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DISEASES
OF
METABOLISM
AND
NUTRITION

—
VON NOORDEN



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Physician-in-Chief to the City Hospital, Frankfort-on-Main

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CLINICAL TREATISES

on the

PATHOLOGY *and* THERAPY
of DISORDERS *of*
METABOLISM *and* NUTRITION

By

PROF. DR. CARL VON NOORDEN

Physician in Chief to the City Hospital, Frankfurt a. M.

AUTHORIZED AMERICAN EDITION
TRANSLATED UNDER *the* DIRECTION OF
BOARDMAN REED, M. D.,
PROFESSOR *of* DISEASES *of the*
GASTRO-INTESTINAL TRACT,
HYGIENE *and* CLIMATOLOGY,
DEPARTMENT *of* MEDICINE, TEMPLE
COLLEGE; PHYSICIAN *to the* SAMARI-
TAN HOSPITAL, PHILADELPHIA, ETC.

PART II

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NOTE BY THE AMERICAN EDITOR.

Prof. von Noorden's handling of the subject of nephritis in the following pages is bold, original, and somewhat iconoclastic. He rides roughshod over mosscovered tradition. Nothing is sacred to him but indubitably demonstrated truth. He has a way, too, of confirming or refuting alleged truths for himself taking nothing for granted. This is the proper course in the determination of scientific questions.

The author has by actual experiments exploded the myth so long accepted that the light meats are safer than the dark ones in various diseases including nephritis. He has questioned and gone far toward disproving the theory that milk is the best diet in all cases of nephritis. Indeed he has demonstrated that in many cases, certainly, the ingestion of fluids in this disease needs to be restricted rather than encouraged. In various other respects he has established for the treatment of the different forms of Bright's Disease, rules founded upon a critical scientific study of numerous cases, instead of the familiar directions handed down from an earlier period when clinical observations were less exact and pathologic theories more nebulous than at present.

It is refreshing and invigorating to receive instruction from one so sure of his ground as Prof. von Noorden. He prescribes a therapy the effectiveness of which he has proved repeatedly, and other clinicians may safely follow his lead.

As in the case of the preceding volume, Dr. A. C. Croftan has done the translating in a very creditable and satisfactory manner. It is not often that a foreign author has his thoughts rendered into English by one who is not only familiar with both languages, but also exceptionally well acquainted with the subjects under discussion.

BOARDMAN REED.

1833 Chestnut Street, Philadelphia.

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INTRODUCTORY.

In the present treatise I propose discussing the most important fundamental principles of the treatment of renal diseases. Since my first publications concerning the pathology of the kidneys (Albuminuria in Healthy Men, 1885) I have continually devoted labor and interest to the study of these questions from their theoretical side as well as in their practical and empirical aspects, believing that I should no longer withhold the presentation of my views, especially as they differ in many points from the usual statements of the textbooks and manuals. Clinical and experimental investigations of these questions have been repeatedly undertaken by me or my students and the results published. Still the circle of these researches is not yet closed, in part because the works newly begun delay the completion, and in part because new complications of the question have been constantly arising. I will undertake here the discussion especially of the two chief forms of renal disease, acute nephritis and the contracted kidney. The one called the parenchymatous or better, sub-chronic, form of nephritis, does not require to be so exhaustively considered. Its changeable picture, which in its clinical behavior at one time approaches the acute and at another time the chronic contracted kidney, is less adapted to an analysis of the important fundamental therapeutic indications.

I. THE CUSTOMARY THERAPY OF KIDNEY DISEASES.

(a) *Acute Nephritis*.—Kidney diseases belong to a class of disorders in which dietetic therapy—a system that in its complete form must be considered an achievement of recent times—was employed very early, and along clearly defined lines. Long before we undertook to influence the course of diseases of the heart, blood-vessels, blood, lungs and nervous system by means of a special dietetic regimen, long before we understood the extraordinary influence of forced feeding upon the course of chronic wasting diseases and of certain disturbances of the nervous system, even before we attained to a rational dietetic therapy of the more frequent and important diseases of the stomach and intestines, a dietetic schema for the treatment of kidney diseases had been formulated. It culminated in the preference for a milk diet. No matter which one of the text-books, hand-books, or monographs on nephritis that were published during the seventies and eighties (the earliest period of rational dietetic therapy) is consulted, we always find milk or its derivatives, *i.e.*, sour milk, butter-milk, more rarely kefir and kumyss, designated as the most important and the most agreeable food for nephritic patients. Some authors demand the most rigid enforcement of the milk regimen; others are prepared to concede more latitude, not because they

mean thereby to render the diet more favorable for the treatment of the disease, but because they often encounter practical difficulties in enforcing a milk diet; so that it seems wiser to circumvent these difficulties, by allowing a certain variety of diet, than to expose the patient to the dangers of insufficient nourishment by adhering too closely to a principle. A milk diet has always been especially insisted upon for patients with acute nephritis; and I may say without exaggeration that to-day, just as two or three decades ago, a milk diet is at least tried, in every case of acute nephritis occurring in general practice, with the addition perhaps of some other dishes prepared with milk. Often it is energetically carried out until all blood has disappeared from the urine, until albuminuria and cylindruria have greatly diminished, freer diuresis is established, and the disappearance of edema shows that the disease is in process of healing. It may be said that in practice the administration of an exclusive milk diet occupies so important a place in the treatment of acute nephritis that it has replaced all other systems of dietetic treatment in the disease.

(b) *Sub-Chronic Nephritis*.—For the sub-chronic form of nephritis with edema (so-called perenchymatous nephritis), essentially the same dietetic treatment has been introduced and maintained. But it has been recognized, even by the earlier writers, that in this form of nephritis a pure milk diet cannot be administered so exclusively as in the acute forms of the disease. This is fully explained by the long duration of this

form; for, as a rule, many months elapse before the disease either ends fatally or develops into the ordinary chronic form. Although the majority of treatises on nephritis, and among these the best (I may cite Senator, for example) recognize the difficulty or even the impossibility of systematically carrying out a strict milk diet, others urgently recommend it as essentially the most reliable form of diet in parenchymatous nephritis (*e.g.* Semmola and G. See). A large experience both in office and in consultation practically has taught me that this recommendation does not merely exist on paper, but that it is often actually acted upon. I have seen many patients who had not taken any other nourishment than milk and mineral water for many months: this I consider a wonderful exhibition of energy. Only a few of these patients were under the care of German physicians; most of them were treated by French practitioners, or physicians who were largely dominated by the influence of the Paris school (Belgium, Russia, or the Balkan States). It is exceedingly difficult to formulate a reliable judgment in regard to the utility of a long continued milk diet, particularly in parenchymatous nephritis; this is due to the fact that a prognosis is more difficult to make in this than in any other form of nephritis. But I am willing to acknowledge, both on the strength of the publications mentioned above and of my own experience, that occasionally the disease runs a comparatively favorable course in patients living on an exclusive milk diet. The

kidney affection gradually merges into the much less dangerous chronic form, and this, under certain circumstances, is, as we know, compatible with long life. On the other hand, I have encountered cases in which a long continued milk diet undoubtedly worked harm. I will refer to the subject below. As a rule patients who do not bear the milk diet well are permitted to eat small quantities of meat, preferably of white meats (*cf.* below), one or two eggs per day, and besides some vegetables, fruit, fruit syrups, cereals, butter and sugar. Such a mixed diet offers a certain variety, and can be given for some time. Strong condiments, alcohol and other stimulating drinks should of course be prohibited.

(c) *The Contracted Kidney.*—While the dietetic regulations recommended by different clinicians in the treatment of acute and chronic diffuse parenchymatous nephritis are practically uniform, the dietetic *régime* advocated in chronic atrophic nephritis varies considerably. Here, too, we find enthusiastic adherents of an exclusive milk diet *sans phrase*, and here again I notice that particularly the modern Paris school clings to the *régime lacte* with the greatest tenacity. As an example, I may mention the case of a man of forty, the owner of a vineyard in Burgundy, who took no other nourishment from the time albuminuria was discovered in the spring of 1899, until July, 1900, when I saw him for the first time. He drank three to four liters daily, with one bottle of Vichy Celestin. The physicians who attended him insisted most obstinately on keeping

him on this diet, in spite of the fact that his condition was becoming visibly and progressively worse; as ocular disturbances, stenocardiac attacks and cardiac dilatation, all conditions that were absent at the time when the albuminuria was first discovered, developed under this milk treatment. We will return to this case later. In Germany we occasionally find this rigorous diet insisted upon in chronic atrophic nephritis, but, on the whole, much less frequently than in France and other countries. As a rule, the directions given are similar to those I described in the last paragraphs of the chapter on parenchymatous nephritis. In general practice physicians, as a rule, insist on partial milk diet; the average quantity of milk that, as I learn from my case histories that extend over many years, is ordinarily prescribed, and that in most cases the patients are able to take, is about one and a half to two liters per day. Only within recent years, thanks to the stimulus of my communication at the Congress for Internal Medicine, at Carlsbad, in 1899, it has become customary to prescribe smaller quantities of milk.

Most authors acknowledge that theoretically meat and eggs should be omitted from the diet of patients suffering from atrophic nephritis, but that it is best not to exclude these articles in so chronic a disease. Nevertheless, certain restrictions must be imposed, both in regard to the quantity of eggs and meats to be permitted, and the form in which they are administered. As to the quality, raw eggs are usually forbidden; while of meats the white part alone (chicken, veal, pork,

See
p 50

hare, fish) is permitted, or, at least, more strongly recommended.

Raw and stewed fruits, cereals, legumes, and fats of all kinds are usually allowed without restriction, unless special contraindications exist; most vegetables are also given, excepting radishes and other roots that contain highly irritating oils; asparagus is also as a rule forbidden. All strong spices (mustard, pepper, cinnamon, nutmeg, etc.) are bad and vinegar has a specially bad reputation; as a rule, patients are forbidden to take any vinegar and are instructed to use lemon-juice instead.

Opinions in regard to the permissibility of alcohol vary. While some eschew both light and heavy liquors, believing them to be a dangerous poison for the kidney even in very small quantities, others are more liberal, and allow a certain amount of wine in accordance with the habits, tastes, and general condition of the patient—although rarely more than half a bottle of light table wine per day. Others prefer fruit wine (cider) for reasons that are not quite clear, since it contains hardly less alcohol than light brands of table wines; the two differ merely in regard to the proportion of perfectly harmless low fatty acids and their esters they contain. Beer is usually rigidly prohibited; and justly so, for beer-drinking is easily carried to excess.

II. THE PRINCIPLE OF SAVING THE KIDNEYS IN RENAL DISEASES.

When we review all these dietary regulations, that in great part have been developed from practical experience, we will discover that they are all based on the same principle and all emanate from the same idea, namely, to save the diseased organ, the kidneys, as much as possible. Protective therapy in general is intended in the first place to save the diseased organ all superfluous work, and in the second place to eliminate all those irritants from the diet that might stimulate it to increased effort. Such treatment is particularly rational in nephritis, because the functional powers of the kidneys in this disease are reduced to such an extent that in order to perform any additional work at all the last vestige of reserve force would have to be expended. F. A. Hoffmann,¹ in a series of brilliant writings, was the first to undertake an analysis of the principles governing this method of treating organic lesions of certain organs. For a long time we have been in the habit of treating certain organic and functional diseases of the nervous system, certain disorders of the stomach and intestine and, in particular, certain heart lesions by this method, and in many instances we may be gratified to find that protective treatment produces marked improvement in the functional pow-

¹F. A. Hoffmann, *Allgemeine Therapie*. Leipsic. 4th Ed., 1895.

ers of the affected organ or even restores approximately normal functional activity in cases in which the organ was damaged by irreparable anatomic lesions. We must always remember, however, that protective therapy directed toward sparing one organ should never go so far as to indirectly damage some other important organ, or the organism in general. This caution seems to be so self-evident that it seems hardly worthy of particular mention; nevertheless, unfortunately, it is frequently neglected: we often find that a certain dietary or other prescriptions are given that may be perfectly rational as far as the disease of one organ is concerned, but that unquestionably do harm to the organism in general. In other words, dietary regulations are frequently one-sided, and consequently injurious. Some ten years ago I undertook to study this question in detail, particularly in regard to the routine treatment of diseases of the stomach in vogue at that time.¹ I am much gratified to find that this little monograph acquired some significance in the subsequent development of the dietetic treatment of diseases of the stomach.

We will see below that in the treatment of diseases of the kidney the ordinary routine prescriptions may occasionally do harm, and actually have been followed by deleterious consequences.

There are certain natural limits to every system of protective therapy. In diseases of the heart, for in-

¹Von Noorden, "Der Stoffwechsel der Magenkranken und seine Ansprüche an die Therapie." *Berliner Klinik.*, Heft. 55, 1893.

stance, we cannot reduce the activity of the organ below a certain level; in diseases of the stomach we cannot reduce the functional activity of the stomach beyond a certain degree; and the same applies to the kidneys, for, in the case of these organs, we can only reduce their excretory function to a certain extent. In estimating to what extent we are justified in sparing the organ, we must remember that in acute diseases of the kidneys we can and must carry the protective principle further, and may at the same time expect more rapid and better results than in chronic forms of nephritis. We know this from our general pathologic experience, and we know from clinical experience, besides, that if we do not treat acute forms by sparing the organ, this neglect is fraught with more serious results than in chronic disorders. In diseases of the heart, the nerves, the stomach, etc., we proceed in exactly the same manner and (as we see from the short sketch of the ordinary method of treatment that I have given in a preceding chapter) the same principle is now established in the treatment of acute and chronic diseases of the kidneys.

The question arises, How are we to know whether or not this or that diet really spares the kidneys? In the first place, we must study the results of general clinical experience, and must attempt to determine how the general course of the disease is modified by one or the other system of dietary regulations. I consider this study of the development of the disease to be by far the most important criterion for the administration of any given diet. This question can, in fact, only be an-

swered on the basis of clinical experience; we must presuppose, however, that the person who attempts to answer this question has really enjoyed a particularly wide experience in regard to the influence of different forms of diet on the course of the disease. In this particular field it is rare to encounter such individuals, for many clinicians who talk and write on the dietetic treatment of diseases of the kidneys are so prejudiced in favor of the common method of treatment that they have employed no other therapy for years, consequently they are by no means qualified to judge whether some other system of therapy might not produce better, or at least equally good, results. I will have occasion to show later on that my own extended experience is in many respects at variance with commonly accepted views.

A second important criterion is the degree of albuminuria, particularly if the absolute quantity of albumin voided in the urine in twenty-four hours is determined, and we do not content ourselves with estimating the percentage of albumin in the daily urine by analyzing a few samples that are voided at random. This is a very important point, and has been emphasized by different authors; unfortunately, it is not sufficiently considered in practice. It is, of course, altogether wrong to consider albuminuria an index of the severity of the disease, particularly in comparing different cases of nephritis with one another. A patient with contracted kidney, for instance, may excrete 0.1 per cent. of albumin in the urine, and may at the same time be in less serious condition than another case with

contracted kidney who is only excreting 0.02 per cent. of albumin. But, even in estimating the gravity of any individual case, albuminuria should be utilized with great care as an index of the intensity of the disease at any given period and as an indication of the good or bad results of any particular method of treatment. Only in the case of acute nephritis do I consider albuminuria to be an important and, under certain circumstances, a conclusive index; for here there can be no doubt that, as a rule, improvement is accompanied with a decrease of albuminuria, whereas an exacerbation always goes hand in hand with an increased excretion of albumin.

