiene has any notable effect upon the blood. Persons may grow very pale under bad hygienic conditions, but their blood is usually not affected unless one of the diseased conditions mentioned above is present."

Bad hygiene in connection with diseased conditions aids the development of anemia, and the need of favor-

[1] Cabot, R. C.: Physical Diagnosis, 5th edition, Wm. Wood & Co., New York, 1912, p. 447.

[2] Selenksy, McCollum, and others have shown that food deficient in certain substances has marked effects upon the condition of the blood.

able hygiene in overcoming the effect of anemia is well known by many who work with the sick and diseased.

In this connection it is necessary to speak of medicines in the cure of anemia. Hemoglobin contains iron, and for this reason iron has been used for many years in the treatment of anemia. It is most often prescribed by physicians in a form known as Blaud's pills. These consist of ferrous carbonate and must be prepared fresh. Other methods of administering iron are employed, but the most valuable way to get iron into the blood is through the food eaten. It is a known fact that certain foods are rich in iron, and the most effective way at times to give iron to the body is by securing in the diet foodstuffs that are rich in iron. (See Table V on page 175.)

In the individual weighing from 132 to 154 pounds there are about 3 grams of iron. In numerous experiments to determine the amount of iron needed to sustain the equilibrium of the body Sherman[1] reports that "the requirement appears to have varied with individuals and with the nature of the diet from 0.006 to 0.016 gram (6–16 mg.) of iron per man per day." In estimating the amount of food rich in iron required Sherman says, "We might conclude from these results that a daily allowance of 10 to 12 mg. of food should suffice for the maintenance of iron equilibrium in an average man under favorable conditions, but until the conditions which determine a larger metabolism of iron are more clearly defined it would seem desirable to set a higher standard, perhaps 15 mg. of food iron per man per day."

Those who desire to enrich the blood with iron will have more success by eating food[2] rich in iron than by taking iron internally. Taking iron into the stomach

[1] Sherman, H. C.: Chemistry of Food and Nutrition, The Macmillan Co., New York, 1920, p. 299.

[2] Care must be taken not to be misled by advertisements. Manufacturers and distributors frequently create or capitalize a popular interest in health without assuming responsibility for results. Just now "Have you had your iron, today?" is a familiar slogan. Figure 18 and Table V will indicate accessible sources of food iron.

and depending upon the processes of absorption and assimilation to change this medicinal iron into blood iron is a doubtful measure.

Appreciating the desire of people to have good blood, unscrupulous manufacturers put on the market and widely advertise preparations which are supposed to have a peculiar power of conveying iron to the blood-

Fig. 25.—Nostrum manufacturers seek to obtain reliability and sanction for their nostrums by securing a physician's endorsement.

cells. As illustrative of this type of "patent medicine" business the advertisement (Fig. 25), appearing in numerous newspapers, is reproduced.

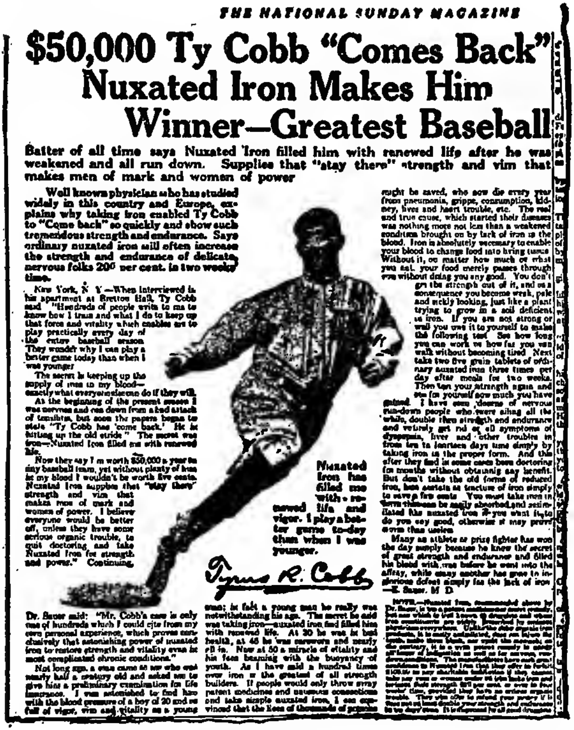
The advertisement in Fig. 26 has appeared also in many newspapers.

Regarding Nuxated Iron, the Journal of the American Medical Association[1] makes the following remarks:

[1] Journal American Medical Association, October 21, 1916, p. 1244.

"Nuxated Iron is put on the market by the Dae Health Laboratories of Detroit. On the trade package we read:

" 'FORMULA.—The valuable blood, nerve force, and tissue properties of this preparation are due to organic iron in the form of ferrum peptonate in combination with nux vomica, phosphoglycerate de chaux, and other valuable ingredients.'



Greatly reduced photographic reproduction of a typical "Nuxated Iron" newspaper advertisement.

Fig. 26.—Before Mr. Willard lost to Mr. Dempsey the former was advertised in a manner similar to the above.

"Packages of the nostrum purchased on the open market were subjected to analysis both in the Chemical Laboratory of the American Medical Association and elsewhere. Qualitative tests indicated the presence of iron, calcium, magnesium carbonate, glycerophosphate, and small amounts of potassium and chlorid, and the presence of cascara. Quantitative examinations were made, and so far as the essential ingredients—nux vomica and iron—of the nostrum are concerned, gave the following results:

Total nux vomica alkaloids per tablet...... $\frac{1}{500}$ grain.
Iron (Fe) per tablet........................ $\frac{1}{25}$ grain.

"According to these analyses, there is only one-twenty-fifth of a grain of iron in each 'Nuxated Iron' tablet, while the amount of nux vomica, expressed in terms of its potent alkaloids, is practically negligible. If a person wants to take iron on his own responsibility —and this cannot be recommended—it is possible to get this drug in a staple form in the well known Blaud's Pills. In a dollar bottle of 'Nuxated Iron' the purchaser gets, according to our analysis, less than $2\frac{1}{2}$ grains of iron; in 100 Blaud's Pills, which can be purchased at any drug store for from 50 to 75 cents, there are 48 grains of iron. The claim that 'Nuxated Iron' possesses great advantages over other forms of iron is the sheerest advertising buncombe."

One part of the patent medicine fake is to give the preparation seeming reliability and character by using the name of a physician in the advertising matter. The Journal points out that the physician used to endorse Nuxated Iron is without professional standing.

This preparation has been dealt with at some length because it represents a group of nostrums that advertise to procure health for the individual, and all their advertising and medicine are directly subversive of health. The individual who seeks to live a complete and effective life will leave out of account all such commercialized products. Health comes from living in the right way and cannot be secured by taking patent medicine. If one is sick, then health can be obtained only by an accurate diagnosis of the malady and by appropriate treatment to overcome the disease. Moreover, the chances of success in diagnosis and treatment are better with a regular physician in charge of the case.

As regards the use of iron preparations in the treatment of anemia, there is accumulating evidence that the giving of iron is unscientific. The theory of Bunge,[1]

[1] Hatcher, R. A., and Wilbert, M. J.: Pharmacology of Useful Drugs, American Medical Association, Chicago, 1915, p. 362.

that organic iron was more serviceable in anemia, is no longer held by pharmacologists, although urged valiantly by interested manufacturers of organic iron preparations. Recent experimental work at the George Williams Hooper Foundation for Medical Research by Whipple and Robscheit[1] shows that the usual iron preparations prescribed are inert so far as the effect on anemia was concerned, and that dietary treatment was at once helpful and constant in its effects.

We are coming back in this instance as in so many other cases to look to suitable food, proper care of the body, and correct habits as more useful than drugs in rebuilding devitalized bodies. Potent drugs will always be invaluable help to the physician in the care of sick persons, but hygienic living is the foundation of all sane procedures for both well and sick.

White Blood-cells.—The leukocytes of the blood are concerned primarily in defending the body against a sudden attack of bacteria. They represent the Light Horse Cavalry of the blood, and when infection occurs they respond by a great increase in numbers, and an immediate mobilization at the site of the infection.

The lymphocytes are concerned in protecting the body in the more chronic diseases, and their number is increased usually in the course of such diseases.

The white cells are strengthened and made better soldiers for the protection of the body by means that increase the general health of the body. There is an increase in leukocytes in the blood after vigorous muscular exertion, cold baths, and massage. These measures tend in proper conditions to increase the general health and by increasing the number of leukocytes they increase the resistance to disease. In disease the count of these cells has important meaning. Experience shows that the higher the percentage of leukocytes, the severer the

[1] Whipple, G. H., and Robscheit, F. S.: Iron and Arsenic as Influencing Blood Regeneration Following Simple Anemia, Archives Internal Medicine, May, 1921.

infection, "while the body's resistance is mirrored in the height of the total leukocyte count." Measures for increasing the number of leukocytes and maintaining a high count are valuable in the maintenance of health. The measures concerned with improving the general health are the rules of hygienic living.

Metchnikoff has pointed out the way in which the leukocytes destroy bacteria by eating them. He called this process "phagocytosis," and gave the name phagocytes ("eating cells") to the leukocytes. In discussing the substances in the plasma the assistance rendered these cells by the opsonins will be described.

It is not known just what part the platelets play in the blood (they are involved in coagulation), and hence no information can be given with reference to them.

Plasma.—The fluid part of the blood is the plasma. It is a straw-colored liquid.

(*a*) *Water.*—Ninety per cent. of the plasma is water. It serves to carry in solution the food-stuffs, salts, and waste substances. Its percentage in the blood remains fairly constant. When water is taken into the stomach it is absorbed either partly there or after it has passed into the intestines and colon. Whenever the percentage of water in the blood rises above a certain point it is eliminated from the blood by the kidneys. It may be retained in the tissues in large amounts in certain diseases when the kidneys and heart are affected, or when the tissues are loaded with salt due to the diminished power of excretion.

Most people in health drink too little water rather than too much. In addition to the water taken in food, it is desirable to drink four glasses. This should be distributed between meals and on rising in the morning and on retiring at night. The question of hot water and drinking at meal times was discussed in Chapter VII.

(*b*) *Gases.*—The presence of nitrogen in the plasma is of no importance. It is inert and plays no part in the function of the circulation.

The carbon dioxid is a waste product of oxidation. It results from the combustion of food materials. The plasma carries it in solution and it is also found chemically combined with the alkali of the blood in the form of a bicarbonate. The fact that carbon dioxid, an acid, combines with an alkali is significant in that it indicates the way the body acts to keep the blood from developing acidity. Acidity of the blood develops in physical overwork, in certain kidney conditions in which the acid of the blood is not removed by the impaired kidney, and in heart and lung deficiencies in which the excess carbon dioxid is not removed rapidly enough.

A competent heart and blood-vessels are most important in maintaining the proper condition of the blood, and an efficient respiratory system is necessary to remove the excess carbon dioxid as fast as it is produced. It is the height of folly to take measures to change the character of the blood when the difficulty lies in the condition of the digestive, circulatory, or respiratory apparatus.

The oxygen is carried in the blood both in the plasma and in chemical combination with hemoglobin in the red blood-cells. As stated above, an adequate supply of hemoglobin is essential in transporting oxygen to the cells. There are a certain number of people who are living constantly below the level of their best, because they are unable to carry to their tissues the proper amount of oxygen needed. A series of examinations made on school teachers gives the following figures on morbidity as presented by Terman.[1] It should be noted that circulatory conditions are prominent in the types of illness presented, and although more prominent for women than men, are factors of importance distinctly related to the other diseases in the table shown on page 252.

[1] Terman, L. M.: The Teacher's Health, Houghton Mifflin Company, Boston, 1913, p. 16.

THE DISTRIBUTION OF ILLNESS CAUSING ABSENCE

	Male elementary teachers, per cent.	Female elementary teachers, per cent.	Female infant school teachers, per cent.
Nervous troubles	32.3	36.0	31.2
Pulmonary tuberculosis	7.9	6.0	9.3
Other respiratory troubles	17.9	16.8	13.7
Anemia and general debility	5.5	12.0	12.7
Gastric and intestinal troubles	8.9	7.6	8.8
All other illnesses	27.5	21.6	24.3

These figures for teachers are given because they represent the blood and health disturbances in an occupation that is indoors and distinctly sedentary.

The improvement in hemoglobin content following an outdoor life in a girls' camp where good food, adequate rest and sleep, and outdoor air and exercises were provided is shown by the following figures:

Group of Forty Girls. Ages Twelve to Eighteen Years

Average gain[1] in hemoglobin in nine weeks = 7 points.
Greatest gain in hemoglobin in nine weeks = 20 points.

(*c*) *Food-stuffs.*—Other important constituents of the plasma of the blood are the three groups of food-stuffs: carbohydrate, fat, and protein. The blood and lymph streams are the only channels by which the food from the digestive tract can be transported to the outlying cells of the body. The character of the blood and its rapidity of movement are vital links in the whole matter of feeding the body. Its nourishing power is dependent upon the carbohydrates, fat, protein, and other substances present.

1. *Carbohydrates.*—Sugar is constantly in the blood in a proportion of 0.1 to 0.15 per cent. This amount is provided by the glycogen supply of the liver, and when during activity the muscles use up the sugar of the blood,

[1] Normal hemoglobin content of the blood is 100 per cent.

the liver at once supplies an amount sufficient to keep up the margin. The supply of glycogen under normal conditions is maintained chiefly by the carbohydrate food. If excessive amounts of sugar are eaten so that the liver cannot effectively store the amount ingested, the oversupply in the blood will be eliminated by the kidneys. There should be a balance between the supply of energy foods and the expenditure of energy. Practically, this means that if one eats large amounts of energy foods, one should engage vigorously in muscular work. Conversely, if one works hard at physical labor, there is required sufficient energy foods to supply that expended. Any other arrangement will result either in loss of weight or increase of weight due to the oxidation of the cells of the body, on the one hand, or the storage of the surplus in the body cells on the other.

2. *Fat.*—Fat is digested in the intestine and broken up into fatty acid and glycerin. These two substances are absorbed, and after passing through the epithelium of the intestinal wall they are synthetized into fat of the form characteristic of the particular animal. It is found in the blood, therefore, as fat, and as such it is transported to the cells. As absorbed it may serve different purposes.

1. It may be at once oxidized and provide energy in the form of heat.
2. It may be stored in the body cells as fat.
3. It may be combined with other substances to form some complex constituent of the body, such as lecithin.
4. It may be changed into sugar and serve the body in that way.

The fat of the body as stated by Howell[1] "originates partly from the fat of the food, particularly in carnivora, and partly from the carbohydrate of the food, especially in herbivora, in whose diet this food-stuff forms such a large part."

There is a good deal of interest in the question of why

[1] Howell, W. H.: Text-book of Physiology, W. B. Saunders Co., Philadelphia, 1910, p. 877.

some people become fat and others on similar diets fail to take on weight. Voit has stated that this difference is due to the varying capacity of individuals to destroy food materials in the body. When food is eaten, digested, and absorbed in excess of the energy requirements of the body, the excess is stored partly as glycogen in the liver, but chiefly as fat. Some people who eat a great deal of food are unable to completely digest or absorb sufficient amount to acquire an excess. Moreover, as Howell[1] states, "A diet which will give such an excess to one individual, may in the body of another of the same weight be all consumed." Differences of this kind are frequently inherited. Individuals who have little tendency to lay up a store of fat may be made to do so by increasing the amount of fat and carbohydrate in the food and by changing the mode of life. Individuals who worry, who expend large amounts of energy in fretting and aimless movements do not store fat easily. Unless the thinness of the individual is marked, there should be no desire to lay up a store of fat. It is so much extra weight to carry and is valuable only as an indication that nutritional processes are active and pronounced. Fat on the body is like money in the bank without interest. It pays no dividends and should not be sought for its own sake. The hygiene of living that makes possible the deposition of fat may be very desirable, but fat itself is of no particular import except for those underweight. The rôle of fat in such cases seems to be that of a reserve food supply.

3. *Protein.*—The protein of the blood exists in three forms—serum albumin, serum globulin, and fibrinogen. The history of protein in the body is uncertain and not as yet clear. Whether or not in the process of digestion the complex protein molecule is split into its final divisions, the amino-acids, and then built up from these units into more complex body proteins, has been a source of some discussion and much investigation. We are

[1] Howell, W. H.: Loc. cit., p. 879.

not at all certain just what goes on. It has been shown in numerous experiments that proteins have a specific "dynamic action" in the body in that they facilitate the building-up processes of the body to a greater extent than do fats or carbohydrates.[1] For the growing child proteins are more essential than for the adult. The tendency of the day is for people of adult years to eat less meat and obtain the protein necessary from vegetables.

(*d*) *Salts of the Blood.*—In addition to the water, gases, and food-stuffs, the plasma of the blood contains important salts. They serve a variety of functions. The inorganic salts of the blood are valuable in maintaining normal osmotic pressure in the tissues of the body and in some way are combined in the chemical composition of the cells, and are necessary to normal action by the cells. The salts of calcium are important in the coagulation of the blood and the curdling of milk, and the sodium, calcium, and magnesium play a useful part in the contraction of the heart and the irritability of muscular and nervous tissue. The part played by the iron salts in the production of hemoglobin has been described.

1. *Special Considerations.*—It is estimated that the average man takes with his food from 10 to 20 grams[2] of salt in the form of sodium chlorid a day. This is in excess of the needs of the body because one may keep in good health with only 1 to 2 grams in the diet. Bunge has shown that men and animals living on a pure meat diet evince no desire for salt in addition to that in the food, but on a vegetable diet there is an intense craving for salt. This is due to the fact that vegetables are rich in potassium salts which combine with the available sodium chlorid, giving potassium chlorid and sodium sulphate. One may eat too much salt in the food; there is no danger in eating too little, if the proper selection of foods is made.

[1] Burge, W. E.: Reason for Specific Dynamic Action of Protein, American Journal of Physiology, March 1, 1919.

[2] Ten to 20 grams = $\frac{1}{3}$ to $\frac{2}{3}$ ounce.

There is reason to believe that the abnormal enlargement of the thyroid gland may be due to the absence or presence of certain salts in the diet, because of the geographic distribution of many cases.[1] Goiter may show at puberty, but it usually is temporary. The thyroid also may enlarge at the menstrual period. The pubertal and adolescent enlargements of the thyroid are usually without significance.

The importance of habitat in connection with the development of goiter is given by Osler[2] as follows:

"Goiter, on the whole, is rare in the United States; it is perhaps most common in the region of the Great Lakes. In an investigation in Michigan Dock found a large number of cases, and the disease is not very uncommon in lower Canada. In England it is common in certain regions: the Thames valley, the Dales, Derbyshire, Sussex, and Hampshire. It is very prevalent about Oxford and the upper Thames valley. In Switzerland, in the mountains of Germany and Austria, the mountainous districts of France, and in the Pyrenees the disease is very prevalent. In the regions of Central Asia, in the Abyssinian Mountains, and in the Himalayas there are many foci of the disease."

The cause of the disease is not clearly known, but there is considerable evidence to indicate that the character of the water drunk may have something to do with its occurrence. On this point Osler[3] says:

"The water in goitrous districts is hard, rich in lime and magnesia, poor in iodin, and (so Redin affirms of the Swiss waters) with a high degree of radio-activity. Others speak of a 'miasma' of the soil that gets into the drinking-water. McCarrison in Kashmir found that the specific agent could be killed by boiling the water and that it did not pass a Berkefeld filter. He produced goiter in himself and others by the daily consumption of the residue of the filter, but the residue when boiled was harmless. The disease was transmitted to goats who drank water contaminated by goiter patients. There are 'goiter springs' and 'goiter wells.'"

[1] Love, A. G., and Davenport, C. B.: Defects Found in Drafted Men, War Department, 1920, Washington, D. C. Hayhurst, E. R.: The Present-day Sources of Common Salt in Relation to Health, Journal American Medical Association, January, 7 1922, p. 18.

[2] Osler, Wm.: The Principles and Practice of Medicine, D. Appleton & Co., New York, 1912, p. 82.

[3] Ibid.

Irritation of the gland by clothing has been given as a cause.

Whether the salts found in certain waters cause this disease, or whether the cause is bacterial or parasitic, or whether pressure is a causative factor, is open to question—the exact cause is unknown. With the available evidence, it is clear that the prevention of goiter lies in elimination of the factors under suspicion. Persons in predisposed families should leave goiter districts and live in healthy localities. The drinking-water in suspected areas should be boiled, for experimental evidence indicates that the "cause" may be destroyed by boiling. Tight collars should be avoided, especially by those suffering any thyroid enlargement.

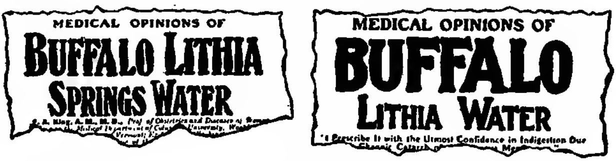
2. *Use of Mineral Waters.*—Mineral waters are considered valuable in the treatment of certain diseases, but much of their supposed value lies in the comfortable surroundings, the outdoor activities, the exercise, the baths—all are important factors. Consequently, the use of mineral water away from the health resort is frequently disappointing. Persons in good health do not require special waters; persons with disease should consult a physician.

The use of spring water in cities is not demanded on health grounds unless the city water-supply is contaminated.

The commercial exploitation of mineral waters has led to many fantastic health claims. The following account of Buffalo Lithia Water is illustrative of many "waters" that are supposed to have mysterious or unusual virtues in curing disease. The exposé given here appeared in the Journal of the American Medical Association and has been reprinted in a pamphlet, "Mineral Waters,"[1] describing a large number of fraudulently advertised waters:

[1] Journal American Medical Association, Chicago, June 13, 1914. Published by the Propaganda Department of the Association, 535 N. Dearborn Street, Chicago.

Buffalo Lithia Water.—Some years ago Alexander Haig evolved the theory that most diseases are due to uric acid. The data on which he founded his theory were not corroborated by scientific men, and investigation showed that his methods were unreliable. In spite of the fact that Haig's theories are utterly discredited, and have been for years, the uric acid fallacy still persists, although it is now largely confined to the public. Shrewd business men, especially those who are more intent on making money than they are concerned with the manner in which that money is made, owe much to Haig's theory. As a business proposition, uric acid has been one of the best-paying fallacies on the market—and possibly still is.



NOW AND THEN

Fig. 27.—Showing how "Buffalo Lithia Water" in the course of time became "Buffalo Lithia *Springs* Water." The government has shown that, to obtain a therapeutic dose of lithium from Buffalo Lithia Springs Water, it would be necessary to drink 200,000 gallons of the water. The government also declared that Potomac River water contained five times as much lithium as does Buffalo Lithia Springs Water.

Contemporary with, and to a certain extent a corollary of, the uric acid fallacy was another, viz., that lithium would eliminate uric acid. This at once gave a good working principle for the proprietary men. Uric acid, we were told, causes disease; lithium, we were also told, would eliminate uric acid; therefore, lithium is the new elixir of life! Could anything be simpler?

Accepting this theory, it was inevitable that mineral waters containing lithium salts should become highly popular. Many exploiters of mineral waters began to place most emphasis on the lithium salts in their waters even in those cases in which lithium was present in such infinitesimal amounts as to render its detection impossible by any but spectroscopic methods.

One of the best known, because most widely advertised, of the so-called lithia waters is Buffalo Lithia Water—or what used to be called Buffalo Lithia Water. After the Federal Food and Drugs Act came into effect, by which falsification on the label was penalized, the name of Buffalo Lithia Water was changed to Buffalo Lithia Springs Water. When Buffalo Lithia Water was subjected to examination by the government chemists it was found to contain so little lithium that the amount present was unweighable—it could be demonstrated only by the spectroscope. It was evidently, therefore, not a lithia water in that it did not contain—at least in quantities that could be consumed—an amount of lithium that would give the therapeutic effects of lithium. Possibly the company imagined that by changing the name from "Buffalo Lithia Water" to "Buffalo Lithia Springs Water" it had cleverly evaded the federal law. Their argument, apparently, was to this effect: The springs from which this water is taken are known as Buffalo Lithia Springs; therefore, it is not a misstatement of facts to call this Buffalo Lithia Springs Water.

WHAT IS A LITHIA WATER?

The Supreme Court of the District of Columbia, holding a district court, has recently given an opinion on the Buffalo Lithia Springs Water case. The findings of the court are refreshingly simple, and characterized by that broad common-sense view that is becoming increasingly more common among modern jurists. Read Judge Gould's opinion as to what constitutes a lithia water:

"Speaking generally, and as an individual of average intelligence and information, it would seem that if one were offered a water which the vendor told him was a 'lithia' water, one would have the right to expect enough lithium in the water to justify its characterization as such, thus differentiating it from ordinary potable water; and this amount would reasonably be expected to have some effect on the consumer of the water by reason of the presence of the lithium."

Certainly a reasonable attitude, and one which the man in the street not only can understand but will agree with. Then came the question as to the actual lithium content of Buffalo Lithia Springs Water, and the court said:

"For a person to obtain a therapeutic dose of lithium by drinking Buffalo Lithia Water he would have to drink from 150,000 to 225,000 gallons of water per day. It was further testified, without contradiction, that Potomac River water contains five times as much lithium per gallon as the water in controversy."

(*e*) *Protective Substances.*—In addition to the water, gases, food-stuffs, and salts, there are protective substances in the blood, serving to save the body from the ravages of disease. This fact has been known for some time. About forty years ago Traube showed that if a small quantity of putrefying material was added to fresh blood, the blood possessed the power of retaining its normal condition, and this experiment raised the question whether the protective power of the blood resided in the plasma or in the blood-cells. Buchner named the germicidal constituents of the plasma "alexins" (defenders).

Metchnikoff was the first to emphasize the importance of the blood-cells, and he showed how the white cells of the blood swallowed and destroyed the bacteria. The phagocyte is not always able to win the fight with the bacteria, and if weakened by unhygienic living or disease, or attacked by bacteria either more powerful or more numerous than usual, the phagocytes themselves may be overcome in the contest.

It is also known that there are in the plasma certain substances that make it possible for the phagocytes to more readily attack bacteria. These substances are called "opsonins," meaning "to buy victuals." It is not known just how they are formed nor what increases their quantity, but it is known that when these substances are abundant, the phagocytes are able to devour large quantities of bacteria; that when these substances are deficient the phagocytes feed less readily upon the bacteria.

There are other protective substances in the blood, probably in the plasma. The story of the scientific experiments that have been laboriously performed to determine these secrets of the blood is too long to be told here. It is a story of great adventure and great achievement.

It is a well-known fact that persons are protected from recurring attacks of a disease once experienced. Most of the communicable diseases, scarlet fever, measles, diphtheria, typhoid, are, as a rule, capable of infecting the same individual only once.

The protection afforded to the individual by an attack of a disease is called "immunity" and is due in part to certain substances developed in the blood in the course of the disease and called by the name "antibodies." By this is meant that these substances have the power of exerting adverse ("anti"—against) action against the invading bacteria. A description of these antibodies and the general character of them is so well given by Evans[1] that he is quoted in detail on this point:

[1] Evans, W.: Medical Science of Today, Seeley, Service & Co., London, 1912, pp. 89, 90.

"Many animals secrete poisonous substances which they can, at will, inject into their enemies, and these poisons are called "venoms." Poisonous snakes, scorpions, some spiders, toads, and salamanders may be mentioned as examples. In the venoms formed by these animals there are no germs, but they contain chemical substances, most of which are of extreme virulence. Some snake venoms are so potent that it has been calculated that a quarter of a drop is sufficient to prove fatal to a man within a short time. We may compare such a venom to the toxine produced by bacteria and it will be instructive to consider how an antidote to snake venom can be obtained. It does not appear that the animals that habitually attack snakes, such as the mongoose and the secretary-bird, possess any natural antibodies so that they might be bitten with impunity, for they seem to depend for their safety on their agility. If a series of very small quantity of snake venom (very, very much less than would prove fatal) be injected at intervals into an animal, such as a horse, it will be found after a time, that when a poisonous dose is subsequently administered, the animal does not die, and in fact seems none the worse for the dose that would have killed it, if it had not been protected. This immunity is found to be due to certain substances, 'antibodies' as we may term them, in the blood of the animal, and if some of the animal's blood be obtained and the liquid part, or 'serum,' separated from the corpuscles and the clot, 'antivenom' serum, as it is called, is obtained. The action of the antivenom on the venom appears to be purely chemical, the two neutralizing each other, as do an acid and an alkali in a test-tube. If a suitable quantity of antivenom be mixed with a poisonous dose of snake venom and the mixture be injected into an unprotected animal, no harmful result follows. Again, if a suitable amount of antivenom serum be injected into an animal and then later a poisonous dose of venom be injected, no symptoms are caused, for the antivenom already in the body of the animal has neutralized the venom subsequently injected. Nay, more, if a poisonous dose of venom be injected into an animal, and then soon after the correct amount of antivenom be injected—in this case also the animal survives unharmed. But it is absolutely essential that the interval between the injection of the poison and its antidote should not be too long. If the dose of poison is such that would naturally kill the animal in three hours, the antidote must be given not later than one hour after the poison."

This explanation of the nature of antibodies may be added to from a description by Vaughan,[1] who says:

"Immunity due to bactericidal constituents of the blood, whether it be natural or acquired, is always relative. Even the immunity secured by one attack of the disease may be overcome, in most instances at least, by the administration of an overwhelming dose of

[1] Vaughan, V. C.: Infection and Immunity, Commemoration Volume, American Medical Association, Chicago, 1915, pp. 152, 153.

the virus in virulent form. . . . A highly germicidal blood is of great value in preventing infection, because the first few organisms that find their way into the body are promptly killed before they can multiply and while the amount of poison set free is too small to produce any marked effect."

In another place he says:

"Normal blood and the serum obtained from it contain non-specific, bactericidal ferments or enzymes. In normal blood these enzymes are not specific and they display marked, distinctive action on certain bacteria, and are wholly without effect with others."