In subchronic nephritis with œdema this criterion is less reliable. In this disease periodic fluctuations in the excretion of albumin seem to occur spontaneously and seem to be altogether uninfluenced by the diet; they are in fact independent of the changes in the general disease picture. An attempt to estimate the effect of any given dietary on the course of the disease from the fluctuations in the amount of albumin excreted may lead to very serious errors.

This may be seen very clearly from the following case, that I had occasion to observe continuously during two months. The patient was a student of medicine, twenty-two years old, who was confined to bed on account of moderate œdema, and who consequently collected his urine very carefully. No drugs at all were administered. The patient was also forced to do without bathing and sweating, because he had only re-

cently recovered from an attack of pericarditis. Whenever the attempt was made to produce diaphoresis he developed violent palpitation.

First Period.—Pure milk diet. (Fourteen days.) Pure milk diet, *i.e.*, daily $2\frac{1}{2}$ liters of milk and 3-10 of a liter of cream. The average amount of urine excreted was 1,950 c.cm., the average amount of albumin 8.7 g. (precipitation of the albumin by boiling with the addition of sodium chlorid and acetic acid. Determination of the nitrogen in the washed precipitate).

Second Period.—(Fourteen days.) Instead of the 2 liters of milk, the substitution of 200 g. of meat (weighed raw, usually beef, sometimes veal), 2 eggs, 100 g. of white bread and 50 g. of butter, 1,500 c.cm. of seltzer water, in addition $\frac{1}{2}$ liter of milk and 3-10 of a liter of cream. The percentage of nitrogen and the calories of the diet were approximately the same as in the first period. The average amount of urine excreted was equal to 2,100 c.cm.; the average amount of albumin was 4.2 g. a day. During the first two days of this second period the excretion of albumin was slightly increased, but then was rapidly and continuously decreased (down to 2.6 g.) and then rose a little on the last three days (to 3.8 to 4.1 g.).

Third Period.—(Fourteen days.) Milk-cream diet exactly as in Period One. The average excretion of urine was 2,050 c.cm.; the average excretion of albumin 3.8 g. in the first week, and 7.2 g. in the second week. The excretion of albumin was still increasing when the fourth period was begun.

Fourth Period.—(Fourteen days.) The diet the same as in the second period. The average excretion of urine was 1,780 g. (The weather was very hot.) The average excretion of albumin was 8.1 g. in the first week, and then rapidly fell in the second week, namely, to 6.9—5.7—5.1—5.4—4.2—3.7—3.6 g., that is, an average of 4.9 g.

Six weeks later the patient was again placed under observation for eight days, and a mixed diet selected at random. The general condition of the patient had not undergone any particular change in the meantime. The average excretion of urine was 1,680 c.cm. and the average excretion of albumin 6.1 g.

The patient died four weeks later from erysipelas.

We see distinctly from this series of observations how uncertain it is to draw any conclusions in regard to the value of a certain diet from a short series of determinations of the albumin excretion. If we were to limit ourselves to considering single short periods of these series, and to compare the different periods, we might interpret them to signify that in some cases the addition of meat and eggs was beneficial, in others again that it was detrimental. This case is not by any means isolated—in fact, I consider it typical, and the careful and protracted studies that I have carried out in different cases show that a periodic rise and fall of albuminuria is a common symptom. This should teach us that fluctuations in the excretion of albumin are valueless as an indicator of the advantages or disadvantages accruing from a certain diet.

In chronic contracted kidney albuminuria is still more unreliable as an index. The degree of albuminuria is, on the average, much smaller than in the sub-chronic form; even if the percentage of albumin excreted is doubled, the total excretion is usually only increased by a few tenths of a gram; if, for instance, a patient is voiding 2,500 c.cm. of urine and excreting a quarter *pro mille* of albumin on one day and a half *pro mille* on another, the difference in the daily excretions only amounts to 0.6 g. Acute exacerbations, that occur quite frequently in contracted kidney, particularly in young subjects, almost regularly produce an excretion of more albumin, and at the same time usually hæmaturia. The latter symptom slowly disappears; just as in acute nephritis. Aside from these fluctuations in the excretion of albumin, the total quantity of albumin passed in a day usually fluctuates within very narrow boundaries. I have frequently observed that any sudden change in the diet usually leads to a remarkable increase of the albuminuria, regardless of whether we pass from a milk diet to a meat diet, or inversely, from a meat diet to a milk diet, or to a vegetarian diet. At the end of a few days, or at most at the expiration of about a week, the old level is reached again.

Here, then, we see once more that we are by no means justified in drawing hasty conclusions from a comparison of short periods; even when longer periods are utilized for purposes of comparison, we should proceed with great care; whereas in acute nephritis in-

crease and decrease of albuminuria are apparently dependent on improvement or exacerbation of the primary disease; and whereas this also applies to a limited degree to subchronic forms of nephritis, we must concede that in chronic nephritis the degree of albuminuria is quite independent of the disease picture at any given moment. We may find, for instance, that the disease picture becomes more and more threatening, while at the same time the albuminuria decreases, and inversely we may find that the excretion of albuminuria increases (both procentically and absolutely) while at the same time certain threatening symptoms disappear. In cases of this kind, then, we witness a paradox phenomenon, namely, that the patient improves, and that the prognosis grows more favorable, while at the same time the albuminuria increases. This is a prolific source of error for those physicians who gauge the result of their therapeutic measures principally from the degree of albuminuria; it also constitutes a source of continuous and altogether unnecessary worry for those patients who are in the habit of frequently sending their urine to the apothecary for quantitative analysis, and who make their mood and their happiness dependent on the result of this analysis.

On a previous page, for instance, I reported the case of a wine grower from Burgundy, who developed serious symptoms of stenocardia and dilatation of the heart while he was on a strict milk diet. In this case the whole syndrome presented was apparently very threatening; he was excreting from 3,000 to 4,000 c.cm. of

urine daily, containing on an average .05 per cent. of albumin; in other words, he was excreting about 1.5 to 2.0 g. of albumin a day. A mixed diet containing 5-4 of a liter of fluid was begun by my orders, and the attacks of stenocardia ceased, the heart boundaries became smaller, and his sight, that had been progressively failing, improved considerably. Since that time the patient has been enjoying comparative well-being for about a year and a half; at the same time the excretion of albuminuria has increased, while the average excretion of urine is from 1,000 to 1,200 c.cm. On an average the excretion of albumin is as high as 0.3 to 0.4 per cent., that is, from 3.0 to 4.8 g. a day. I consider this increase in the excretion of albumin to be without significance as compared to the marked improvement in the general health of the patient, nor do I consider this case to be an isolated occurrence. Since I have been in the habit of prescribing a diet containing very little fluid to patients with contracted kidneys I have frequently made the same observation, namely, that the percentage of albumin increases as the amount of fluid is decreased, and that occasionally the absolute quantity of albumin excreted is also increased, while at the same time the general health of the patient is markedly improved. I will not enter into a discussion of my reasons for prescribing a diet containing little fluid to patients with contracted kidneys, for I have discussed this subject in detail in another place. I will also have to refer to it briefly again. In treating cases with contracted kidney in this way, it is well to call their attention to

a possible increase in the albuminuria and to advise them to estimate the severity of their disease and their progress not from the analysis of the urine but from their general condition.

When we carefully consider the significance of all the points I have enumerated, we learn just how much importance to attach to albuminuria in cases of contracted kidney. We need not attach too much significance even to considerable fluctuations in the amount of albumin excreted, but at the same time we should not underrate the importance of these fluctuations, if they occur in the same direction as the changes in the general condition of the patient and other important symptoms of the disease. In all cases in which this parallelism can be discovered, we should allow it to govern our dietary regulations.

A third important criterion for the condition of the kidneys and the changes that they undergo as a result of our prescriptions, is the excretory power of the kidneys. The great majority of metabolic products leave the body through the kidneys. The chief danger in diseases of the kidneys lies in the inability of these organs, when they are diseased, to fulfil their excretory function. Long ago the attempt was made to study the eliminatory powers of the kidneys in acute and chronic nephritis by administering certain well-characterized chemicals as, for instance, iodid of potash and salicylic acid, and to study their excretion. Of late years methylene blue has also been extensively used for this purpose.

In the beginning of the eighties, when I was assistant in Riegel's Clinic in Giessen, I performed experiments of this kind in numerous cases of renal disease; later, I resumed these investigations from time to time. I have never, however, considered the results obtained worthy of publication, for they merely taught me that the period at which the drugs first appear in the urine and the time during which they are eliminated varies greatly and follows no fixed rule. They also showed me that the elimination of certain drugs (iodid of potassium and methylene blue in particular) frequently proceed in an altogether different way than the elimination of normal metabolic products. Thus I examined a patient with contracted kidney and a very slight degree of albuminuria, and in two series of experiments determined that the first traces of iodine did not appear in the urine until three or three and a half hours had elapsed. (At the same time iodid of potassium appeared in from fifteen to twenty minutes in the saliva, showing that absorption was normal.) The time during which the elimination of a small dose of iodid of potash (0.2 g.) continued was five and six days in the two experiments. During this time, a study of the metabolic products excreted showed that urea, uric acid, phosphoric acid, and sodium chlorid were excreted in a perfectly normal manner by the kidneys. Inversely, I have repeatedly been able to determine that in cases of acute nephritis the elimination of iodine proceeded in a perfectly normal or nearly normal manner, whereas at the same time the elimination of normal

terminal metabolic products was greatly interfered with. Only in a small minority of the cases did the elimination of drugs and of natural metabolic products go hand in hand.

A number of other authors have repeated and amplified these investigations. From all the results that have been published, we learn that the determination of the excretion of certain chemicals that can be readily recognized in the urine may occasionally be of value in interpreting the significance of drug treatment in diseases of the kidneys, and may also possibly form the basis of certain theoretical conclusions; but, at the same time, we find that these studies do not by any means permit us to draw any definite conclusions in regard to the power of the kidneys to eliminate normal excretory products. The only way in which to determine the power of the kidneys in the latter respect is to adopt the much more tedious method of testing the elimination of these products themselves.

III. THE FACTS OF METABOLISM AS A BASIS FOR THE DIETARY REGULATIONS TO BE ADOPTED IN THE PROTECTIVE THERAPY OF KIDNEY DISEASES.

If we investigate the eliminating powers of the kidneys according to the same principles and the same methods that we adopt in metabolic investigations we will find that some substances are readily excreted by the kidneys when they are diseased, whereas others are excreted only with difficulty. The first author¹ who occupied himself with the metabolism of nephritic subjects, R. Fleischer, already called attention to this fact; later investigators, as Prior, von Noorden, Ad. Ritter, Biernatzki, Zülzer, and others, have contributed much to the same subject, and have found that differences in regard to the excretory powers of the kidneys in nephritis exist in the case of at least the majority of excretory substances formed in the body. In the meantime I have continued these investigations. In some cases I studied the excretion of different meta-

¹Fleischer, Beitrag z. Lehre von den Nierenkrankheiten. Arch. f. klin. Med. XXIX. S. 129. 1881.—Prior, Einwirkung der Albuminate auf die Thätigkeit der Nieren. Zeitschr. f. klin. Med. XVIII. 72. 1890.—v. Noorden und Ritter, Unters. über den Stoffwechsel Nierenkranker. Zeitschr. f. klin. Med. XIX. Suppl. 5. 197. 1891.—Biernatzki, Die Magenverdauung bei Nierenentzündung. Centralblatt f. klin. Medicin. 1890, S. 265, und Berliner klin. Wochenschr. 1891, S. 611 und 652.—Zülzer, Ueber die Alloxur-Körperausscheidung bei Nephritis. Berliner klinische Wochenschrift. 1896. Further literature by von Noorden: Path. des Stoffwechsels. S. 360ff. Berlin 1893.

bolic products as compared with their ingestion; in other cases I merely studied the excretion of certain definite substances (urea, creatinin, uric acid, alloxuric bases, phosphoric acid, sulphuric acid, sodium chloride, etc.). My assistant, Dr. Mohr, is at the present moment occupied with sifting this material and performing a number of investigations on this subject according to uniform methods. He will report on the results of his work at a future time. Investigations of this character are of course chiefly of theoretical interest, but I also attach much importance to them from a practical and therapeutic point of view; they teach us which end products are readily excreted by the kidneys when they are diseased, and which products are excreted with difficulty. In this way they enable us to consider this factor in selecting the diet. The rule naturally suggests itself to exclude all those articles of diet that in process of metabolism form end-products that are eliminated with difficulty, or at least if not to omit these articles of diet, to reduce them to the smallest possible measure. In this way we protect the organism from the retention and accumulation of waste products that must all be considered more or less toxic. On the other hand, and this is at least as important, we arrive at a definite and rational therapeusis of kidney diseases based on the principle of protecting the organ. The fundamental principle is to withhold all such articles of diet as are excreted with difficulty by the organ when it is diseased. We should strenuously avoid the entrance of any such substances into the blood stream. When-

ever we cause substances to circulate through the kidneys that are capable of being excreted, we produce irritation of these organs, and as soon as a disproportion is established between the irritation exercised by these excretory bodies and the functional powers of the kidneys, then, we necessarily damage the kidneys. The smaller the power of the kidneys to excrete a certain substance, the more important is it to omit from the diet this substance or any article of diet from which this substance may be formed in the body. I regard a detailed study of these factors to be an exceedingly fruitful field of investigation and one that should lead to a rational dietetic therapeutics of renal diseases; this system of treatment, as I have shown above, has been much neglected even though the majority of writers recognize that the main indication for the treatment of diseases of the kidneys is to protect and to spare the organ.

In the following I intend to discuss the dietetic treatment of renal diseases from this point of view. I wish to emphasize in particular, however, that I can only mention the most important factors; I also wish to make this reservation, that our knowledge of the powers of the kidneys to excrete certain substances when they are in a diseased state calls for corroboration and for amplification in many directions. I am in a position to base the statements I make on a large series of investigations, some of them old, some of them new. In addition, very much has been written on this subject by various authors so that many reports are accessible

in the literature. Finally, as I have already mentioned above, Dr. Mohr will subject the whole material at our disposal to a critical review and will soon publish a summary of his studies. One point that is particularly important and that I shall attempt to bring out clearly below is the limit to which, according to established biological principles, the kidneys when they are diseased can and should be protected without at the same time injuring other organs.

In acute diseases of the kidneys (and these are particularly suitable for extended protective treatment), also in recent stages of so-called chronic parenchymatous nephritis, and finally in those rare forms of acute hemorrhagic nephritis that occasionally occur as exacerbations of chronic contracted kidney the following scheme may be adopted, with the reservation that I have made above.

The following substances are excreted with difficulty:

Urea,
 Creatinin,
 Pigments,
 Hippuric acid,
 Phosphates,
 Inorganic sulphates,
 Potassium salt?
 Water (see below).

The following substances are well excreted:

Uric acid,
 Xanthin bases,

'Aromatic substances,
'Ammonia,
'Amido acids,
Chlorides,
Carbonates,
'Water (see below)'.
'

In regard to water, that is mentioned twice, certain differences must be noted. In the beginning of the disease water is eliminated with difficulty, I may even say with more difficulty than any other substance, including urea. In this way large quantities of water that were intended to be excreted are retained. In the subsequent course of nephritis (provided improvement occurs at all) the kidney acquires the power of excreting some of this water very much more readily than before, so that at this later period of the disease it is not difficult at all to force almost any quantity of water through the kidneys.

As I have already stated, the scheme that I have given applies particularly to acute nephritis and to those forms of nephritis that are clinically related to it. In discussing therefore the therapeutic conclusions that can be drawn from our knowledge of the elimination of certain excretory products, the conditions obtaining in this respect in acute nephritis must be studied with particular care. True, in contracted kidney certain excretory products are also eliminated with difficulty, but only during the period of acute exacerbation and in the terminal stages. The latter, of course, may be of short duration or may extend over a long period. We must

also remember that in contracted kidney we occasionally encounter transitory disturbances in the urinary excretion that rapidly disappear again. In the hopeless terminal stage of contracted kidney that I have spoken of we should make all concessions to the patient's subjective feelings and permit great latitude in diet. In the acute exacerbations, however, the same rules should govern the dietetic treatment as in acute nephritis.

From the scheme that I have given above we can conclude that urea, creatinin, phosphates and under certain circumstances, water should be avoided in renal disease; the same applies to hippuric acid, although quantitatively speaking it is not as important. The same postulate can be made for pigments.

(a) *Creatin.*

It is a comparatively easy matter to omit substances from the diet that are injurious on account of the creatinin they contain. The mother substance of creatinin, namely, creatin, is present only in meat extracts, meat broths, etc.; in white of egg, in the yolk of egg, and in milk it is present only in traces; it is completely absent from vegetables. If all articles of diet containing creatin are eliminated from the bill of fare the urinary creatinin is reduced to a minimum in healthy subjects. The small quantity that continues to be excreted is probably derived from the creatin contained in the musculature of the patient. These small quantities amounting to a few centigrams a day can of course not be kept away from the kidneys.

(b) *Urinary Pigments.*

Very little can be said on this subject, as we know little about it. The most important urinary pigments, urobilin and hematoporphyrin, and probably the majority of the other normal urinary pigments, are derivatives of the hemoglobin that undergoes metabolic disassimilation. The organism possesses the power of building up hemoglobin from simple molecules (how is unknown), even if no hemoglobin is introduced with the diet. We are unable to influence or to regulate the metabolism of hemoglobin by dietary restrictions; the only thing that we can do is to omit articles of diet containing hemoglobin, for we know that a certain portion of the hemoglobin ingested is absorbed and increases the excretion of bile pigments and the formation of urobilin in the intestine. The latter is absorbed, enters the blood current and is in this way carried to the kidneys.

Hematoporphyrin can hardly be considered a normal metabolic product and the quantities that are eliminated by the kidneys are so small that this substance need not be considered in the treatment of renal disease. I need hardly mention that everything should be avoided that may lead to hematoporphyrinuria; among other things the administration of sulphonal and trional.

(c) *Phosphoric Acid.*

Phosphoric acid offers peculiar but not insurmountable difficulties, for this substance is present in large quantities in meat, in yolk of egg, and particularly in

milk and in many vegetables. Milk contains so much phosphoric acid that adults who are living on a pure milk diet show a daily increase in the urinary phosphorus excretion amounting to 3 to 4 g. It is impossible to predict the amount of phosphorus that will be excreted in the urine on a milk diet. This is owing to the fact that the percentage of phosphoric acid contained in milk varies, but as I have shown in a previous dissertation on the treatment of renal lithiasis (compare also the reports by my pupils G. Herxheimer and J. Strauss), we possess a very convenient and harmless means of preventing a portion of the phosphoric acid contained in the food from passing through the kidneys; all that is needed is to see that sufficient quantities of calcium carbonate enter the intestinal tract together with the phosphoric acid. If calcium is present phosphoric acid even in healthy subjects is excreted in much smaller quantities in the urine. A large proportion of the phosphoric acid, under certain circumstances more than one half, unites with the calcium and remains in the intestine, or after circulating through the body is poured with the intestinal excretions into the intestine and appears in the feces. I therefore advise my patients with acute nephritis, provided they are living on a diet containing much phosphoric acid, to take a small quantity of carbonate of calcium several times a day. The kidneys are not overloaded by the calcium because only a small portion of this substance is eliminated through the kidneys; the greater portion remains in the intestine, or after absorption is again

excreted into the lower portions of the intestinal canal. I may be allowed to call attention to the fact that a mineral water that is very popular in the treatment of renal disease, namely, the "Wildunger Helenenquelle," contains very much carbonate of lime. In view of the fact that milk contains a large proportion of phosphoric acid and in view also of the fact that phosphoric acid (as R. Fleischer was the first to show), is frequently eliminated with difficulty by the kidneys, milk does not seem to be so harmless an article of diet, as far as the kidneys are concerned, as is usually assumed. On the other hand it might be argued that milk contains a considerable percentage of calcium, so that in this way the relatively large quantities of phosphoric acid would be neutralized; but this argument is invalid, for the calcium contained in the milk is largely in inorganic combination and unable to combine the phosphoric acid. If, however, we add a little carbonate of calcium to the milk the excretion of phosphorus in the urine decreases. I have advised this measure for a long time. Another advantage of the addition of calcium is that it renders the milk more digestible for many people.

(d) *Urea and Sulphates. (Ingestion of Albumin.)*

In regard to urea and, as I shall presently show, the sulphates, we encounter great difficulties. I will discuss both of them together, because both of them are derived from the protein molecule. In order to reduce the amount of urea in the blood and the tissues we must reduce the amount of protein in the food.

From numerous investigations and debates on the demands of the human organism for protein and on the minimum amount of protein that must be introduced daily, we have learned one important fact, namely, that it is permissible to administer very small quantities for a short time without injuring the health of normal subjects, and without causing an excessive disassimilation of organic protoplasm, provided of course that corresponding quantities of carbohydrates and fat are administered at the same time. A perfectly healthy, strong and muscular individual can without detriment, sustain a reduction of the normal amount of protein to 60 g. a day for two or three weeks. It is certainly rational to utilize this empiric fact and to apply it to the treatment of acute nephritis.

As soon as we recognize this to be a fact we must surely hesitate to consider an exclusive milk diet to be the ideal dietetic treatment, for milk contains a relatively large proportion of albumin; 60 g. of protein the quantity I mentioned above, are contained in about three half to seven quarter liters of good cows' milk. If, as is usually done, the amount of milk is increased to about three liters a day, the subject receives from 110 to 120 g. of protein. From this amount, after deduction of the nitrogen that is excreted in the feces and in other nitrogenous constituents of the urine, about 30 to 35 g. are converted into urea and have to be excreted by the kidneys. The kidneys in nearly all acute disease are functionally unable to excrete such large quantities of urea; in this way a

colossal retention of urea occurs that is by no means counteracted by energetic diaphoretic procedures. In addition the kidneys are permanently irritated by the large quantities of urea circulating in the blood, for urea is the most powerful stimulant of renal activity that we know. Milk, therefore, if we investigate the subject thoroughly, is not as innocent as it appears. A preparation of milk called Gäertner's fat milk possesses considerable advantage over ordinary milk, for it contains only one-half to two-thirds as much protein as ordinary milk.

In view of all these considerations I have for a number of years avoided an exclusive milk diet in acute diseases of the kidneys. I rarely give over three half liters of milk a day, and I may add that my results are very good. In order to render the milk more nutritious I add a little cream; this does no harm because cream contains very little protein, and consists almost exclusively of milk fat. I have found that the addition of one-quarter of a liter of cream to a liter of milk is the most suitable mixture in kidney diseases. It is not immaterial what kind of cream is used; ordinary cream as it is sold may be excellent as far as its taste and its constitution are concerned, but I hesitate to prescribe it for patients suffering from kidney diseases or from diseases that predispose to dyspeptic disturbances. Ordinary cream can only rarely be boiled without coagulation and unboiled cream, according to my experience and that of many of my colleagues, is not suitable; for this reason I use almost

exclusively sterilized cream. Until recently I used a Swiss cream that was very rich, but that was not satisfactory as far as its taste was concerned; nowadays I use a preparation made from Holstein cream that has been introduced by the firm of O. Rademann, in Frankfurt a.M. This preserved article has good keeping properties and tastes as well as fresh cream; in addition it is very rich (30 to 33 per cent. of fat). A mixture of 1500 c.cm. of milk and $\frac{3}{8}$ of a liter of cream contains about 55 g. of protein, 70 g. of milk sugar, and 165 to 170 g. of fat. This represents a total nutritive value of 2,050 to 2,100 calories, that is as many calories as are contained in $3\frac{1}{4}$ liters of good milk. The percentage of protein in the milk-cream mixture, however, is about one-half lower than the protein of $3\frac{1}{4}$ liters of milk.

The amount of nutriment contained in the milk cream mixture ($1\frac{1}{2}$ liters and $\frac{3}{8}$ liter) is in the majority of cases sufficient to maintain a good state of nutrition in patients who are forced to remain in bed. Those physicians will find this quantity of food perfectly sufficient who, on the one hand wish to avoid overloading the stomach and intestine in renal disease, and on the other hand do not care to give patients with kidney disease who are forced to remain in bed too much fat. I wish to warn expressly against over-feeding with fat, and I wish to emphasize this particularly because I have frequently seen patients with acute parenchymatous nephritis receive an enormous amount of nutriment for the purpose of giving them

“strength.” We may positively assume from our knowledge of the human economy, that as long as the disease persists and convalescence has not begun, nearly all the superfluous fat is deposited as fat, and is not utilized for the increase of protoplasm. However useful therefore over-feeding with fat may be in other diseased conditions, it can only do harm in nephritic cases, for in this disease the action of the heart must be considered exclusively; I have actually found that this method of treatment does harm and that the patients suffer from this source as soon as they get up from a long period of rest in bed after having gained from 10 to 20 kg. of fat.

If under particular circumstances, for instance, in very large and strong subjects who are used to large quantities of food, or in subjects who are very much reduced, the administration of an excessive number of calories in the food seems indicated, soups, porridge or pudding made of amylaceous material containing little protein (as oat meal, flour, groats, maizena, etc.), with the addition of a little butter, sugar and fruit syrup and prepared to suit the personal tastes of the patient, may be given. Aside from very small quantities of albumin and traces of ash these substances contain nothing that is excreted by the kidneys or that overtaxes the diseased organs.

We see therefore that without adhering strictly to a pure milk diet in the form in which it is ordinarily administered, we can feed sufferers from renal disease very well, in fact the principle of sparing the kidney that

originally led to the adoption of milk diet can be carried out much more systematically under this mixed diet than with the customary pure milk diet.

When in the subsequent course of acute nephritis the stage of abundant diuresis is reached and the excretion of water remains normal or even hypernormal for some time (usually about a week), then we may assume positively that the power of the kidneys to eliminate urea and different salts is also approaching normal. I at least have never seen a case of acute nephritis in which increased diuresis was not at the same time accompanied by a great increase in the elimination of residual excrementitious substances. In this respect acute nephritis differs from contracted kidney, for in the terminal stages of the latter disease free diuresis may appear, while at the same time the solid metabolic waste products are retained. In this stage of acute nephritis when the disease of the kidney is improving, there is no good reason why the administration of proteins should not be increased; at the same time this increase should be gradual, and the same precautions should be exercised as in the administration of carbohydrates after they have been withheld for some time in diabetes.

It is unnecessary to give more than 100 to 110 g. of protein *pro die* as long as any trace of nephritis remains. The most practical way to increase proteins in the healing stage of acute nephritis is to gradually increase the amount of milk to 2, or at most 2½ liters, with the addition of cream and some cereal, legumes,

fresh vegetables, and boiled fruit. There is no objection to small quantities of meat and eggs provided the amount of protein ingested is allowed not to exceed the quantity I have mentioned above.

(e) *Hippuric Acid.*

Hippuric acid, as is well known, is generated from benzoic acid and glyocol by a synthetic process in the kidneys themselves. In nephritis, particularly in the more acute forms this synthesis is rendered more difficult, so that a proportionately large part of the benzoic acid that is ingested, or that is formed within the body and enters the blood, leaves the kidneys unchanged, or in the form of a salt. The other component, glyocol, under these circumstances is also in small part excreted unchanged. The greater proportion that under normal circumstances would have been converted into hippuric acid, is converted into urea, and is excreted as such. While it is not known that the excretion of benzoic acid is a particularly difficult task when the kidneys are diseased, or that benzoic acid can directly damage the kidneys, we should nevertheless (from the standpoint of protective therapy, prevent the entrance of benzoic acid into the blood stream circulating through the diseased kidneys, for when we over-load the blood with benzoic acid we impose a task on the sick kidneys that they are not capable of performing. We can easily avoid this irritation and this stimulation of the organ if we regulate the diet in such a manner that as little benzoic acid as possible circu-

lates in the blood. From this point of view green vegetables, fruit containing kernels, and cranberries that contain large quantities of benzoic esters, should not be permitted in acute inflammation of the kidneys. In such fruit as pears and apples, and in many berries (particularly raspberries and grapes), on the other hand, we find traces only of benzoic acid; these fruits therefore, and syrups made from them, constitute an excellent addition to the diet of nephritic cases, for they are borne very well, they stimulate digestive processes, and offer some variety. I called particular attention to unfermented beverages that are sold under the name of Frada, and can be procured anywhere; they are made from fresh fruit and are particularly suitable. A preparation of sterilized grape juice that is sold under the name of Nectar, and is made by the Actiengesellschaft für Obstverwertung (Company for the Manufacture of Fruit Products), in Wurms, is particularly good, chiefly because it tastes better than all the other preparations of this kind. These fruit syrups all contain considerable quantities of nutritive sugars, and this is an additional advantage that must not be underrated (Nectar, for instance, contains 18 g. of invert sugar in each 100 c.cm. of fluid). It is impossible to exclude all benzoic acid, even if all vegetable diet is forbidden, for in the first place milk seems to contain small quantities of benzoic acid, and in the second place certain putrefactive processes that go on in the intestine generate benzoic acid, or precursors of benzoic acid, from protein.