There is, then, normal serum containing general protective agents, and immune serum containing specific defenders against specific diseases. This Vaughan makes clear when he says: "The essential difference between the germicidal constituent of normal serum and that of immune serum is that the latter is specific, while the former is not." Normal serum may be made immune by inoculation or vaccination for certain diseases, *e. g.*, smallpox, typhoid.

The process of preparing an antisubstance for certain diseases has developed rapidly in recent years. The different serums used so effectively in the treatment of certain diseases are founded upon this knowledge of the protective nature of normal serum and immune serum. The aim of medical science in the use of immune serums of other animals for treatment of disease in man is to assist the blood by injecting into it antibodies that have been formed usually in the body of another animal.

It is to be remembered that the blood normally contains substances that have the definite power of destroying the poisons of certain bacteria. It would be valuable to know just how far hygienic living serves to increase the formation and powers of these antibodies. The exact significance of this is not known, but it has been abundantly demonstrated that there is a very close relation between vigorous health and resistance to infection and disease, and this increased power of resistance probably develops through an increase in strength in the protective substances of the plasma. The drunkard, the chronically fatigued, the soft liver, and the high feeder—these are types that show a weakened resistance to infection.[1] The vigorous outdoor type of man and woman, active in exercise, healthy in habits, and exact in body care, promises more in high resistance to infection than the indoor sedentary type of unhygienic habits and unwholesome attitudes for living.

(*f*) *Autacoids.*—The water, gases, food-stuffs, salts, and protective substances make the plasma appear exceedingly complex. There are still other important constituents, namely, the secretions of certain glands giving their products directly into the blood-stream. It is generally well known that a gland is a group of cells that produce and pour out a secretion upon some surface of the body. The sweat glands, the salivary, the gastric glands are familiar examples. These secretions are carried from the gland by a duct or canal-like passage. There are other glands that have no ducts and are, therefore, called ductless glands. Glands with this structure are the thyroid in the neck, the thymus which lies above the heart and disappears during puberty, the suprarenals above the kidneys, the pituitary gland at the base of the brain, certain parts of the ovaries, and the testicles. It has been ascertained that these glands true to their structure provide a secretion, but instead

[1] It is not always true that the strong and vigorous endure disease better than the weak. In some diseases the strong man apparently succumbs most readily, due to the fact that his metabolic activity is more rapid and the poison set free by bacteria in the body is broken up to exert its influence more effectively on the strong than on one whose metabolism was slower and less thorough. To support the view that the strong at times more readily succumb to infections than the weak, Vaughan quotes Boghursts' account of the plague in London in 1665:

"Of all the common hackney prostitutes of Luteners-lane, dog-yard, cross-lane, Baldwins-gardens, Hatton-gardens, and other places, the common criers of oranges, oysters, fruits, etc., all the impudent drunken, drubbing bayles and fellows and many others of the *rouge route*, there is but few missing—verifying the testimony of Diemerbroech that the plague left the rotten bodies and took the sound."

of this being given to the body in the usual way, it is poured directly into the blood. It is further known that some of these glands are more active under emotional excitement. "The active principles of this secretion have been called *autacoids*, meaning self-remedy. Autacoids that stimulate are called *hormones*, those that inhibit, *chalones*."

From the earliest times there has been a practice to assign certain virtues to certain organs of the body and especially in the treatment of disease of the same organs. Thus it is that the works of Celsus and Dioscorides advocate the giving of organs from animals for the treatment of disease of the same organs in man. Savage man in the belief that bravery was a matter of the heart cultivated the custom of eating the hearts of his enemies which he had slain in order to increase his own courage. Throughout the eighteenth century "the lung of the fox was advised for shortness of breath, for the fox is able to run long distances at a high speed; the brain of the hare for tremors, and rennet for disordesr of the stomach."

Very little has ever been determined[1] concerning the ways in which man can utilize the internal secretions so as to enable him to live more effectively, but there are a few indications that emphasize the avoidance of certain acts in order to preserve his health with reference to the way in which these glands operate.

The thyroid in the neck usually enlarges during puberty, but this seems to be physiologic, and with proper living no untoward results occur. Lack of development of the thyroid in children may be compensated very largely by internal administration of thyroid extract, a preparation made usually from the gland of a sheep.

The secretions of the pituitary gland, the thymus, and the suprarenals are very important especially in mat-

[1] The use of animal extracts of the glands of internal secretions has grown rapidly of late. Endocrinology has not progressed far enough for the impartial observer to advise with any assurance concerning general matters or general principles.

ters of growth and development, but we have no definite knowledge of the way in which care and attention of the body may influence the glands in a direct way.

The secretions from the ovaries and testicles are so important that they make the characters that mark the female, on the one hand, and the male on the other; they are essential to the development of the most vigorous type of manhood and womanhood. It is most important for women to avoid gonorrhea because this disease frequently invades the ovaries, requiring removal of the diseased organs. Serious disturbance of health often follows the artificial menopause produced.

(*g*) *Waste Substances in Plasma.*—Even as in a fire in the furnace there are ashes of the combustion, so in the body there are substances left by the process of chemical reaction. These waste materials are called end-products, waste substances, or fatigue products. The waste from fats and carbohydrates is chiefly in the form of carbon dioxid and water; that from protein is more complex and consists chiefly of the following: urea, uric acid, and creatin.

The waste as it is formed in the cells of the body is gradually extruded into the lymph spaces of the tissues, and thence finds its way into the circulating blood. The rapidity with which this waste is removed is a good index of the efficiency of the circulation, and a rapid removal is essential for the best and most vigorous health.

There is definite knowledge available regarding the things that tend to increase the amount of waste, and that help in the removal of the excess. It is very important to keep the body as free as possible from substances that are in their very nature poisonous.

Use of food in greater amounts than is required by the body probably results in the same type of reaction in the body as occurs in the furnace when too much fuel is thrown upon the fire. The combustion in each case is partial and incomplete. Any undue amount of waste must be removed in order to secure any really effective combustion at all. Now the waste from fat and sugar is simple and resembles the smoke of a fire; it is readily removed. The waste from protein is complex and resembles the clinkers of the furnace in its more complex character and especially in its difficulty of removal. So that, to reduce unnecessary waste and to secure most complete combustion one will not overeat, and especially one will not eat many nucleoproteins, because they give rise to the purin bases.

To secure efficiency in the handling of food in the body, the processes of digestion, absorption, and assimilation should go on in an orderly, economical, and rapid manner; such action is impeded by overeating and especially the overeating of meat.

It is important to so live that unnecessary waste is not produced; that the elimination of waste from the cells and tissues will at all times be facilitated and not retarded. Exercise, especially of the out-of-door variety, is absolutely essential in this respect. The contractions of the muscles aid the removal of waste from the tissue spaces, move the lymph along to the heart, and stimulate the complete combustion of food materials.

One so often hears persons speak of the blood as being "bad," and especially in the spring of the year are some inclined to think of the blood as being in a "bad condition." Only recently a student of medicine came to my office to consult me regarding a pronounced case of acne (pimples) occurring chiefly on the back and shoulders. He thought his blood was "bad" and his general feeling of unfitness he attributed to the same cause.

A simple word picture of this youth and his mode of living tells the story. He was accustomed to bathe once a week or in a fortnight, and the condition of his skin, as shown both by the sense of sight and the sense of smell, confirmed his history. His teeth were dirty, and he said that he "brushed them once in a while." He took no exercise at all aside from that involved in walking a half mile to school and home again at night. He was studying disease for the purpose of curing other people, and yet his whole body was a fit subject for clinical study in how not to care for the body. It was perfectly clear that the "badness" in his blood arose from his bad habits of eating, his lack of exercise, and his total lack of the most simple and elemental care of the body. All the pills and medicines in the world, baskets of sulphur burned in his room or in his body, would not bring "goodness" to his blood. The waste products of his body, the clinkers of the furnace, must first be removed before any improvement in his skin could be noted.

The reason why persons so often speak of "bad blood' as accompanying the opening of spring is because one so often sees people who have lived the most unhygienic lives during the winter—cooping themselves up in a hot and ill-ventilated house, overeating, and generally abstaining from bathing because of the inclemency of the weather. When people learn to eat moderately, to exercise regularly in the open whenever possible, to live in well-ventilated rooms, and to keep the body in all parts scrupulously clean, then, and then only, will the question of "bad" blood be removed. Pimples, blotches, cold sores, eczema,[1] and many skin disturbances are often expressions of bad living. God in his wisdom was not visiting our student with punishments, as was once believed; he was merely paying the price of living poorly and at a low level.

The "patent medicine" interests would have people believe that "good" blood depends upon medicine. Taking sarsaparilla in the spring will not "purify" the blood. The only reliable procedure for purifying the blood is by removing the waste. This may be done by exercising, especially in the open air, and by lightening the diet.

[1] Eczema in infants and children may be a phenomenon of protein sensitization. See The Value of Cutaneous Sensitization Tests Employed in Eczema and Papular Urticaria of Childhood, Sidlick, D. M., and Knowles, F. C., American Journal Diseases of Children, April, 1922, p. 316.

In the diet one should avoid especially pastries, sweets, greasy foods, all alcohol, and much meat, and should partake of fresh fruits, green vegetables, coarse whole cereals, pure milk, eggs, and a little meat.

The Vessels.—The vessels of the circulation have been compared to the water mains of a city, but the likeness is in form only. In structure they are very unlike. The arteries are elastic vessels, the veins are collapsible tubes with valves.

The elasticity of the arteries permits them to stretch and respond to the changing demands of pressure in the circulation. This quality provides a very adjustable mechanism especially useful during increased physical activity.

The Arteries.—Loss of elasticity in the arteries results in a condition known as arteriosclerosis. This may develop in early adult life or come only in old age. The cause or causes are not known. Age alone cannot be regarded as a cause because of the possible factors extending over many years. Moreover, the condition has been found in children.

MacCollum[1] gives an excellent summary of the knowledge of this condition and notes six main points around which fall the experimental and clinical evidence:

1. Hereditary tendencies have been emphasized by numerous workers. Osler[2] has called attention to the fact that one may inherit elastic tissue of poor quality in precisely the same way that one may inherit defective nervous tissue.
2. Hard muscular work has been cited often as a factor. As a condition it is always complicated by the varying standards of personal hygiene. Syphilis and other infections, abuse of alcohol and tobacco, toxins, and metallic poisons in certain trades expose the worker to possible causes.

[1] MacCollum, W. G.: Physiological Reviews, January, 1922, pp. 70–91.
[2] Osler, W.: Modern Medicine, 1915, p. 453.

3. High blood-pressure as a cause plays a contradictory rôle. Numerous authors cite "mental activity or overactivity, mental diseases, and various nervous disturbances" as possible factors in arteriosclerosis. Others mention diabetes, chronic nephritis, and obesity as causes.
4. Infections, intoxications, and unbalanced diets are probably the most important causative factors. Ophüls shows in an excellent review that arteriosclerosis is related definitely to infections, especially the chronic infections of the rheumatic type.
5. Intoxications of alcohol, tobacco, lead, and intestinal poisons (constipation) have been popularly assigned as causes. The general statements have not been substantiated by workers in this field.
6. Unbalanced diet seems to be a factor, at least in the experiments with lower animals. Experiments with rabbits seem to show that animal food in the diet of the vegetarian rabbit does cause modification in the arterial wall. The relation of this to man, however, is not so clear.

These various causes may be regrouped under two headings: poisons and overwork. The former would include the infections and the intoxications; the latter would include physical, mental, and gastric overwork. Extreme physical labor, prolonged for years, continuous overwork in mental tasks, overwork of the gastro-intestinal tract, with or without proper diet, suggest that an important phase of the problem is social adjustment.

One needs to get a true perspective to evade the dangers of modern life. To live the temperate life—temperate in all things, in work, in play, in mental endeavor, in eating and in drinking—is to see straight and keep values clear. Osler advises to "shun Bacchus and Venus," and the disasters that come from sharing company with those imposters may be avoided.

The Veins.—The arteries are more easily injured, and yet the veins suffer change that interferes with the activity of the individual at times. The veins are concerned with carrying blood from the tissues back to the heart, and, therefore, should not be obstructed in any way in the performance of that work. Valves in the course of the veins prevent the backward flow that would otherwise result in a system under such low pressure and in part working against gravity. Muscular activity is very important in assisting the onward flow of blood in the veins.

One needs to be guided by two principles in preserving the normal condition of the veins—exercise that will give assistance to the return of blood to the heart, and freedom of the venous return flow by not wearing tight bands, tight garters, tight collars, or tight corsets. The body should be as unhampered by clothing as it can be.

Varicose Veins.—Varicose veins are broken-down vessels in which the valves and walls have given away resulting in slowing of the circulation in the part involved. Varicosities result from a variety of causes.[1] Prominent in their production is obstruction at some point between the varicosity and the heart. This may be due to a thrombosis (inflammation of the wall of the vein with clot formation), pressure on the vein from without, as in tumor growth or pregnancy, or to structural change in the liver preventing an unimpeded return of blood to the heart. Aside from obstruction it is known that occupation influences the condition. Prolonged standing with its accompanying congestion in the legs accounts for certain cases. It is commonly known that motormen suffer from varicose veins, while postmen are peculiarly free from the condition. Athletes engaging in pole vaulting and high jumping at times develop varicosities, due apparently to the effect of landing on the feet violently. The influence of obstructing bands,

[1] The significance of gravity is shown in the greater frequency of varicose veins among tall persons. See Statistics, vol. xv, Part I, Army Anthropology, The Medical Department of the United States Army in the World War, Washington, D. C., 1921, pp. 345, 346.

such as garters, corsets, and belts, is probably also important in many cases.

Mild cases of varicose veins require no special treatment. Surgery is often required when supportive treatment by elastic stockings is not effective.

The Heart.—The blood, vessels, and pump were noted as the chief elements in the circulation. The constituents of the blood may be normal, the vessels elastic and efficient, and yet, if the pump is unable effectively to do the work of pushing the blood to the tissues and forcing back the venous blood, the efficiency of the scheme is gone.

The heart is made up of muscle and divided into four chambers that are connected with each other through valves and vessels. Now, as a pump, it is dependent upon two factors: the valves must fit tightly and work properly, and the muscle of the heart wall must be strong and controlled enough to produce a vigorous heart impulse. Injury to the valves of the heart or to the heart muscle itself not infrequently occurs. The valves are delicate little leaves that are easily injured by certain forces; the heart muscle is supplied with blood exactly as are the other muscles of the body and has endurance or lacks it precisely as other muscles do. It is just as dependent upon good food as the other parts of the body, and its importance is fundamental because of the dependency of other organs upon the circulation. Alcohol, tobacco, or poisons from disease in the body may ruin a heart just as bad oil will ruin an engine. In many ways it is helpful to think of the heart as a little motor pumping about 10 tons of blood a day—a tidy job for a 10-ounce motor.

Injury to the Valves.—The valves are most frequently injured by infectious disease. The bacteria that may gain access to the blood at the time scar and destroy the shape of the valves, and prevent them from effectively controlling the blood in the proper chambers of the heart. The following communicable diseases are most important in this respect and, therefore, should be avoided as far as possible: acute rheumatic fever (rheumatism), scarlet fever, tonsillitis, syphilis, and pneumonia. Infected teeth are also important as a cause of injury to the heart because they serve frequently as the gateway through which the organism that causes rheumatism enters the body.

Table IX, presented by Halsey[1] from a study of New York school children, shows the prevalence of certain diseases in cardiac cases as compared with non-cardiacs:

TABLE IX

COMPARISON OF HISTORY OF OCCURRENCE OF INFECTIOUS DISEASE OF CARDIACS AND NON-CARDIACS

	Cardiacs.		Non-cardiacs.	
	Number.	Per cent.	Number.	Per cent.
Tonsillitis	82	64	55	18
Rheumatism	57	45	16	5
Measles	45	36	176	58
Pneumonia	23	18	14	5
Diphtheria	21	17	27	9
Chorea	18	14	1	
Pertussis	17	13	100	33
Scarlet fever	16	12	14	5
Influenza	2	..	17	5
Bronchitis	8	..	0	
Typhoid	2	..	0	
Nephritis	2	..	0	
Jaundice	1	..	0	
Otitis media	1	..	0	
Chickenpox	0	..	12	4
Polyomyelitis	0	..	4	1
Total	125		297	

It is with regret that one finds parents so often without appreciation of the danger to the child of having the so-called "children's diseases." It should be emphatically stated that these diseases do *not* belong to children at all and should never be contracted unless absolutely

[1] Halsey, R. H.: Heart Disease in Children of School Age, Journal American Medical Association, August 27, 1921, p. 672.

unavoidable. A child of eight years recently seen in the hospital gave a history of having had scarlet fever, pneumonia, neuritis, measles, whooping-cough, chicken-pox, mumps, tonsillitis. Her heart was badly damaged. This was to be expected as a result of the infections she had experienced.

Injury to the Muscles.—For years many have felt that athletics injure the heart because of the intense strain on the circulation in athletic contests. Opinions are rapidly changing in this respect today, and most workers in this field are saying that the heart is not injured in the performances of athletic events unless there exists at the time of the participation an infection. Mackenzie, of England, than whom there is no greater authority on the heart, takes this position. If the tonsils or teeth are infected, or if a focus of infection is present anywhere in the body, vigorous exercise is not desirable. One who has a normal heart may engage freely in exercise if the body is free from infection.

The influence of pre-existing disease, metallic poisons, and emotional excitement are mentioned by Phipps[1] as important for those engaged in physical occupations. Emotional excitement will not injure the muscle, but the first two will. Phipps says: "Trauma and muscular strain damage the tonicity or contractility, or produce an acute dilatation, when there is pre-existing disease; metallic or bacterial poisons may cause or aggravate lesions of the muscle, valves, or innervation; emotional stress may upset the normal rhythm."

The Convalescent Heart.—After a prolonged sickness or an operation the heart is weakened because of two factors: the poisons from the disease and the inactivity of the body. During and following an attack of rheumatism or tonsillitis the heart is very liable to injury. Complete rest in bed during the disease and very gradual activity afterward are important. No one can afford

[1] Phipps, C.: Heart Disease in Industry, Journal American Medical Association, February 25, 1922, p. 562.

needlessly to endanger the heart; it is too vital an organ. Remembering that the heart is a muscle, it will be easy to comprehend how inactivity weakens the heart by comparing the effects of non-use of the skeletal muscles. Therefore, after a period of illness in bed, the individual should begin, gradually, an active life. A sudden exertion before the heart has been strengthened by exercise may result disastrously.

The Influence of Poisons Upon the Heart.—The practice by the laity of using certain drugs for colds and headaches is distinctly dangerous because of the injury to the heart. Most headache remedies depend for their effectiveness upon acetanilid. Acetanilid, antipyrin, and phenacetin are drugs made from coal-tar. They have a definite depressing effect upon the heart muscle. They should not be used indiscriminately. They are dangerous, and yet there are on the market hundreds of so-called headache and cold cures, labeled "absolutely safe," that depend for their effect on acetanilid. Aspirin, widely advertised as a remedy for colds, headaches, and pain in general, is not without danger to the heart. Self-diagnosis and self-treatment of disease are unscientific and should not be undertaken by one who aims to achieve for himself the best in the way of living. Simple disorders requiring home remedies and home care may, of course, be handled without medical aid. Disorders, however, that require drugs should have scientific and intelligent diagnosis and therapy. Only a reputable physician can give this.

The Influence of Tobacco.—Tobacco presents to the lay mind a moral question. It is usually discussed on that basis by the opponents of its use. It is more rational to discuss it as a health question. Its effect on health and particularly its effect on the heart has been a matter of fact for some time.

Investigations carried out on healthy men and on men suffering from "soldier's heart" by Parkinson and Koefod[1]

[1] The Lancet, August 18, 1917, vol. cxciii, No. 4903, p. 232.

showed the following immediate effects of cigarette smoking on such individuals:

"1. The immediate effect of cigarette smoking upon the circulatory system and upon the breathlessness of exertion was observed in 30 smokers, of whom 20 were men affected with "soldier's heart" and 10 were healthy soldiers. Each subject smoked either four or five cigarettes during a period of forty minutes.

"2. A demonstrable effect was recorded in 17 of the 20 patients; the 3 unaffected were non-inhalers. Nine of the 10 controls, all inhalers, were influenced in the same fashion, though not to the same degree.

"3. The average pulse-rate among the patients during smoking was nine beats higher than before smoking; in the healthy controls it was six higher. Initial slowing of the heart was never observed, nor any irregularity referable to smoking.

"4. The rate of respiration in the patients was unaffected; in the controls it was slightly reduced.

"5. The average systolic blood-pressure was raised by 5 to 10 mm. Hg., and the diastolic by 5 mm., both in patients and controls.

"6. These effects appeared within five minutes; with the first cigarette they almost reached the maximum, and this was maintained throughout the smoking period.

"7. A simple exertion test was performed before smoking and repeated on its cessation. In the patients the pulse-rate maintained a higher level throughout the test *after* smoking, and half of them were more breathless both subjectively and objectively. In 2 patients precordial pain was induced by smoking, apart from exertion. But in the controls the pulse-rate curve during exertion was much the same after smoking as before, and breathlessness was induced in 2 only.

"8. These observations show that, in health, the smoking of a single cigarette by an habitual smoker usually raises the pulse-rate and blood-pressure perceptibly; and these effects are a little more pronounced in cases of "soldier's heart." Moreover, the smoking of a few cigarettes can render healthy men more breathless on exertion, and manifestly does so in a large proportion of these patients.

"9. Excessive cigarette smoking is not the essential cause in most cases of "soldier's heart"; but, in our opinion, it is an important contributory factor in the breathlessness and precordial pain of many of them."

While these circulatory changes can be demonstrated, it is important to remember that they may not be as serious in their effect as would seem to be implied. Certainly smoking to excess is injurious to health. For some, one cigar may be "excess"; for others the margin is greater. For any person "four or five cigarettes during a period of forty minutes" is marked excess.

A Need for Accuracy.—The leaf of the tobacco plant is used for smoking and chewing, and in powdered form as snuff. There are many reasons why tobacco should not be used by man, and probably few reasons for its use. With this viewpoint there are some people who say that a person who uses tobacco is a fool, and that he will go insane if he smokes cigarettes. Now such a statement is at variance with the facts. In condemning or praising any method or practice care should be exercised in forming a judgment and discretion used in stating a belief. What does tobacco do to the cells of the body?[1] How does it injure them? What may be the loss in terms of efficiency? These are the questions that we should be prepared to answer.

[1] Webb, G. B.: The Effect of the Inhalation of Cigarette Smoke on the Lungs, American Review of Tuberculosis, 1918, vol. ii, p. 25; Krause, A. K.: Tobacco Smoke and Pulmonary Tuberculosis, American Review of Tuberculosis, 1918, vol. ii, p. 99.

General Effects of Tobacco.[1]—"In the first place we know men who are strong physically, keen mentally, and sound morally, who at times use tobacco. If they use it moderately, they may reply to our question by saying "smoking does not hurt me." By such a statement one means that there is no perceptible harm. Some experiments[2] indicate that moderate and habitual use of tobacco is not harmful to *adults* and distinctly helpful to certain ones.

"It is true that the use of tobacco forms a habit that tends to increase the amount of tobacco used. This is the special danger in cigarette smoking. It leads frequently to the use of so many cigarettes that health and strength are lost.

"That smoking causes undesirable effect upon the body is shown in the custom of college athletes. Coaches and trainers do not permit smoking by those who play on the team, and all athletes who seek to excel in sport do not use tobacco.

"We know that smoking impairs one's physical efficiency. A war correspondent, visiting the Italian trenches in the Trentino during the recent war, writes as follows:

"'As we pushed on, all our old sins of pipes and cigarettes began to be expiated in our middle-aged hearts. . . . So we struggled on, the easy perspiration bathing our bodies. Hiatt was doing better than I, being younger and less guilty of cigarettes. I could force myself until I could go no further; would stop; would droop over my alpenstock and pant like a netted fish.'

"Men who smoke to excess find that they become nervous, lose their appetite for wholesome food, and show a distinct loss in efficiency." On the other hand, many men who smoke moderately testify to the values

[1] Taken in part from Healthful Living, pp. 413–415, The Macmillan Co., New York, 1920.

[2] Gies, W. J., and others: Effect of Tobacco on Man, New York Medical Journal, June 1, 1921, p. 809.

they experience in satisfying a habit that for them has no known deleterious effects.

The Effects of Tobacco Upon Youth.—"The youth who looks forward to physical efficiency as well as mental efficiency as important factors in doing a work and achieving a place in the world, should leave tobacco alone. The growing boy is injured by the use of tobacco. His growth is interfered with, his heart is made irritable, and his stomach disturbed. If the boy thinks he wants to smoke, he should wait until he is twenty-five years old; then with developed body and a wiser mind, if the use of tobacco seems desirable, let him make the choice, cognizant of its dangers and limitations. The youth who looks forward to excellence in athletics, to achievement in business or the professions, to authority and control in store and factory, will select his habits as carefully as his friends, his food as carefully as his facts, and he will leave tobacco out of the things that are for him."

Tobacco and the Sexes.—The increase in the use of tobacco by women has caused great concern to many people who are interested in racial health. The statement has been made that smoking is more serious in its effects on women because of their possessing a more delicately adjusted nervous system. No proof of a scientific kind has been presented to show this.

More significant in effect is the secret and hidden character of the act, resulting in destructive tendencies in personality, showing especially in loss of confidence, lack of self-expression, and even fears. No woman or man may with impunity carry on any secret practice without distinct personal loss that is reflected in the general health and well being of the body.

CHAPTER X

HYGIENE OF THE EXCRETORY SYSTEM

I. Plan of Discussion.
II. Nature and Function of the Skin:
  The Skin as an Index of Health.
III. Care of the Skin:
  1. The Warm Bath.
  2. The Hot Bath.
  3. The Cold Bath.
  4. Substitutes for the Cold Shower or Tub.
  5. The Habit of Bathing.
  6. Other Forms of Bathing:
    Sea Bathing.
    The Turkish Bath.
    The Russian Bath.
    The Sun Bath.
IV. The Complexion.
V. Care of the Hair.
VI. Care of the Nails.
VII. Care of the Hands.
VIII. Pointed Paragraphs.
IX. The Clothing of the Body:
  1. Seasonal Clothing.
  2. Underclothing.
  3. How to Wear Clothing.
X. Elimination of Body Waste By the Kidneys.
XI. Keeping the Kidneys Efficient.
XII. Injury of the Kidneys By Disease.
XIII. Kidney Remedies.
XIV. Medical Examination.
XV. Intestines as Organs of Elimination.
XVI. Causes of Constipation.

Plan of Discussion.—The waste of the body is carried off via the lungs, the skin (to a limited extent), the intestines, and the kidneys. We have discussed the part of the lungs in the removal of carbon dioxid; in this chapter the part played by the other organs in this system and their proper care will be presented.

Nature and Function of the Skin.—The skin is a flexible and elastic covering of the body that serves largely for protection, but slightly as an organ of elimination. For this latter function it is dependent upon innumerable sweat glands located in the skin that give off in a day from 1 to 2 pints of liquid. This excretion when profuse is composed[1] of small quantities of sodium chlorid, sulphates, phosphates of the alkaline salts, urea, uric acid, creatinin, aromatic oxyacids, ethereal sulphates of phenol and skatol, and at times albumin. The action of these glands is increased during exercise, or by any condition that brings more blood to the skin, as an increase of temperature of the surrounding air either by direct heat or by clothing that is a poor heat conductor.

The Skin as an Index of Health.—It is a fact that the skin is an important index of health. This is so because we see in an individual more of skin than of any other tissue, and the skin responds to circulation, waste products, poisons, bacteria, very much as other parts of the body do. If the skin is healthy in appearance it represents internal health, although it is not an infallible guide. The muscles of the face, especially, indicate general muscular tone, and if the skin is sagging and flabby there, it represents usually a weak muscular tone all over the body.

Because the skin stands in the popular mind for bodily health, and because most people have the laudable desire to appear well and strong and vital, it is a practice with certain individuals to decorate the skin of the face. Some criticize this as a remnant of barbarism and cite instances of savages who practice face painting, but it is reasonable to suppose that in modern life it relates to a desire to appear attractive, to seem healthy and vigorous. It is important to emphasize in this connection that such health is only skin deep, that it fools no one, and *that the counterfeit is evidence of the absence of the real thing.* Furthermore, health comes from within

[1] Burton-Opitz, R.: Text-book of Physiology, W. B. Saunders Co., Philadelphia, 1921, pp. 896, 897. Howell, W. H.: Text-book of Physiology, W. B. Saunders Co., Philadelphia, 1919, p. 830.

and cannot be put on. It cannot be bought in a box. The skin itself is kept healthy by proper functioning of the body with regular removal of waste, by cleanliness, by avoidance of certain poisons and foods, and of conditions that disturb the internal secretions of the body. This last point will be discussed in connection with the hygiene of the reproductive system.

The skin serves as an index of health because we are accustomed to judge health by "looks." It is true, of course, that the outward appearance is suggestive of the internal health. Persons are continually judging the health status of other persons by the way they walk or sit, by the appearance of the skin or facial expression. How often one conveys impressions of poor physical condition by the way one walks is not generally appreciated. The posture oft proclaims the man, and it is important to remember that good posture, clear skin, and happy expression are real evidences of health.

It is unnecessary to rely upon general signs in determining health. The science of medicine has advanced beyond the tongue and conjunctiva stage. The laboratory sciences are used to determine the way the body is performing its functions. The list of examinations given on pages 108, 109, indicates the available scientific procedures that may be used to determine the cause of ill health. Many of these procedures naturally relate to the eliminative system because many of man's errors in living show so quickly in disturbed elimination. To care properly for this system is a matter of importance.