(b) *Ammonia.*

This substance, as will be seen from the tables I have given, is included among the nitrogenous bodies that are readily excreted by nephritic cases. This is perfectly correct, for even in cases in which the excretion of urea is very much reduced, the excretion of ammonia is approximately normal. The amount of ammonia eliminated is, as we know, dependent on the amount of acids that circulate in the blood and that are intended to be excreted. Abnormal acidity of the blood, (acidosis, as in diabetes and fever, for instance), does not as a rule seem to occur in nephritis. Possibly in some cases there is acidosis, for I have occasionally encountered cases of severe nephritis in which the values for ammonia were exceedingly high (1.0 to 1.5 g. *pro die*) in the prodromal stage of uremia. In view of the fact that ammonia is so readily eliminated, even in advanced stages of renal insufficiency, we might almost be tempted to administer acids, for we know that the administration of acids increases the excretion of ammonia; in this way we would aid the elimination of a portion of the nitrogen that would otherwise have to be excreted in the form of urea. The only acids that would be available for this purpose would be mineral acids, chiefly hydrochloric acid. As far as I know nothing has so far been published on this subject. I have only studied one case of chronic parenchymatous nephritis in this regard. The patient received daily doses of 100 drops of dilute hydrochloric acid (German Pharmacopeia). The excretion of am-

monia was increased from an average of 0.78 to 1.97 g., but the excretion of urea did not decrease correspondingly. As the total amount of nitrogen excreted in the urine was 6 to 7 g. the additional excretion of 1 g. of nitrogen, while hydrochloric acid was being administered, was of some value. Organic acids with the exception possibly of the acids of the benzene series (and these are not without danger), are not available for this purpose for the reason that they do not reach the kidneys in the form of acids but are oxidized to water and carbon dioxide very soon after they enter the blood. This also applies to acetic acid, and I will add a few words concerning this substance.

(g) *Acetic Acid and Citric Acid.*

There is an old popular prejudice to the effect that acetic acid should be altogether eliminated from the diet of patients suffering from renal disease, from renal lithiasis, and from bladder troubles.

While it is true that vinegar is no indispensable ingredient of our food it is nevertheless an important adjuvant to our dietary; for many people it would constitute a great hardship if they had to stop the use of vinegar. If it is necessary to interdict many articles of diet in certain diseases (kidney diseases belong to this group), it is best not to forbid more than is absolutely necessary. Many persons would not be satisfied to substitute citric acid for vinegar, and others would rather not eat certain articles of diet that need the addition of acid in order to be palatable, than to

replace vinegar by lemon juice. In addition it is very doubtful whether lemon juice is not more injurious than vinegar. I have already mentioned that no trace of vinegar is excreted in the urine; the same cannot be said of citric acid, for a certain proportion of this substance (how much is not known), escapes oxidation in the blood and tissues and passes through the kidneys, usually, it is true, combined with an alkali. My practical experience coincides altogether with this theoretical view, and I have arrived at the conclusion that vinegar is harmless in diseases of the kidneys, in renal lithiasis, and in diseases of the bladder and urethra. Contrary to the ordinary teachings I have been in the habit for many years of allowing such patients to take vinegar, and I have never seen the slightest disadvantage from this practice.

(h) *Uric Acid and Alloxuric Bases.*

It was formerly believed that uric acid is eliminated with difficulty in nephritis. Certain theories regarding the retention of uric acid and concerning arthritis urica (gout) were based on this assumption. Different investigators found only small or minimal quantities of uric acid in nephritic urine. In the meantime it has been shown that these findings were due to deficiencies in the older methods of uric acid determination (compare v. Noorden, *Pathologie des Stoffwechsels*, page 371. Berlin, 1893). Numerous investigators, v. Ackeren,¹ Stadthagen and Zülzer working with im-

¹Stadthagen, Ueber das Vorkommen der Harnsäure, etc., *Virchow's Archiv* 109. S. 79. 1887.—van Ackeren, Ueber Harn-

proved methods, found in a large series of investigations, that the values for uric acid in nephritis were normal. This was found to be the case in a series of uric acid determinations that were carried out in my ward in different forms of nephritis. Retention of uric acid does seem to occur occasionally (as determined by marked fluctuations in the excretion of uric acid); and as a matter of fact uric acid is occasionally found in the blood of uremic subjects (v. Jaksch¹), a finding that also speaks for the retention of uric acid in advanced cases of nephritis. Nevertheless I consider uric acid to be a substance that is in general relatively well excreted.

The same applies to the congeners of uric acid, the alloxuric bases,² (Kolisch, Zülzer, Baginsky, Rommel, personal observation). I will not enter into a discussion of the statement made by Kolisch, that in nephritis the alloxuric bases are occasionally increased, while the uric acid is correspondingly decreased. This particular question is irrelevant, for it seems that all authors agree that the sum of these two closely related substances is normal in nephritis.

säure-Ausscheidung bei einigen Krankheiten. *Charité-Annalen* 17. S. 206. 1892.—Zülzer, Ueber die Alloxurkörper-Ausscheidung bei Nephritis. *Berl. klin. Wochenschr.* 1896. No. 4.

¹v. Jaksch. Ueber die klin. Bedeutung des Vorkommens von Harnsäure in Blut. *Prager Festschrift.* S. 79. 1890 und *Centralbl. f. innere Medicin.* 1896. No. 21.

Kolisch, Wesen und Behandlung der urathischen Diathese. *Stuttgart* 1895 und *Wiener med. Blätter* 1896. No. 8.—Baginsky, Zur Kenntniss der Ausscheidung von Alloxurkörpern bei Erkrankungen des kindlichen Alters. *Zeitschr. f. phys. Chemie* 21. S. 412. 1895.—Rommel, Ueber die Ausscheidung der Alloxurkörper. *Inaug-Dissert.* Berlin. 1896.

Although uric acid and the xanthin bases are relatively well excreted, we must never forget that these bodies are toxic; we must also remember that occasionally their elimination is somewhat retarded (that is, they accumulate in the blood and the tissues), and that their retention has occasionally been observed, consequently it is advisable in all forms of nephritis to withhold all such articles of food as we know favor the formation of alloxuric bodies. To this group belong all animal tissues containing nuclei, in particular glands (thymus, or in kitchen parlance, *vis de veau*, liver, spleen, kidneys and strong meat broths).

Muscle meat also contains a certain proportion of alloxuric bases in solution, and some alloxuric bases are formed by the digestion of the muscular nuclei. The quantities introduced in this way, however, are so small that they do not justify us in forbidding the use of meat in nephritis on these grounds. Only in cases in which the kidneys are in a condition of acute irritation (acute nephritis and acute exacerbations of chronic nephritis), certain objections can be opposed to the use of meat as the carrier and the source of alloxuric bodies. If meat is permitted at all no difference need be made between different kinds of muscle meat (dark and white meat). I will refer to this subject in detail below (compare page 85). see p. 15

(9) *Alcohol.*

'Almost nothing is known in regard to the excretion of alcohol by diseased kidneys. Experiments were

begun at my instigation, but they are not yet completed, owing to the decided technical difficulties encountered in the quantitative estimation of alcohol; and I cannot yet report upon them. We know, however, that alcohol is one of the worst poisons for the kidneys when it is carried to them in the blood and circulates around and through their substance for any length of time. It is immaterial whether it is absorbed from concentrated spirituous liquors, such as whiskey, etc., or from mild alcoholic beverages, like beer, etc. Alcohol undoubtedly irritates the kidneys directly. We do not know the limits beyond which alcohol is injurious to them in health. That there is a zone within which no harm can result, we may assume with certainty; and we must not allow zealous temperance advocates to confuse us on this point, which has been proven by experience. For the kidneys, when they are diseased, the limits of the harmless zone are undoubtedly narrower than for healthy kidneys. As we do not know these limits nothing can be said against the prohibition of alcohol, at least in acute disease, on the part of cautious physicians, provided, of course, no definite indications make its use advisable or necessary. I belong to those heretics who, in spite of the noise made by the Anti-Alcoholic League, recognize alcohol to be a very important and often an indispensable medicine. Even in patients with acute or chronic nephritis, I sometimes find indications for its use. Among these indications I include attacks of cardiac weakness with small and thready pulse. Small, oft repeated doses

of alcohol in concentrated form act remarkably well and so rapidly in such cases that all objections to its employment may be overlooked. Moreover, everyone who is not intentionally blind to these things must admit that in some nephritic patients the power of the stomach to retain food is decidedly improved by the administration of small quantities of wine or of diluted brandy. They stimulate the appetite and moderate the nausea, which in the case of acute and sub-chronic nephritis only too often makes nutrition difficult.

I cannot say that I have ever witnessed any harmful results from the careful use of alcohol in acute and sub-chronic nephritis. But I usually avoid it unless special indications are present. Perhaps we have all become too careful, under the influence of the propaganda against alcohol. We must remember that two of the food stuffs which give excellent results in the convalescent stage of acute nephritis and in the sub-chronic form of the disease, supply the patient with much alcohol; viz., kefyр and kumyss. They contain 2.2 per cent. of alcohol on an average. As in kumyss or kefyр cures the quantity taken reaches three or four liters a day, 66 to 88 g. of alcohol are ingested, or about the same amount as is contained in 100 to 130 cm. of cognac, in one liter of moderately heavy Rhine or Burgundy wine, or in one and a half to two liters of beer. Everyone seems to believe that such quantities of alcohol in the form of cognac, wine, or beer are harmful for nephritic patients, yet in the form of

kefyr or kumys they are prescribed unhesitatingly; this is a paradox that awaits solution.

For alcohol in atrophic nephritis, see below.

(j) *Water (Sweating Cures).*

I have already said that water is very badly excreted by the kidneys when they are acutely diseased and frequently also in sub-acute and sub-chronic forms of nephritis; individual cases differ greatly in this respect. On the other hand, there is no substance which excites the function of the kidneys so powerfully as does water. If active diuresis is induced by abundant water drinking, other excretory substances that may have accumulated in the body are usually flushed out at the same time. I say "usually" because this does not always happen. I can recall, several cases of chronic nephritis in which diuresis suddenly became more free, but in which at the same time the quantity of solid urinary constituents and especially the quantity of urea did not increase.

From the standpoint of prophylactic therapy that we are discussing, the limitation of water seems to be indicated in cases where the kidneys refuse to excrete it, in cases where diuresis is not increased by water drinking, and in cases where the water ingested only serves to augment the œdema and hydræmia. A condition of hydræmia must be regarded as a constant source of irritation to the kidneys, and the problem that confronts us is to prevent excessive stimulation of these organs as much as possible.

It is customary to permit patients with acute nephritis and allied conditions, even if there is much œdema and a scanty flow of urine, to drink large quantities of fluid (milk and mildly alkaline waters). The generous supply of water is expected, as it were, to forcibly overcome the resistance offered by the kidneys to the elimination of excretory substances. It is my impression that harm is occasionally done in this way; the œdema increases from day to day, the strength of the heart diminishes, respiration becomes impeded, and nausea and vomiting become more frequent. Under such conditions, that do not of course obtain in every case of acute nephritis, I have often been forced to reduce the quantity of fluid and of food in general to the smallest possible amount. In these cases the patients are often strong and in good general condition and well able to bear a great diminution in the amount of food; they may even stand total abstinence from food for a few days. Patients are benefited more in this way than if they are persuaded or even forced to take food; for we must always remember that a large part of the food will be vomited. As a matter of fact patients with severe nephritis absorb extremely little of their nutriment; only water is demanded with eagerness,—this is remarkable in view of the fact that the tissues are more than saturated with water. In cases of this kind in which only small quantities of nutritious food can be tolerated I have frequently seen decided improvement follow the restriction of water also.

This was most marked in the case of a boy of eleven

years whom I treated in the summer of 1894 for acute nephritis of unknown origin. The treatment consisted of vapor baths repeated daily. Very marked œdema was present.

DAY OF DISEASE	QUANTITY OF URINE	NITROGEN IN URINE	NOURISHMENT
	c. cm.	g.	
5	120	2.3	1 liter of milk, 800 c. cm. of Fachinger water.
6	90	—	The same.
7	130	3.5	The same.
8	150	—	The same.
9	200	3.8	Sucking of pieces of ice, in smallest possible quantities.
10	250	—	The same.
11	510	6.9	The same.
12	890	—	The same.
13	1480	12.8	Half a liter of milk, otherwise only ice.
14	1730	—	Milk and water as desired.
16	2350	18.3	The same.

On the tenth day, although diuresis was not yet markedly increased, the patient bitterly complained of thirst, the general condition had decidedly improved, and diminution of the œdema was noticed for the first time; from the thirteenth day on it decreased rapidly, and on the eighteenth hardly a trace remained. Further convalescence was undisturbed.

So great a diminution of food and drink as was ordered for several days in this case cannot be enforced for any length of time, nor is it permissible. Usually it is a difficult matter even to slightly restrict the use of fluids, for all foods that are permissible in this stage of nephritis contain much water; milk, of course, especially.

We are happily in a position to obviate this difficulty

in another way, *viz.*—by making the patient sweat. The really great value of diaphoresis¹ in acute nephritis depends, in my judgment, upon the withdrawal of water from the blood and tissues. It is questionable whether in addition certain poisonous substances which ought really to be excreted by the kidneys are eliminated in the sweat and the kidneys spared in this way. Although this has been claimed for centuries, no one has as yet proved that it is true. The perspiration of nephritic patients contains only traces of urea (the maximum is about 1 to 1.3 g. in the total quantity of a profuse sweat), and in addition a barely determinable trace of uric acid. The remaining constituents are harmless substances: water, salt and small quantities of organic fatty acids. In spite of strenuous efforts to detect poisonous substances in the sweat none have ever been found. I see no necessity for formulating such doubtful hypotheses on the excretion of poisons by means of diaphoresis, when we can explain the curative effect of this procedure so much more simply by the fact that it relieves the kidneys of the task of excreting water.

No matter how great the loss of water through the

¹As to the diaphoretic method, I prefer not to give the patient a hot bath and wrap him in warm blankets, but to expose him to the rays of electric lights without a previous bath. For this purpose I use portable tunnels that can be applied to any bed; to the inner surface of this apparatus some 6 to 10 incandescent globes are attached. The procedure calls forth a large amount of perspiration and spares the patient very much more than does the hot bath followed by the pack; the latter requires more than double the amount of time to produce active sweating.

skin may be, the question arises as to whether it is sensible to allow the patient to drink freely on the one hand, thus introducing large quantities of water into the body, while attempting on the other to equalize the harmful increase of hydræmia and of œdema thus caused by instituting so exhaustive and so violent a method of treatment as diaphoresis. That is really beating about the bush. If by sweating our patient we really succeeded in getting rid of poisonous substances that would otherwise be retained in the body and would unduly irritate the kidneys or poison the organism, this troublesome procedure would not only be justified but necessary. But, as stated above, this is by no means the case, and it seems doubtful whether we are justified in relying upon diaphoresis to such an extent as to allow nephritics with œdema to drink water freely, or even, as is generally done, to administer hot tea and mineral waters in order to increase sweating. From practical experience I am opposed to this procedure in so far as the first stage of nephritis is concerned. I believe I am justified in taking the stand that it is better not to give as much water as possible for the purpose, as the saying is, of exciting diuresis; because exciting diuresis is synonymous with irritating and consequently harming the diseased kidneys. According to my way of thinking it is much better to give as little water as possible, that is, as small a quantity as is commensurate with the patient's demand for liquid nourishment, and at the same time not more than is needed to quench his thirst. This will always be at

least one and a half to one and three-quarters liters per day. If in spite of the fact that the use of water is restricted as much as possible diuresis fails and the œdema increases, diaphoresis must naturally be resorted to. This plan of regulating the ingestion of fluid seems to me the most suitable method of shielding the kidneys and of preventing the excessive development of dropsy.

In later stages of acute nephritis we may pursue a different course. Whenever diuresis increases of its own accord in cases of nephritis with œdema, or whenever diuresis, as we frequently see, is marked from the onset and at the same time œdema is slight, we need not diminish the quantity of water. The kidneys in these cases are capable of performing the work which the free ingestion of water imposes upon them. There are even certain advantages in allowing the patient to drink much water during the convalescent stage of acute nephritis, because the rapid flow of water coming from the glomeruli flushes out the products of coagulation, extravasated blood cells and degenerated kidney epithelium contained in the tubules. In addition, the solid constituents of the urine reach the kidneys in more dilute solution and are consequently more readily eliminated and produce less irritation of the diseased organs, which still require a certain amount of care, than if they were in a more concentrated solution. From this point of view it seems to me very extreme and narrow minded to prolong diaphoretic treatment in spite of free diuresis as long as albuminuria persists. Many physicians inclined to dogmatism have come to

have firmly fixed in their minds the idea that sweating is a direct cure for albuminuria or even for inflammation of the kidney. As to this there need be no words wasted. Diaphoresis is directed against hydræmia and œdema. It is a sensible procedure and of the utmost value during the period of anuria and oliguria; later, however, when diuresis is profuse and œdema has disappeared, diaphoretic procedures can, to say the least, be dispensed with. They are unnecessary if the quantity of ingested fluid is regulated according to the functional powers of the kidneys and if care is taken to preserve the proper proportions between the fluid ingested and that excreted.

(k) *Drugs.*

One word about drugs in acute nephritis. Many physicians prescribe diuretin, caffenin, digitalis, juniper, petroselinum, species diureticæ, etc., in the early stages of nephritis, *i.e.*, at the period of oliguria, in order to stimulate diuresis. This treatment is still very common as I know from my consultation practise, although warning against it has frequently been given. I regard such prescribing as radically wrong. These stimulants are, so to speak, whip-lashings. It would be the greatest paradox to economize the work of the kidneys to the utmost possible extent in one direction, and in the other to excite them to increased activity by means of the strongest stimulants we possess. These remedies should be used only in the later stages of nephritis, and especially in the chronic form of the disease. For further facts on drugs see under "The Contracted Kidney."

IV. THE PRINCIPLES UNDERLYING THE DIETETIC AND PHYSICAL TREATMENT OF ACUTE NEPHRITIS.

If we take into consideration all the facts that have been enumerated so far in regard to the diet in acute nephritis we arrive at the following conclusions:

(a) *In severe cases of acute nephritis in which the secretion of urine is greatly reduced* (anuria and oliguria), in which œdema is increasing, and in which there is impending danger of uræmia, the diet should be limited to the smallest possible quantity, and should consist of about half a liter of milk a day. The ingestion of fluid nourishment should be avoided as much as possible; in order to combat the thirst small pieces of ice may be sucked, or very small quantities of water (tablespoonsful) may be swallowed. Both these restrictions aid in sparing the kidneys, a precaution that is particularly important at this time. It may be desirable under certain circumstances (see above) to add small quantities of alcohol (brandy or the like) to the water. The surplus water in the tissues should be removed by diaphoresis.

It is impossible to persist in this scanty diet for any length of time, certainly not more than for four or five days, for otherwise the strength of the patient may become impaired. This short period of restriction is, however, sufficient, for the dangerous stage of pro-

nounced oliguria rarely persists longer. The patient either succumbs to uræmia during this time, or develops symptoms that point to an improvement in the functional activity of the kidneys.

(b) *Cases in which the secretion of water by the kidneys is reduced but in which anuria does not threaten*; moderate œdema—occurring with particular frequency in the course of acute infectious diseases, and quite as frequently after acute infectious diseases. The chief article of diet in these cases should be milk, to which a small quantity of carbonate of lime should be added, for reasons that I have stated above. The amount of milk need not exceed 1,500 c.cm., particularly if about three-eighths of a liter of sweet cream are added, and the nutritive value of the mixture is thereby increased. By the administration of this quantity of milk and cream the demands of the body for nutriment are completely covered. In case the patient demands more food, or if the patient is very much reduced so that increased feeding is desirable, it is better not to give more milk but to add certain other articles of diet that possess a high caloric value, and at the same time contain little protein. These additions moreover should contain no substances that can irritate the kidneys, and nothing that is difficult to eliminate. Among such articles I might mention rice, groats, maizena (made into soup, porridge or pudding with a part of the milk and cream, and with butter and sugar), then bread, (Albert cakes, or fine zwieback) made of very fine white flour with butter, and finally

fruit syrups, particularly sterilized grape juice (see above).

The following is a sample of a daily menu containing the smallest possible quantity of protein, and still possessing the greatest possible nutritive value:

	PROTEIDS	CARBO- HYDRATES	FAT
Milk, 150 g.	48	67	45
Cream (sterile), 375 g.	7	10	115 and more
Rice, 50 g.,	4	33	—
Zwieback, 50 g.,	7	30	12
Butter, 50 g.,	—	—	40
Sugar, 20 g.,	—	20	—
	66	160	212

This quantity of food is not difficult to master, and is very digestible; it contains 2,900 calories. If we attempted to administer the same number of calories in the form of milk we would have to give from four and a half to five liters, and this quantity of milk would contain more than 180 g. of protein. It will be seen that even if we give up the rigid practise of a "strict milk diet" in the treatment of nephritic cases, we can arrange a suitable diet that is well borne, contains any desired quantity of calories, and a small percentage of protein. It will rarely be necessary in recent forms of acute nephritis to administer a dietary containing as many calories as the menu given in the above table.

It is impossible to fix any definite limits in regard to the amount of water that should be given in excess of the water contained in the mixture of 1,500 c.cm. of

milk and cream. If oliguria and œdema are prominent the amount of water must be limited, and the elimination of water from the body favored by sweating. If, however, the kidneys are capable of excreting water (as in many instances of acute nephritis throughout the course of the disease), it is better to administer abundant quantities of fluid for the reasons that I have discussed above (compare page 53). Whether or not it is advisable to produce sweating besides will depend on the effect of abundant diuresis on the œdema. If, despite of good diuresis, œdema persists, sweating may be indicated. If œdema disappears sweating becomes unnecessary. In the latter case we may even say that the administration of abundant quantities of water (for the purpose of increasing diuresis) and sweating are antagonistic to one another.

(c) *The convalescent stage of acute nephritis.* In this stage the administration of food should be more abundant, particularly if the diet was insufficient before, or if it is desired to improve the general nutrition of the patient. A part of the dietary may consist of milk, but more than two and one-half liters (containing about 80 g. of protein) should not be given, for otherwise the amount of protein ingested becomes so large that there is no room for other articles of diet. In this way we are prevented from offering the patient variety and from increasing the nutritive value of the diet.

The following articles of diet in addition to those that we have declared permissible in the earlier stage

of the disease, may be added to the ordinary bill of fare—white bread, legumes, cereals (oats and barley), small quantities of mild fresh cheese (cream cheese), some fruits, particularly grapes, small quantities of egg or meat (either white or red meat) (compare below). Care should be exercised in arranging the diet that the quantity of protein is gradually increased and does not exceed about 100 g. *pro die*, up to the time the nephritic process is healed. I have already stated that the administration of large quantities of fluid is very important at this period. I usually prescribe a bottle a day of unfermented grape juice (“nectar,” see above), in this stage, for this beverage is a wholesome and very nourishing article of diet, and in addition possesses the advantage of stimulating the action of the bowels that are frequently sluggish in the later stages of nephritis, and at the same time, as I know from experience, of actively stimulating diuresis.

Sweating is unnecessary, provided diuresis is abundant and œdema disappears. There are cases, however (and they are by no means rare), in which œdema persists or returns intermittently even though diuresis is abundant. This demonstrates positively that in nephritis œdema is to a certain extent dependent on the power of the kidneys to eliminate water (compare v. Noorden, “Lehrbuch der Pathologie des Stoffwechsels,” page 364, Berlin, 1893). In cases of this kind stimulation of diuresis by drugs, etc., is of very little value; sweating, on the other hand, is a very useful adjuvant to the treatment. Œdema can only be removed and

prevented by stimulating the activity of the skin, not by increasing the action of the heart (for instance, by digitalis, strophanthus, etc.) or stimulation of the kidneys (caffein, calomel, diuretin, etc.). This applies still more forcibly and more frequently to many forms of subchronic nephritis than to the convalescent stage of acute nephritis. Instead of administering forced sweat cures, patients suffering from either condition (that is, patients in the later stages of acute nephritis, and patients with subchronic nephritis in whom diuresis is abundant but œdema does not disappear) may be sent to some dry climate. The climate, for instance, of the Egyptian desert produces a mild and continuous stimulation of the pores, and accomplishes just as much as forced sweat cures at home. In such a climate the patient may be permitted to take abundant quantities of water, and in this way thoroughly to flush the tissues without at the same time having to fear that the water will be retained in the body. Œdema, under these circumstances, disappears with extraordinary rapidity, and those forms of nephritis that can heal at all usually recover rapidly if the water economy is regulated in this way. The subchronic forms of nephritis under these circumstances gradually assume the character of chronic nephritis (secondary contracted kidney), a form of the disease that is less dangerous and remains uncomplicated for long periods of time. Nephritics of the class I have described should be advised to spend the winter in Egypt. Good results are almost invariably seen. Patients with

chronic nephritis without œdema (genuine contracted kidney and other forms) will also find Egypt a pleasant place to spend the winter because the climate is so excellent and there are so many diversions, and finally because it can be reached in such a convenient manner even by patients who have to be very careful. From a general hygienic point of view, then, a winter in Egypt may be recommended, but at the same time we should not expect marked curative effects in chronic nephritis from such a change of climate.

There is not much choice among the different cities and locations in Egypt. Cairo itself is hardly a good place for the class of patients we are discussing. Helouan, situated immediately above Cairo, however, has a distinct desert climate. The accommodations are sufficiently comfortable and the expense of living is not very great. I am glad to learn that a German physician, Dr. Urbahn, is about to construct a sanitarium in this location. This is particularly important, as the hotel arrangements are by no means suitable for the treatment of serious diseases. The one other place that should be thought of besides Helouan is Assouan. The climatic conditions (in particular as regards moisture) are still more favorable than in Helouan. I hardly think, however, that this place will ever develop into a health resort; the hotels, it is true, offer every imaginable comfort, but they are not suited for housing persons suffering from serious diseases.

In addition to Egypt the steppes of southern Russia enjoy a certain reputation as climatic health resorts for

certain forms of nephritis; the conditions here are similar to those in Egypt—that is, the percentage of moisture in the air is very low. Here, too, abundant quantities of fluids (kumyss, kefir) may be administered to the patients without having to fear that the enormous ingestion of water will lead to a reappearance of œdema.¹ For some of the details (characterization of the different articles of diet and different condiments), and for the rationale of some of the general prescriptions I have given in these paragraphs, I refer to the preceding chapter.

¹What the author says concerning the climates of Egypt, applies with equal force to various excellent dry climates in the United States, particularly the table lands of Arizona and New Mexico, as well as the foot hills in Southern California, about Redlands and Pasadena.—*Ed.*

V. THE PRINCIPLES UNDERLYING THE DIETETIC AND PHYSICAL TREATMENT OF CONTRACTED KIDNEY.

(a) *General Considerations.*

I will now discuss the treatment of chronic contracted kidney. I have already discussed the customary dietetic therapy of this form of nephritis, but have not yet touched on other methods of treatment (compare page 14). As far as I can see a number of methods of treatment have been adopted in this disease that are not really justifiable even though they are commonly employed. The chief error that is made by practising physicians in general is that they apply principles that are correct, or at least permissible in the treatment of acute forms of nephritis, to the treatment of contracted kidney. The latter disease is an essentially chronic condition. In the least favorable cases, provided unforeseen complications do not abbreviate the course of the disease, the condition persists for many years; in favorable cases it persists for many decades; complete recovery is excluded. Our chief aim must therefore be to prolong the course of the disease as much as possible, and to enable the patients to maintain their strength, to continue their work and to enjoy life for years and decades. The essential postulates in the treatment of atrophic nephritis are to protect the kidney from noxious influences, to strengthen the

whole organism, to spare the heart on the one hand, and to strengthen the heart muscle on the other. In the first place, then, we must treat the lesion of the kidney itself; in addition every patient with contracted kidney must be treated like a sufferer from heart disease, in some cases like a patient with valvular diseases in which compensation is good, in others like a patient with valvular disease in which compensation is failing. Psychic treatment also plays an important rôle. Many sufferers from contracted kidney, like patients with diabetes and pulmonary tuberculosis, are fully capable of performing their routine work despite the disease (provided they take care of themselves in certain directions). Many of these patients would be fully justified in taking a hopeful view of the future; nevertheless we find that a majority give up all hope and allow themselves to be depressed by morbid thoughts; as a natural result they do not enjoy life and sacrifice much energy. The chief blame must be attached to the frequency with which these patients have their urine analyzed. Many of them make their mood and their feelings dependent on the results of these tests. Whenever the physician tells the patient perfectly truthfully that the second analysis of the urine revealed the presence of only half as much albumin as the first analysis, the patient may be encouraged and satisfied for the time being, but communications of this kind frequently cause the patient to worry constantly, for the second analysis is followed by a third and a fourth, etc., and every physician must realize that in chronic atrophic

nephritis the excretion of albumin is subject to fluctuations, so that each successive analysis cannot possibly furnish more encouraging results than the preceding one. In acute nephritis this is, of course, frequently the case. If only isolated samples of urine are analyzed instead of the whole quantity voided in 24 hours these fluctuations are apt to be particularly marked. The values for albumin vary according to the general condition of the patient, but are in part altogether independent of this factor. The degree of albuminuria, therefore, is no true index of the actual state of the disease, and as we do more harm than good in telling the patient the exact quantity of albumin excreted, I consider it to be an essential feature of the psychic treatment of these cases to divert the patient's attention as much as possible from the analysis of the urine. The physician himself should be careful not to attach too much value to these analyses and not to judge the results from too one-sided a point of view, otherwise his judgment may become biased and he may overlook other indications for treatment.

As in acute nephritis, the chief indication for dietetic treatment is in sparing the kidneys. It is unnecessary, in fact, bad practice to carry the restriction of the diet as far as in acute diseases of the kidneys. This principle is universally recognized in all the text- and hand-books on the subject, and is analogous to similar methods that are vogue in the treatment of other diseases.

In discussing the treatment of contracted kidney we

must always remember that this is a protean disease, and that it calls for different methods of therapy in its different stages. Atrophic nephritis is compatible with fairly good health for years and decades. During all this time the patient may be fully capable of performing ordinary physical and mental labor provided he does not over-tax himself. The treatment of this stage is satisfactory. The patient should be carefully advised in regard to the best method of treatment, for the duration of this period of the disease will depend altogether on the persistency with which he carries out the regulations imposed; if he violates them the disease may make a turn for the worse in a very short time and irreparable damage be done in this way. Treatment, in the more extended sense of the word, is of course not the only factor that determines the prognosis, for we occasionally encounter malignant forms of the disease that baffle all treatment. These forms, however, like similar forms of diabetes mellitus, are much less frequent than relatively benign forms.