Care of the Skin.—So far as organic health is concerned, it is probably true that bathing is not essential to health. There are numerous examples of people who live long and are peculiarly free from disease without bathing, except perhaps at very infrequent intervals. But the modern conception of health always involves something more than mere freedom from disease, and in this matter as in others the significance of the indirect and reflex influences of procedures upon mental attitude, outlook, and sense of bodily well-being must not be missed. One of the values often associated with exercise is the shower that follows the activity. This is serviceable not alone because of the removal of dirt, but also because of the reflex, stimulating effects upon the nervous system.

The external layer of the skin is made up of many scale-like cells packed very close together. These outermost cells are dead and are continually shed from the surface of ~~the body~~. Held together by the sebaceous matter from the oil glands of the skin, they form with the dirt that collects upon the body a pellicle that covers the openings of the perspiratory glands. The oil glands and perspiratory glands are continually pouring their secretions upon the surface of the body. To remove this waste accumulation it is very desirable that bathing be made a regular and frequent habit.

The Warm Bath.—The warm bath (from 90° to 98° F.) is essentially a cleansing bath. The heat causes dilation of the skin vessels with resulting redness of the skin and increase in perspiration. The warm bath produces relaxation of the muscles and is particularly beneficial after fatiguing labor. It soothes the individual and is conducive to sleep and rest. For some, however, the warm bath is stimulating and should not be taken before retiring. This effect of stimulation is liable to occur if a hot bath is taken (over 98° F.).

The Hot Bath.—The hot bath (over 98° F.) should be taken only if prescribed by a physician.

The Cold Bath (under 65° F.).—Bathing in cold water is becoming more and more popular, due largely to the pronounced beneficial effects. It should be performed in the morning on arising because of its stimulating action. The cold water acting upon the nerve endings in the skin arouses them to increased activity, causing constriction of the vessels (to be followed subsequently by dilatation) and a wholesome stimulation of the nerves.

The ideal method of taking the cold bath is by means of the shower; bombardment of the skin by the dashing particles of water is markedly beneficial in addition to the effect of the cold. Moreover, the shower is a much more sanitary affair than the tub.

The tub, though, is available to more people than the shower, and it may be used effectively to secure all that is essential. The procedure for the cold tub should be as follows: Fill the tub from 12 to 14 inches with water as cold as can be borne. For men the tub may be filled during the shaving process. Before entering the tub wash the face and neck with cold water. If desired, certain parts of the body may be cleansed with soap and warm water. One is then ready to enter the cold tub. It is important to proceed according to directions. Step into the tub and sit down, allowing the water to come over the legs and thighs. At once lie back so that the water rolls over the chest and shoulders. Immediately get out of the tub and rub down with a coarse towel.

The normal result of the cold bath is to drive the blood from the skin vessels to the internal organs. On emerging from the bath the vessels of the skin dilate, the skin becomes flushed, and a pleasing sensation of warmth follows. This is called the reaction. If reaction does not occur, this is an indication that the bath is not suited to the individual.

For those who can bathe in cold water there are distinct health benefits. Most people, except the aged, can indulge in this form of bathing the year around if the practice is started in the summer, and if a warm bathroom is available. Some people say that they cannot take a cold bath because of the shock to the nervous system. On the contrary, it may be noted that the majority of people with profit to health can and should practice the cold bath daily. In addition to serving as an effective protection against colds it remains a procedure with marked wholesome effects upon the general health, promoting appetite, digestion of food, and improved mental activity. The cold bath should be taken before breakfast; the warm bath before retiring. A complete body bath should never be taken until at least two hours after a meal, and preferably three. The best time, of course, is before eating.

Lusk states, "Cool baths and winds increase the metabolism which must be effected through the chemical regulation." The effect of baths and douches lasting three and a half to five minutes is given by Lusk,[1] who refers to the work of Rubner. "When the water has a temperature of about 16° C. (about 61° F.) he (Rubner) finds that the carbon dioxid elimination may be very largely increased, especially in the case of the douche. The effect of the douche was more marked if taken before breakfast when the intestinal tract was free from food. The results before breakfast were as follows":

Influence of Cold Baths on Metabolism in Man

	Douche 16° C. Increase, per cent.	Bath 16° C. Increase, per cent.
Volume of respiration....	54.5	22.9
Carbon dioxid excreted ..	149.5	64.8
Oxygen absorbed........	110.1	46.8

This increased metabolism lasts about one and a half hours. The cold bath, by diminishing body heat and by increasing metabolic processes, is a desirable procedure for a person who is overweight.

Substitutes for the Cold Shower or Tub.—If the tub or shower is not available, or if the physical condition does not warrant the full bath, the cold sponge bath should be employed. There are few persons in America who cannot take advantage of this procedure. A sponge as large as a quart can should be used. Saturate the sponge with cold water and squeeze over the arms, chest,

[1] Lusk, G.: The Science of Nutrition, W. B. Saunders Co., Philadelphia, 1919, p. 144.

back, and legs. Follow with a vigorous rub of the entire body with a coarse towel.

For those who have not the facilities for the above, washing the face, neck, and chest with cold water will be found very helpful in protecting the body against cold.

The Habit of Bathing.—The great thing in all education for health is to establish habits. Much of the routine care of the body involves at first considerable effort of will and careful planning of the day's program. The chief point of importance in forming a habit, as James has so well pointed out, is to permit no exception to occur. This instruction is particularly important in cold bathing. Permit no exception. Begin in the summertime; day in and day out follow the program.[1] In several months the habit will be fairly started, and after a year's experience the body will have become so accustomed to the refreshing and stimulating reaction that the habit could hardly be given up at all.

Other Forms of Bathing.—Sea bathing is held by many to be especially beneficial to health. The virtue ascribed, usually, is in the salt of the water. In this connection it should be noted that salt is not absorbed through the skin, and that if salt were the efficacious agent then sea baths could be taken at home by purchasing sea salt. Salt baths may be taken in this way, but the values of transporting the ocean to the apartment are psychologic, if any at all.

The real values in sea bathing are to be assigned to other factors. The outdoor air, the usual sunshine, the happy companions, the play and sport on the beach—these are the great tonics, the real cause for the exhilaration and bodily well-being that come from a swim in the ocean. A business firm specializing in sea salt would try to convince otherwise; this is because they have salt to sell and are not able to sell pleasurable recreation, pure outdoor air, and sunshine.

[1] It will be necessary for women to interrupt this schedule during the menstrual period.

It is important not to stay in the cold water of the ocean too long. If the body feels chilly it is time to come out and get a good rub down. Probably for most people twenty minutes is the limit in time to be allowed. Certainly, blueness of the lips or finger-tips indicates that the heart and lungs are meeting with difficulty the body needs; the intelligent person will not disobey such signs.

The *Turkish bath* is a form of bathing available usually in large cities only. The Romans in the later days of the Empire engaged in many of the procedures used in the modern Turkish bath. This form of bathing is well borne by most people, and although to be classed as a luxury and in no sense a real necessity for living healthfully, it is valuable after severe physical exertion, and for certain types of muscular and joint conditions following rheumatism.

The *Russian bath* is similar to the Turkish, but differs in providing hot vapor instead of hot air. This type of bath is recommended often for certain dry forms of bronchitis and chronic laryngitis.

The *sun bath* indicates, by its name, that the body may be bathed without water. We may consider logically, therefore, exposure of the body to the sun and air as in effect a bath. For some years sunlight has been used, especially in Switzerland, for the treatment of bone and joint tuberculosis. The extension of physiotherapy, especially since the World War, has emphasized anew the value of the sun's rays in stimulating metabolic processes, and particularly the formation of hemoglobin. Thus, the sun bath is to be considered as a valuable hygienic measure, improving nutrition and general health. Exposure to the sun's rays should be, for brief periods, very gradually extended. If the exposure is overdone, sunstroke may occur. Not infrequently, people on vacations suffer with headache and general debility from too much exposure to the sun.

The Complexion.—The care of the skin of the face presents to many persons serious problems. The complexion is important as a matter of justifiable personal pride. Some of the fundamental facts in relation to the complexion are given below:

1. The complexion is an indication of internal bodily states. Pallor, flabbiness, blotches, pimples, discolorations, enlarged blood-vessels, floridness are signs of habits of living and of the general health.
2. These unfavorable and undesirable signs are to be removed (when possible) by correcting the errors in living, by removing the cause.
3. The quality of the skin in different individuals varies so greatly that a preparation effective for one person may be injurious to another. The dry skin and the oily skin require care of a different kind.
4. Local conditions may injure the skin of the face and result in constant disturbance until the conditions are removed.

Unless one works at a dirty or greasy occupation the face should never be washed with hot water and soap. For most persons, it may be said, that washing the face three times daily in cold water is sufficient for cleansing purposes. The cold water tones up the elastic tissue in the skin, improves the circulation, and is a deterrent to the appearance of wrinkles. With the exception noted above soap should not be used. The hope that many people have in medicated soap is directly proportional to their belief in the mystical and the magical, and to their reading of promising advertisements. No justification exists for any reliance on medicated soaps. As a rule, their virtue lies chiefly in their odor or appearance. One soap claims to be a health soap because of the presence of carbolic acid; another seeks preference because it is impregnated with the salve that is to be used with it; all rest their case upon unwarranted and unscientific claims.

The following advertisement of a "skin beautifier" illustrates the tendency to be combated: ". . . makes the skin transparent. Blemishes of every kind disappear as if by magic."

This "beautifier" on analysis gives: Zinc oxid, 7 per cent.; bicarbonate of soda, 5 per cent.; glycerin, 10 per cent., and water, 78 per cent. The ingredients cost about

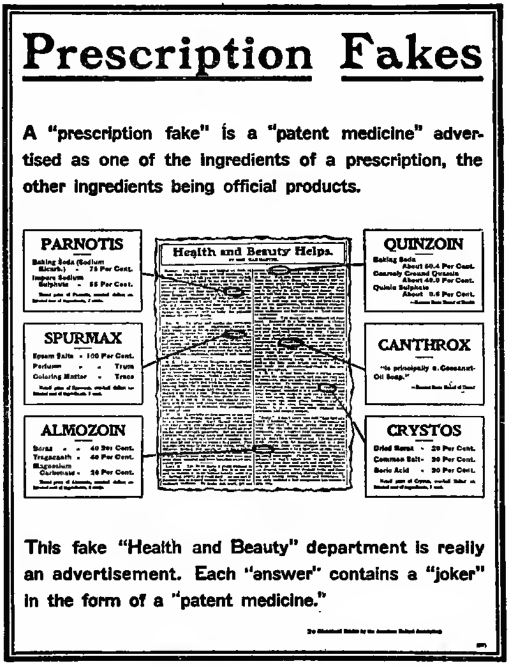


Fig. 28.—Newspapers publishing such health columns should receive the condemnation of all advertisers of honest products. (By courtesy of the American Medical Association.)

4 cents; the preparation sells for 50 cents. This profit will buy seats at the "Follies" for the manufacturer; the skin often remains unbeautiful.

People today too often desire magic in medicine. To such superstitious minds the "medicine man" speaks with more authority than the scientific physician. They long for buncombe. This tendency is capitalized by the patent medicine interests who for simple compounds of soda and borax use elaborate, meaningless, but mysterious names.

Frequently cosmetics are advertised under fake columns (Fig. 28) in second rate newspapers, as "Answers to Correspondents," "Health and Beauty Advice," or "Health and Beauty Helps." In one such column the following appeared:

"Lucile. A good 'liquid powder' or face wash is made by dissolving 4 ounces of spurmax in ½ pint of hot water and adding 2 teaspoonfuls of glycerin. This home-made complexion beautifier whitens the skin without the use of powder and is particularly recommended for anyone who has a sallow, dark, or oily skin."

On careful chemical analysis, spurmax is found to consist of

Crystallized magnesium sulphate (Epsom salts)	100 per cent.
Perfume	trace.
Coloring-matter	trace.

The retail price of spurmax is one-half dollar. The estimated cost of the ingredients is less than one cent.

The necessity for all persons understanding the nature of the skin, its needs and functions, stands out as an imperative demand in these days of such blatant and unshamed lying in advertisements.

If a soap is used for cleansing the face, the only desideratum is that it be pure and non-irritating. For persons with an oily skin or persons living in cities where the air is filled with soot, the daily use of soap may be necessary; but pallor is to be corrected by improving the quality of the blood, flabbiness of the skin by exercise and cold baths, blotches and pimples by medical advice and guidance when hygiene alone has not sufficed.

If the skin is unusually dry, a little oil may be applied. In hot weather a little powder may be welcomed. Certainly, if used sparingly, there can be no harm; its use is a matter of taste.

The use of hot water on the face and subsequent exposure to cold air or wind usually results in chapping. In "make-up" for dramatics it is important to apply a plain cream to the face before the paints or charcoal are used. This permits their easy removal and prevents clogging of the pores with irritating substances.

Care of the Hair.—The hair grows from follicles in the skin. At the follicle the hair cells are alive, the growth occurs in the follicle, and the hair is pushed out. The ends of the hair are dead and resemble the outer layer of the skin in this respect. This physiologic fact should be borne in mind when singeing is proposed as a method "to prevent the hair from bleeding." The scalp has numerous oil or sebaceous glands which pour out their secretion near the roots of each hair follicle. This secretion keeps the hair oily and prevents breaking. Individuals vary in the amount of oil produced by the scalp; some scalps are dry, others are very oily.

The hair should be cared for as a part of the general plan to keep one's self clean, well-groomed, and in good condition. The loss of hair or dirtiness of the scalp may have nothing to do with digestion of food, but it is to be noted that health is a complex matter associated with indirect as well as direct factors. Reasonable care and attention to the body results often in reflex mental states of optimism and cheer, in wholesome ways of looking at problems, in consciousness of power, that are immensely valuable to society as well as to the individual. Shampooing the hair should be performed whenever the hair and scalp are dirty. For some with oily scalps this may mean once a week; for others with dry scalps, two or three week intervals will be desirable. For the shampoo, any good toilet soap may be used. There is no special value in the advertised products. A good shampoo liquid soap is the official *linamentum saponis mollis*. This may be purchased at any drug store. It contains 50 parts of soft soap, 2 parts of oil of lavender, and 33 parts of alcohol.

After thoroughly washing the hair and vigorously massaging the scalp with the finger-tips, the soap should be entirely removed by frequent douching. In winter one should always end with cold water. The hair should then be thoroughly dried, and particular attention should be paid to drying the hair at the back of the neck and around the ears before going out-of-doors.

If the scalp is found to be particularly dry after shampooing, it will be advisable to add a small amount of oil or grease. For this purpose, pure liquid vaselin will be found very good. Some advise olive oil. The addition of the oil prevents cracking and breaking of the hair and scaling of the outermost cells of the scalp.

Daily massage of the scalp will improve the circulation and favor the growth and luster of the hair. The procedure of the hostler in caring for his horse may be an example applied here. The hair will be maintained in good condition by keeping it clean and by frequent brushing.

Care of the Nails.—The nails are similar to the hair in that they are growths from the skin. A Chinese custom, gradually disappearing, is still found, especially among Chinese students, who wear the nails long and pointed, indicating that they have no need to do physical work. The condition of the nails is a sign of the care given to the body by the individual American just as truly as the long nail is a sign of the vocation of the Chinese. Clean, well-kept nails may be considered with other items of personal hygiene as representative of the interest of the individual in maintaining an optimum physical state. That some persons give more attention to the care of the nails than they do to the care of the nervous system is merely a sign of the quality of the latter and the mixing of values; it does not mean that the nails should be neglected.

The cuticle surrounding the nail should be pressed back once or twice a week with an orange stick. If excessively dry, the cuticle may be softened by applying pure liquid vaselin at night before retiring. Unless the cuticle is cared for in this way "hang nails" are liable to form and may give rise to serious infections. The surface of the nail should never be scraped.

The nails of the fingers should be cut in a curve with a pair of curved scissors. Filing of the cut surface to give smoothness is desirable. The toe nails should be cut straight across, to prevent ingrowing of the nails.

Care of the Hands.—The hands are always contaminated with bacteria. Numerous experiments have shown that it is very difficult to sterilize the hands and nails, even after scrubbing with soap, hot water, lime and soda, and soaking in bichlorid. The fingers contain in the folds of the cuticle and under the nails always a varying amount of débris that is bacteriologic. A typical sample shows various cocci, particularly streptococci and staphylococci, colon bacilli and spirillæ, yeast cells and other fungi derived from the mouth, soil, food, body surface, water, nose, eyes, sewage, dust, dirt, etc.

It would seem that these were significant facts if they helped one to prevent infection by the hands. To prevent such infection there are at least two important notations:

1. Clean hands for all first-aid services. In bandaging wounds, or attending to any injury of the skin, first clean the hands as thoroughly as possible with soap and hot water.
2. Prevent auto-infections. Because of the varying uses to which the hands are put, and the nature and conditions of the objects handled, the hands are always dirty, *i. e.*, they harbor bacteria. So long as the skin of the hands is not broken, these bacteria cause no disturbance if they are not transferred to the mouth, nose, or to an opening in the skin of the body produced by scratches or cuts in its epidermal covering. It is important, therefore, to indicate the ways in which the hands carry bacteria.

(*a*) Scratching the body with the nails.

By scratching the body with the nails the skin may be broken and a direct infection result from the infected nail. In this way lupus, acne, boils, and carbuncles have been transmitted. In this way also a disturbance in one part of the body may be spread widely over the body, *e. g.*, poison ivy.

(*b*) Biting the nails.

Biting the nails is unhygienic because of the effect on the nails, of the undesirable nervous habit, and of transmission to the mouth of bacteria from the fingers.

(*c*) Putting fingers in the mouth.

It has been stated by Chapin that if the salivary glands secreted indigo, this world would be a blue place indeed. His reference strikes at a very common and reprehensible practice. It is seen among persons who moisten their fingers with saliva to turn the pages of book or magazine. Conductors engage in this universal trade as they give out transfers. It should be stated, therefore, that nothing should be put into the mouth except clean food and clean drink.

Some people develop phobias relating to this fact of contamination of the hands. Such persons refuse to handle money without gloves and build up a number of similar prohibitions that are senseless and foolish.

Pointed Paragraphs.—The great variety of practice in the hygiene of the skin, hair, and nails, and the many questions asked by students suggest that pointed directions be given to set forth in concise fashion the best judgments on many questions:

1. Hair tonics have no special value. Health of the hair depends upon the general health and the blood-supply in the scalp. It may be desirable to have a special prescription. This should be given by a physician and based upon the local condition.

2. Daily massage of the scalp and frequent shampooing to keep the hair clean are the best tonics to be applied locally.
3. There is no danger from frequent shampooing of the hair. The mechanical stimulation is very beneficial. If excessively dry, a little oil may be added.
4. The cold bath in the winter may produce an itching of the skin of the legs. This bath pruritus is seen in persons with an excessively dry skin. The condition may be controlled by oiling the parts affected after the morning bath.
5. It is advisable for men to shave themselves. Troublesome and obstinate skin diseases are not infrequently contracted in public barber shops. The damp towel, or shaving brush, is usually the medium of infection.
6. Shaving of the head to promote growth of the hair is a useless procedure.
7. Curling the hair on pins or papers is not injurious, but procedures used to produce a "permanent wave"[1] make the hair unusually dry and brittle, and destroy the "life" and luster of the hair.
8. Hair removers should be used only upon the advice of a physician. One sure method of removing superfluous hair is by electrolysis. This requires a specialist skilled in the technic. Painful and serious abscesses are caused at times by crude methods of removing the hair from the armpit.
9. It has been said that the only sensible thing to do for gray hair is to admire it. Some persons are unable to face the problem as squarely as that. If dyes are used, great care should be taken that they do not contain lead, for serious results frequently follow in the form of lead-poisoning. The following item (Fig. 29) in the New York Tribune

[1] It is interesting to note that negroes use preparations to take out the kink in the hair and the white race (women) employ numerous measures to achieve a curl or wave.

of August 8, 1920, indicates the danger of such treatment:

Singer Treated for Gray Hair Sues for $25,000

Mrs. Gertrude Bianco and Her Husband Seek Damage From Specialist

Mrs. Gertrude Bianco, of 316 West 122d Street, a concert singer, alleging that she was blind for several days, the glands in her neck swollen and lumps developed on her head, following treatment to restore gray hair to its natural shade, filed a suit for $25,000 damages in the Supreme Court yesterday against John Andre, of 57 West Thirty-ninth Street. Attilio Bianco, husband of the plaintiff, also filed a suit for $5,000 damages against Andre for loss of his wife's services. Mrs. Bianco says she called on Andre on December 26 in company with a friend who had recommended the defendant as an expert in the treatment of the hair. Andre, it is alleged, assured Mrs. Bianco he could make her gray locks black again, and in such a manner that neither salt water, steam nor hair lotions would tarnish them.

The plaintiff submitted to the treatment. In a few days, she claims, all the things happened to her of which she complains, she was in great pain, besides being incapacitated for some time, and suffered financial loss.

Fig. 29.—The use of dye preparations for the hair is frequently dangerous.

10. Perspiration checks depend for their action upon salicylic acid. The nostrum PERSPIRO is said to be the prescription marketed by a patient for whom it was prescribed. The well-known Thiersche's powder is the foundation of most perspiration remedies. It contains salicylic acid 1 gram and boric acid 10 grams.

11. Most deodorants depend upon aluminum for their effect. Odor-o-no, Mum, and others widely advertised are very simple preparations, perfumed, and given names that advertise easily.
12. There are numerous depilatories on the market. Whether as Delatone, Delol, El Rado or Nodene, they are dependent for their action upon barium, calcium, or sodium sulphid. Analyses are given in Nostrums and Quackery, Volume II.
13. If the hands are always washed carefully before eating and if fingers are carefully kept out of the mouth and nose, and if the body is not scratched with the nails, the bacteria and other dirt that accumulate on the hands may be considered as harmless.

The Clothing of the Body.—The rôle of clothing in modern civilization appears in an uncertain light when one observes furs in summer and the thinnest of silk stockings in winter, or when the young child with bare legs is exposed to the cold harsh winds of winter or early spring. Are these feminine foibles of no moment? Is clothing to be judged by style merely? Are wholesomeness and beauty forever at odds in human dress? There lies in this very problem of clothing the real heart of the problem of health. The hygienic knowledge is available, but it must compete against selfish and foolish attitudes, unworthy life goals and guides. Here as elsewhere the problem of living finely and well consists in the utilization of scientific fact, of demonstrated truth. The willingness to sacrifice health for high heels, to waste in crude and vulgar ways the affective values of life for momentary popularity, to let the race take care of itself, are attitudes that must give way before the dominant sense of the social and moral responsibility for living at one's best. The hygiene of clothing also demands, therefore, at the very outset the application of scientific fact.

Seasonal Clothing.—Clothing should be used as a protective covering for the body and should fulfil the demands of the body as regards heat conservation or dissipation. For civilized man only about 20 per cent. of his surface is normally exposed to the air. For protecting the body against cold, clothing that holds air in its meshes is most satisfactory. Rubner has shown how valuable fur is because of this quality. He cites the fact that the hair of the black cat, black lamb, rabbit, skunk, raccoon, mink, musk-deer, and sheep weighs very little itself, but the fur contains so much air that it may be said to consist by weight of 97.3 to 98.8 per cent. of air, and only from 1.2 to 2.7 per cent. of hair.

Hot weather clothing that will permit circulation of air and yet that will absorb moisture is very important. Garments that do not take up moisture but allow perspiration to collect on the surface of the body are highly unsatisfactory, because in times of high temperature evaporation is retarded, and hence cooling of the body is interfered with; and at low temperatures a great amount of heat is lost by conduction through the moisture, and hence there is rapid chilling of the body.

Clothing has marked influence on metabolic changes occurring in the body as given by Lusk,[1] who uses Rubner's figures:

INFLUENCE OF CLOTHES ON METABOLISM IN MAN AT A TEMPERATURE OF 11° TO 12° C. (ABOUT 52° TO 53° F.)

	CO_2 in grams per hour.	H_2O in grams per hour.	Remarks.
Summer clothes	28.4	58	Cold, occasional shivering.
Summer clothes and winter overcoat	26.9	50	Chilly part of the time.
Summer clothes and fur coat	23.6	63	Comfortably warm.

[1] Lusk, G.: The Science of Nutrition, W. B. Saunders Co., Philadelphia, 1919, p. 149.

This is the sort of scientific evidence from which the hygienist determines his rules. It will be observed that the individual with "summer clothes" had to burn more food material, as indicated by the greater CO_2 output, than the individual who wore "summer clothes and winter overcoat" or the one dressed with "summer clothes and fur coat." This means, of course, that children and women, who are chiefly concerned in this matter, are losing valuable body heat by lack of proper protection of the body. It thus becomes a matter of prime importance in health that the body heat be conserved, that the losses of heat be prevented. This is of particular importance on cold, windy days because of the greater loss at such times.

Men who spend the days indoors in heated apartments and offices will find it convenient and practical and healthful to use light-weight suits, and in cold weather to secure the additional protection by a suitable overcoat. Women are less easily provided for because of the widely varying types and quality of clothing used. The principle to be applied by each person, however, is that of adequate protection from cold in winter and freedom from moisture on the body in summer. City persons living indoor lives will find it desirable to have for out-of-door or sport wear durable clothing that will not only be suitable for physical activity but also serve adequately the temperature and climatic changes.

The farmer, the truckman, the outdoor worker generally will find it essential in cold weather to wear woolen next to the skin. This is admirable for two reasons: it is very absorbent, and hence it takes up the perspiration, and it prevents rapid evaporation, and hence it is warm.

Old persons and children will find it very satisfactory to use woolens in winter. For summer wear light cotton fabrics are very satisfactory. Silk is usually expensive, but is always soft and cool.

The color of clothing is of high importance. White and all light colors absorb fewest of the heat rays and thus are more suitable as colors for summer wear. White is preferable to colors produced by cheap anilin dyes. Such dyes at times cause marked irritation of the skin.

Underclothing.—Underclothing is essential to protect the outer garments from the perspiration of the body, and to provide a covering that may be readily washed, kept clean, and changed to meet the temperature and seasonal changes. Underclothing should be changed frequently. This necessity varies with the amount of perspiration of the individual. When taken off at night the underclothing should be placed over a chair in such fashion that it will be thoroughly aired. Damp underclothing should be changed at once, and especially if the day is windy or cold. Soiled underwear favors the development of micro-organisms which produce at times annoying skin diseases.

Fortunately, women of the present day need little instruction in the matter of tight lacing of corsets. The old days of the wasp waist are gone—let us hope—forever. It is held by some that women would be healthier if they did not wear corsets, but this is conditioned upon other matters, such as support for clothing, proper exercise involving the trunk muscles, and child bearing. The more flexible corset or waist so popular today is generally desirable.

How to Wear Clothing.—The average woman who will wear dresses and undergarments supported from the shoulders or hips, who will be physically active, and who will allow at least two years to elapse between pregnancies, will be healthier and happier without a corset. For those who wear skirts supported at the waist a light corset will be found very helpful.

The hygienic principle to keep in mind in corseting the trunk relates to the height, rigidity, and fit of the garment. The corset should be low and flexible. It should fit snugly over the hip bones and give support to the lower third of the abdominal wall, exerting a force upward and backward. In no case should the corset be permitted to compress the waist or lower chest. It is important in this connection to emphasize the value to the wearer of the corset of standing away from the corset and not permitting herself to hang on the corset as a support.

Unfortunately, men of the present day are victims of a custom in clothing that is injurious in a similar way as is the corset for women. Discarding suspenders for supporting the trousers, men today in large numbers wear belts. Because the trousers are often cut high to complete the dressing joint with the vest, the belt is tightened around the waist. This causes an undesirable constriction. It is important, therefore, if a belt is worn to support the trousers that the bearing of the belt come on the hip bones of the pelvis and not above. An observation of the position of the belt in laborers doing heavy work, such as trenching, will indicate the superior value of the low position.

All tight and constricting clothing should be excluded if one seeks to secure maximum health and efficiency. Garters worn around the legs will, if too tight or if worn above the knee especially, constrict the blood-vessels and impede the venous return. The growing practice among women of having garters attached to the corset or underclothing is admirable in this connection, but it should be remembered that the point of attachment should be at the side of the hips rather than in front. The front pull exerts a traction upon the pelvis tending to produce an increased lumbar curve, or hollow back, with all the attendant ills and discomforts. For men, the usual garter to support the socks is not bad if not worn too tight. The sense of freedom and exhilaration that comes at times when, in sport or camp costume, one omits the usual garter, is an indication of the value that would come by the provision of a support for men's socks that would be practical and yet not constricting.

Collars should never be worn tight enough to constrict the surface blood-vessels of the neck. Headaches not infrequently result from tight collars. It is advisable for men to wear a collar $\frac{1}{4}$ inch larger than the size of the shirt band.

Socks and stockings should be large enough to permit free movement of the toes. It is important to change them frequently, especially in summer. When tired, it is very helpful to change the shoes and stockings. Bathing the feet after fatiguing work is very refreshing. If there is excessive perspiration of the feet with an offensive odor, it will be found helpful daily to bathe the feet in cool water, dry, and dust on the feet a powder of salicylic acid 1 part and starch 4 parts. One may use to advantage a powder of equal parts of alum and talc. This powder should be dusted also into the socks or stockings, which should be put on fresh every day.

Elimination of Body Waste by the Kidneys.—The kidneys are two glandular organs that remove from the blood excess water and waste materials. About 3 to 4 pints of water are removed daily. The waste is in the form of urea, uric acid, creatin, creatinin, phosphates and sulphates of calcium, sodium and potassium, together with other complex chemical compounds. Efficient action of the skin makes less strenuous the demands upon the kidneys. The waste materials removed by the kidneys are chiefly the end-products of protein metabolism. Diets rich in protein increase the work that the kidneys must do. Urea is increased with muscular exercise; with a decrease in the normal action of the kidneys, the urea in the sweat is increased.