The therapeutic principles that we will have to study somewhat in detail apply (unless otherwise specified) essentially to the ordinary mild forms of the disease, namely, those forms that can be influenced by treatment. For the treatment of acute exacerbations of the disease I must refer to what has been said in preceding paragraphs. I will refer to the treatment of the later stages that immediately precede the end or determine the fatal issue, wherever it seems necessary, for in-

stance, in the paragraphs on the administration of water. Generally speaking the dietetic treatment of threatening exacerbations of the disease will vary according to the peculiarities of each individual case. If there is reasonable hope of improving the disease process after it has once taken a turn for the worse, we should immediately institute rigid and persistent measures directed towards sparing the kidney. This protective therapy should be the same as in acute diseases of the kidney. When there is no hope for the patient, the dietary regulations should be very liberal and the desires and tastes of the patient should be met as far as possible. This humane rule is frequently violated, and as I have often seen patients tortured up to the end with a rigorous diet according to the principles in common use in nephritis. In these cases a diet offering much variety and favoring the tastes of the patient is much more appropriate.

From the pathology of metabolism we learn that in that stage of contracted kidney which, as we have seen above, persists for a long time and is not accompanied by serious disturbances in the general health of the patient, the excretion of urinary products is not greatly interfered with. Certain irregularities are of course observed; we may find, for instance, that the excretion of urea, etc., fluctuates considerably fairly early in the disease, so that in this respect the urinary findings differ from those in a normal subject fed on the same diet. At the same time we never encounter a serious retention of excrementitious substances. If a

certain proportion of excretory products is retained on one day we will usually find that it is eliminated on the next day or the second day following. Pronounced retention of excretory material is only seen in the later stages of the disease, and must be considered a much more serious prognostic sign in this disease than in acute and subchronic nephritis. For many years I have performed numerous metabolic investigations in my clinic on cases of contracted kidney, and whenever I have found that considerable quantities of urea, phosphoric acid, etc., were retained for long periods of time (not only for one, two or three days), I have always noticed that the disease soon took an unfavorable turn.¹

(b) *Alcohol.*

Shielding the kidneys, in the first place, aims at the exclusion of such irritants as are known to cause disease of the organ. Alcohol, above all others, is to be counted among these. One of the most common known causes of atrophic nephritis is the abuse of alcohol; not only the imbibing of strong drink, but, even more frequently, the free use of beer, wine and

¹In rendering this judgment I naturally presuppose that all those precautionary measures were adopted in performing these investigations that are necessary in renal diseases (compare von Noorden, "Methodik der Stoffwechsel Untersuchungen," Berlin, 1892). In the cases that I have studied I was dealing throughout with small or medium quantities of excretory substances (corresponding to from 80 to 100 g. of protein). Whether or not retention occurs in earlier stages of contracted kidney if more work is thrown on the diseased organs, has not so far been exhaustively studied from a practical point of view; moreover, such an investigation would be devoid of value.

cider. We may positively assume that the diseased organ is more sensitive to alcohol than is the healthy kidney. Although I am no friend of the teetotalism of the day, either in health or in disease, yet for patients with atrophic nephritis I would positively recommend total abstinence, provided that there are no urgent indications for the transitory use of alcohol. Not to take these into consideration would be a mistake. The most frequent indications for the use of alcohol are lack of appetite and disturbances of the heart. Some patients with atrophic nephritis who are habituated to the regular use of alcoholic liquors, suffer from severe anorexia as soon as alcohol is totally withdrawn; consequently they lose strength. Small quantities of alcohol (about half a bottle of light wine) taken during the day, overcome the anorexia at once, and will certainly be less injurious to the organism than the digestive disturbance consequent upon its withdrawal. Cases of this kind are not exactly common, but every practitioner will meet with them. Among the various disturbances of the heart that occur in the course of atrophic nephritis, stenocardiac attacks are especially amenable to treatment with alcohol. I have frequently succeeded, even in advanced stages of the disease, in preventing the nightly appearance or attacks of uræmic-cardiac asthma by the administration of half a bottle of champagne, etc., in the evening. In all these and similar cases, alcohol takes the place of any other medicine, the dose and selection of which must be carefully controlled by the physician. The

patient should be forbidden to use alcohol as a table beverage. This is one of the small but necessary privations to which he must submit in order that he may not of his own accord accelerate the course of the disease.

It will be seen (see page 50) that I am more strict and more careful about the use of alcohol in atrophic nephritis than in the acute forms of the disease. This may appear singular, but it is in accordance with practical demands. A patient with acute or parenchymatous nephritis will rarely exceed the quantity of alcohol which his physician allows him; besides he is under constant medical treatment and control. The patient with atrophic kidneys on the other hand is chiefly under his own supervision after he has once obtained the necessary advice as to his mode of life. He will only be shielded from injurious misuse of alcohol if he abstains totally from whiskey, beer, wine and cider; otherwise he will often be tempted by social conditions to overstep the limits. Few people withstand these temptations; the majority yield in time, and so return from the single and probably harmless glass allowed them to uncontrollable quantities.

In atrophic nephritis, the kidneys must not alone be taken into account, but the vascular system and the heart as well. In atrophic nephritis the arteries are hardly ever intact, and it is well established that next to the virus of syphilis and lead, alcohol is one of the substances which are most injurious to the arterial walls. The involvement of the arteries is inevitable

sooner or later in atrophic nephritis and is a dangerous complication that should not be encouraged or hastened by the use of alcohol. The heart of atrophic patients is also threatened by alcohol; irritation of this organ by alcohol must be avoided as strenuously as irritation by other cardiac stimulants (see below).

The reaction of different individuals to alcohol varies greatly. In some subjects there may be acceleration of the pulse beat and a rush of blood to the head after one single glass of beer or wine; this may sometimes even occur in very early stages of atrophic nephritis when the heart on objective examination still appears to be absolutely sound.

I remember a fellow student who was always teased at the club because he could not "stand" anything and had palpitation of the heart after one or two glasses of beer. On the solicitation of his friends he had himself examined by our clinical teacher, who, after repeated examinations, pronounced the heart to be absolutely sound, and declared its excitation by alcohol to be a nervous phenomenon. Some months later my friend discovered albumin in his urine while examining it in our course in physiologic chemistry. At that time the well-known work of Leube on "Albuminuria in Healthy Persons" appeared and our comrade was assured that he was simply suffering from physiological albuminuria, as no other symptom of nephritis was present. Four years later he succumbed to typical atrophic nephritis.

The heart of these patients is always in a state of

labile equilibrium; it is abnormally irritable, and frequently reveals the direct harmful influence of alcohol much better and more positively than is the case in more acute forms of nephritis.

A sufferer from atrophic nephritis should be instructed by his physician that alcohol unless prescribed as a medicine is for him a dangerous poison. If he insists upon taking it he does so at his own risk.

(c) *Condiments.*

Spices proper must be included among directly harmful and injurious articles, particularly irritating condiments like pepper, ginger, mustard, etc. Salt, vinegar and lemon juice on the other hand are not included in this class (comp. page 47). Nothing definite is known in regard to the exact dose of certain condiments that is injurious, nor in regard to the manner in which they exercise their deleterious effects on the kidney; in fact we do not know accurately which of the group of condiments are really harmful. It is quite possible that in interdicting a diet containing spices to nephritic patients we deprive them of more than is really necessary. In view of the fact that we know so little on this subject I may be permitted to record an observation that I made a number of years ago. The patient was an engineer of 29 years, who had been suffering for two years from a disease of the kidneys that had been diagnosed as atrophic kidney. Notwithstanding the lesion of the kidneys, that had produced a distinct hypertrophy of the left ventricle, the pa-

tient's general condition was good and his strength up to par. In June the patient, whom I had seen before, consulted me because his urine had become markedly darker. The urine contained a very small quantity of blood pigment and under the microscope red corpuscles and blood casts could be discovered. This finding, notwithstanding the fact that the patient's urine had been examined at frequent intervals, had never been made before. On investigating the recent history of this case it was found that he had been eating large quantities of summer radishes during the preceding week, although the use of this vegetable had been strictly interdicted. A few days later it was found that all the blood had disappeared from the urine. The patient who was passionately fond of radishes would not believe that they had caused the aggravation of his condition but thought he had caught cold. In August of the same year despite the warnings I had given him, he again ate radishes, two or three as large as an apple a day, and again developed hematuria by the end of the week, this time of a more severe type than before and lasting over three weeks. This was an *experimentum crucis*. I made a similar observation some time ago in a patient who ate much celery. I had performed some experiments some time before on the diuretic effect of celery in certain heart lesions with the result, by the way, that I found the effect to be too slight to warrant the use of celery as a diuretic. In a patient with contracted kidney I had also tried celery as a diuretic and had found that it increased diuresis tempor-

arily by about 600-800 c.cm. without at the same time harming the patient. In another patient afflicted with the same disease however the administration of celery was immediately followed by increased albuminuria persisting for two days. On the other hand, I have not been able to verify the generally accepted statement that asparagus does harm in nephritic cases and should be forbidden. I gave two women a pound of asparagus a day for ten days and failed to note the slightest bad effects, above all no increase in the albuminuria. In one of the patients in fact diuresis and the percentic and absolute albumen excretion were at no time so favorable as during the ten days during which she ate asparagus.

Other observations in this field were made in cases of diabetes, who in addition to glycosuria suffered from albuminuria, some of them without distinct signs of contracted kidney. Many of these patients were treated in my private clinic for diabetics in Frankfurt and received large quantities of asparagus every day during the asparagus season and in none of them did I notice any increase in the albuminuria nor in the nephrogenous microscopic elements of the urine. In some of them albumen actually disappeared from the urine during the time they were getting asparagus.

Since then, following the usual custom observed in the dietetic treatment of contracted kidney, I have, it is true, warned against the *excessive* use of asparagus, but have always permitted *small* quantities (i.e., about

half a pound two or three times a week during the asparagus season), and have never seen any bad effects from this practice. It would be well if clinicians would publish similar observations; if many reports of this kind could be collected we might learn more in regard to the injurious or non-injurious character of different condiments and of the vegetables that contain them.

I will briefly enumerate those spices and similar substances that are supposed to exercise a harmful effect on the kidneys. It will be well to eliminate these articles from the diet of nephritic cases until their non-injurious character is established:

White and black pepper, cayenne pepper, paprica, curry, cloves, vanilla (?), nutmeg, English and German mustard, anis, leek, garlic, caraway, knob celery and table celery, asparagus (?), mushrooms (?), morel and truffles.

(d) *Drugs.*

Certain drugs are to be avoided in atropic nephritis on the same principle as many spices. To this class belong, among others: cantharidin, copaiva, turpentine, salicylic acid, carbolic acid, resorcin, hydroquinon, lead, copper, boric acid, silver and mercury and their salts, iodoform and the tar preparations. It is well to be especially careful with the use of drugs of every kind in patients with atrophic nephritis because the disease runs a protracted course and intercurrent diseases are frequent, so that occasion is more often offered to give medicinal prescriptions than in acute nephritis.

Some drugs (although which ones and under what circumstances has not been positively proven), are very slowly excreted by the kidneys when they are diseased; this has been determined for the iodine salts, salicylic acid, antipyrine, methylene blue, and boric acid. In the case of one patient who took 1 g. of muriate of quinine, the quinine was qualitatively demonstrable in the urine after eight days, in spite of free diuresis; in another case where by mistake 2 mg. of atropine were given subcutaneously instead of 2 cg. of morphine, enough atropin was found in the urine, even after eight days, to make the physiological atropin test clearly evident with one drop of the extract of the total daily quantity of urine, measuring 2 c.cm. In one patient with atrophic nephritis, whom I treated when assistant in Gerhardt's clinic, the application of iodoform to a small skin wound was followed by a maniacal state of poisoning. The cause of the symptoms, which only lasted a few hours, was not clear at first; but a few days later another patient with atrophic nephritis became ill with the same symptoms after an incision made to drain the œdema had been dressed with iodoform gauze. Observation on atrophic nephritis patients made with drugs given to combat diminishing diuresis and lowered cardiac strength are also worthy of consideration: i.e., with digitalis, caffeine, diuretin, camphor, scilla, etc. If we succeed in causing improvement of the heart's action and increased diuresis by these drugs no harmful side-effects appear; if we do not succeed, however, then their use and that of

similar drugs is regularly followed by an aggravation of the general condition, far more marked than in the case of cardiac patients under similar circumstances. This evidently depends upon the difficult elimination of these substances and their retention in the body and should teach us not to prolong drug treatment in order to secure free diuresis, and not to attempt to *force* a favorable result, should it fail to appear soon, by increasing the dose. In cardiac patients one may sometimes succeed; but in nephritis this method of drug treatment is rarely successful and is very frequently followed by bad general effects.

(e) *Coffee, Tea, Tobacco.*

In addition to various substances (either foods or medicines), that I have enumerated and that should be withheld, or at least used with great care in cases of contracted kidney, some others must be mentioned which require our attention less on account of their action on the kidneys than on the heart. The condition of the heart determines the fate of patients with atrophic nephritis. Without entering into the pathogenesis of cardiac hypertrophy in nephritis, I wish to emphasize the fact that a strong heart may compensate the disease of the kidney parenchyma for a long time, for years or even for decades. Although a patient with atrophic nephritis must finally succumb to the progressive insufficiency of the kidneys we frequently see patients stricken and die with the symptoms of cardiac failure, long before the disappearance

of the kidney tissue has reached a stage that is incompatible with life. Our chief task must be to support the functional activity of the heart, and this is, as a matter of fact, the most gratifying part of the treatment of contracted kidney. It is important to avoid one-sided protective therapy in regard to the heart in kidney patients; the heart should be strengthened by means of systematic exercise according to the principle established by Oertel; cardiac irritants which merely excite the organ and necessitate an increase of work at the same time strengthening its muscle tissues should be avoided and the desired result attained by muscular exercise alone. Coffee, tea and tobacco are such injurious irritants, for they dissipate the energy of the heart instead of increasing its strength. I do not mean to say that they must always be completely withheld from patients with atrophic nephritis. In small quantities they do not excite the heart; but we know that the excitability of the heart varies in different individuals; this can be demonstrated in healthy subjects by comparing the individual tolerance for coffee or cigars in different persons. In diseases of the circulatory system and of the kidneys, the heart is vastly more sensitive to such irritants than in health. Consequently, if we harbor the humane and justifiable desire of withholding nothing more than is absolutely necessary from our patients, small quantities of coffee, tea and tobacco may be allowed, provided we first try to find out from their history and from careful observation, what effect such substances have upon the heart, especially

upon the frequency of the pulse, the intensity of the cardiac impulse, and upon subjective sensations. These observations must be frequently repeated, as changes in the sensibility of the patient may develop; the quantity allowed must be definitely settled upon and the patient must understand the reason for restricting the use of coffee, tea and tobacco, so that he may not overstep the limit drawn. In view of the extraordinary differences that we know to exist in regard to the susceptibility of different individuals to the above named irritants, no definite quantity suited to all cases can be named. The fact remains to be emphasized that the restriction of such substances must not be delayed until injurious effects actually appear; the attempt should rather be made to prevent harm by early restrictions. In doing this we fulfil the important indication of protecting the heart.