Keeping the Kidneys Efficient.—There should be proper care of all the following factors influencing the kidneys:

1. Rational diet: The body should not be overburdened with protein, and particularly nucleoprotein food. Inadequate combustion, with greater waste, results from overeating (especially of protein), just as inadequate combustion with clinkers results from putting too much fuel in the furnace. This waste in the body must be removed by the kidneys.

In addition, it is to be remembered that irritating foods and highly seasoned foods are undesirable.

The need for keeping the protein and particularly the nucleoprotein content small has been mentioned. Meats should not be eaten more than once a day. The difference chemically between the red and white meats is in the greater amount of purin bases yielded by the former; the important point, however, is to keep the total protein intake below 100 grams daily.

2. Sufficient water must be drunk to keep the kidneys flushed out, to dilute the waste, and to prevent the irritation that results from the concentrated urine. At least one glass between each meal, one with each meal, one before retiring, and one on rising in the morning, should be taken.
3. Free action of the skin: Exercise, prevention of chilling the body in winter, and appropriate light clothing in summer are important.
4. Exercise: The exercise should not be too severe. It has been found that vigorous athletics produce an albuminuria, but whether it is transient or represents a permanent injury to the cells of the kidneys is not known. It is important to observe moderation in athletics.

Injury of the Kidneys by Disease.—Because the kidneys are eliminative organs it falls to them to act as poison and toxin removers during disease. It is, therefore, a prudent act and often a vital matter to protect the kidneys during disease, and more intelligently, to prevent the disease, if possible, and to avoid the risk of renal injury. The kidneys are liable especially to injury in scarlet fever, typhoid fever, malaria, and in all the infectious diseases. One imperative reason for relying on medical skill at these times rather than on the unscientific and banal pathies, is to forestall kidney disturbance by accurate diagnosis and preventive treatment. Figure 30 shows Bright's disease a prominent cause of death, more fatal than cancer.

Kidney Remedies.—"Kidney troubles" are frequently treated by means of patent medicines. This happens because of the prevailing ignorance regarding the physiology of the renal system, and the lack of understanding of the kind and nature of renal disturbances, combined with the tendency to expect pills, decoctions, and mixtures to restore diseased tissues to normal condition.

In the first place it should be pointed out that kidney disease does not, as a rule, cause a pain in the lower back. Lumbar pain in women is more frequently due

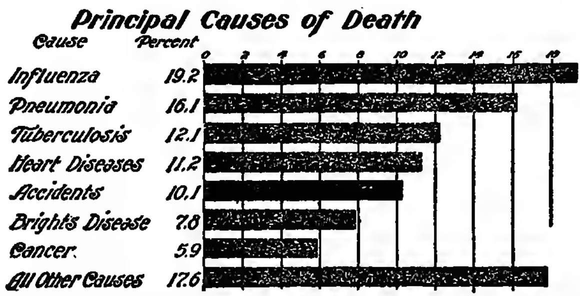


Fig. 30.—Principal causes of death, adult male lives, 1917 to July 1, 1920. (By courtesy of The Prudential Insurance Company of America.)

to displacements of the uterus or disturbance of the tubes or ovaries; in both sexes pain in the lower back is not infrequently due to weak or flat feet and to improper shoes.

Again, it should be remembered that the bladder is only a receptacle for the secretion of urine. Painful or burning micturition does not represent kidney disturbance, but usually represents an inflammation of the bladder that may be due to infection or to irritating substances eliminated by the kidneys.

An illustration of the fraud and quackery in patent medicines of the kidney-cure type is exhibited in the parallel (Fig. 31) of the advertising claims made by the manufacturers of Swamp Root in England and in America. The British labels are the same as those used in this country before the Federal Food and Drugs Act. This change therefore does not represent any inherent honesty in the manufacturing concern, for it is still falsifying on the British labels.

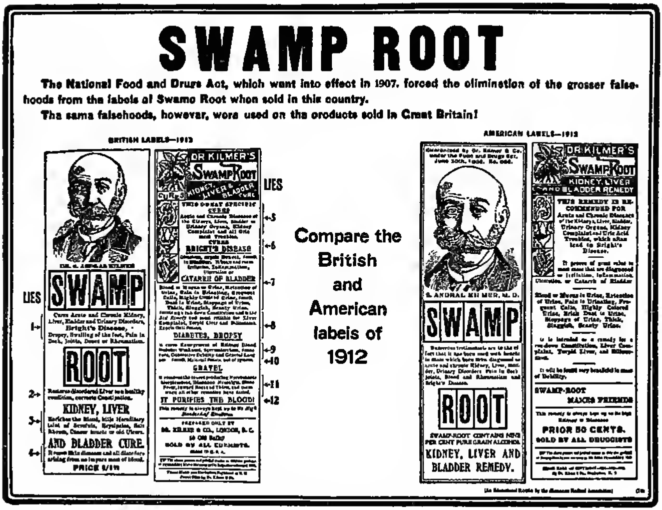


Fig. 31.—In Britain Swamp Root is a cure, in America it is a remedy. Lying on the trade package is permitted in Great Britain. (By courtesy of the American Medical Association.)

The general value of testimonials used by the "patent medicine" business is indicated in Fig. 32. Doan's Kidney Pills are widely advertised, with similar endorsements—*i. e.*, those of persons dying of kidney disease.[1]

Treatment of kidney disease must be based upon diagnosis of the condition present. When physicians who have given years to the study of disease, who have

[1] See Nostrums and Quackery, vol. ii, pp. 186–191, American Medical Association, Chicago, 1921.

at their command the chemical laboratory, microscope, and x-ray, still find it exceedingly difficult at times to determine the exact condition, how absurd it is for one to make a self-diagnosis and to prescribe patent medicines. The kidney may be affected with tuberculosis, with tumor, with stone formation, with infection of common pus organisms, with degenerative changes as in Brights' disease, as well as other serious and subtle

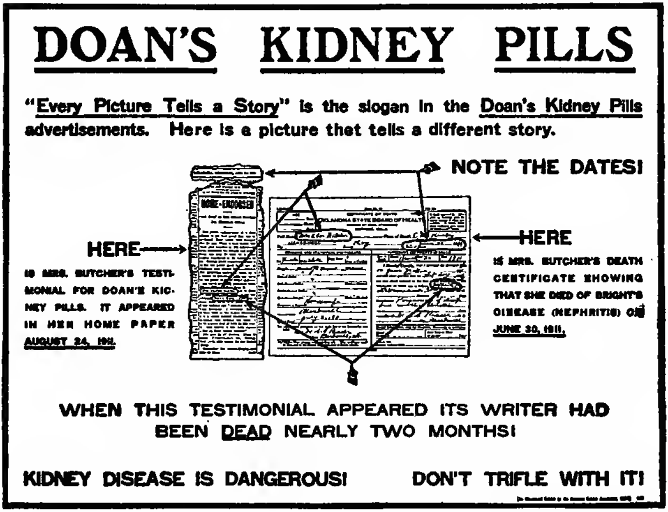


Fig. 32.—Testimonials as used by patent medicine manufacturers are usually worthless—those from the tomb particularly so. (By courtesy of the American Medical Association.)

disturbances. Health of the kidneys is to be restored only by intelligent care in medical examination, diagnosis, and treatment, and not by resort to guess work, faith, and mysterious drugs.

Medical Examination.—As stated before, intelligent care of the human body would provide at regular intervals examination of the body. This advocacy of periodic medical examination is justified by the early detection of kidney disturbance. Diseased kidneys may serve for many years if proper measures are followed in diet, exercise, and general living conditions. The great increase in middle age of deaths from kidney disease represents in part the lack of personal hygiene among many persons, but also the absence of any well-organized periodic examination.

The sort of work being done by the Life Extension Institute, Inc., typifies what is needed everywhere, and the kind of service, expert and medical, of which persons should avail themselves.

The periodic medical examination that leads to correction of errors in diet, exercise, living and working conditions, may prolong active and vigorous life much beyond what we are accustomed to. Old age is a relative term. Some persons die of old age diseases at forty years; others live happily at sixty or seventy. Scientific medical examinations at regular intervals are the beginnings of intelligent care of the body.

Intestines as Organs of Elimination.—In addition to the waste eliminated by the skin and kidneys the waste of undigested food is removed by the intestines. In the former the waste comes largely from the action of the body cells; in the latter it comes chiefly from food.

Food material passing through the alimentary tract is digested, and the digested foods are absorbed into the blood-stream. The undigested waste material left behind passes along the intestinal tract to be removed from the body at periodic intervals. The movement of the contents of the tract is facilitated by a rhythmic contraction of the muscular walls of the intestine. This is called peristalsis. Peristalsis is favored by exercise and by the presence of food in masses that stimulate the rhythmic contractions. The importance of food not highly concentrated, but with some waste, such as found in green vegetables, is to be recognized in this respect.

The lack of proper peristalsis and inadequate action of the intestines produces a stagnation in the tract and a condition of infrequency or irregularity in bowel action, called constipation. There are many different causes of constipation, some congenital or anatomic, others purely hygienic.

Causes of Constipation.—1. Visceroptosis—a dropping down of the viscera of the abdomen is due often to bad posture. Frequently it is associated with general bodily weakness resulting from prolonged or serious sickness, but often it results from laziness and lack of proper exercise.

2. Lack of tone is found in children without enough vigor to produce peristaltic movements; it is a characteristic condition in nervous cases and neurasthenic individuals. Constipation is constant among mental patients in institutions.

3. Chronic appendicitis is associated with constipation.

4. Lack of exercise: Sluggishness of the circulation and general nutritive processes, associated with physical inactivity, are prominent as causes of constipation.

5. Improper diet: Man has an alimentary tract developed in relation to certain foods in the intestines. The foods that have played a part in determining the nature of the human intestine have been coarse foods and, therefore, a concentrated diet, refined and too easily digested, is unsuited for its action. The day will not soon come when man, for any appreciable length of time, can live fully and completely on refined food, or powdered food, or liquid food.

6. Pressure of unhygienic clothing as a cause, was formerly more important than it is today, but it should be stated that constriction of the waist by the belt or corset should not be tolerated.

7. Lack of sufficient water: Too little drinking of water is a frequent cause of constipation.

8. Lack of habit of emptying the bowel: The daily habit of emptying the bowel at a regular time should be developed and rigidly followed. This is very important in the training of children. The most favorable time;

both as regards the physiologic states of the bowel and the organization of the day's program, is immediately after breakfast. It should be mentioned in this connection that a very common cause for unsatisfactory results at this time is improper height of the toilet seat. It is usually too high. An ideal seat would place the body in the position naturally assumed by man in primitive conditions. The seat should be low enough to bring the knees above the seat level. This may be accomplished by placing the feet on a small box.

CHAPTER XI

THE HYGIENE OF THE NERVOUS SYSTEM

I. The Nature of the Nervous System.
II. Factors of Importance in Maintaining the Health of the Nervous System:
   1. Harmony of Action Between Cerebrospinal and Autonomic Systems.
   2. Relation of Training to the Health of the Nervous System.
   3. The Significance of Defective Inheritance in the Nervous System.
III. The Normal Mental Life.
IV. Worry:
   1. Worry Over What We Have Done.
   2. Worry Over What We Are Going to Do.
   3. Worry Over the Opinion of Others.
   4. Worry Over Health.
V. Development of Wholesome Mental Habits:
   1. Confidence.
   2. Faith in the Goodness of Life.
   3. Openmindedness.
   4. Unselfishness.
VI. Insanity:
   1. Types of Insanity.
   2. Causes of Insanity:
      (*a*) Syphilis.
      (*b*) Alcohol and Other Poisons.
      (*c*) Physical Diseases.
      (*d*) Mental Habits.
VII. Alcohol and the Nervous System.

The Nature of the Nervous System.—The nervous system is an organization of stimulus-receiving and stimulus-sending elements. In simple one-celled organisms a stimulus is carried to all parts of the cell without the use of a special mechanism. In the human body, however, there is a highly developed system of conducting nerves and co-ordinating nerve centers. In fact, there are two closely allied systems, the cerebrospinal and the autonomic,[1] engaged in relating the individual to his environment. The former is concerned with voluntary movements; the latter with the involuntary movements and actions—types of activity associated with the involuntary muscles and the secretory glands. There is another interesting and important characteristic difference in the two systems: the cerebrospinal is concerned with the receptive, cognitive, and will aspects of life, phases represented by the large sense experiences that occur, by the understanding and interpreting of stimuli, and by the planning and purposing that precede the ultimate desired goal of the voluntary act, always an act of will; the autonomic, on the other hand, is concerned almost entirely with controlling the processes that maintain automatically the life of the individual. Some of these (autonomic) processes are protective, some deal with the transformation of energy, others with certain emptying mechanisms—all, however, are associated with the action of involuntary muscle in blood-vessel, heart, intestine, or other organ and with secretory cells.

The cerebrospinal nervous system may be said to consist of brain, spinal cord, and nerves that lead to and from both brain and cord. The nerves coming to and from the brain are associated almost entirely with functions located in the head, such as sight, hearing, the use of the tongue, the sense of smell, and so forth, and are called cranial nerves. The nerves coming to and from the cord are associated with the skin and muscles of the body, and are called spinal nerves. It is to be noted that the phrase *to and from* is used. This use relates to function and not to structure. Thus it is that certain nerves carry incoming currents or stimuli and are known as *afferent nerves;* others carry outgoing currents or stimuli and are known as *efferent nerves.*

The afferent nerves carry to the brain either directly

[1] Langley has suggested "autonomic" for the old term "sympathetic," as applying to the part of the nervous system in control of the involuntary muscles and secretory glands.

or by way of the cord stimulations from the skin, muscles, or other distal parts; the brain receives this stimulation, reacts in accordance with its character, and then sends out an impulse over the efferent nerves. No act may be considered completed until the entire circuit is made and the stimulus received has been responded to.[1]

The stimulations or impulses that pass over the efferent and afferent nerves travel over units in the nerve structure that consist essentially of a cell body with a number of branching processes. The message does not travel over a route like a telephone message, but at a number of places the route is broken and the message must transfer from one unit of the system to another. At many of these breaks in the course of afferent or efferent mechanisms a choice of routes presents itself. Which unit shall be chosen to carry the message? Now all that we do in education or in training of self relates to the selection of routes, to the formation of pathways in the brain and cord. Many connections are made that are not serviceable—they are discarded. The successful ones persist and habit forms to bind finally in firm bonds the individual, limiting and defining the range of activity for all time. Habits may be changed when they are "young"; on the other hand, it is often impossible to change habits that have been formed for years. There are exceptions, though, and by the force of a great emotion, or strong impelling ideals, the individual may with constant care entirely change the extent and character of his habits.

The autonomic system is associated with the digestive, nutritive, excretory, and secretory functions of the body.[2] Structurally it consists of groups of nerve tissue bound together into the chains that lie in front of the vertebral column (Fig. 33). By means of nerve branches they con-

[1] The response may be inhibition of visible activity.

[2] Timme, W.: The Autonomic Reciprocal Activities of Brain and Viscera, Journal American Medical Association, January 23, 1915.

nect with other masses of nerve tissue, plexuses situated in the neighborhood of different organs.

These two systems, the cerebrospinal and autonomic, are closely associated in activity. In fact, the health

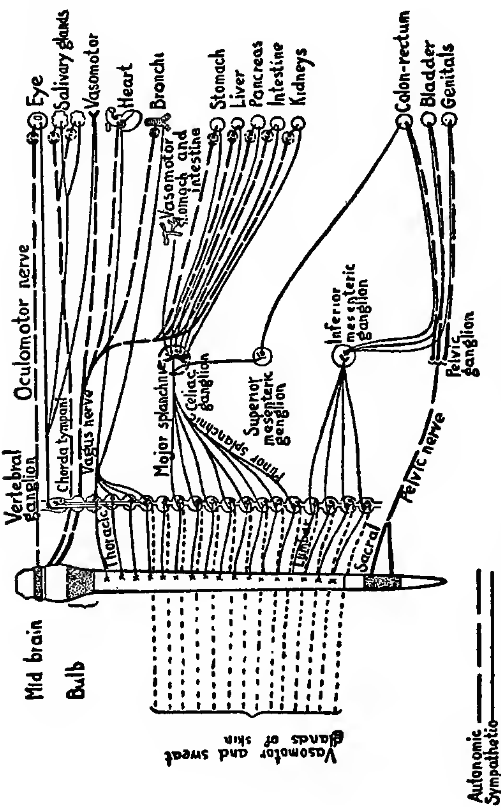


Fig. 33.—Diagram showing the autonomic nervous system with the sympathetic portion indicated. Today the term "autonomic" is used to include the cerebral part, the sympathetic (thoracicolumbar), and sacral divisions.

of the individual is dependent upon the maintenance of a proper balance of activity between the two and a certain co-ordination and harmonious action.

Factors of Importance in Maintaining the Health of the Nervous System.—Some parts of the human body are older than others in the sense that they have undergone less modification in the process of evolution. Other structures may be considered as quite new. Thus the nervous system with its elaborate modification of the brain of man represents comparatively a recent achievement in organic evolution. Nevertheless, the nervous system embodies the whole story of human development, and, because of this fact, it exhibits in many of its reactions the primitive responses of the race.

The autonomic system is associated with the functions concerned in the maintenance of life. It is also connected with the whole emotional life. Cannon[1] has very clearly written of this relation of the emotions and has stated with scientific accuracy the fortifying mechanisms that are brought into play by the action of this system. Probably all cerebrospinal activity involves some excitation of the autonomic system. The two systems are so closely related that for many purposes of psychology they are considered as one. For interpretation of health values it is important to indicate some of the essential factors that are to be considered by those who are seeking to live at the optimum point.

Harmony of Action Between Cerebrospinal and Autonomic Systems.—The health of the nervous system and, indeed, of the body as a whole, depends upon a nice adjustment of the work to be done by the two systems. Overuse of either one or improper use produces characteristic results.

A marked tendency in organic evolution has been the elaboration of the cerebral hemispheres. The effort has been directed toward central development. The necessities in education and in economic life have made the cerebrospinal a superior instrument for securing satisfactions in life. The autonomic nervous system,

[1] Cannon, W. B.: Bodily Changes in Pain, Hunger, Fear, and Rage, D. Appleton & Co., New York, 1915.

of supreme importance to the Pleistocene man, is today in a secondary position as regards social uses, needs, and duties.

This tendency has led unquestionably to a glorification of the cerebrospinal, so that in education, in business generally, in industry there has been little appreciation of the place and the importance of the autonomic nervous system in the life of man. It has produced the scholar who sneers at the physical basis of neural elaboration, the monk who seeks to give spiritual guidance by living a more or less ascetic life; it has evolved the scholastic system that omits from the educational curriculum the play life of the child. Historically, this tendency has given us, as Hetherington suggests, asceticism with its degradation of the body, scholasticism with its contempt of the physical, and Puritanism with its hatred and fear of play, self-expression, and drama.

Fortunately for man there is a growing appreciation of the importance of the autonomic system as a groundwork and foundation for the cerebrospinal. The great increase in nervous diseases, in nervous breakdowns points the way to a new emphasis. The basis of life must be made secure. The whole tendency of civilization, with the tremendous growth of industrialism and the factory system, with the exhaltation of "system" and "efficiency" as guides in production, is to cut straight across the essential biologic needs of man, the organism. The neurasthenic, the "shell shocked," the nervous woman, the irritable man are persons who have taken on cerebrospinal activities beyond their capacity for accomplishment.

They need relief from the demands of the environment. As Weir Mitchell taught, "They need rest."

Fundamentally, the cause of this maladjustment is twofold. One factor is an inheritance of nerve tissue of poor quality. The fact that some individuals break, others do not, is a familiar one. The other factor is the philosophy of the century. To get ahead, to succeed, to become a captain of industry, to achieve the maximum production of wealth—these guides lead to nervous breakdowns and moral disasters.

The superiority of life on the cerebrospinal plane to life on the autonomic level is unquestioned. We can never justify a mode of living with health as the end of life. To develop the cerebrospinal system to its maximum point is the only acceptable ideal, but its foundation must never be forgotten. Socrates or Newton, Gladstone or Roosevelt, the common man himself, garbed though he be in his own heart as a modern Galahad in search of the Grail, will always need a generous participation in play, recreation, and physical work sufficient to keep the physical organism fit and ready to serve the cerebrospinal system to its best development. One who seeks to live most and to serve best will be guided very largely by this balance of systems. The great ideals of achievement and of service should rarely mean slow suicide; he only is fit to serve who keeps himself at his best.

Relation of Training to the Health of the Nervous System.—It is recognized that one may inherit a defective nervous system just as well as a defect of the skin, skeleton, or musculature. Nature passes on to the offspring the kind of characters the parents possess. This fact is immutable. Unfortunately, recognition of it serves as an explanatory excuse for much undesirable and unhealthful nervous response that is due to improper training. Not infrequently bad disposition, moods, temper, or irritability in the child are explained or excused, as the case may be, by the presence of similar traits in the parent. This explanation is based upon a belief in the hereditary transmission of the characteristic concerned. It is important, therefore, to evaluate the evidence in the matter and to determine the significance of training in the development of a harmonious well-balanced nervous system.

Bergson states one view of the problem: "Each of us, glancing back over his history, will find that his child-personality, though indivisible, united in itself divers persons which could remain blended just because they were in their nascent state: this indecision, so charged with promise, is one of the greatest charms of childhood. But these interwoven personalities become incompatible in course of growth, and, as each of us can live but one life, a choice must perforce be made. We choose in reality without ceasing; without ceasing, also, we abandon many things. The route we pursue in time is strewn with the remains of all that we began to be, of all that we might have been."

This states the problem as regards the nervous system and such matters as "nervousness," "fears," "moods," attitudes, bad tempers, etc. The child who fears lightning and thunder probably expresses this instinct of fear because the parent was afraid also in the presence of the child.[1] Intelligent response by the parent would in many cases prevent an instinctive response by the child. The bad disposition in the child means usually bad disposition in the home. That is, we are dealing here with the effects of training; we are not dealing with biologic characters that are immutable.

It should be remembered, also, that bodily states often determine mental and emotional reactions. James says, "Our moods and resolutions are more determined by the condition of our circulation than by our logical grounds." This has its bearing and should receive consideration. It is quite in harmony with James' theory of the emotions. But, indeed, the identity of bodily states and emotions, both as responses to a situation, renders another aspect important. Mental and emotional states are so closely associated with the physical expression of them that even the posture has influence on the way one thinks and how one feels. One with a

[1] There is not complete agreement on this point. See Thorndike, E. L.: Educational Psychology, Vol. I, pp. 57–68, Teachers College, 1919.

depressing mood may speak hopefully and act happy; and presently the emotion of joy will come. Thus for health and happiness it may be essential to cultivate the power to replace moods, to rise above the depression of the moment by act of will.

The health and happiness of the individual are intimately bound up with the sort of habits and attitudes he develops and holds. Education should give all an equal opportunity to form proper habits and to develop wholesome attitudes. This does not mean uniformity in education, nor will it lead to a level of mediocrity. There will always be the superior ones who achieve, and inferior ones who accomplish little. Both groups may be healthy and happy if proper habits and attitudes are developed. It is important not to feed boys and girls mentally with such fallacies as "All men are created equal." Such an attitude leads directly to social unrest, social inefficiency, social unhappiness. One person is not the equal of another by birth, nor can equality be conferred. Each person is just as "good" as he makes himself, limited, of course, by heredity and environment.

The business of government is to supply equality of opportunity for all before the law, for service and for education. The business of education, as Professor Briggs suggests, is to train each individual to his maximum, to learn to do better the things he would probably do anyway.

This means definitely as regards one's nervous system that one should not try to do work beyond his ability. An individual with C grade intelligence in a position requiring B grade intelligence is a failure. Socially he is inefficient; individually he is unhappy, and with reference to his nervous system extremely unhealthy.

To gain wholesome attitudes concerning home relationships and worthy use of leisure, to hold vocation and avocation in proper relationship, to develop desirable social and moral qualities, breadth of view, scientific appreciations, are the foundations of health of the nervous system. Skill, honesty, diligence, spirit of sportsmanship, courage, self-control, faithfulness, loyalty to high ideals, interest in and love for play—these are the result of training,[1] not of birth.

Within certain limits anyone may determine the kind of nervous system he will have. He may control worry by steadfastly refusing to worry over little things; he may avoid fears by early abstinence from all indulgence of fear; he may surmount an irascible temper, moody disposition, or introspective manner by constantly seeking early and at all times for controlled expression, cheerfulness in life, and the needs of others.

The Significance of Defective Inheritance in the Nervous System.—The most favorable training will not compensate for defects in nerve structure. Numerous examples can be given by clinicians of types surviving the stress and strain of life's problems in a favorable environment, that break completely when subjected to unusual and too severe demands. Many miscalled "shell shock" cases of the World War testify to this fact. It must be recognized that many expressions of bad temper and bad disposition, as well as bad politics, bad economics, and bad sociology are due to defective innervation that cannot in the present organization of society be prevented easily. Numerous instances of this state of affairs occurred during the preparedness campaign in America before the war and continued even during its progress.

Frequently the conscientious objector and pacifist are individuals with defective nervous systems whose position is one of personal apology for their own inadequacy. For some, pacifism was a philosophic doctrine with rational background in their individual lives before the war. For many it served as an excuse for their own inability to meet the demands of the social environment. Usually the pacifist in war times is the most militant of

[1] See Atlantic Monthly, July, 1921, an article by Theodore Knappen on the Morain Park School, Dayton, Ohio.

persons in peace, fighting lost causes, posing as a martyr, intensely antisocial; even with members of his own family his relations are often strained. According to his own statements he is frequently misunderstood.

The pacifistic philosophy even when held by those of sound nervous system is frequently so short sighted that it cannot see the larger goals beyond the immediate, insistent difficulties that must be met. The attitude of such people is similar to the one held by numerous persons to whom the operating-room of a hospital is a place of horrors where hideous things are done to living bodies with sharp knives. They even regard the surgeon as a monster of callousness because he can do such work without repulsion.

The normal mental attitude toward difficult affairs of life sees through the dangers, the strains, and the uncertainties to the distant goal, the desired end. Thus, one would not view war nor operations as ends in themselves, but only imperfect means to other ends more worth while than the conditions which provoke the war or the operation. Until humanity has evolved among men better procedures than those represented by the gun and the knife, injustice, slavery, and cancer must be met with the tools that are serviceable. The normal life will be prepared to meet crises. When the crises come, and the stresses and strains weigh heavily, then habits of clear thought, attitudes of social responsibility, of honesty in facing problems, and of meeting them squarely, will be sane guides and counsellors.

The Normal Mental Life.—The normal mental life flows from states of satisfyingness. The healthy state of mind is satisfaction with life. Mental activity that is hurried, driven, anxious, or depressed, that is charged with "long-range apprehensions," fears, worries, is distinctly injurious to health both of mind and of body.

Now the healthful mental state can be developed just as surely as big muscles can be. The process is neither so simple nor so easy, but it is not too much to say that most persons can so direct their thoughts and so order their lives as to attain, gradually, a higher level of control than either their heredity or training would have promised.

Mental training means a training in control, in removal of unwholesome states, and in substitution constantly of wholesome plans, purposes, and satisfying interests.

Worry.—The most common form of abnormal mental functioning is called worry. It represents a situation that has been created by civilization with its many "long-range apprehensions," fears, and outcomes. It requires the direct cultivation and development of a mental quality that will offset, neutralize, and render harmless the tendency to worry. We cannot put man back to the state of the lower animals where only immediate danger provides a stimulus. The food-supply next month is of no concern to a cow or a camel, it is to man; the length of tail or glossiness of fur amounts to nothing at all in the immediate jealousies and quarrels of the fox, appearance does in man; the wildness in a young colt does not cause the sire or dam to lose sleep, it does in man.

With man, then, the elaboration of the cerebrospinal nervous system has brought into the field of mental activity fears and anxieties that cannot be met at once; they have "long-range" quality.

Now to such situations there must be presented a philosophy of life, a point of view, a characteristic reaction that will enable the individual to meet the problem, whatever it may be.

It must be clear at the outset that a wholesome mental attitude cannot suddenly be acquired. It can never be a gift; it is always won. It comes by persistent and conscientious effort to see straight, to keep the values of life clear.

Worry may be better understood by analyzing it in the common groups in which it most often occurs. They are: what we have done, what we are going to do, what people think of us, and our health, mental and physical.

Worry Over What We Have Done.—Worry over some work that was done badly or some act that should have been omitted is a very common form of worry. It is tied up with the third form of worry, the opinion of others, because we see the social judgment upon the act or work more than our own cognizance of its impropriety or inferiority. Now one can lessen worry about what one has done only by reflecting briefly, "What is done, is done." The mistake should be a lesson and not a subject for regrets and recriminations. The experience may be made a stepping-stone; worry over it makes it a stumbling-block.

The present and coming generations will have increasing need of a philosophic faith that will lead from mistakes and failures to calm, clear resolution rather than to incoherent, aimless wanderings of the mind. This generation shows its need for help along this line. The faith of our fathers is not strong today. "The Everlasting Arms" do not appear to be "underneath" bearing up the sojourner in life's whirlpools or recesses. The constant invention of new religions indicates the demand. There is a turning to Christian Science, to the Higher Thought, to New Thought, to Psychotherapeutics, to Occultism, to Spiritualism—even to Epicureanism (let us eat and drink, for tomorrow we shall die). These may be effective for simple minds in need of formulæ; the intelligent soul will face the mistake, the act and its consequences, and will say, "It's done, but because it's ignoble or because it's muddled, or because it's unwholesome, it shall not be done again." No need for hocus pocus here. Break your best china—then think of a lovely rose? No! Such formulæ are only for those weak spirits who would never be interested in achieving intelligent control in life anyway.