(f) *Meat.*

Heretofore only those substances have been discussed that are known to have a harmful effect upon patients with contracted kidneys, or that at least are, more or less correctly, believed to do harm. We will now enter into a discussion of the dietetic treatment proper.

First of all I should like to repeat the statement frequently made in this treatise, that in consideration of the extraordinarily long duration of the disease and the natural craving for variety in diet, not as much, but as little, as possible should be forbidden the patients.

I mean that qualitatively speaking we should be satisfied to prohibit the above named irritants and spices, or to restrict their use. This rule should be supplemented by a warning against the regular use of strong meat broths and extracts, because the extractives contained in them are irritating to the heart and perhaps also to the kidneys, when taken in concentrated form. In the same way nephritic patients are to be warned more than healthy persons, against the use of spoiled food stuffs (especially meats, so called "hautgout meat"). Among the symptoms which appear after poisoning with meat or sausage, mild kidney irritation is not rarely met with (albumin and blood in the urine); if from the outset the kidneys are a *locus minoris resistentiæ*, the danger of acute kidney irritation from the toxins of decaying food is naturally greater.

Aside from these precautions, the choice of food should not be further limited. I know that I am expressing views that are in many ways opposed to the teachings of ordinary practise. For, as has been previously stated, many physicians still cling to the practise of supplying patients suffering from atrophic nephritis with the necessary amount of albumin in the form of milk-proteids, and where this cannot be strictly adhered to or carried out the patient is usually restricted to the use of white meats (fish, veal, white fowl, fresh pork and usually also calves' brains, calves' feet and calves' thymus).

I have arrived at the conclusion, not theoretically

and not from a spirit of contradiction, but from actual observation in practise, that the above mentioned rule in the treatment of patients with atrophic nephritis must be given up. This view is in no sense new; it has been frequently advanced by others in hand- and text-books on kidney diseases (see the review of the literature of Offer-Rosenqvist and L. Mohr); but it is important to emphasize it anew, because it has not sufficiently influenced physicians in their actual practise, and because most of the patients with atrophic nephritis, whether in the early or late stages of the disease, whether young or old, man or woman, rich or poor, carry about in their pockets the same routine prescription: eat only white meat. As a matter of fact this direction does an extraordinary amount of harm, because patients who really carry it out and avoid dark meat as they would poison—and their number is by no means small—in time develop such an aversion to white meat that they reduce the consumption of all meat to a minimum. As eggs are also as a rule forbidden or decidedly restricted, and as very few people can take large quantities of milk for any length of time, and since finally the patients are not sufficiently instructed as to the choice of vegetables that they can and should eat in order to substitute animal proteins, the prohibition of dark meat leads, in many cases, to the long continued adoption of a diet that is very poor in proteins.

In the course of the last two years I have studied several patients with contracted kidneys, who by the

order of their physician had eaten no dark meat at all for some time (at least for several months). For two successive days, while continuing their regular diet, *i.e.*, before making any dietetic changes, I had the total twenty-four hours' urine collected in order to determine the amount of proteid metabolism. Only in one case did the excretion of nitrogen for the twenty-four hours exceed 10 g.; as a rule it remained decidedly below this amount. The separate values were as follows:

¹ FIRST DAY	SECOND DAY
7.2 g. N.	7.8 g. N.
6.8 " "	8.2 " "
9.1 " "	7.1 " "
9.8 " "	7.6 " "
10.0 " "	6.9 " "
9.0 " "	7.7 " "
6.5 " "	6.8 " "
9.8 " "	9.4 " "
8.7 " "	8.1 " "
8.6 " "	6.8 " "
7.9 " "	6.7 " "
10.8 " "	9.9 " "

As is well known, the statement has frequently been made of late that the normal daily amount of proteids, which C. v. Voit placed at 118 g. (calculated for 70 kg. of body weight), is much too high. Some ten years ago it was said that 20 per cent. might be deducted from Voit's proteid figures, without causing permanent injury to a healthy organism; nowadays it is even claimed that 40 per cent. and more can be

¹It might be argued that the nitrogen values in this table are so low because some urea was retained within the body. But it is very unlikely that I happened to strike periods of N. retention in every case while making these examinations; above all, however, it must be mentioned that the bill of fare on the test days did actually show a very small amount of proteids.

deducted. I should be very sorry if this view, which tends to vegetarianism, were to gain ground, for it would be reactionary. As far as healthy persons are concerned, I will not enter further into this question. In sick people I have never seen any benefits accrue from the long continued restriction of proteids; on the contrary, I have frequently noticed very harmful effects during the fifteen years I have been studying this question. I should like to formulate the rule that N-metabolism, measured by the excretion of urinary nitrogen, may be transiently (that is, for days or weeks), but never permanently, lowered below 12 g. (calculated for 70 kg. of body weight). This necessitates the ingestion of about 85 g. of proteids (mixed diet), after deducting the loss through the fæces. I regard this amount as the extreme lower limit, and it is better to remain above than below it. In the nephritic patients reported upon in the above table, the ingestion of proteids was estimated at from 50 to 70 g. a day.

That a very low proteid diet prolonged for months or for years exercises a harmful influence upon nephritic patients is shown by the fact that these patients, who are weak and delicate, are easily tired and incapable of performing any real muscular work. As soon as they are given a greater variety of food and poteids with the free use of dark meats they recover rapidly. I emphasized the success of this method of treatment in badly nourished nephritic patients some

years ago¹ (at the Carlsbad Congree for Internal Medicine), and, after a larger experience I can fully confirm what was said at that time.

It is true of course that theoretically an appropriate and ample diet can be readily arranged without including dark meat; practically, however, the matter is not so simple. In view of these difficulties and the objectionable features they give rise to, the question arises whether or not dark meat as opposed to white is really so harmful in nephritis as practitioners in general seem to assume. The objections to dark meat are based on the supposition that it contains considerably more of the nitrogenous extractives that are injurious to the kidneys. How unfounded this supposition is and how little it is supported by chemical analysis, is shown by the observations made and published by Th. Offer and Rosenquist² at my request. In numerous analyses, the nitrogenous extractives were sometimes found to be more abundant in dark, and sometimes in white meat. Greater differences were found in the same class of animals and between several samples from the group of white meat on the one hand and of dark meat on the other, than between the average amount contained in white and dark meat. Certain kinds of white meat (poultry, hare) were even found to be richer in extractives, on an average, than beef.

¹Von Noorden, "Treatment of Chronic Kidney Diseases, Therapy of the Present," 1899, page 243.

²Offer und Rosenquist, "On the Difference Between White and Dark Meat in the Nourishment of the Sick," *Berl. Klin. Wochens.*, 1899, No. 43 and 45.

Any differences that may be found in rare meats may disappear completely after the meat has been prepared in the kitchen. Meat, that may have been relatively rich in nitrogenous extractives in the raw state, will as a rule contain less of the extractives after boiling than meat that may have been relatively poor in such substances after roasting. Since nephritis patients should not eat large quantities of meat in any case, and since in the course of preparation a large part of the easily soluble extractives are lost, it makes a difference of only a fraction of a decigramme (calculated per day) whether meat relatively rich or comparatively poor in extractives is given.

Senator¹ tried to raise objections to the methods employed by Offer and Rosenquist, but his objections have been refuted by these two authors in a second monograph that they have published.

I have tried in still another way to determine what effect different kinds of meat exercise on the function of the kidney. My two assistants, Kaufmann and Mohr² studied the elimination of urinary substances after the ingestion of equivalent portions of white and of dark meat. They attempted to determine whether the ingestion of dark meat interfered with the excretory powers of diseased kidneys, and whether it increased albuminuria. In one series of experiments they found that white meats, in another that dark

¹Senator, *Berl. klin. Wochenschr.*, 1899, No. 44. Offer and Rosenquist, *ibid*, No. 45.

²Kaufmann and Mohr, the work will appear at the end of this year in the *Zeitschrift f. klin. Med.*

meats gave better results. No definite conclusions could be drawn from these very difficult investigations; the results were certainly ambiguous. Another author has recently communicated some experiments that may be utilized in determining this question. A. Pick¹ namely, found that the intensity of the albuminuria is not to any great extent dependent on the form in which the proteid is eaten.

It appears to me that clinical experience is much more important than all the investigations that at best extend over very short periods of time. I have been studying numerous cases of nephritis for many years, and I have found that there can be no reasonable objection to the administration of dark meat to patients with contracted kidney. I have also found that it is much easier to feed these patients in a rational manner and to raise their general strength if the diet can be selected so as to include dark meats. It is certainly much easier to feed these patients correctly by allowing them this latitude than by telling them that white meat is non-injurious and dark meat is injurious. A statement of this kind is based on false premises in the first place, and in addition does not take into consideration the actual practical conditions of every day life, nor the comfort of the patients.

(g) *The Amount of Proteid Ingested.*

The question arises how much protein, and in par-

¹A. Pick, on "The Influence of Nutrition on Proteid Excretion," *Prag. Med. Woch.*, XXIV, No. 14, 16, 22, 1899.

particular how much meat should we allow patients with contracted kidneys to eat. I have been guided in this important question by empiricism. The problem is largely theoretical, and has been much discussed from this point of view, but I do not believe that it can be settled by theoretical considerations alone. I allowed patients with contracted kidney to select a diet themselves from among the articles that were permitted, and to eat as much of each article as they cared to. These patients, on a diet of this kind, felt as well for a considerable period of time as can be expected in cases of contracted kidney. On two successive days, then, I collected the 24 hours' urine, and determined the nitrogen excretion. All those patients who were living on compulsory diet, for instance, were being utilized for metabolic studies, or who were on a rigid hospital diet, were excluded from these experiments. Patients who had been living for some time on a uniform diet, for instance a diet containing no white meat, or on strict milk diet, were also excluded. Nearly all of the patients moreover belonged to the better classes. In the course of the last five years I have in this way gathered the following figures that in order to make comparison easier I have calculated for 70 kg. of body weight. In order to eliminate any serious source of error in the calculation I have excluded very lean and very fat persons from this series of investigations.

Thirteen male cases the N average for two days was: Twice between 12 and 13 g.; four

times between 13 and 15 g.; four times between 15 and 16 g.; once between 16 and 17 g.; twice between 17 and 18 g.

Ten female cases; the N average for two days was: Twice between 10 and 11 g.; four times between 11 and 13 g.; three times between 13 and 14 g.; once between 16 and 17 g.

The majority of the values, therefore, lay between 13 and 16 g. of nitrogen in men, and between 11 and 14 g. in women.

The majority of the values, therefore, in men lay between 13 and 16 g., in women between 11 and 14 g. of nitrogen (calculated for 70 kg. of body weight). Calculated for albumin we found in men 81 to 100 g., in women 69 to 87 g. As a certain proportion of the nitrogen was excreted in the fæces, that were not examined, we may estimate from these figures that the consumption of albumin was: In men, about 92 to 112 g.; in women, about 80 to 100 g.: calculated for 70 kg. of body weight.

I believe that these values, that, by the way, are altogether rational and reliable according to the general biological laws of nutrition, may be called normal values for such patients suffering from contracted kidney who are in a good state of nutrition, and in whom it is desired to maintain the strength. In acute exacerbations, as they frequently occur in the course of atrophic nephritis, this sum must naturally be reduced according to the laws that obtain in the dietetic treatment of acute irritation of the kidneys (compare the

chapter on acute nephritis). In the latter stages of contracted kidney, when serious disturbances of the digestion and the appetite appear, this sum total of proteid material can rarely be managed.

Basing on the assumption that a patient with contracted kidneys takes on an average 750 c.cm. of milk (with about 26 g. of albumin), and 2 eggs (with about 13 g. of albumin) a day, and that about 20 g. of nitrogenous material are ingested with vegetable food (bread, vegetables, etc.), the following values remain for meat:

In men, from 33 to 63 g. of albumin, equal to 215 to 315 g. of meat (weighed raw); in women 21 to 41 g. of albumin, equal to 155 to 255 g. of meat (weighed raw). After cooking this amount of raw meat would weigh about 30 per cent. less if prepared with the juice, about 40 per cent. less prepared in some dry manner. This quantity of albumin on the one hand, or of meat on the other, is as a rule sufficient, and we may always be certain that we are giving the patient sufficient albumin to maintain his strength.

(h) *The Allowance of Water.*

The amount of water to be allowed patients with contracted kidneys is an important question to be solved. In all previous works on the subject this question has either been altogether neglected or has merely been touched, without due recognition of its great significance.

Three years ago I¹ was the first to call attention to this subject. The main object had always been to produce free diuresis in cases of contracted kidneys; it was believed that this plan was as correct in this form of nephritis as it undoubtedly is in acute nephritis (with certain exceptions; compare page 53). This object was accomplished very easily, because the patients, if left to themselves would drink very much water. As a matter of fact an increase in the excretion of urine above normal was almost considered a diagnostically important sign of contracted kidneys. Free diuresis under these circumstances was usually favored by giving large quantities of milk and mineral waters. It was by no means rare to find a daily excretion of from 3 to 4 liters of urine. The consumption of large quantities of fluid seemed to be justified, and was carried out willingly by the patients, because together with the increased diuresis the percentage of albumin in the urine usually decreased. The reputation that many watering places enjoy in the treatment of contracted kidney is due to this factor. As a rule increased diuresis in contracted kidney following the consumption of much mineral water causes nothing more than a dilution of the urine. The percentage of albumin becomes lower, whereas the absolute total quantity excreted during the day remains the same, or may even increase. There are cases of course in which the increase of the urinary excretion diminishes not

¹Congress f. inn, Medicine in Carlsbad, 1899. ●

only the percentage but also the absolute quantity of albumin excreted.

It is questionable, however, whether these slight and inconstant fluctuations in the degree of albuminuria are very important, and whether they are not insignificant as compared with certain other factors that may act detrimentally. The flooding of the vascular system with water over-taxes the heart to an extraordinary degree, and ultimately damages the organ. The water that is absorbed from the intestine can only be excreted by the kidneys if the blood pressure is increased. It is difficult to demonstrate directly that the heart actually is damaged by excessive water drinking; but indirectly this can be shown, for many cases of weak heart are on record that give a history of having indulged in abundant water drinking for long periods of time. In cases of this kind improvement may frequently be witnessed if the amount of water is limited. Three years ago I was able to report favorable results from this method of treatment; since that time I have had more experience with this subject, and I can testify to the fact that even in cases of dilatation of the heart, or in patients suffering from occasional stenocardiac attacks, the restriction of water may lead to marked improvement. This improvement is not only transitory but is permanent, as shown by the following two case reports. I quote these reports from the Proceedings of the Congress of 1899. The two patients are alive today, and are enjoying good health, notwithstanding the fact that both of them

(particularly the first one) suffered attacks of cardiac insufficiency many years ago. I need hardly mention that this complication is ordinarily considered a very bad prognostic sign in contracted kidney.