The psychologist is helpful with this type of worry. He tells us that the mind is so constituted that a morbid memory cannot be driven out by repeating, "I will forget it." *One thought can only be driven out by another.*

The stream of consciousness is a stream and is always flowing. Selection of a proper subject for mental examination or engaging in work of an interesting kind will replace the undesirable worry with an acceptable activity. This choice must be conscious, intelligent, and directed.

This form of worry is seen in its simple manifestations among those who get up to unlock the door to make sure they locked it. Better is it for one to allow a burglar to carry the entire house away than to subject one's nervous system to such activity.

It is important to give thought to the morrow, but one should practice doing carefully what one has to do and then dismissing the matter from the mind. The danger of losing mental health must be set over against the cost of leaving the gas burning in the hall, or the door unlocked, or the possible errors in the final examination.

Worry Over What We Are Going to Do.—Worry about a task that is to be done is destructive of the power to do the task well. Here again substitution is important. One should substitute work on the task for the useless fear—whether one has sufficient ability for the task or not. To size up the work, to decide to do it, and then to start is the beginning of successful accomplishment. One should avoid spending too much time deciding what to do. A proper amount of attention should be given to consideration of the thing to be done, and then —one should pounce upon it. A mistake may be made; others make mistakes. Important questions have been and probably often will be decided wrong.

The young person who worries about success prevents himself from succeeding. The whirling, interesting present moment is the treasure to grasp. The yesterday with its failures, the morrow with its unknown, are to be passed by. Life is here and now. One who exists now only to live at some future time misses the great opportunity. The training one puts oneself through is life, not a preparation for life. This very moment will never come again. Even now it is gone. The hand that writes, the eye that sees this line cannot bring it back. Here and now is life—fill it full of "work, of play, of love, of worship."[1] The summum bonum is Happiness.[2] Not the base kind that smacks of race tracks, wine, music halls, and commercialized vice. But rather the kind that Saleeby speaks of,[3] "There is no human end but happiness, high or low. Its one absolute negation is neither poverty nor ill-health, nor material failure, nor yet starvation—'he that is of a merry heart hath a continual feast.' The one absolute negation of happiness is worry or discontent. A prosperous society consisting of strenuous worried business men who have no time to play with their children, or listen to great music, or gaze upon the noble face of the sky, or commune with the soul . . . of which another poet, Wordsworth, said that it was 'like a star that dwelt apart'—such a society may be as efficient as a bee-hive, as large as London and as wealthy, but it stultifies its own ends, and would be better not at all. 'Better a handful with quietness than both the hands full with travail and vexation of spirit.' " We might well say of happiness as Emerson said of the beautiful, "Though we travel the world over to find the beautiful, we must carry it with us, or we find it not."

Worry over what we are to do may take various forms. At times it will be directed at vocations; at other times it is greatly exercised over the problem of marriage. These are important problems. They are not to be solved out of hand, nor do they admit of continual analysis.

[1] Cabot, R.: What Men Live By, Houghton Mifflin Co., Boston, 1914.

[2] Henri Poincaré starts one of his recent books with the remark that the chief aim of man is to search for truth. Truth and happiness are very much akin when truth in concrete forms is directed in the service of man and happiness remains truthful, free from sham, and the similitudes of mere smiles.

[3] Saleeby, C. W.: Worry, Frederick A. Stokes Co., New York, 1907, p. 22.

To find one's best work where the tasks will have meaning and the compensations are paid in happiness and joy is not easy. But worry over the outcome of a vocation prevents any careful study of the vocation, its special requirements, its fields of opportunity and responsibility. The choice of a life mate causes less worry as a rule than the choice of a vocation because the former is so often an emotional act rather than an intellectual judgment. The worry comes more often *after* the choice has been made. More intelligence and less emotion before and less analysis and more love after marriage would probably decrease if not entirely eliminate worry in this field.

Worry Over the Opinions of Others.—A friend of mine keeps on his desk a card index of data that he is constantly using. Under the section C he has a card headed "Criticisms." There he has written from time to time criticisms of his work, his manner, his personality. Some have been very helpful; others have been silly—in his judgment. The only intelligent response to others' opinions is to be thankful for the criticism. If it is good, use it; if it is silly, throw it into the waste basket.

The danger to mental health of being sensitive to criticism cannot be overstated. Most persons do not appreciate the mental damage that comes from nursing a slight or mulling over in the mind a fancied wrong. One should avoid moods and poutings as one would the plague.

If someone has spoken unjustly, unfairly, one should classify the criticism as foolish and the critic as unreasonable and *forget it.* If the criticism is a just one, one should swallow one's pride, bow the knee, and *learn.* It is not a question of courage, it is a question of perspective. As Theodore Roosevelt[1] would say, "It is a question of the major interest driving out the minor interest."

[1] Robinson, C. R.: My Brother, Theodore Roosevelt, Chas. Scribner's Sons, New York, 1921, p. 274.

Women need to be particularly alive to this matter of criticism. All sensitive natures must cultivate the unheroic and commonplace. One cannot with any safety indulge in the melancholy pleasure of playing the martyr. I know a woman who always seeks out difficult and burdensome tasks, so she can say afterward, "Oh, how hard it was! No one knows how I have suffered." For such there is no mental poise, no happiness at all until the relation of self to the world has been adjusted.

Worry Over Health.—It is important to form the habit of taking the health of mind and body for what it is and making the best of it. True, if the condition can be improved, the most careful and scientific care should be used to restore it entirely. But useless fear and worry not only prevent the development of the best health, but, indeed, produce disturbances that are quite distressing.

Whenever the activity of the cerebrospinal system flows over into the realm of autonomic control a precious balance and harmony are disturbed. The nutritive processes of life are designed to go on without conscious direction. The beating of the heart, breathing, digestion, peristalsis, liver activity, excretion, and other functional activities are controlled by the autonomic system and spinal cord. The higher centers should at no time be conscious of them or concerned about them. Saleeby[1] says, "Those bodily processes and functions which are under the control of the lower levels of the nervous system are best performed when those lower levels are left undisturbed by orders from above. This is true not only of such functions as sleep and digestion but also of other functions which, at one time in the history of the individual, have required the most direct and painstaking efforts of conscious attention."

Functional diseases of the nervous system are frequently caused by worry. Both hysteria and neurasthenia result from worry. The following question and answer

[1] Saleeby, C. W.: Loc. cit., p. 33.

from Dr. Evans' column in the Chicago Tribune[1] illustrate a case of neurasthenia and suggests in the last sentence of the reply the reason for the development of Christian Science and other religious cults.

MENTAL HELP IS NEEDED

Hopeless writes: I have doctored ever since I was five years old. At that time I had typhoid fever and pneumonia. It left me with nervous trouble and which I have tried hard to overcome. I cannot go any place because I get nervous. It seems to work on the stomach. There is a beating and I always feel as if I have to vomit. Do you think exercise will help, such as swimming and tennis?

REPLY

Taking medicine will do you no good. You are a neurasthenic and you suffer from anxieties and fears. You can be cured, but it will take time. It is a matter of mental and social training. If you get in the line of such training and have the patience and perseverance to stick, you can win. There are bushels of religions, philosophies, cults, and such suited to just your kind of people.

The emotional person will often require a symbol, creed, or formula by which to guide life; the person with matured intelligence, with rational guides, will not require any hocus pocus, but will, by volitional power, force himself to think properly, to control emotions, and to banish fears. The neurotic person who is unable to or does not desire to heal himself should in every instance engage the services of a scientific physician who commands the respect of the patient by the power of his personality.[2] Psychologists recognize this power and call it suggestion. The skilful physician uses suggestion in functional disturbances. Such a procedure for the neurotic will secure the service that a magic cult would give and, in addition, it would provide that medical care which will be needed in the advent of a real organic disease.

Worry over one's health leads inevitably to increased

[1] Chicago Tribune, Aug. 23, 1921.

[2] It would appear that Dr. Evans could have served Hopeless better if he had been in a position to recommend a physician.

disturbance of body functions. Hysteria, neurasthenia, hypochondria, with its many fears, are matters of gradual growth. They are not suddenly developed out of hand.

One who allows oneself to worry about small matters, who expects heart disease or deafness from every sore throat, is laying a foundation in abnormal mental reactions for unhappiness and ill health.

Development of Wholesome Mental Habits.—It is quite possible for many persons to develop wholesome mental responses and for many to achieve a higher type of control than the usual and customary. The secret lies in holding even, in unimportant situations, the unemotional, sane, intelligent attitude. Saleeby[1] says, "It is pre-eminent necessity for the irradiation amongst the people of that fine temper, half philosophic, half religious, half intellectual, half emotional, half rational acceptance, half faith—the faith of Socrates that to the good man no evil thing can happen—the temper that possessed the soul of Wordsworth, who, whilst others were distressed, disheartened, at the betrayal of a patriot, addressed him in these great words:

> " 'There's not a breathing of the common wind
> That will forget thee; thou hast great allies;
> Thy friends are exultations, agonies,
> And love, and man's unconquerable mind.' "

To train oneself in small things to meet the problems of life is the beginning of that power which in the crises of life will find the owner strong, able, and sufficient. Such training should be begun in childhood.[2] Situations should be met by boys and girls without allowing them to expect the rescuing hand.[3]

A list of wholesome mental traits important for health will not satisfy everyone, perhaps, but the following

[1] Saleeby, C. W.: Loc. cit., p. 2.

[2] Paton, S.: Human Behavior, Chas. Scribner's Sons, New York, 1921, pp. 394–454.

[3] Williams, J. F.: Values of Camping for Girls, Teacher s College Record, January, 1920.

appear significant: confidence, faith in the goodness of life, open-mindedness, and unselfishness.

Confidence.—Confidence in self, in one's power, in the intrinsic value and worthwhileness of one's own personality is essential for the most abundant life. It was the principle that Jesus taught in his insistence upon the love of the Father for each person. This belief in one's power and one's worth lies at the foundation of all worthwhile work and accomplishment.

Experimentally, its value has been determined. Give a subject a puzzle, and if he says, "I don't suppose I can do it," he renders his mind less able to discover the means for its solution. He may even insist that it can't be done. If inadvertently he solves the puzzle, but hasn't learned the process, he will attack it with more confidence. The experience of success increases his confidence.

This fact has significant meaning for education. It suggests one reason for the large number of persons who lack grit, courage, confidence. It corroborates the views of Goddard[1] with respect to the necessity for vocational training and adjustment.

The only way to develop confidence is to try honestly, and to keep at it until the experience of success comes. Reasonable intelligence would prevent selection of work for which one was wholly unsuited, and from which no success to mention could be expected.

Faith in the Goodness of Life.—Faith in the goodness of life, here and now, will be based upon an understanding of man's relation to man and to God. It will not consider this world an evil from which an escape is Nirvana to the soul. Rather it will hold the pulsing moment to be real life in which all that one most desires is enshrined. The devastating war, the serious disease, the broken promise, the unrequited love, are but incidents to the man with faith in the goodness of life, whose

[1] Goddard, H. H.: Human Efficiency and Levels of Intelligence, Princeton University Press, 1920.

course is chartered not by individual suffering, shame, or joy, but by the progress of the race.

What happens to the individual is important, but what happens to the race of man is supreme. Viewing that, one should see with Tennyson—

> "That nothing walks with aimless feet,
> That not one life shall be destroyed
> Or cast as rubbish to the void
> Till God hath made the pile complete."

and with Browning when he sings,

> "God's in His Heaven,
> All's right with the world."

The path to faith in the goodness of life lies among the commonplace every-day affairs of work and play. The exotic, the bizarre, sensational course must be avoided. The simple life, as Pastor Wagner[1] taught, makes for such faith.

Faith in the goodness of life means optimism. It is not the optimism of the Christian Scientist who says that all things are beautiful. Values need not be mixed in that way. All things are not beautiful. Many things are rotten, ugly, and totally to be condemned. Optimism means joy in the wonderful things of life, of which there are many.

Nothing is quite so destructive of real happiness and health of mind as pessimism. Doubt, fear, and self-consciousness are the plague-demons of joy. On the contrary, play, laughter, lack of a dull seriousness are the tonic needed by the jaded nerves of civilized man. Those who can play (and play is a psychologic attitude) live, they burn; others only smoulder.

Bangs' poem of a happy child strikes the note for this faith that is the testimony of poets and the scientific record of physicians:

[1] Wagner, Charles: The Simple Life, McClure, Phillips & Co., New York, 1902.

"I do not sorrow when there's snow
Or rain, or fog, or sleet,
There are more toys at home, you know,
Than out there on the street.

"So whether we have bright sunshine,
Or clouds all through the day,
I never sorrow or repine,
But play, and play, and play."

Open-mindedness.—Open-mindedness and breadth of view make for sanity. The restricted vision, the institutionalized mind, continually clashes with the growing liberalism in the world. It will increasingly clash because asceticism, scholasticism, and Puritanism are meeting everywhere the opposition of minds freed from the traditional. To keep an open mind means to be willing to accept any new proposal, however at variance with established belief or custom, whenever the new presents facts to sustain its contention. The open mind will see the facts, will not close itself off from the facts. It prevents thereby the rigidity of mind so allied to the fixed idea of the insane. Open-mindedness means plasticity of mind, ability to see new relationships, to feel new meanings, to find new values. It makes for variety, interest, and health.

Unselfishness.—Finally, unselfishness as an attitude is to be cultivated because of its wholesome effect on health. It may be warranted on moral and social grounds, but aside from these justifications it lies at the very root of satisfactions in life. Mental growth and mental health feed on satisfying situations. The permanent satisfactions in modern society come from unselfish service to the world. In a primitive society the original instincts for selfish ends would be more satisfying, but today the selfish person erects a splendid isolation around himself, that leaves him, because of the very gregariousness of man, an unhappy, disgruntled, and unwholesome soul.

There seem to be at the very foundation of all wholesome mental life—confidence and belief in self, faith in the goodness of the world, open-mindedness and breadth of view, and unselfishness. To others may appear other values. It is for all to choose. What roads we travel matters very little. That we arrive at our desired goal and that the goal shall be worth while—this is the test.

Insanity.—Insanity is a mental disease with such departures of mental functioning from the normal that the whole personality of the individual is changed. This change is usually gradual. Commonly it is looked upon as sudden, peculiar, and mysterious. Quite the contrary is the case. It is the logical result of changes occurring in the brain, its causes are, in the main, well known, and it comes as a gradual deterioration. Many of the insane in hospitals today might have retained their mental health if they had known the necessary facts and had acted in accordance with them.

In insanity there are two elements involved—the predisposing and the exciting. "The predisposing are the inherited and acquired abnormalities of the individual, while the exciting are to be found in the storms and stresses of life. Of these two the first must positively be present, but not always being evident, it is often overlooked, and it is the second or the exciting cause, itself relatively unimportant, that is held in popular belief, generally alone responsible. Thus we hear of persons 'going insane' from grief and from disappointment, from fear and from shock; but, while it is true that without something of these the disease might never have developed, it is equally true that none of them alone can bring it on. Storm and stress factors enter into the development of practically all mental disorders, both mild and severe, but they are only *factors*, the ultimate causes lie deeper."[1]

Types of Insanity.—The types of insanity are fairly well defined. De Fursac[2] suggests a classification that is used as a basis for the simplification given below:

[1] Platt, C.: The Psychology of Thought and Feeling, Dodd, Mead & Co., New York, 1921, p. 233.
[2] De Fursac, J. R.: Manual of Psychiatry, John Wiley & Sons, New York, 1913.

1. Psychoses based upon defective nervous tissue, called morbid predisposition or constitutional psychopathic condition. In this group are paranoia, manic depressive insanity, obsessions, sexual perversions, and mental instability. Mental hygiene is most important in this group.
2. Psychoses based upon toxic or infectious processes. In the former are alcoholism, morphinomania, and cocainomania, and in the latter, infections such as typhoid, diphtheria, hydrophobia, influenza, and tuberculosis. Personal hygiene is very important in this group.
3. Psychoses based upon syphilitic infection, as seen in general paralysis (paresis) and locomotor ataxia. Personal and social hygiene are important in this group.
4. Psychoses based upon auto-intoxication (Kraepelin's view), such as dementia præcox. This condition occurs usually before the age of twenty-five and rarely after thirty. It follows a poisoning of the body, at times after a severe infection, as scarlet fever, or at other times a disorder of the sex glands seems to be the factor, as indicated by its appearance at puberty or in the female at the first childbirth. Meyer[1] believes that this type belongs more properly with the constitutional psychopathic group (Group 1 above).
5. Psychoses of involution, such as affective melancholia and senile dementia.

Causes of Insanity.—The causes[2] of insanity are known in the main. Omitting heredity, they may be considered under four headings:

Syphilis.—Paresis, often called general paralysis, and popularly known as "softening of the brain," accounts for about 20 per cent. of the insane admitted to state hospitals. Syphilis as a factor may be considered even more important because of its relation to tabes dorsalis and the mental deterioration that comes in the late stages of this condition. Syphilis is a common infection; insanity, a relatively rare condition. The disease may be expended upon other organs than the brain, but when it attacks the brain some form of mental disturbance is bound to result.

In the main, syphilis is recognized as the cause of paresis. The disease at this stage is incurable by any

[1] Meyer, A.: Fundamental Conceptions of Dementia Præcox, British Medical Journal, September 29, 1906.

[2] Paton, S.: Human Behavior, Charles Scribner's Sons, New York, 1921, p. 27.

means known to medical science. The brain tissue has been changed, and when once altered, it is thereafter impossible to restore it to normal.

This causative factor causes serious destruction to other organs of the body, namely, the heart, liver, blood-vessels, and bones. It presents a problem not only to the individual but also to society that should challenge the most intelligent effort for diagnosis, isolation, and treatment.[1] Its frequent connection with immoral living and its certain moral and social censure of the infected individual are the factors that have prevented a rational administration by boards of health. In the light of all the unhappiness, ill health, and early deaths caused by the disease it is not too much to say that it should be treated according to the established principles of communicable disease control.

A pamphlet prepared by the Committee on Mental Hygiene of the State Charities Aid Association (N. Y.) gives the following as additional causes of insanity. This pamphlet is authoritative, having the endorsement of leading psychiatrists and neurologists:

Alcohol and Other Poisons.—Another group of mental diseases are due directly to the habitual use of alcohol. Alcoholic insanity may be brought on by the regular use of alcohol even in "moderate" quantities not producing intoxication. The close relation between alcohol and insanity has only recently been fully realized. Statistics as to the number of cases in which alcohol is the direct cause necessarily vary in different localities. Fully 30 per cent. of the men and 10 per cent. of the women admitted to the State Hospitals are suffering from conditions due directly or indirectly to alcohol. So marked is the effect of alcohol upon the brain and

[1] Bigelow, N. A.: Sex Education, The Macmillan Co., New York, 1916. The Problem of Sex Education in Schools, United States Public Health Service, Washington, 1919. Social Hygiene Education, Bulletin No. 13, Teacher s College, New York, 1921. The United States Interdepartmental Social Hygiene Board Activities, 1919–1921, Reprint Annual Report, June 30, 1921, Washington.

the nerve tissue that it helps to bring about a number of mental breakdowns in addition to the alcoholic insanities. Alcohol is a poison. A long series of careful tests[1] performed by eminent authorities showed that even small quantities of alcohol may lower the mental capacity, and that it takes much longer than is usually supposed for this effect to wear off.

In this day of keen competition every man needs the highest possible development of his mental capacities. Not only is the highest mental development impossible with the continued use of alcohol, but impairment of the mental faculties is likely to follow.

Other poisons, such as opium, morphin, and cocain, which, with alcohol, are the principal parts of many patent remedies, often weaken the mental powers and produce insanity.

Physical Diseases.—Some mental breakdowns may be traced to the effects of other physical diseases. Typhoid fever, influenza, diphtheria, and some other diseases often so poison the system that for some time after the disease itself has left, the regular functions of the body are seriously interfered with. It is probable, also, that the poisons so produced interfere with the nervous system. Consequently, a mental breakdown is sometimes a delayed result of such diseases. Among other physical causes of insanity are tuberculosis and diseases of the arteries, heart, and kidneys. Aside from the direct physical effect of these diseases, they have a tendency to disturb the mind by discouragement. A person suffering from any such disease should have good nursing, skilled medical treatment, pleasant surroundings, and freedom from anxiety. Often these can be had only in a hospital. Prejudice against hospital care is largely unjustified.

Overwork is often spoken of as a cause of insanity. This is not correct.[2] Hard work alone rarely causes a

[1] Williams, J. F.: Healthful Living, The Macmillan Co., New York, 1919, pp. 407–413.

[2] Overwork associated with other conditions may result in an exhaustion psychosis.

nervous breakdown. It only becomes a menace to health when associated with worry and loss of sleep, or causes mentioned under other headings.

The control of infectious diseases, protection of food and water supplies, temperance, and healthful home and factories, all these help to prevent mental as well as physical diseases.

Mental Habits.—Aside from physical causes there are also mental causes. They are the most important causes of some forms of insanity. The healthy state of mind is one of satisfaction with life. This does not depend so much upon our surroundings, or how much money we have, or how many troubles come to us, as upon the way in which we train ourselves to deal with difficulties and troubles. Anyone who departs too far from this state of satisfaction must be regarded as tending toward an unhealthy condition. Of course, not all persons start with the same kind of mental makeup. Some, owing to heredity, unusual experiences, or bad training, have what is called a morbid disposition. But disposition is not something fixed like the color of our eyes. It must be looked upon as made up of many tendencies which often can be changed or modified by training and proper mental habits. *Health is a duty* which the individual owes to himself and to others. Mental health is as important as physical health. The average person little realizes the danger of brooding over slights, injuries, disappointments, or misfortunes, or of lack of frankness, or of an unnatural attitude toward his fellowmen, shown by unusual sensitiveness or marked suspicion. Yet all these unwholesome and painful trains of thought may, if persisted in and unrelieved by healthy interests and activities, tend toward insanity. Wholesome work relieved by periods of rest and simple pleasures, and an interest in the affairs of others, are important preventives of unwholesome ways of thinking.

Alcohol and the Nervous System.—The alcohol problem has not been settled by prohibition. It will be settled only by education. The eighteenth amendment is the quick way to remove the deterioration in human life; it must be supplemented by the continued effort of education.

Alcohol presents a social problem that cannot be treated at this time. Evaluation of its relation to poverty, immorality, crime, and general unhappiness is a matter of social economy. What are the facts regarding the effects of alcohol upon the health of the user?

The chief effects are seen in the nervous system. Digestive tract and circulatory system show untoward changes from alcohol, but the nervous system is mainly attacked. Legrain[1] made a careful study of the effects of alcohol on the nervous system, and presented data that should be considered carefully by the opponents of prohibition.

The external effects show in the irritability, the increased susceptibility to disease, the lowered vitality. The internal effects are more marked, and of most significance are the experiments of Professor Stockard of the Cornell University Medical School, which show the influence of alcohol as a detrimental factor in inheritance.

Professor Stockard[2] has proved that the germ cells of males can be so injured by allowing the individual to inhale the fumes of alcohol that they give rise to defective offspring although mated with vigorous untreated females. In commenting on this work the Journal of the American Medical Association[3] said,

> "The extension of these unique investigations, in which the offspring from the treated animals which reach maturity are usually nervous and slightly undersized, have further shown that the effect of the injury of the germ cells is not only exhibited by the immediate offspring of alcoholized animals, but is conveyed through their descendants for at least three generations. There are many instances of matings followed by negative results or early abortions,

[1] A monograph on Alcoholism and Heredity, published in the Annales Medico-phychologiques, December, 1921.

[2] Stockard, C. R.: Archives of Internal Medicine, 1912, x, 369; American Naturalist, 1913, xlvii; Proceedings of the Society of Experimental Biology and Medicine, 1914, xi, 136.

[3] Journal of American Medical Association, October 17, 1914.

stillborn young, or defectives. An instructive illustration was afforded in a case in which two of the four young were completely eyeless, the eyeballs, optic nerves, and chiasma being absent. Such defects result, according to Stockard, from the injury originally inflicted on the germ cells by the experimental treatment. Yet this injury may have been received by early generations only. Thus the parents of the anophthalmic guinea-pigs just mentioned were untreated, their four grandparents were also untreated, but their great-grandfathers were all alcoholized and the great-grandmothers were all normal animals. The defective eyes of descendants are due to impaired development, not to the direct action of alcohol. Plainly the spermatozoön is actually weakened if not disabled by the alcohol treatment and all individuals arising from combinations involving such a germ cell are likely to be below normal. There is food for reflection in these facts."

The scientific evidence is available. Alcohol is not a food (it burns too fast for the human machine), it poisons the highest centers, and sets free the lowest instincts by removing the inhibitions and controls of the brain. It is in the same position, so far as social approval may go, with the use of cocain, morphin, and other drugs. The classical study of the effects of alcohol by Dodge and Benedict[1] may serve as the scientific basis for the determination of action by all rational minds.

The modern view of health that is sustained largely by an ideal of social responsibility rejects the fallacious argument for personal liberty. Oh, Liberty, how many crimes are committed in thy name! Liberty does not mean the right to do as one pleases, but rather an opportunity to develop to the highest and secure the greatest happiness in life *so long* as other members in society are not injured. Ideas or odors cannot be deported, but one can get rid of the source of the disturbance, and then eradicate the effects. The most needed thing today in connection with the alcohol problem is education that will make the deportation effective and the eradication complete.

[1] Dodge, R., and Benedict, F. G.: Psychological Effects of Alcohol, Carnegie Institute, Washington, D. C., 1915.

CHAPTER XII

HYGIENE OF THE SEXUAL ASPECTS OF LIFE

I. A Difficulty of Terminology.
II. The Sex Instinct in Life.
III. New Interpretations of Sex.
IV. The Institution of Marriage.
V. Menstruation.
VI. Pregnancy.
VII. The Social or Venereal Diseases:
  1. Gonorrhea.
  2. Syphilis.

A Difficulty of Terminology.—The *hygiene* of the *reproductive system* would be the logical term to use in sequence to the previous chapters, but here, as elsewhere, the logical does not always serve. The hygiene of the reproductive system would relate to the care of the reproductive organs, to menstruation, to pregnancy and labor, and to the prevention of disease. The sex instincts, however, relate to the whole of life and touch problems that reach into all aspects of life. The hygiene of the sexual aspects of life, known as social hygiene, concerns itself not only with the hygiene of organs, but indeed also with the institution of marriage, social customs, prostitution, perhaps even the Malthusian movement. The finest forms of life can develop only where work, play, friendship, love, and worship are continually expressed in fine forms and under high standards.

A newer concept of social hygiene has come in recent years in the social hygiene movement itself. In a report on Social Hygiene Education[1] the following is found under the heading "Fundamental Principles of Social Hygiene Education":

[1] Teacher s College Bulletin, Twelfth Series, No. 13, Teacher s College, New York, 1920.

"Meaning of social hygiene: The American social hygiene movement aims at the best possible development of all *physical, psychical,* and *social* aspects of life as it is determined or influenced, directly or indirectly, by the sexual instincts and related traditions.

"*Sex hygiene education* or *sex-education* in its largest sense includes all scientific, social (including ethical), and religious instruction and influence which directly and indirectly may help young people prepare to meet the problems of life that have their center in the sexual instinct, and inevitably come into the life of every normal human being."

The Sex Instinct in Life.—If the instincts of man be studied, it will be found that they group themselves into two categories—one looking toward preservation of the individual, the other toward perpetuation of the race. The first is personal, real, and conscious of its end; the second is personal, real, but largely unconscious.

Freud claims that the sex instinct is the root of all life, the energy for all activity, whether sexual, intellectual, or physical. Many feel that he claims too great a hierarchy for sex, but all students of life also know that this instinct is not a simple thing at all, but that it is, at least in its expressions, bound up with most of the human problems of the sexes.

The life impulse has worked itself out in a variety of ways. In the vegetable world there are asexual and sexual forms of reproduction providing for the perpetuation of the species without the guidance of instinct or intelligence. In the animal kingdom the maintenance of species has been entrusted to the sex instinct. With the lower animals this instinct is marvelous in its skill in acquiring just the proper conditions for effective action. The beetle *Sitaris* is a wonderful illustration of the power of this instinct to provide for life, to satisfy its essential purpose.[1]

[1] Bergson, H.: Creative Evolution, Henry Holt & Co., New York, 1913, p. 146.

With man, however, nature departed from her scheme of the animal world by bringing in intelligence. If instinct had ruled in the primates such as man, there would not, of course, be the civilized life of a modern man, the social disharmonies, prostitution, and the whole chain of social ills that have arisen for modern man. Instinct in man as the supreme force would have given a life comparable to that of the lower animals. The development of intelligence made possible the forms of civilized life, the economic achievements of society, and the moral and social advances of the race. The chasm between instinct and intelligence as used in human life accounts for most of the social disorders of the race.

Sex conduct if guided only by instinctive urge is on the level of lower animal life; if directed by intelligence and the forces of the affective life, it can be made to contribute to life values in the same way that intelligence has enriched life in other fields.

There are those who are willing to attribute to man power for fine controls in aspects of life other than sex, but who insist "we have always had these disharmonies and always must have them." They frequently end by saying, "Human nature is human nature." Such a person is thinking on a level with the inhabitants of the age described by Lecky in his History of European Morals.

It is probably true that the whole of life, sex, emotions, spirit, work, play, and love are best achieved and best expressed when intelligence rules and guides and when the purely instinctive elements are controlled. Moreover, evolution is continually developing such control. Human conduct today is different from the human conduct of two thousand years ago. The young person interested in achieving the finest life must be guided by the compelling dictates of intelligence and not by the force of instinct in all manifestations of sex in life. This will mean, then, that intelligence is to control, to direct, to approve, or disapprove of instinctive desire. This progress will come mainly through an enrichment of our social inheritance.

New Interpretations of Sex.—The instinct of sex denotes a great desire. Its free expression because of social ills produced has been subjected to almost universal disapproval. Its very reality has been viewed with apprehension. The scholastic doctrine that we are conceived in sin drew the lines that determined the picture of all sex activity. Platt[1] speaks of this peculiar view in the following words:

"So far are the extremities of the sexual function separated in man's mind that the first step, its inception, has always been counted as more or less shameful, and the last step, its culmination, has been esteemed as a blessing. Gods and heroes have been gloriously born into this world, but so firmly is the idea of an unworthy, carnal lust attached to the beginning of the great miracle of nature that theologians and peoples have always felt it necessary to provide for them a supernatural or immaculate conception."

Science recognizes no such interpretation of nature. For the intelligent no value is conserved by such distorted view. Rather, must there come into our consciousness an appreciation of the beautiful aspects of sex. The sexual life in man must be concieved as a different sort of thing entirely than that among the lower animals. True, it issues in the production of new individuals, but just because man is man, a being of intelligence, it differs in its "high spiritual meaning and purpose."

It is just this thought that prompts the following statement of fundamental principles in the Report on Social Hygiene Education[2]:

"Human meanings of sex: It is only by frankly

[1] Platt, C.: Psychology of Thought and Feeling," Dodd, Mead & Co., New York, 1921, p. 43.

[2] Teacher s College Bulletin, Twelfth Series, No. 13, Teacher s College, New York, 1913.

recognizing and developing the psychical and social and esthetic meanings of sex, that are distinctly human and superadded to the merely propagative function of the animal, that people can be led far away from the almost universal secrecy, disrespect, vulgarity, and irreverence concerning every aspect of sex in human life. Sex instincts and processes are essentially pure and beautiful phases of that wonderful something we call 'Life.' Sex-education should aim to give this *esthetic attitude* by presenting life as fundamentally free from the degradation arising from the common misuse and misunderstanding of the sexual nature."

The Institution of Marriage.—Marriage is a human institution serving in the establishment of homes and the rearing of children.[1] It has profound possibilities for unhappiness and social distresses; it has sublime possibilities for happiness and social progress. Probably its values far outweigh its failures; certainly society would be less satisfying for all without marriage. In the paragraphs that can be devoted to its discussion in this book only a few outlines can be traced; adequate treatment would require a volume in itself. Yet in a little space some very important matters affecting health and happiness can be set forth.

There is a need for a broad general understanding of marriage by young men and women.[2] What does it mean? What does it give? What does it require? First and foremost in any catechism of marriage would appear the statement: *Young people should value, in the opposite sex, things other than the sexual merely.* Sex attraction is not enough to be satisfying for the whole of life. Winds of feeling are not fair weather for the matrimonial venture. They are too gusty. The human vessel needs the support

[1] Castle, W. E.: Genetics and Eugenics, Harvard University Press.

[2] Addams, J.: A New Conscience and an Ancient Evil, The Macmillan Co., New York. Ulrich, M. S.: Mothers of America, American Social Hygiene Association, Publication No. 180, New York. Bigelow, M. A.: Sex-Education, The Macmillan Co., New York, 1916.

of an auxiliary engine supplying appropriate power in the form of interests and ideals.

Marked incompatibilities should be avoided: The man interested in camping, out-of-doors, and the woman not interested; the woman fine in her appreciations, manner, and standards, and the man coarse; the woman artistic, and the man crude; the man ambitious, productive, with a strong social sense, and the woman a creature of decoration, only to be entertained. The power of the sex appeal is often not great enough to hold together in comradeship, happiness, and enduring love the man and woman of no common general interests.

The young man and young woman should have enough imagination to see that married life is not one continual act of love making in the usual sense of that term. That there should be expression of love cannot be denied, but the broad general common interests of life are the channels through which love may be continually set free and expressed, and true comradeship developed.

There are those who would have marriage to begin and to end at will. At the other extreme are the orthodoxists who would make of it an indissoluble bond. Perhaps somewhere between lies the golden mean in which all the social and all the individual values will be preserved. Certainly there will be less reason for extreme positions if the male-made double standard of morals can be abolished, and if the male-made institution of prostitution can be broken down. Marriage can mean all that it ought to mean if one principle is remembered: Everything exchanged between husband and wife can only be the free gift of love, can never be demanded as a right.[1] Love never demands. The tenderness of love, the thoughtfulness of love, the sacrifice of love are the portals to love itself.

When shall young people marry? Biologically they are prepared to assume the reproductive functions in

[1] The thought is expressed by Ellen Key in her book, The Morality of Women, Ralph Seymour Co., Chicago, 1921.

adolescence. But society with its economic demands, its plans of education, its organization of trades, occupations, and professions has gradually prolonged the marriageable age. The young man should never feel that he has solved the control of the sex impulse by marriage; he has as great or greater need for control after marriage. This control is necessary during certain physiologic periods and also during pregnancy.

Menstruation.—For the woman the menstrual period involves certain marked physiologic changes. These are more marked on the psychic side in the few days before the period. During the period the woman should live the usual life if possible, avoiding undue fatigue, work, or strain. Vigorous running and jumping are not to be advised, and yet moderate exercise is helpful.

It is entirely correct to bathe the body at this time and to keep clean. This should be accomplished by a sponge bath, avoiding the tub and shower. During this period the feet should be kept dry, the body not exposed to cold, and plenty of rest in sleep indulged at night.

Pregnancy.—During pregnancy exercise should be continued daily and plenty of time spent out of doors —at least a walk of two miles, and one hour in the open air if possible. The diet should be supervised and the condition of the patient carefully determined by the physician in charge. After the birth of the child every reasonable effort should be made to nurse the baby because the child has more chances for life and, moreover, it is better for the mother.[1]

The Social or Venereal Diseases.—The social diseases, gonorrhea and syphilis, are, in the main, diseases contracted in clandestine or organized prostitution. Some cases are acquired asexually, but they are, in the main, the vaginitis[2] cases seen in institutions for girls, such

[1] West, M.: Care of Children Series, Nos. 1, 2, and 3, Children's Bureau, U. S. Department of Labor, Washington, D. C.

[2] There is some evidence that the asexual vaginitis cases are not caused by the gonococcus. Relationship not definitely determined.

as asylums or orphanages. Commercialized or clandestine prostitution provide the chief infections.

The venereal diseases constitute one of the most serious handicaps and hazards for any health plan that confronts society today. The extent of these diseases cannot accurately be stated. That it is very great is suggested by the number of cases of gonorrhea ophthalmia and syphilitic insane, by the sterility in men and women, and by the abdominal operations on women occasioned by gonorrhea. It has been estimated that a large proportion of the operations on married women for abdominal conditions are occasioned by gonorrhea transmitted by the husband, supposedly cured of the disease. The extent of the infection in the nation is not accurately known, but the possible and frequent results of the infection is a well-known medical fact.

Gonorrhea.—This disease is caused by the gonococcus, an organism that is grown with difficulty in artificial media, that dies soon on exposure outside the body, but that grows with rapidity on the mucous membrane of the genito-urinary tract and on the mucous membrane of the eyes.

Contrary to popular opinion, it is not an insignificant disease. The initial symptoms may pass quickly, but the complications are serious and almost always result. In the male there may occur stricture of the urinary passage, involvement of the prostate gland, and infection of the sperm ducts leading from the testes, producing sterility at times. The disease may extend throughout the body, involving the joints and producing an inflammation that results frequently in stiffness and loss of motor function. At times the heart itself is involved, and less frequently other body structures.

The disease is exceedingly difficult to cure. Even after all the symptoms have cleared up gonococci may still remain in the prostatic glands; when discharged later, they are able to produce the disease. A cure can be prognosticated only after two tests have been made:

1. Massage of the prostate and examination of the secretion under the microscope for gonococci.
2. The complement-fixation test for gonorrhea.

In the female the complications may result more disastrously. In addition to the local disturbance, infection of the tubes and ovaries is almost certain to occur. This results frequently in sterility, and often requires an abdominal operation for removal of the diseased organ. Not infrequently the removal of both ovaries is necessary, thus producing an artificial menopause, and causing the woman continuous ill health and nervous disturbances.

In the female treatment is very unsatisfactory. Some gynecologists question if a complete cure is ever secured; all recognize its extreme difficulty.

For any young person to look upon this disease as insignificant, and to ignore the scientific evidence available is a sign of ignorance or stupidity, or both.

Syphilis.—This disease is caused by a spiral-shaped organism, the *Spirochæta pallida.* It produces a disease that may attack any part of the body structure. The course of the disease is divided into three stages:

The first stage is marked by a characteristic sore or lesion, usually on the genitals. The second stage presents a typical sore throat with characteristic patches, an eruption on the skin, and at times such disturbance of nutrition that the hair is lost in characteristic fashion. The third stage sets in anywhere from two to twenty years after the original infection with disturbances in the bones, joints, liver, heart, blood-vessels, and nervous system.

In addition to the serious effects upon the individual himself the disease may be transmitted to offspring by prenatal infection, so that the succeeding generation may be syphilitic.

In both male and female the disease may be cured in the early stage of the disease with thorough treatment by a reputable physician. For syphilis of the nervous system no satisfactory results have been secured in treatment. Locomotor ataxia may be checked in its development and a certain amount of muscular re-education accomplished, but, in the main, the results must be considered as meager.

Again, as in gonorrhea, we have a disease that is capable not only of destroying the health of the individual but also, and quite as important, wrecking his life and bringing strains and stresses upon family and friends that are unfair and unwarranted.

There is a sort of justice to the dissolute when syphilis produces an aneurysm of the blood-vessels or causes his disablement or death by disease of the nervous system. He pays the price with his life. But here, as in all diseases contracted selfishly and without thought of and care for others, it is most unfair to family and friends to be a burden and care through the years of adult life because of selfish and uncontrolled desires in youth.[1]

Here, as elsewhere in life, the problem of living well is the problem of seeing straight, of not getting values mixed. The important matters in life relate not to wealth or to social position, not to culture or to vocation, but to the eternal truths of all time. To know the truth, to know thyself in whom the truth really lies—here is the magic wand for health and happiness.

[1] The following pamphlets published by the American Social Hygiene Association may be secured from the New York office for 10 cents each: Sex in Life, No. 52; The Boy Problem, No. 284; Health for Men, No. 283; Healthy, Happy Womanhood, No. 60; Keeping Fit, No. 55; Sex-education in the Home, No. 61; Human Welfare and the Monogamous Ideal; No. 314, Conquering an Old Enemy, No. 250.

CHAPTER XIII

PREVENTION IN SPECIFIC DISEASES

The Emphasis of Hygiene.—The time is past when one thinks of disease as necessary. For many persons it is a grim reality, a dread specter continually threatening and at times grasping its victims. But the point of view in this book maintains that much disease is unnecessary, that its occurrence represents failure of some person, or persons, to observe the laws of healthful living. Consequently, the emphasis for living finely and well is always to be placed upon the ways and means of attaining and maintaining health.

The Universal Distribution of Disease.—The emphasis on healthful processes should not shut us off from recognition of the fact of disease and the means of its prevention. Disease is a common phenomenon in all life. It varies with races, geographic location, climate, and mode of living. Complete eradication of disease, while not theoretically impossible, is not probable in the near future. Men will need to accomplish great studies in sanitation, in hygiene, and in improvement of racial stocks through application of eugenic principles. At present man is subject not only to a variety of diseases that are present all the time with marked seasonal increases in certain months, but is attacked at times with epidemic diseases that cause great gaps in the population. At times, assuming a world-wide character, a disease may sweep in severe form over the entire habitable world, as recently occurred in influenza. Such a manifestation is called a pandemic.

The studies made by scientific medicine in combating the prevalence and force of smallpox, bubonic plague, typhoid, syphilis, cholera, yellow fever, and malaria are tokens of promise that should hearten the race in its struggle for existence.

Types of Disease.—Commonly, we think of the transmissible diseases when discussing the ills that affect the human body, but such view is incomplete and unsatisfactory. It is important to make clear the forms of disturbance which may arise in the body. They may be classified for our purposes into seven groups:

1. The communicable diseases.
2. The diseases of nutrition.
3. The acute poisons.
4. The chronic degenerative diseases.
5. The functional nervous diseases.
6. The local infections.
7. Cancer and tumors.

Causes of Disease.—The cause of disease has been a momentous question from early times. Curious beliefs have arisen out of the efforts of man to determine the reason for loss of health. The early philosophers, the medicine man of savage tribes, the modern types of the unscientific and irrational give illustrations of superstition, occultism, and frank ignorance at work on the problem. Whether it is "evil spirits" abiding in the person, or "subluxated vertebræ" pressing on nerves, or insufficient force of mind over matter, the cause seems to persist until attacked in laboratory and hospital with medical and surgical service.

The causes of disease are as follows:

1. *Causes of communicable disease:*
   (*a*) Bacteria which act by producing virulent poisons (toxins) destructive to the cells of the body.
   (*b*) Other organisms which as parasites act by producing poisons, by using up the blood of the host, and by obstruction of vital and important pathways and organs.
2. *Causes of nutritional disease:*
   (*a*) Absence of essential food elements, salts, or other matter from the diet.
   (*b*) Presence or absence of important secretions from the endocrine glands.
3. *Causes of acute poisoning:*
   (*a*) Poisons developed in animal matter, such as milk, meat, and fish.
   (*b*) Poisons developed in improperly canned vegetables and fruits.
   (*c*) Poisons from certain metals, such as lead, mercury, and phosphorus. These poisons come usually from certain trades in which these metals are used.
4. *Causes of chronic degenerative disease:*
   While heredity unquestionably plays an important part in these disorders, it is also true that improper living is chiefly the causative factor. Intemperate living as exemplified in mental or physical strain, mental or physical inactivity, too much or too little food or improper food. Certain cases are undoubtedly due to long-continued infections or the action of poisons over a period of years. Some cases seem to be associated with injuries and physical strains.
5. *Causes of functional disease:*
   There is included in this category those diseases of bodily disturbance due to maladjustment of the individual to life and represented by the improper functioning of the mind and emotions. Not infrequently there is a sexual basis for these disturbances; always there is a strong psychic force at work. The increase in this type of disease is to be expected so long as the standards of life remain what they are, and the social-economic strains continue without relief of a more wholesome and more scientific approach to the problems of human life.
6. *Causes of the local infections:*
   Included in this group are the pyogenic infections due to entrance of streptococcus or staphylococcus into the body.[1]

[1] A local infection may become general, such as occurs in septicemia (blood-poisoning). Care for infections of this type is very important so that general involvement of the body may not occur.

7. *Cancer and tumors:*
Included here are the various forms of carcinomata, tumors, or other wild growths.

The Transmission of Disease.—Bacteria may be transmitted directly from one person to another, as in tuberculosis, diphtheria, measles, whooping-cough, etc., or by means of agents, such as drinking-water, milk, food, soil, or objects, such as cups, handkerchiefs, toys, money, books, clothing, etc.

Insects and vermin may carry the disease agent either directly as a host or indirectly through infection of food supplies. Malaria is the classic example of direct carrier, in which the mosquito acts as the host for the malarial parasite that reaches the blood-stream of man by means of the bite of the infected mosquito. Flies are notorious agents for transmitting disease by contamination of food. Rats are indirectly responsible for bubonic plague by harboring the rat flea in which occurs the complete cycle of the organism causing the disease.

It is important to note, therefore, that disease-producing bacteria or parasites may be transmitted to man by

1. Direct contact of the sick with the well,
2. Infection of food and drink supplies,
3. Contamination of articles used, or by
4. Insects and vermin which harbor the germs of certain diseases.

The Prevention of Disease.—The question of living finely, in the present state of society, frequently resolves itself into combating the prevalent agencies of disease transmission. Moreover, in addition, man must be awake to the dangers from improper food combinations, the hazards of acute poisoning, the menace of hereditary taint, the perils of degenerative disease, the attacks of pathogenic bacteria, and the deplorable functional disturbances. To face squarely the problems involved requires more courage than some can muster. These blunder along through life, frequently escaping disaster through chance. Others when confronted with the facts develop an unwholesome fear and proceed at once to a procedure in hygiene and sanitation that marks them as "freaks" or neurotics, according to the motive behind their program. Somewhere between these two extremes lies that golden mean that calculates life's hazards as the athlete measures the height of the obstacle to be surmounted. It all is part of the great game. The fact that the normal habitat of tetanus is the intestinal tract of herbivora,[1] and that, therefore, the bacillus is found most frequently in stable yards, will not mean that horses and barns will be shunned, nor that puncture of the foot by a nail in a board in the barnyard will be ignored. The rational life will recognize the facts of life and life processes; the courageous life will meet and face the facts. Prevention of disease will be considered by those who live fully, as an important means for rendering service. To avoid colds, to evade pneumonia, to escape Brights' disease are pathways not to Nirvana, but to that condition of physical superiority that is justified only by service and finds its fullest and best satisfaction in worth-while work.

The prevention of disease resolves itself into what might be called general and specific means.

General Means of Prevention.—Resistance: It is a common observation that some persons when exposed to disease contract and develop the infection, while others do not. This freedom from disease by one exposed to it illustrates what science understands by the term "resistance." Resistance to disease may be racial, *e. g.*, the Jew and tuberculosis, and at times it seems to be an individual matter entirely. Resistance to disease in general may be developed. Healthful conditions of the body tissues and fluids renders the protective mechanism of the body more effective in its safe-guarding activities.

[1] Park found tetanus bacilli in the excreta of about 15 per cent. of horses and calves in the vicinity of New York City. They are present in other herbivora to a less extent.

Resistance is developed through proper habits of living and is a result of correct adjustments of the body to the life of the environment.[1] Resistance and health are in one sense synonymous. Both flow from hygienic living. Resistance may not always protect from disease because at times an organism will be so virulent that the protective forces of the body are broken through. It represents, however, the first line of defense in all war on disease.

Disinfection,[2] isolation, and quarantine: Disinfection is an effort to destroy the attacking disease agent; isolation and quarantine aim to confine and control the patient while there is a possibility of transmitting living organisms.

Knowledge of the life history of various disease-producing organisms has made possible a more intelligent, and, therefore, a more effective attack on the problems presented by communicable disease. Isolation and quarantine have grown in importance; disinfection has, perhaps, diminished.

Special Means of Prevention.—Artificial resistance: That some persons possess a high degree of resistance to disease is well known. This non-susceptibility has been called immunity. It is also known that immunity may be conferred artificially, and so there has developed, markedly in recent years, definite procedure in serum and vaccine prophylaxis to prevent disease by giving the individual an artificial resistance or artificial immunity. Notable achievements in this direction have been vacci-

[1] It is generally believed that fatigue lowers resistance to disease. People speak of "catching cold" because "they got tired out." There seems to be some evidence from experience for this general belief. On the contrary, Oppenheimer and Spaeth found in experimenting with white rats that fatigue increases resistance to the toxins of both tetanus and pneumococcus (Type I). While this work (Oppenheimer, E. H., and Spaeth, R. A., American Journal of Hygiene, January, 1922, p. 51) does not discredit entirely the popular belief, it suggests at least the necessity for more scientific study of the factors influencing living, particularly human living.

[2] Rosenau, M. J.: Preventive Medicine and Hygiene, D. Appleton & Co., New York, 1913, pp. 966–1034.

nation for smallpox, inoculation for typhoid, and antitoxin and toxin-antitoxin[1] for diphtheria.

Avoidance of the cause of disease: In the final analysis, disease prevention rests largely upon the avoidance of the causative agent of disease. It is, therefore, important to describe the prophylaxis of the diseases of the six groups named, with appropriate emphasis upon the more significant examples.

Prevention of Communicable Disease[2]:

1. Typhoid fever.
   (*a*) Cause of the Disease.—*Typhoid bacillus.* The bacillus is spread chiefly in the water and milk supply. Contamination of wells, springs, and even municipal reservoirs by sewage containing typhoid bacilli does occur. The milk supply is infected by means of polluted water used in washing the utensils or by unclean hands of the milker. Butter, ice, oysters, lettuce, and cabbage are known to have transmitted the disease. Flies may carry the organism by feeding on the excreta of typhoid patients and then contaminating exposed food by walking on it. Typhoid "carriers" employed in the preparation or handling of food may transmit the disease. Food, fingers, and flies represent an alliterative triumvirate of immense importance in causation.
   (*b*) Prevention.
      1. Protection of individual and community water supplies by proper disposal of excreta, by appropriate location of privies, and by protection of the watershed of reservoirs.
      2. If gathered in an insanitary way pasteurization of all milk used for drinking purposes and for making of dairy products. Education and supervision of dairy men and milk distributors in the proper way of gathering and handling milk.
      3. Careful washing in water of certain foods eaten raw.
      4. Examination and supervision by health authorities of typhoid "carriers."
      5. Proper construction of privies so as to be fly-proof and water-tight.
      6. Adequate and sanitary care of the discharges and clothing of typhoid patient.
      7. Vaccination with the typhoid vaccine.

[1] Toxin-antitoxin is given to individuals who are susceptible to diphtheria, as shown by the Schick test.

[2] Tuberculosis has been discussed in Chapter VIII, and the venereal diseases in Chapter XII.

2. Typhus fever.
   (a) **Cause of the Disease.**—An organism (as yet not completely identified) that is transmitted by the body louse. The seriousness of this disease in central Europe during the World War directed the attention of all persons to the underlying insanitary conditions as important factors. Uncleanliness, lack of bathing facilities, overcrowding, inadequate food and clothing are conditions favoring the growth of the body louse.
   (b) **Prevention.**
      1. Fumigation or disinfection of clothing, living and sleeping quarters of those with the disease.
      2. Fumigation and disinfection of all persons likely to harbor the louse, such as soldiers and refugees.
      3. Isolation and quarantine separately of all those suffering from the disease and those suspected or exposed to the disease.
3. Relapsing fever.
   (a) **Cause of the Disease.**—*Spirillum obermeieri.* This organism is transmitted by bedbugs, fleas, biting flies, and lice.
   (b) **Prevention.**
      1. Cleanliness in the home. Destruction of the vermin by means of thorough cleaning of all crevices in woodwork and furniture with corrosive sublimate or kerosene and fumigation with sulphur.
      2. Isolation of the patient.
      3. Disinfection of all clothing worn by patient, also the bed clothing.
4. Smallpox (variola).
   (a) **Cause of the disease** is unknown. An organism has never been isolated, but the virus is supposed to be transmitted by the secretions of the eye, nose, mouth, and skin.
   (b) **Prevention.**
      1. Vaccination is of first and major importance. The value and importance of vaccination may be indicated by the fact that systematic vaccination in the six provinces near Manila, P. I., of a population of over a million, with a death-rate from smallpox exceeding 6000, has resulted in no deaths from smallpox in the vaccinated. Vaccination protects and should be rigidly required of all persons. (See Chapter V.)
      2. Isolation of the patient.
      3. Disinfection of the patient, room, and furniture after the disease.
5. Chicken-pox (varicella).
   (a) **Cause of the disease** is unknown. Chapin[1] has shown that the disease is transferred even when the patient is in a cubicle. It is believed to be air-borne.

[1] Chapin, C. V.: Source and Modes of Infection, John Wiley & Sons, New York, 1912, p. 270.

(*b*) **Prevention.**

The disease is readily transmissible. It can only be prevented from spreading by strict isolation.

6. Scarlet fever.
   (*a*) **Cause of the disease is unknown.** A streptococcus has been found in the blood of patients dying from the disease and it is often found in the mouth, but it has not been demonstrated[1] as the cause of the disease. The seasonal prevalence is shown in Fig. 34.
   (*b*) **Prevention.**

   The disease is readily transmissible. It can only be prevented from spreading by isolation. All dishes used by patient should be sterilized; all waste matter and uneaten food burned. Thorough cleaning of the room after use by the patient to be done with hot water and soap and bichlorid 1 : 2000. Room should be aired and sunned for two weeks after termination of the case.
7. Measles (morbilli).
   (*a*) **Cause of the disease is unknown.** The mortality from measles in Massachusetts is shown in Fig. 35.
   (*b*) **Prevention.**

   Isolation of the patient is alone effective. Disinfection after the disease is over is useless. This view is held by the majority of health officers and epidemiologists. The disease is transmitted by mild cases, carriers, early cases, and convalescents. The same may be said for whooping-cough, influenza, pneumonia, and cerebrospinal meningitis. Chapin[2] gives the evidence upon which these statements are based.
8. Mumps (epidemic parotitis).
   (*a*) **Cause of the disease is unknown.**
   (*b*) **Prevention.**

   Isolation of the patient is alone effective. See Measles.
9. Whooping-cough (pertussis).
   (*a*) **Cause of the disease is the** ***bacillus of Bordet and Gengou.*** The disease is more prevalent in the late spring. See Fig. 36.
   (*b*) **Prevention.**
      1. Vaccine treatment is effective in a large percentage of the cases.
      2. To prevent its spread, isolation is alone effective.

[1] The demonstration of the cause of disease must meet rigid requirements. The germ theory of disease as given by Koch provides for:

1. The isolation and identification of a specific organism in the tissues or fluids of the body affected.
2. The production of the same disease in another body by injection of the organism secured from the first.
3. The recovery of the organism from the second body with its isolation and identification with the organism as taken from the first body.

[2] Chapin, C. V.: Loc. cit., pp. 145, 146, 253, 278.

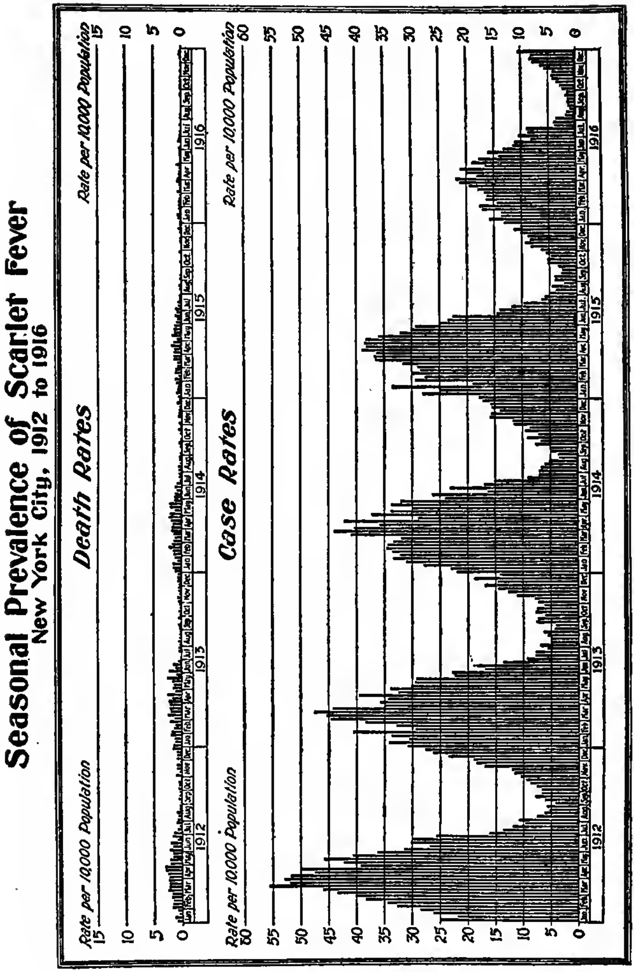


Fig. 34.—The winter months are more favorable for the development of scarlet fever. (By courtesy of The Prudential Insurance Company of America.)

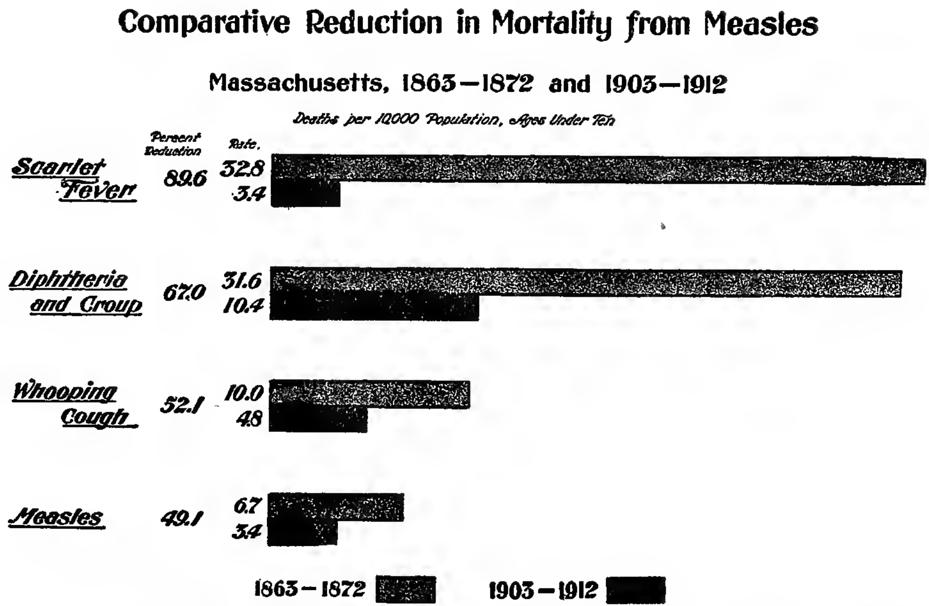


Fig. 35.—Measles shows less relative reduction in mortality in Massachusetts than scarlet fever, diphtheria, or whooping-cough. (By courtesy of The Prudential Insurance Company of America.)

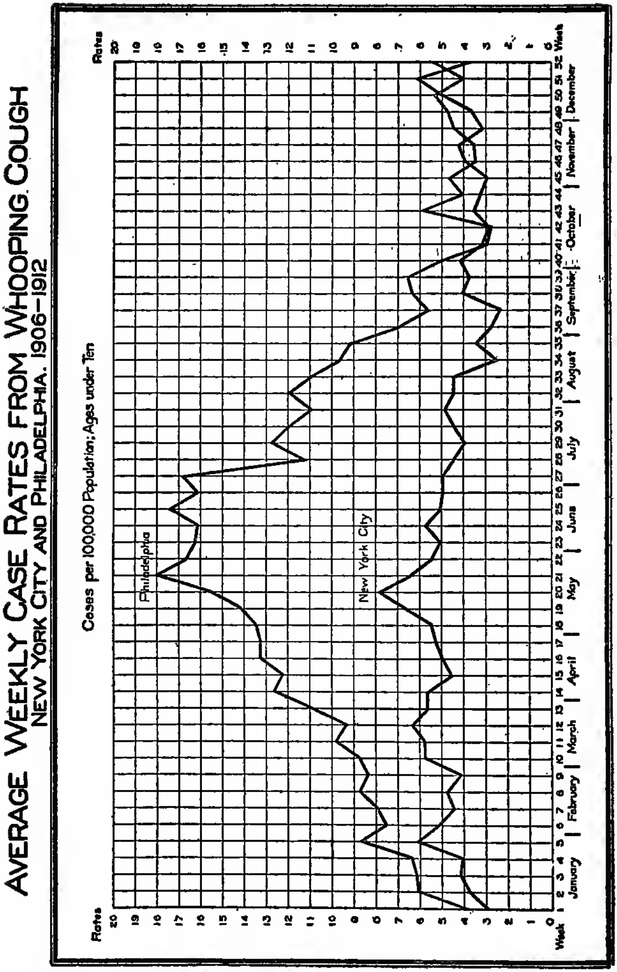


Fig. 36.—Notice that whooping-cough shows the highest rate in May. (By courtesy of The Prudential Insurance Company of America.)

10. Influenza.
    (*a*) **Cause of the Disease.**—The influenza bacillus has been given as the cause. The recent epidemic (1918) raised some doubts. At the present time this question cannot be called settled.
    (*b*) **Prevention.**
        1. Vaccine treatment has been helpful in some cases. Not yet established as a sure method.
        2. The control of the spread of influenza is a matter for public health officers primarily. It spreads along lines of communication. Doubtless many persons are carriers. Individual prophylaxis relates to keeping up the resistance and avoiding crowds. Contrary to a very common belief, there is no scientific evidence that whisky prevents the disease.
11. Cerebrospinal meningitis.
    (*a*) **Cause of the disease is the** ***Diplococcus intracellularis.***
    (*b*) **Prevention.**
        The disease is spread by carriers. Disinfection is futile to stop the spread of the disease. The patient should be isolated.
12. Pneumonia.[1]
    (*a*) **Cause of the disease is the** *pneumococcus* in Type I, II, and III. Type IV is caused by a mixed strain in which are *streptococci* and *pneumococci.*
    (*b*) **Prevention.**
        The pneumococcus is present in the mouths of from 40 to 50 per cent.[2] of well persons. It has greater virulence in the winter. Prevention of the disease relates to keeping the mouth clean by brushing and cleaning of teeth and tongue and by keeping objects and hands out of the mouth and avoiding exposure to cold and wet. In particular avoid chilling the body. An effective serum is available for treatment of Type I pneumonia.
13. Diphtheria.
    (*a*) **Cause of the disease is the** ***Klebs-Löffler bacillus.*** See Fig. 37, and note the age susceptibility in diphtheria, the pre-antitoxin and antitoxin periods, and the effect of early administration of antitoxin.
    (*b*) **Prevention.**
        1. Isolation of patient and avoidance of contact with the case.
        2. Use of Schick test to determine susceptibility.
        3. Giving of toxin-antitoxin to those susceptible to the Schick test.
        4. Giving of a prophylactic dose of antitoxin to those exposed to the disease.
        5. Be on guard against it, especially in the winter and spring. See Fig. 38.

[1] Stimson, P. M.: Review of the Literature on Respiratory Diseases from January, 1920 to June, 1921, American Journal of Diseases of Children, March, April, 1922, pp. 261–282, 338–374.
[2] Chapin, C. V.: Loc. cit., pp. 101, 102.

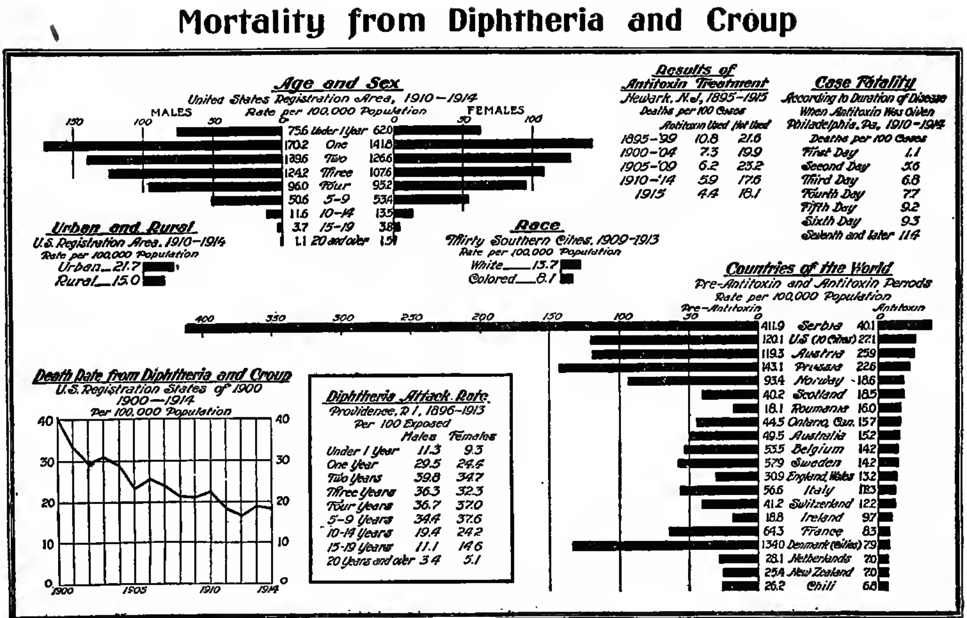


Fig. 37.—Mortality from diphtheria and croup by age and sex, urban and rural, race, and the effect of antitoxin. (By courtesy of The Prudential Insurance Company of America.)

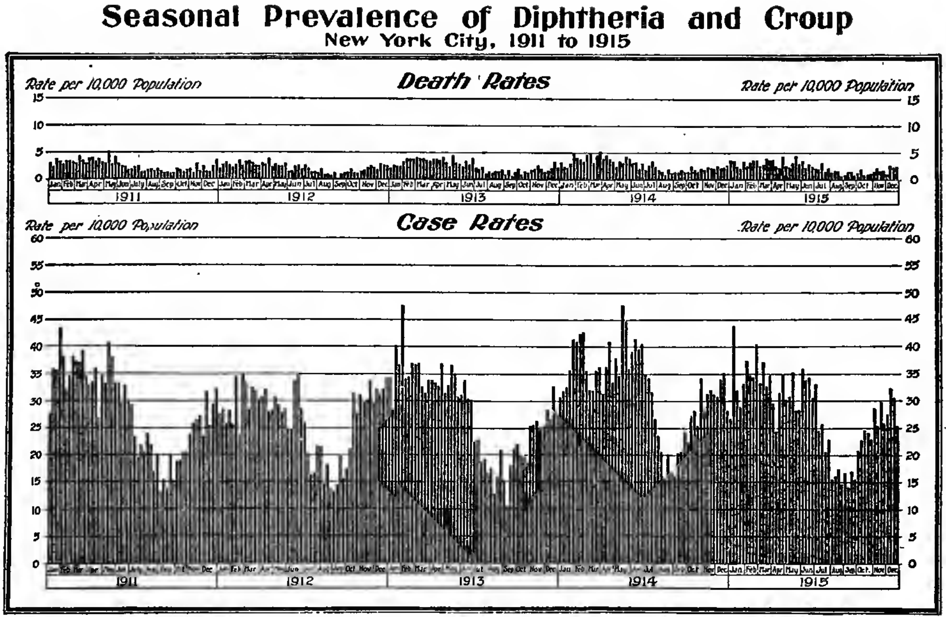


Fig. 38.—Note the relation between morbidity (case rates) and mortality (death rates). (By courtesy of The Prudential Insurance Company of America.)

14. Rheumatic fever.
    (*a*) Cause of the disease is unknown. Probably a streptococcus is the factor. Whatever the organism is, "in four-fifths of the cases of rheumatic fever tonsillitis precedes or accompanies the disease."[1]
    (*b*) Prevention (see Chapter XIV).
        1. Removal of diseased tonsils and adenoids.
        2. Proper treatment of abscess, decayed teeth, and inflamed gums.
        3. Proper treatment of foci of infection in nose or sinuses.
        4. Avoidance of chilling the body.
15. Malaria.
    (*a*) Cause of the disease is the *Plasmodium malariæ.*
    (*b*) Prevention.
        1. Destruction of the Anopheles mosquitoes by draining their breeding places, and by destruction of larvæ by covering with oil swamps that cannot be drained. The effect of adequate sanitary measures in the

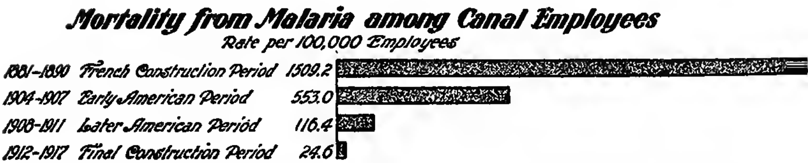


Fig. 39.—After adequate sanitary measures by General Gorgas in 1908 the disease was controlled. (By courtesy of The Prudential Insurance Company of America.)

Canal Zone from 1908 to 1917 is indicated in Fig. 39. Figure 40 shows the geographic distribution of the disease in the United States and the reduction in malaria mortality in typical southern cities.
        2. Prevention of entrance of the parasite into the human body requires precaution against being bitten by the Anopheles. Screening of living quarters with a screen of 2.5 mm. mesh, and staying indoors after sunset.
        3. In malarial districts, the use of prophylactic doses of quinin has been helpful.
        4. Prevention of infection of the mosquito requires protection of malarial patients from the Anopheles. If the Anopheles bites a person sick with malaria and sucks out blood containing the malarial parasite the mosquito becomes infected. After an interval

[1] Winslow, K.: The Prevention of Disease, W. B. Saunders Co., Philadelphia, 1916, p. 203.

the parasite completes a cycle of development in its host. If the mosquito now bites a well person it will produce the disease by conveying some of the parasites through the salivay secretion in the proboscis of the mosquito.

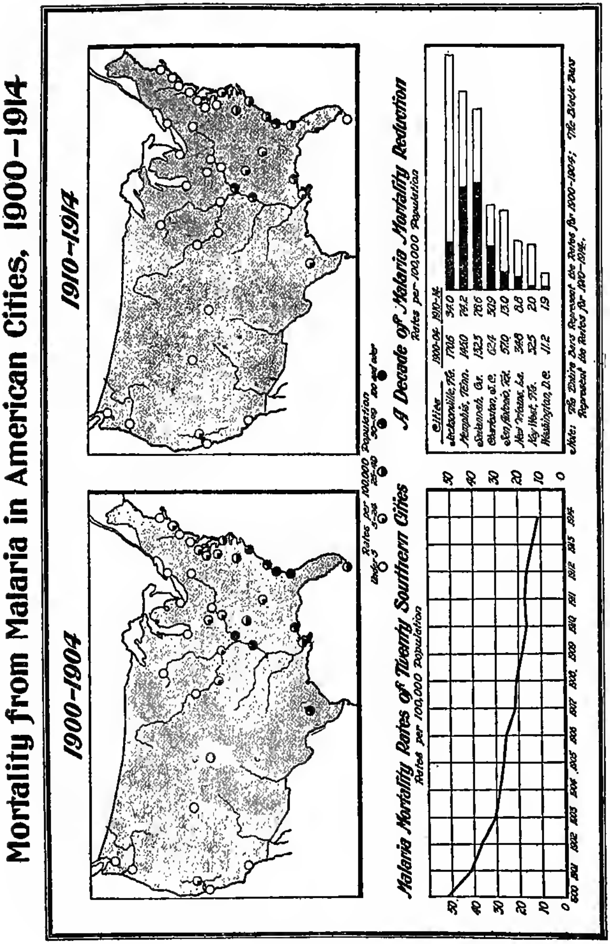


Fig. 40.—The geographic distribution of malaria. (By courtesy of The Prudential Insurance Company of America.)

16. Anthrax.
 (*a*) Cause of the disease is the *Bacillus anthracis.*
 (*b*) Prevention.

The disease is transmitted through herbivora, especially sheep and cows. The hides, wool, secretions, excretions, and blood of infected animals may give the disease to man through any abrasions of the exposed skin or by dust carried to the lungs.[1] Veterinarians, grooms, shepherds, drivers, butchers, and tanners are often exposed. They must be careful not to scratch themselves when at work with animals or their hides. The disease has been transmitted by shaving brush bristles, leather gloves, and other articles coming from animals. New shaving brushes should be boiled in water for at least three hours before using.[2]

Rosenau[3] says: "The prevention of anthrax is first and foremost a problem in animal husbandry which in this country comes under the purview of the Bureau of Animal Industry. Animals having anthrax should be killed and all anthrax carcasses should be buried, incinerated, or tanked in such a manner as to destroy the infection and prevent its dissemination. This is one of the reasons for international sanitary agreement, for the wool from Prussia, the hair and mohair from Asiatic Turkey, the horsehair from China, the bristles from Siberia, and the hides from India may carry the anthrax spores from these far-off lands and cause infection among our workmen."

17. Hydrophobia (rabies).
 (*a*) Cause of the disease in man is a virus conveyed in the bite of some lower animal, usually the dog.
 (*b*) Prevention.
  1. The wound produced by the bite of an animal supposed to be rabid should be cauterized with fuming nitric acid. This should be thoroughly done.
  2. If the dog dies of rabies, then the patient should have the Pasteur prophylactic treatment.
  3. Muzzling of all dogs if the disease appears in any community.

18. Lockjaw (tetanus).
 (*a*) Cause of the disease is the *Tetanus bacillus.*

[1] Chapin, C. V.: Loc. cit., p. 286.

[2] There is no way of sterilizing shaving brushes without injury to the brush. If boiled for three hours many types of brushes would be severely damaged. In New York City shaving brushes cannot be sold unless the bristles have been sterilized before manufacture by heating in an autoclave at high temperature for three or four hours.

[3] Rosenau, M. J.: Preventive Medicine and Hygiene, D. Appleton & Co., New York, 1913, p. 943.

(*b*) Prevention.
1. Thorough cleansing of all wounds.
2. If wound contains garden earth, street dirt, or manure from herbivora the cleansing process should be most complete, even to enlargement of the wound to promote free bleeding. Wounds caused by blank cartridges and fireworks are especially dangerous.
3. Use of tetanus antitoxin in suspected cases.

19. Trichiniasis (trichinosis).
(*a*) Cause of the disease is the *Trichina spiralis*.
(*b*) Prevention.
1. Careful inspection of pork by meat inspectors.
2. Thorough cooking of all pork eaten. Uncooked pork should never be eaten.

20. Hookworm disease (anchylostomiasis).
(*a*) Cause of the disease is the hookworm, one species of which is zoölogically known as the *Anchylostoma duodenale;* the form seen more often in America is the *Necator americanus*.
(*b*) Prevention.
The disease is transmitted through soil polluted by human excrement and the prevention aims directly therefore at:
1. Preventing human pollution of the soil, and
2. Medicinal treatment of cases to diminish the infection.

Education in personal hygiene, habits of cleanliness, and sanitary disposal of the body excretions will eliminate the disease.

21. Intestinal tapeworms.
(*a*) Cause of the disease is any one of a number of cestodes. The *Tænia saginata* of beef, *Tænia solium* of pork, *Bothriocephalus* of fish may infect the body of man.
(*b*) Prevention.
1. Careful inspection by experts of meat at abattoirs.
2. Thorough cooking of all meat.

Prevention of Nutritional Disease:

1. Rickets.
(*a*) Cause of the Disease.—Not fully determined as yet. The lack of calcium and phosphorous salts and vitamin A seem to be important etiologic factors.
(*b*) Prevention.
The easiest prevention in the light of the unknown factors is exposure to sunlight,[1] or the addition of cod-liver oil to the diet. The oil used should be as pure a product as possible.

2. Scurvy (scorbutus).
(*a*) Cause of the disease is the absence in the diet of vitamin C in sufficient quantities.

[1] Sunlight will cure the disease, as shown by Hess and McCollum. Hess, A. F.: Journal of Biological Chemistry, January, 1922, p. 77; McCollum, E. V.: American Journal of Diseases of Children, February, 1922, p. 91.

(*b*) **Prevention.**

Oranges, lemons, and canned tomato juice are efficient antiscorbutics. Raw fruits, vegetables, and salads will supply sufficient vitamin C if used regularly throughout the year.

3. Pellagra.

(*a*) **Cause of the disease** has not been definitely determined. There is believed to be a relation between the disease and a vegetable diet (restricted in kind of vegetables and without meat).

(*b*) **Prevention.**[1]

Prevention seems possible along dietary lines alone. Addition of meat and variety in cereals and vegetables prevents the disease.

4. Diabetes.

(*a*) **Cause of the disease** is not known. There is often an hereditary predisposition. Associated in the production of the disease at times are disturbances in the nervous system, exophthalmic goiter, disease of the liver or pancreas.

(*b*) **Prevention.**

Individuals whose parents[2] have had diabetes should be exceedingly careful of exercise, diet, and general hygiene. Diet is most important. Restriction in quantity of food eaten and restriction especially of sugars are to be practised. A semi-annual medical examination would be advisable.

5. Gout.

(*a*) **Cause**[3] **of the disease** is the accumulation in the body of excess purin bases derived from the nucleoproteins of food. See Chapter VII.

(*b*) **Prevention.**

1. Moderation in eating, avoidance of alcohol, tea, coffee, and cocoa.
2. Elimination of meat and vegetables rich in nucleoproteins.
3. Outdoor exercise. Avoid sedentary life.

6. Goiter.

(*a*) **Cause of the disease** is not known. It has been attributed to the mineral content of drinking-water, to infection of the individual, to poor hygiene of life.

(*b*) **Prevention.**

Because the cause is so uncertain, the prevention cannot be sure. Removal from goitrous districts or boiling all drinking-water in goitrous areas would seem important.

[1] Goldberger and Wheeler: The Experimental Production of Pellagra, Bulletin 120, Hygienic Laboratory, V. S. P. H. S., February, 1920. Wheeler, G. A.: Treatment and Prevention of Pellagra, Journal American Medical Association, April 1, 1922, p. 955.

[2] This refers, of course, to real diabetes. Sugar in the urine does not always mean diabetes.

[3] Predisposing factors are heredity, the male sex, and alcohol.

7. Cretinism and myxedema.
   (*a*) Cause of the disease is the deficiency in thyroid secretion in the child (cretinism) or in the adult (myxedema).
   (*b*) **Prevention.**
   The development of the disease with our present information cannot be prevented. The giving of thyroid extract in cretinism will stop the progress of the disease and restore the person practically to normal. The extract must be given for life.
8. Obesity.
   (*a*) **Cause of the Disease.**—In susceptible persons, eating too much food and lack of exercise. It is often hereditary.
   (*b*) **Prevention.**
      1. Exercise.
      2. Reduction of fats and carbohydrates in the diet.

Prevention of Acute Poisoning.—A distinction is to be made between food infections and food poisoning. A food infection is due to the growth of micro-organisms. Rosenau and Weiss[1] affirm that students of the subject of food infections "now believe that practically all instances . . . are due to the *bacillus of Gärtner* (B. enteritidis), which is taken as a type of a group of closely related organisms." Food infection is not common in America. There have been in recent years numerous cases of food poisoning. This disturbance is due to the *product of the growth* of bacterial life. The organism producing the toxin is the *Bacillus botulinus*. It may grow in meat, sausage, and vegetables. It has been found in improperly canned vegetables. Recently several deaths were caused by the eating of olives which had not been prepared properly, so that botulism developed. An excellent extended discussion of food poisoning is given by Rosenau, Preventive Medicine and Hygiene, pp. 538–570.

The acute poisons from meats or canned vegetables are to be prevented by better inspection in food industries, and by care in the selection and use of food products.

The poisons from lead and other metals can be avoided by protection of the worker in certain trades by means of masks and facial appliances, and by careful washing of the hands, especially painters, before eating.

[1] Rosenau, M. J., and Weiss, P. D.: Food Infections, Journal of American Medical Association, December 17, 1921, p. 1948.

Prevention of Chronic Degenerative Disease.—Chronic degenerative diseases are seen particularly in the heart, blood-vessels, kidneys, and nervous system. They represent the deterioration in systems due to wear and tear, growing more pronounced with age, and the unusual degeneration due to poisons from unhygienic living, or chronic poisoning from metals or chronic pus infections.

The prevention of such diseases lies in the observance of the rules given in Chapters IX and X, and avoidance of metallic poisons.

Prevention of Functional Disease:

1. Neurasthenia.
   (*a*) **Cause of the disease** is complex. Hereditary predisposition plays an important part. Upon hereditary weakness the stresses and strains of life at times bear too heavily. With such overload the individual frequently develops bodily complaints that have little or no organic basis.

   The common active causes of breakdowns are mental and physical overstrain, worry, sexual disorders, poisons, such as morphin, tobacco, or alcohol, and the poisons from typhoid, malaria, influenza, and syphilis.

   (*b*) **Prevention.**

   The prevention relates directly to the cause of the disease. Cabot has many helpful suggestions in his book, "What Men Live By." See also Paton's "Human Behavior."
2. Hysteria.
   (*a*) **Cause of the disease** is complex. Heredity is a most important factor in its causation. Charcot held that every case was based on bad heredity. Exciting causes are mental or emotional shock, long-continued anxiety or care, worry, and mental strain. In some cases sexual worries or disturbances may induce the disease.

   (*b*) **Prevention.**

   On the basis of psychology prevention must be based on educational lines.
   1. Education must seek to inculcate habits of self-control.
   2. Whims and desires are to be gratified only on a rational basis of worth.
   3. Sympathy must not be too lavish. Trifling hurts and sorrows are not to be made the occasion for excessive sympathy. The treatment of girl children must be made similar to the treatment of boys in this respect. Self-reliance and self-control are as important for girls as for boys.[1]

[1] Williams, J. F.: Values of Camping for Girls, Teacher s College Record, January, 1920.

4. Out-of-door activities with development of interests in sports, games, and friends must replace the day dreaming and romantic, erotic coloring of the usual social life of the girl at the beginning of adolescence.
5. The hereditary factor is a eugenic problem.

Prevention of the Local Infections:

(*a*) **Cause of the infections** are a number of disease-producing organisms that enter through a break in the skin or mucous membranes. (See Chapter XIV for focal infections.)

(*b*) **Prevention.**

Prevention resolves itself into three factors:

1. Keeping the general resistance as high as possible.
2. Avoiding skin and mucous membrane injuries.
3. Careful treatment of all wounds and injuries. (See Chapter XIV for focal infections.)

Prevention of Cancer:

(*a*) **Cause is unknown.** The increase in cancer, the parts most frequently attacked, and the age, sex, and race distribution are given in Fig. 41.

(*b*) **Prevention.**

Although the definite cause is not known, certain conditions are associated with cancer, and prevention has to do directly with these.

1. The mouth and teeth should be kept in good condition. Teeth with rough edges should have dental care.
2. Any local skin defect, such as ulcers, warts, moles, or tumors, should be removed at once if they show any irritation.
3. Any unusual lump appearing in the breast should be examined by a physician.
4. Any lumps or swellings in the soft parts of the body or pain or enlargement of bony parts should be carefully examined.
5. After the change of life the appearance of the menses should be viewed with suspicion, and an early examination by a gynecologist should determine the cause of the condition.
6. Indigestion persisting over long periods may be regarded as favorable for the development of cancer of the stomach.

The preventive measures listed above relate to the avoidance of irritation and the early detection of the disease. Until the cause or causes are known prevention will be unscientific and not particularly effective. Bulkley[1]

[1] Bulkley, L. D.: Cancer a Mutiny of Body Cells, The Medical Record, October 1, 1921; see also, Bulkley, L. D.: On the Responsibility of the General Practitioner in Regard to Cancer, Medical Record, March 12, 1921.

believes that cancer is caused largely by improper diet, and most vegetarians claim that it is caused by the eating

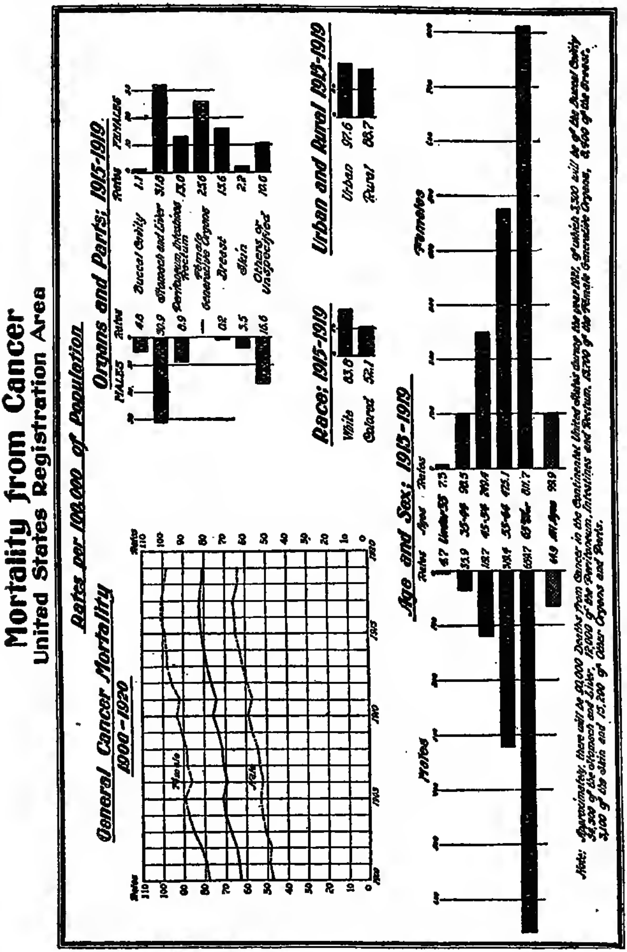


Fig. 41.—Note that cancer is increasing, that stomach and liver are more frequently attacked than other parts; that white persons are more susceptible than colored; and that it is a disease of late adult life. (By courtesy of The Prudential Insurance Company of America.)

of meat. It has been suggested by some that bad personal hygiene in general may be a cause. While recognizing the need for open-mindedness upon this point, it should be said that there is little evidence to support the dietary view.

The recent survey by Janowitz[1] is commented on by the Journal of the American Medical Association[2] as follows: "In view of the reputed relation of cancer of the stomach to the character of the diet, and especially the vegetarian's belief that this disease is the result of meat eating, it is interesting to report that a careful study by Janowitz shows no evident alteration in either the number or the location of cancers of the digestive tract as observed in Berlin during the war,[3] when compared with a similar group of population before the war."

What Are the Chances?—Disease results in recovery or death. The recovery may leave the patient impaired for months, for years, or during life. The course of disease is fairly well known, and the following statement of prognosis should be helpful in estimating the seriousness of different diseases:

1. *Diseases from which recovery is possible:*
   (*a*) Complete cure possible:
      1. Mild intoxications, such as food poisoning.
      2. Mild mechanical and chemical injury.

   (b) Complete cure probable:
      1. Chicken-pox (varicella).
      2. Dengue.
      3. German measles (rubella).

   (*c*) Recovery probable, but dependent upon patient and treatment:
      1. Measles.
      2. Erysipelas.
      3. Mumps.
      4. Early tuberculosis.

      In this group a complication may be fatal.

   (*d*) Recovery probable in the majority of cases:
      1. Serious infections, such as pneumonia, give a guarded prognosis.
      2. Trichinosis, scarlet fever, typhoid, yellow fever.

[1] Janowitz, F.: Ueber das Verhalten der maligner Tumoren des Verdauungstraktus Wahrend des Krieges, Zeitschrift für Krebsforsch., 18, 34, 1921 (abstracted in the Journal of the American Medical Association).

[2] Journal of the American Medical Association, December 24, 1921, p. 2064.

[3] During the war the diet in Germany was very largely a vegetarian one.

2. *Diseases in which recovery from acute attack is probable, but some chronic injury is likely to remain:*
    1. Endocarditis (heart disease).
    2. Infantile paralysis (poliomyelitis).
    3. Acute rheumatic fever.
    4. Nephritis.
    5. Arteriosclerosis.

    Nephritis may not and arteriosclerosis does not show an acute form. Injury to kidneys or arteries is usually permanent.
3. *Diseases in which recovery is rare:*
    1. Hydrophobia.
    2. Tetanus.
    3. Sepsis.
    4. Anthrax.

    The mortality in this group is over 80 per cent. unless a special curative agent is used early. Hydrophobia and tetanus will show a good prognosis under early Pasteur treatment for the former and early antitetanus serum for the latter.
4. *Diseases in which recovery is not sure:*
    1. Malaria.
    2. Secondary syphilis.
    3. Epidemic meningitis.
    4. Diabetes.
    5. Gout.
    6. Chronic tuberculosis.
    7. Tertiary syphilis.
5. *Diseases from which complete recovery is impossible:*
    1. Purulent meningitis.
    2. Acute leukemia.
    3. Acute septic endocarditis (except the gonococcus form).

    Slowly fatal types are:

    4. Chronic leukemia.
    5. Addison's disease.
    6. Carcinomata (cancer) of internal organs (some exceptions).
    7. Leprosy.
    8. Endocarditis (Streptoccocus viridans type).
6. *Diseases in which a functional cure may be secured by the surgeon:*
    1. Renal calculus (stone in the kidneys).
    2. Cholelithiasis (gall-bladder disease).
    3. Internal suppurations.
    4. Malignant growth that has an early diagnosis and complete removal.

The outcome of any disease is dependent upon the nature of the disease itself; upon such personal factors as age, habits, sex, race, heredity, and resistance; upon such environmental factors as economic strains, social surroundings, and sanitary standards; and upon the judgment and skill of physician and nurse.

Summary.—The causes of disease are bacterial, protozoan, and at times metazoan. In addition, poisons from food or drink, or imperfect metabolism of food in the body may produce disease. The maladjustments of the individual to life's problems may result in functional disturbances and failure of endocrine organs to function properly may bring on serious disorders.

The carriers of disease of the communicable kind are either persons suffering in mild form from disease, such as colds, measles, etc., or "carriers" in whom the organism grows and develops without producing the symptoms of the disease. The "carrier" is well recognized in typhoid and diphtheria. In addition, objects may carry disease, although they are held now to be less dangerous than they were thought to be formerly. Nevertheless, infectious material on objects may be transmitted to well persons. Flies, rats, bedbugs, lice, fleas, cows, dogs, cats, and other animals may carry certain infectious agents to man. Typhoid, plague, typhus, tuberculosis, diphtheria, and many other serious diseases may be transmitted by means of insect or other animal carriers.

The defenses against germ disease are the forces of resistance developed in the body naturally and the artificial immunities which may be conferred by vaccination and serum treatment. In constant warfare against many transmissible disease agents are sunlight and air. Thus the environment offers forces of tremendous value to man in combating disease. Organized society has erected administrative defenses in the form of isolation and quarantine which are indeed helpful.

To eliminate causes, to control "carriers," and to build up defenses are the three legs of the tripod—Disease Prevention. To do this, hygiene in all its aspects is immensely valuable.

CHAPTER XIV

HYGIENE OF THE MOUTH, EYE, AND EAR

HYGIENE OF THE MOUTH, NOSE, AND SINUSES WITH REFERENCE TO SEPTIC INFECTIONS

HYGIENE OF THE EYE

HYGIENE OF THE EAR

HYGIENE OF THE MOUTH, NOSE, AND SINUSES WITH REFERENCE TO SEPTIC INFECTIONS

Septic Infections.—The word "sepsis" means a general disease produced by pus-producing bacteria. Specific diseases such as typhoid and diphtheria are recognized as infections, but they are not classed as septic infections because the organisms are not pus producing. Typhoid bacilli select, as a rule, the small intestine for their development, and diphtheria bacilli choose usually the mucous membrane of the nose, pharynx, or larynx.

The organisms producing septic infections are of two types: streptococci and staphylococci. At times the pneumococcus is a factor and in certain tracts the colon bacillus is responsible for the trouble. These organisms may come from outside the body or they may come from the host where they have dwelled for some time without sign. The particular significance of this fact has only in recent years been fully appreciated.

It has been observed that foci of infection in the body may serve as sources from which organisms may be spread to distant parts of the body. There is usually a definite relation between the portal of entry and the lesion or diseased process that develops. This relationship is not established for all cases, but it is so definite in many instances that foci are always under suspicion when infection develops systemically in the body.

Portals of Entry.—The gates by which pus-producing organisms enter the body are several. The skin affords a large field. Boils and skin infections following cuts, abrasions, or other injuries may develop into general septic conditions. Certain disturbances in the gall-bladder come from the extension of colon bacilli normally present in the intestinal canal, and these organisms may also invade the urinary tract, attacking the kidney, ureters, and bladder. While these forms exist and cause serious disturbance at times, the chief portal of entry is in the head and face. Teeth, tonsils, nose, and sinuses are common pathways for organisms. To understand the liability of these structures as foci of infection and the preventive measures to be applied is very important. They will be discussed in the order given above.

Teeth.—The temporary teeth of the child are lost in the second dentition, and are replaced by a permanent set. Belief that the temporary teeth are unimportant is unfounded in fact.[1] Their care is significant for the following reasons: Proper development and care of the

[1] Snyder, J. R.: The Temporary Teeth, Journal American Medical Association, August 14, 1920, pp. 458–460.

temporary set determine the shape and size of the upper and lower jaw bones; they condition the maturing of the permanent set, for if the temporary teeth are lost too early, the permanent teeth do not have the proper stimulus for growth; and finally, good oral hygiene is as important for the health of the child as it is for the health of the adult.

The importance of oral hygiene for children has been demonstrated by Fones in Bridgeport, where a five-year program of oral hygiene in the schools reduced the educational budget spent on re-education from 40 to 17 per cent.

The Cause of Dental Defects.—The quality of tooth substance is determined in part before the child is born. The developing embryo must get the tooth-forming salts from the blood of the mother. Frequently the mother gives up needed and essential salts of her own body to the developing child because of insufficient content in her diet. It is extremely important, therefore, for the pregnant mother to select articles of diet from food with a high calcium content (see page 174).

After birth the importance of dietary factors is not to be forgotten. Too often oral hygiene is viewed too narrowly as a tooth-brush affair merely. Dental deterioration is due to what is omitted from the diet rather than to what the diet contains. Attributing to candy or soft foods the cause of dental decay is not well supported. For example, the Rhodesian skull[1] shows "unmistakable evidence of dental caries, and even of abscesses at the roots of the teeth."[2] Dental decay is not a modern disease apparently, but one experienced by our earliest ancestors.[3] While the evidence is not complete, it would appear that the tooth-brush, candy, and soft foods were unknown to primitive man, but that deficient dietary factors could play then the rôle that they are playing so surely today. For other good reasons the tooth-

[1] Science, p. 129, February 3, 1922.
[2] Journal American Medical Association, p. 586, February 25, 1922.
[3] Ibid., p. 282, January 28, 1922.

brush should be used regularly and well, candy should not be eaten between meals, and coarse food requiring mastication should be selected. But reliance on such procedures for development of good teeth is precarious. Adequate diet is extremely important.[1]

Teeth as Foci of Infections.—There is abundant evidence to show a causal relationship between infected teeth and many varied forms of general bodily disturbance. At times extreme claims are made and tooth extraction is expected to accomplish too much in health restoration. Reaction against overzealousness on the part of the inexperienced should not lose sight of the real facts. Evidence by both foreign and home clinicians is available. Antonius and Czepa,[2] following a systematic use of the *x*-ray in Falta's service, found that 66 per cent. of 225 cases of various diseases had some infectious process at the root of one or more teeth. Their observations led them to affirm a causal relationship between focal infections in the teeth and nephritis, chronic septic endocarditis, joint and muscular rheumatism, neuralgia, and other disturbances.

The Life Extension Institute, Inc., reports that "in a recent series of 200 *x*-rays at the head office of the Institute, 67.5 per cent. were found with infected roots or gums. Among 200 individuals there were 205 foci of infection found." Lambert[3] reports that in 1000 cases of rheumatism at Bellevue Hospital, 68 per cent. showed bad teeth, and that since the establishment of the dental clinic in Bellevue "the number of rheumatics has decreased enormously."

The story of dental infection is most interesting. At times the relationship seems clear enough because of

[1] McCollum, E. V.: The Effect of Diet on Health, Journal of National Dental Association, April, 1922.

[2] Antonius, E., and Czepa, A.: Wiener Archiv für innere Medizin, Vienna, February 15, 1921, p. 293; (abstracted) Journal American Medical Association.

[3] Lambert, A.: Journal American Medical Association, October 16, 1920, p. 1041.

alveolar abscess, marked inflammation, and frank evidence of decay. Quite often, however, the astounding x-ray shows the trouble to be in the root canal or at the tip of the tooth in the jaw, while quite disturbing to the layman is the fact that there may be no signs to the owner that anything is wrong with the teeth. Such cases are only revealed by the x-ray examination.

Because of experience, modern dentistry views with suspicion crowns and bridge work, and especially if these were mounted some years ago before the practice of root canal fillings. It is not an extreme position that the dentist takes when he advises, after an x-ray diagnosis, that expensive crowns be removed or even that teeth be pulled for the purpose of eliminating sources of infection.

Fortunately, there is developing rapidly among dentists a technic for filling root canals in instances when the nerve has been killed. This technic involves use of the x-ray to determine whether or not the filling has reached the tip of the tooth. With extension of this procedure among dentists, and with understanding by laymen of its necessity, certain forms of general bodily disturbance and ill health will be prevented.

Pyorrhea Alveolaris.—Pyorrhea alveolaris[1] is an infection of the gums with characteristic changes in the bony alveolar process that holds the tooth. It begins at the gum margins and extends, causing marked inflammation. A common picture in well-developed pyorrhea shows the gums retracted so that the teeth appear abnormally long; the gums are red and bleed easily; and around their margin a yellowish pus exudes. A disagreeable taste in the mouth, foul breath, and disturbances of digestion are common results. More serious are general systemic infection of other parts due to invasion by pus organisms of the lymph and blood-channels.

The cause of pyorrhea has been assigned to an animal

[1] Bass, C. C., and Johns, F. M.: Pyorrhea Dentalis and Alveolaris, Journal American Medical Association, February 13, 1915.

parasite, the *Endameba buccalis*. The case is not clear against this particular organism, but the preventive and treatment methods are well known. A mouth-wash of 2 drops of the fluidextract of ipecac to ½ glass of water is helpful in the early stages. If the condition is well developed thorough dental prophylaxis is imperative.

How to Keep the Mouth and Teeth Clean.—There is considerable conflicting testimony regarding the efficacy of different methods of oral hygiene. Competent dentists are in essential agreement with the following procedures:

1. Brush the teeth daily, preferably after each meal. Use a rather stiff brush with uneven bristles and thoroughly cleanse all surfaces of the teeth. A rotary, across, and up-and-down motion are the proper movements to make. Never neglect the night brushing. This is the most important single brushing.
2. One should have three tooth-brushes, to be used alternately, This will give time for the bristles to thoroughly dry out.
3. Use a paste or powder that is not scratchy.
4. Food particles caught between teeth should be removed with dental floss. Care should be taken not to injure the gums.
5. An alkaline mouth-wash is useful before retiring, although not essential if the mouth is in good condition. Lime-water made from coarse unslaked lime may be used.
6. Cleansing of the tongue with a tooth-brush used only for this purpose assists in the removal of decomposing material that at times causes foulness of breath.
7. Examination of the teeth by a good dentist every six months, preferably every three months, is strongly advised. Attention to this matter will prevent many defects from occurring. If evidence of dental defect develops, immediate attention should be given to it.

Tonsils as Foci of Infections.—The tonsils are lymphatic glands situated at the entrance to the throat, or pharynx. They lie in pockets or depressions between two bands of musculomembranous tissue called the pillars of the fauces. They serve, like all lymphatic tissue in the body, to protect against bacteria,[1] and because of their situation they are liable to become infected.

[1] Davis, D. J.: The Tonsil in Relation to Infective Processes, Journal American Medical Association, January 31, 1920, pp. 317–320.

The evidence against the tonsils as foci of infection is very strong. Heart disease, rheumatic fever, and chorea have shown certain relationship. St. Lawrence[1] reports a study of 94 cases, and shows the effect of removal of the tonsils upon the recurrence of general disease (Fig. 42). After tonsillectomy the occurrence of rheumatic manifestations dropped from 85 per cent. to slightly over 30 per cent. This careful work shows that the tonsils are the most important single portal of entry for rheumatic infections, and that their removal greatly decreases the liability of recurrences.

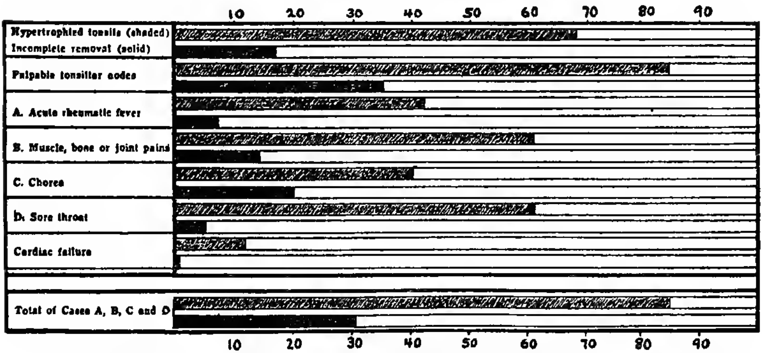


Fig. 42.—Effect of tonsillectomy on the recurrence of rheumatic manifestations: shaded area, number of cases before operation; solid area, number of cases after operation; figures above and below, number of cases. (By courtesy of Dr. William St. Lawrence.)

Belief that removal of the tonsils causes injury to the voice, ears, or interference with the protective mechanism of the body is not well founded. The voice is usually improved after tonsillectomy, particularly if the tonsils are large. Only the amateur in surgery would damage the neighboring throat structures in the operation. In the second week after the operation pain in the ears

[1] St. Lawrence, W.: Effect of Tonsillectomy Upon the Recurrence of Acute Rheumatic Fever and Chorea, Journal American Medical Association, October 19, 1920, pp. 1035–1041.

may be quite marked, but this is temporary and of no vital significance. The protection to the body is unimpaired because the deeper lymphatic nodes take over the work formerly performed by the tonsils. Their protected position in the deeper tissues prevents exposure to the great number of bacteria constantly present in the mouth.

Finally, it should be remembered that removal of the tonsils, especially in children and young adults, results in most salutary effect upon the general health. In particular cases, colds, croup, and tonsillitis are greatly decreased both in severity and frequency. In children, an increase in weight is commonly noted, and favorable effects on the nervous system are most striking. In children the adenoids are usually removed at the time of the tonsillectomy (see page 226 for Adenoids).

The Nose and Sinuses as Foci of Infections.—Four bones of the skull contain distinct cavities which give rise, at times, to local or even general disturbance. These cavities are called sinuses, and all open into the nose or nasopharynx. The *frontal sinus* is located in the frontal bone immediately above the eyebrows; the *ethmoidal sinus* is a series of small cavities in the ethmoidal cells which open into the upper part of the nasal cavity; the *superior maxillary sinus* is a large cavity in the upper jaw bone on either side of the nose, and the *sphenoidal sinus* is a small cavity in the body of the sphenoid bone. This opens into the nasopharynx. These sinuses are lined with mucous membrane. During an acute cold, "influenza, pneumonia, scarlet fever, measles, diphtheria, typhoid fever, and other infective diseases"[1] infection and inflammation may develop in these cavities. Deformities in the nose which prevent free drainage of the sinuses or an infected tooth in the upper jaw opening into the sinus of the superior maxillary bone, are not uncommon ways in which trouble begins. Understand-

[1] Coakley, C. G.: A Manual of Diseases of the Nose and Throat, Lea & Febiger, Philadelphia, 1914, p. 200.

ing of such processes should be helpful in seeing the futility of the punching or manipulating of the spine for "subluxations."

Acute inflammation in these centers may require, and often do demand, surgical attention. If not cared for properly, extension to the brain may occur, with fatal consequences. The sinuses do not play the same kind of a rôle as the teeth and tonsils apparently, and yet at times a chronic sinusities is found to be the cause of general disturbance in health.

Mouth-washes, Sprays, and Gargles.—Liquids are used for cleansing the mouth cavity during an infection. During an attack of tonsillitis or pharyngitis local treatment is very helpful. The chief value lies in the mechanical washing of the inflamed part, and slight reliance should be placed upon drugs or chemicals unless prescribed by a physician.[1] The reason for insisting upon medical direction is the variable conditions that may be found. Shall an antiseptic only be used, an irritant, or an astringent? What preparation is selected depends upon the condition of the mucous membrane. A mouth-wash of salt water, or bicarbonate of soda in water, is beneficial for removing mucus, but the claims of special curative values for advertised gargles and mouth-washes are grossly exaggerated, to say the least.

Chronic conditions in the nose or throat may require sprays, gargles, or drops over a long period of time. The rational procedure is to secure from a specialist a prescription for the condition, and then follow his directions.

HYGIENE OF THE EYE

The Eyes Need Care.—The eyes of man developed to perform a function that has been greatly changed in modern civilization. The invention of Gutenberg has thrown enormous strain upon the eye by requiring

[1] The physician will wish to prescribe in accordance with the condition of the part to be treated.

it, in reading the printed page, to make many more movements than are ever called for in the environment of large objects. Many eyes are unable to make this adjustment. About 35 per cent. of the school teachers in Germany wear glasses, though not more than 15 to 20 per cent. in the United States. This difference Terman[1] suggests to be due to the "unwillingness of our women teachers to risk the disfigurement of spectacles." There are many women who refuse to wear glasses because of pride, but this attitude is probably not the explanation for the condition found in this country. More people in all walks of life need and wear glasses in Germany than in America, because as a people the Germans are inclined to myopia and in America myopia is less frequent.

The use of eyeglasses and spectacles is recommended to correct abnormalities of eye structure or eye function. Myopia (near sight), hyperopia (far sight), presbyopia[2] (far-sight condition of advancing age), astigmatism (unequal curvature of the cornea—front part of the eye) are structural defects to be corrected by proper lenses placed in front of the eye. Weakness or insufficiency of the external muscles of the eyeball may be functional and disappear if strain is removed by proper lenses.

How to Care for the Eyes.—Intelligent care of the eyes will provide:

Early and repeated eye examinations. Such examinations should be made if the individual has headaches, or, if in reading, the book is held nearer than 12 inches.

Examinations should be conducted preferably by oculists rather than by opticians or optometrists. The oculist is a physician who examines the eye with reference to other conditions prevailing in the body. He does not

[1] Terman, L. M.: The Teacher's Health, Houghton Mifflin & Co., 1913, p. 66.

[2] Presbyopia is a very interesting condition. The near point of vision begins to recede at about the age of ten and continues throughout life. At about forty-five it has reached 12 inches, which is our distance for reading and many kinds of work, so that glasses are needed to bring back the near point to the working distance. Glasses for this purpose need to be changed every one to three years.

merely refract the eye. The optician or optometrist in small towns is usually engaged in the jewelry business and conducts eye examinations free for the purpose of selling lenses and frames. He may examine quite accurately the optical defect of the eye, but he is not in a position to interpret the eye condition in terms of general disease. Thus, kidney disease with its eye signs, arteriosclerosis, sarcoma of the eye, and other serious conditions, would be detected by the skilled oculist and missed by the optician. The eye and forehead ache of malarial fever, the characteristic pupil conditions in early locomotor ataxia would be recognized by the physician oculist; the optician or optometrist would not be able to make a differential diagnosis.

Avoidance of fine work, especially by children. The effort to see small relationships, as in sewing, embroidery, drawing, painting, reading, and so forth, is a strain on the eye muscles. Such work should not be continuous for long periods.

Frequent rest for the eyes from study or close work. It will relieve the eyes to look up from close work and allow the eye to look into the distance. Objects 20 feet away are seen by the normal eye without any muscular effort. To look out of the window when doing close work indoors is a very desirable relief for the eye.

Good light. Good light for seeing purposes is light from a steady source, as near like the sun as possible, coming from above or from the side. In all writing it is important that the light come from the left for right-handed persons or from the right for left-handed persons.

Twilight is a poor light with which to do any fine work. For seeing purposes full sunlight may be undesirable because of too great intensity or glare. Reading on a moving train or street car is hard on the eyes because of the wavering source of light, the shadows cast, and the constant change in the focus and adjustment of the external muscles of the eyes required by the vibrating book or paper.

Good light will have the following characters:

1. Steady source.
2. Sufficient intensity to illumine without glare.
3. No shadows produced on the reading or work surface.

Tinted glasses. In caring for the eyes it will be helpful to have tinted glasses for use in the bright sun, especially at the seashore, and during the winter while the snow is on the ground. They should also be used in strong winds, as in automobiling, unless one is obliged to wear glasses for other purposes.

Good general health. The eye responds quickly to lowered states of bodily efficiency. Good health means almost always right living, and the eyes will share in the general effects.

The Cause of Eye Defect or Disturbance.—The proper care of the eyes results uniformly in good eyes. Lack of proper care causes a variety of eye defects or disturbances. Viewed from this angle, of course, we find the following:

1. General ill health, weakness or lowered vitality. The loss of tone in general is expressed in the eye in definite deterioration.
2. Excessive use of the eye. Students, teachers, laboratory workers, and all sedentary workers engaged in close eye work are liable to overuse the eye.
3. Poor light.
4. Irritating forces, such as chemicals, vapors, dust, wind, and excessive heat.
5. Disease of the eye, such as trachoma, pink eye, ulcer of the cornea, ophthalmia neonatorum, etc.
6. Hereditary factor may be a cause of certain abnormalities. The generally accepted opinion is that at birth all eyes are hyperopic, and that as development progresses the eyes in time become the proper size and shape with the refracting media acting symmetrically. If the cornea and lens do not refract rays to a common focus then there

is astigmatism. If the eyeball does not enlarge to the proper size then there is hyperopia. If the eyeball tissues stretch or overdevelop then myopia is the result. Thus myopia is really acquired and hyperopia is congenital.

Uncorrected eye defects and abnormalities cause a variety of disturbing conditions that range all the way from headache to marked general ill health. Use of a defective eye demands extreme effort on the accommodation powers of the eye. It always strains the eye and wastes energy. All children should have the relief and help that scientific oculists can give; all adults owe it to themselves to secure optimum working conitions.

The Use of Drops and Other Treatments.—Drops are used in examination of the eye to paralyze the muscles of accommodation so that the actual defect in the eyeball may be determined. Atropin or homatropin is used for this purpose. In the care of a skilled oculist there is no danger from the use of these drugs. Opticians, jewelers, non-medical "refractionists," and peddlers are prohibited by law from using "drops." This is most fortunate, because their use in cases of glaucoma produces serious results. Persons with glaucoma (excessive pressure within the eyeball) suffer from failing vision, and are likely to be seeking for optical aid. The importance of this law is, therefore, very great.

Eye diseases and abnormalities offer a rich field for the charlatan and patent-medicine faker. Numerous *cures* or *remedies* are on the market claiming "to restore defective sight," "to make the eyes young again." As illustrative of this class of fraudulent preparations the following from Nostrums and Quackery[1] is given:

"The label on Eyelin contained the statements:

Repairs and Rejuvenates the Eye and Sight.
Reshapes and Rejuvenates the Eye and Sight.

[1] Nostrums and Quackery, American Medical Association, Chicago, 1912, pp. 528, 605.

Analysis of the stuff in the government laboratory disclosed the fact that it consisted essentially of vaselin, perfumed."

One dollar a box for vaselin, perfumed, to correct eye defects represents the honesty and integrity of the whole patent-medicine game. Exorbitant prices for simple preparations that are often worthless for the condition described.

Another preparation widely advertised is Murine. Before the advent of the Food and Drugs Act the carton in which this "eye water" was sold read as follows:

Murine A positive cure for Sore Eyes, Red, Inflamed, and Itching Lids.

Since that law has become operative, and a lying label has become illegal instead of merely immoral, the carton bears this legend:

Murine a Reliable Relief for Sore Eyes, Red, Inflamed, and Itching Lids.

On analysis, Murine is found to be a water solution of borax (12 grains to the fluidounce). The price charged for Murine is $1 per ounce; the estimated cost of the preparation is 5 cents per gallon.

Common Disorders of the Eye.—Disorders of the eye are frequently of minor importance, but because of the delicate structure of the eye and the value of perfect vision, intelligent care should be given to all abnormalities, however trivial. The disorders commonly found may be grouped in three headings: injuries, infections, and systemic causes.

Injuries to the eye may result from a blow upon the face, resulting in the condition known as "black eye."

The blackness is due to the breaking of blood-vessels in the soft tissues around the eye with a flooding of blood into the tissues from the broken vessels. If care can be given immediately after the injury ice compresses will be most helpful. After discoloration has occurred hot compresses will be useful in promoting absorption of the extravasated exudate. Local medication is useless, and poultices, beefsteak, etc., are valuable only as they supply heat. A hot-water bag is more desirable from many standpoints than sirloin.

Injury from a foreign body in the eye is very common. The usual cinder, eyelash, or dust-grain is not a serious disorder, but until removed it is extremely troublesome. To remove a foreign substance from the eye gently pull down on the lower lid and look in the lower sac for the irritation. If it is not seen, the upper lid must be everted for examination. To evert the upper lid grasp the edge of the lid with index-finger and thumb of right hand, pulling forward and downward. Ask the patient to look downward, and at the same time turn the lid up over the thumb of left hand placed on the margin of the eye socket with nail side forward. Wipe off the particle with the corner of a *clean* handkerchief or wisp of cotton. If the particle is embedded so that it is not easily removed, refer the case at once to a physician who can use sterile instruments.

Infections of the eye occur more frequently in childhood than in adult life. A common disorder is known as sty of the eye. A sty is an infection and inflammation of one of the glands along the margin of the eyelid. Its cause is not known. Some attribute eye-strain as a factor. Its prevalence in young children would suggest need for ocular examination. It may be caused by some other factor, such as infection due to rubbing the eye with dirty hands. Stys are not usually serious, but should be cared for carefully. When "ripe" they should be opened with a sterile needle, and the pus removed by gentle pressure with a bit of cotton on a toothpick.

After expulsion the wound should be painted with 5 per cent. argyrol and yellow oxid of mercury salve used in the eye.

"Pink-eye" is an inflammation of the conjunctiva. There are two kinds: one seen in cases with cold in the head, influenza, eye-strain, or after exposure to wind or irritating smoke. This type is due to local causes. The other is an infectious inflammation of the conjunctiva, a conjunctivitis, that is very communicable. The pink-eye from irritation should be treated by washing the eye with saturated solution of boric acid; the infectious conjunctivitis requires medical attention.

Purulent conjunctivitis of the newborn is commonly due to gonococcus infection. Before the law requiring obstetricians and midwives to use silver nitrate in the eyes of all infants at birth, this condition was a common cause of blindness.

Trachoma is an exceedingly communicable disease of the eye characterized by granules in the conjunctiva of the lids. It is largely seen among children (especially those of foreign birth) of crowded sections in city schools. It may result in impairment or even total loss of vision. Granular conditions of the lids of a simple type are not to be confused with trachoma. All granular conditions of the eye should be examined by a physician.

Systemic causes of eye disorders are the diseases that show certain eye changes. Thus, kidney and heart disease may be indicated by swelling and baggy formations under the eye; locomotor ataxia shows characteristic pupillary changes, and various poisons indicate their effects in retinal changes.

Blepharitis is an inflammation of the margins of the eyelids. If neglected the eyelashes fall out, not to be replaced. This makes an unsightly deformity.

Chalazions are caused by infections of the ducts and glands along the inner side of the lids. They occur quite commonly. They may appear very much like a sty, and at first it is difficult to decide whether there is a sty or chalazion forming. The latter is sometimes spoken of as a blind sty.

HYGIENE OF THE EAR

The Ear Needs Care.—The ear is subjected in the modern world to a variety and intensity of sound waves out of all proportion to the forces acting when the hearing apparatus was evolved, but the adjustment necessary in modern life affects not so much the organ of hearing as it does the nervous system in general. Noise wastes human energy. Quiet and harmonious sounds are very beneficial. The ear carries to the nervous system all sounds; unfortunately for modern man it is not more selective.

The ear itself is important, however, because it is frequently infected and because it offers a pathway for infection to the mastoid cavities, and even to the brain itself. In the upper part of the throat there opens the eustachian tube that leads from the middle part of the ear structure. Normally the tube serves to permit an equalization of air-pressure in the middle ear with that existing outside the body. Any good book on physiology will explain this structure and function. This middle part of the ear from which the eustachian tube leads has another passageway that connects with the cavities of the bony prominence felt behind the ear, *i. e.*, the mastoid. Infection carried into the middle ear by means of the eustachian tube may extend to the mastoid and thence to the brain, requiring surgical operation or resulting in death.

How to Care for the Ear.—*Prevent so far as possible all infections of the nose and throat.* In children especially this is to be interpreted to mean also prevention of the communicable diseases of childhood, namely, measles, whooping-cough, scarlet fever, and diphtheria. Measles, whooping-cough, and scarlet fever are not infrequently complicated by middle-ear disease which may result in deafness or even in death.

Remove adenoids in children. The adenoid tissue growing near the opening of the eustachian tube causes deafness of varying degrees by shutting off partially or completely this opening.

Avoid diving in cold salt water. In all diving the pressure of the water may force infectious material up the eustachian tube. This has been noted to occur more frequently in salt-water diving. Apparently this is due to the action of salt water in clearing the mucus from the nose and throat and especially from the opening of the tube. Exposure to cold causes ear disturbance at times.

Carefully remove excess wax in the ear canal. The wax that is secreted in the ear canal is a normal and useful product. At times it increases to excess and needs removal to restore hearing. One should never attempt to clean the wax out oneself. The use of hairpins and other hard objects should be avoided. The canal may be cleaned by careful syringing with warm water and wiping of its walls by means of a wooden applicator with cotton on its end.

Refer to a physician all disturbances of the ear. At times foreign substances get into the ear canal. Insects may fly in or children may put into the ear objects, such as a pea, grain of corn, small toys, beads, etc. They need careful removal.

Careful watch of the ear must be kept throughout a cold, an attack of croup, measles, whooping-cough, or scarlet fever in babies and children. Since they are usually unable to tell what hurts them, it is necessary to rely upon daily examination by the physician to avoid serious complications.

Earache accompanying a cold, croup, sore throat, or communicable diseases is caused by infection carried into the middle ear. The practice of putting oil into the ear is traditional and unscientific. Heat in the form of a hot-water bag to the ear or gently syringing the ear with warm water will give relief. During all coughs, colds, etc., occurring in children a nightcap will be found very helpful in preventing an attack of earache.

The Mastoid.—Prevention of middle-ear disturbance by avoidance of the communicable diseases is important not only for the ears but also for the mastoid. Disease of the middle ear may extend to the mastoid, which communicates with the ear. If not cared for properly and promptly a mastoid infection may result fatally.

INDEX