One of the earliest cases I observed occurred in a gentleman who is now (that is, in 1901) forty-seven years old. This patient consulted me three and a half years ago (in the summer of 1898). He was positive at the time that he had been suffering from kidney trouble for at least five years; up to three months before this time no serious symptoms had appeared. For a few months he had been suffering from dyspnoea and painful sensations of pressure in the region of the heart. These symptoms had been increasing so that within the last few weeks he had experienced a feeling of severe nocturnal oppression that caused him to awaken every few nights and forced him to stay out of bed for hours at a time. In two cases these attacks were accompanied by vomiting and bloody expectoration. On examination I found among other things that the left heart was considerably dilated, extending beyond the anterior axillary line; in addition I wish to call particular attention to this sign—there was retinitis albuminurica. He had been accustomed to take between three and a half and four liters of water a day, an amount that had been prescribed by his physician. This amount was contained in one and a half liters of milk, and about five-fourths of a liter of mineral water; I may add that he was in the habit of alternating Fachinger and Neuenahr Waters. The only prescription that I gave him was to limit the amount of fluid to five-fourths of a liter a day; at the time I allowed the patient to determine how much of this fluid was to consist of milk,

water, soup and fruit syrups; I even permitted him occasionally to take a small glass of light wine or of beer. The result of this treatment was that the attacks of cardiac asthma ceased in the course of a few days and they have never reappeared to this day, although the patient is leading a very active life, and is the head of a large industrial establishment. To this day he conscientiously follows my prescriptions, and has never suffered from stenocardiac attacks since. I may mention as a curiosity that this patient, while suffering from some mild digestive disorder on a trip was assured by the physician who took charge of his case that he would kill himself in a short time unless he immediately resumed his milk diet. I saw this patient about half a year ago for the last time and found the apex of the heart two fingers further towards the median line than three years before. I also failed to find anything of the former retinitis; albuminuria of course continued as before.

The second case was a gentleman of fifty, who was sent to me from England with the positive diagnosis of contracted kidney, and who came to take a bathing and water cure at Neuenahr. From the history of the case and from the very careful report of his physician it appeared that the patient had never developed any signs of cardiac weakness, nor any considerable degree of cardiac dilatation up to the time he left home. In Neuenahr this gentleman, who was rather corpulent, led a very quiet uniform life, drank much milk, and very much of the water; it may be imagined how much he took when I mention that he occasionally passed nearly four liters of urine. The urine had been frequently analyzed in Neuenahr, and the physician had determined with much pleasure that the percentage of albumin had decreased greatly (naturally, for the urine was very di-

lute), but no attention was paid to the heart. When this gentleman returned after his course in Neuenahr I examined him again, and found that both ventricles were greatly dilated, that the pulse was rapid and weak, and that the patient developed dyspnoea on the slightest exertion. This distension of the heart had apparently developed in the course of a few weeks. The heart resumed its normal boundaries, decreasing in dimension from day to day, within two weeks, as soon namely as I changed the treatment and forbade excessive water drinking, even restricting the amount of fluid.

A third case is mentioned in the first pages of this monograph. These examples may suffice; in the meantime observations of this character have multiplied and I feel justified in saying that *in many cases of contracted kidney (as in cases of cardiac disease) sensible restriction of water may save life.*

Naturally we must not wait until the cardiac strength has become impaired. However good and apparent the results in many cases of advanced disease may be, the most important part of therapy is after all intelligent prophylaxis; and I should like to recommend (in connection with other measures directed toward shielding and exercising the heart muscle [see pages 83 and 110]) the plan of accustoming patients with atrophic nephritis to restrict the ingestion of fluids, even with the heart is still perfectly strong.

According to my experience it is well to limit the quantity of fluid to one and a quarter liters both in the earlier and in the later stages of the disease—this

amount to include everything taken in liquid form. It is my custom to ignore the water contained in the solid food; with an average diet it measures about 500 to 700 c.cm. If the ingestion of fluid is restricted to this extent about 1,300 to 1,500 c.cm. of urine are excreted daily.

I may conclude this portion of my essay by calling attention to the fact that it is often difficult in practise to limit the fluids to only one and a quarter to one and a half liters. This regulation is much more difficult to enforce in cases of atrophic nephritis than in cases of cardiac disease and in obese patients. Patients with contracted kidney suffer much more from thirst than the latter class of patients; and it is moreover far more troublesome to insure the ingestion of sufficient quantities of other nourishment when the amount of fluid is kept relatively small.

The difficulty of treating many of these patients at home is often so great that I have been forced to admit them to the hospital or private clinic for one to three weeks; or else to send them to sanatoria which follow a course of treatment similar to mine. A large number were admitted into the sanitarium of Dr. Dapper of Kissingen, and his experience with the method of restricting the fluids has been as satisfactory as my own. Naturally the difficulties are much more readily overcome in an institution than they can be at home.

In several of the cases undergoing hospital treatment metabolic experiments were made for the purpose of determining, at least approximately, whether the

limitation of water did not impair the elimination of urinary substances (see below).

After the first obstacles have been overcome the further restriction of fluids is not especially difficult. After two to four weeks thirst is no longer complained of. It only returns to a marked degree after the disease has progressed further, after incurable cardiac weakness has finally appeared in spite of the restriction of fluids, or at the onset of the terminal stages of uræmia. In these stages of the disease, in which hope is no longer possible, there can be no object in torturing the patients by limiting the amount of fluid.

Although in all therapeutic questions experience and bedside observation are most conclusive, I may nevertheless be permitted to add the results of some clinical experiments. The point to be decided more especially was how far, in atrophic nephritis, the elimination of excretory substances is dependent upon the ingestion of water. If it were found that urea, uric acid and urates were less completely excreted when small quantities of water were being ingested than when the kidneys were being flushed, this fact would have to serve as a warning, for the accumulation of urinary products in the body must in no way be encouraged. As a matter of fact the custom of prescribing large quantities of milk and water for these patients and sending them to well-known watering places for systematic drinking cures, originates in the assumption that abundant drinking facilitates the elimination of metabolic products of all kinds. I have carried out

numerous lines of investigation on this subject. The first of these clinical experiments date back some time and were made in connection with certain metabolic investigations on nephritis that I published eleven years ago together with Ad. Ritter of Carlsbad. Later they were continued partly by myself and partly by my pupils, Dr. Dapper of Kissingen and Mr. von Rzetkowski of Warsaw, and finally, in a more elaborate form, by my assistant, Dr. L. Mohr, who will collect and publish all the material in the near future. We found that a restriction of the fluid did not, as a rule, diminish the elimination of the solid urinary constituents. Where this did occur transiently (in only one case), the accumulated excretory material was easily removed from the body by allowing the free ingestion of fluids for one day in the week. I should like to advise this expedient in practise, viz., to permit the patient to drink as much water as he chooses on one day of each week. I also follow this custom in patients with cardiac disease, unless they happen to be in the stage of failing compensation, and allow them to drink water freely on one day of every week; I think that this plan has worked well both in cardiac and in nephritic patients. Furthermore it is important, according to the results of our observations, that the quantity of fluid should not be suddenly diminished to the minimum of one and a quarter liters, especially if it was previously large. I always determine during one or two days how much fluid the patient voluntarily takes, then I gradually diminish the amount by with-

drawing about 150 to 250 c.cm. a day until the quantity is reached at which I mean to keep the patient.

Just as the occasional insertion of a "drinking day" may be welcome and useful, so in the long continued course of atrophic nephritis "drinking cures" may occasionally be useful; and there is no objection to their being taken in places with natural springs producing suitable mineral waters. As a rule I go further, and in many cases prescribe a "flushing-out cure" at home once in two or three months, using two or three liters of fluid per day for about fourteen days. Such transient drinking cures do no harm, at least not in the early stages of atrophic nephritis; they differ essentially from continued flooding of the circulatory system; but the cases must be carefully selected. When appreciable dilatation of the left heart is present I should advise against the use of the drinking cure under any circumstances; damage may often be wrought that can later only be overcome with difficulty, or not at all. Among patients who have not yet developed cardiac weakness there are many who, as soon as they become accustomed to the restriction of fluids, are loud in their praises of this method; they feel markedly improved; but as soon as they resume abundant water drinking even for a short time they complain of all kinds of mild symptoms, such as headache, fullness, heaviness of the limbs, drowsiness, and feelings of oppression.

The same question that I have asked myself will undoubtedly be raised by others, viz.: whether the

restriction of fluid is permissible and useful in those not infrequent cases, in which atrophic nephritis is combined with gout or the uric acid diathesis (gravel). In these diseases free water drinking and flushing of the tissues as well as dilution of the urine serve as important therapeutic measures. Extended clinical experience alone can answer this query. In cases of atrophic nephritis complicated with true gout (arthritis urica) I have for many years employed the same measures as in cases without gout. In no instance have I witnessed any bad results such as more frequent and more severe attacks of gout, or increase of the tophi. On the other hand, several of the gouty and nephritic patients whose heart had become weakened, improved markedly and permanently when the use of water was restricted. Consequently I see no objection to my method even in those cases of atrophic nephritis that are complicated with gout. The method seemed to me to be less promising in patients inclined to lithiasis. In such cases the insertion of a "drinking day" and of a "drinking week" every two months was tried. The patient was further advised to drink 200 c.cm. of hot water containing alternately every month from three to five g. of uricedin, or one g. of urotropin, or three to four g. of a mixture of sodium carbonate, calcaria carbonica and lithium carbonate, in suspension, every morning; in some cases the same dose was repeated every evening at bedtime. By the use of these precautions my patients never suffered any harmful

effects nor any exacerbation of the uric acid diathesis as a result of the restriction of the fluids.

As patients with atrophic nephritis who are suffering at the same time from gout or the uric acid diathesis are especially liable to disease of the blood vessels and cardiac weakness, I advise against depriving them of the advantages accruing to the circulatory organs from the restriction of water.

(i) *Total Nourishment (Caloric Value).*

Aside from deciding between permissible and non-permissible articles of food and prescribing the proper quantity of proteid and fluids, dietetic treatment in contracted kidney must concern itself with the very important problem of the total amount of nutriment to be given. As we all know, the fat content of the body is dependent on the latter factor. Obesity is a grave complication in Bright's disease. Both conditions endanger the heart; when they are combined the danger is doubled. In the case of patients with contracted kidneys, as in cardiac patients, a reduction cure should be decided upon much sooner than in healthy persons with a like adiposis.

These rules are often transgressed in practise; many nephritic patients are met with who were formerly thin or in a normal state of nutrition, but who have become so stout as the result of an unsuitable diet (much milk, butter, farinaceous foods, bread and vegetables), that they must be classed as obese. While they were formerly in a healthy condition in spite of their albuminuria, a variety of secondary cardiac disturbances have

appeared with the obesity, more especially steno-cardiac attacks; these, provided that the disease has not progressed too far, may disappear if the accumulation of fat can be appreciably diminished.

Such a case is described in my monograph on "Obesity" (Nothnagel's "Special Pathology and Therapy," page 100, Vienna, 1900).

The patient was an official of forty years in whose urine an abundant quantity of albumen was found when he was examined for life-insurance. At the time of the examination he was enjoying the best of health. His physician made the diagnosis of "contracted kidney" and was undoubtedly correct; he prescribed a diet containing no meat nor eggs and consisting largely of abundant quantities of milk and farinaceous food. In the course of three months the patient gained many pounds, his weight increasing from 130 to 170 pounds; at the same time he developed attacks of asthma and several times during the night suffered from steno-cardiac seizures. He was in this state when I saw him for the first time. The apex of the heart extended 15 cm. beyond the median line. The degree of albuminuria equalled 0.03 per cent. and was therefore about the same as at the onset of the disease or rather at the time when the disease was discovered (at that time according to the analysis that the patient showed me it was 0.033 per cent.) I prescribed restriction of fluids to 5-4 of a liter; at the same time I interdicted the use of the diet he was taking and substituted a diet containing fewer calories (about 25 calories pro kilo); he was also given cold rubs and later advised to undergo a course of treatment in Homburg. The results were excellent; within six weeks his weight

was reduced to about 150 pounds and at the expiration of another ten weeks to 135 pounds; his albuminuria, of course, persisted, but the distressing symptoms had all disappeared, the apex was three centimeters nearer to the median line and the patient thus escaped the great danger of paralysis of the heart that was threatening. In the Summer of 1901 I had occasion to examine this patient again; his weight had remained stationary between 135 and 140 pounds; he suffered no distress from the heart during the whole intervening time; the apex beat was found 12 cm. exterior to the median line.

It will be seen from all that has been said that over-feeding is dangerous in contracted kidney. Enough food should of course be administered to maintain the nutrition of the patient, but a medium amount of nourishment should never be exceeded. In cases in which it seems desirable to attempt a reduction of excessive fat, reduction cures should of course be instituted only with the greatest care. The main object is not to obtain rapid but good results. For this reason it is well to adhere to the dietary regulations that are indicated during the first stage of a reduction cure and not to carry dietary restrictions beyond this point; the diet should be limited to about 4-5 of the diet needed to maintain the patient *in statu quo* according to calculation (for a scale of dietetic cures in obesity, see von Noorden, "Obesity," page 110ff. Vienna, 1900). Only in exceptional cases may we proceed to the second anti-obesity diet (3-5 of the normal diet required) and never to the third dietary (1-2 to 2-5 of the calculated normal diet).

In many cases it is desirable to place such patients in an institution where they can be under more rigid supervision.

Together with regulation of the total quantity of food that is to be permitted the physician should also give instructions in regard to the distribution of this quantity over the different meals. Here the same factors must be considered as in cardiac disease. It is better to prescribe many small meals than few large ones. As a rule nothing need be eaten between early breakfast and midday dinner but a light lunch and nothing between dinner and supper but a few mouthfuls late in the afternoon in order to decrease the appetite for the two chief meals of the day to such an extent that the patient is not in danger of eating too rapidly or of eating too much at one sitting. In more advanced stages of the disease when the heart is beginning to grow weak it is best to insist on a light meal every two hours.

(j) *Physical Treatment.*

No less important than the dietetic treatment of contracted kidney is the physical treatment. The question arises whether we should attempt to change the water balance of the body by physical means. Practitioners in general maintain that in contracted kidney sweating is as strongly indicated as in acute forms of nephritis (comp. page 53). Hot bathing followed by packs, Roman and Turkish baths and, of recent years, electric light baths all play an important role in

the customary treatment of contracted kidney. Here we again encounter an apparent contradiction; for on the one hand we give as much water as possible for the purpose of flushing the kidneys and all the tissues of the body; on the other hand, we attempt to eliminate a large part of the water given in this way through the pores. The heart has to bear the brunt of the additional labor imposed on the body in this way, for the circulation is at all times overloaded with an excess of fluid. I do not quite understand what advantage is expected to accrue in this disease from sweating; in the later stages of the disease when there is much œdema I can of course see how the patient may be slightly benefited by this means. There is in fact no rational explanation for this practice; our only guide should be practical experience, and my personal experience teaches me that these patients are to say the least not benefited by this method of treatment; it is possible that the employment of hot water and steam-baths or of the electric light baths do no harm if used in moderation; if used in excess they certainly damage the patient very much, for they favor the development of heart weakness and insufficiency. We frequently find that certain manifestations of heart weakness disappear as soon as we stop the bathing. If my advice is followed and the patients are allowed to drink only moderate quantities of water there will be no call for the employment of diaphoretic measures of any kind.

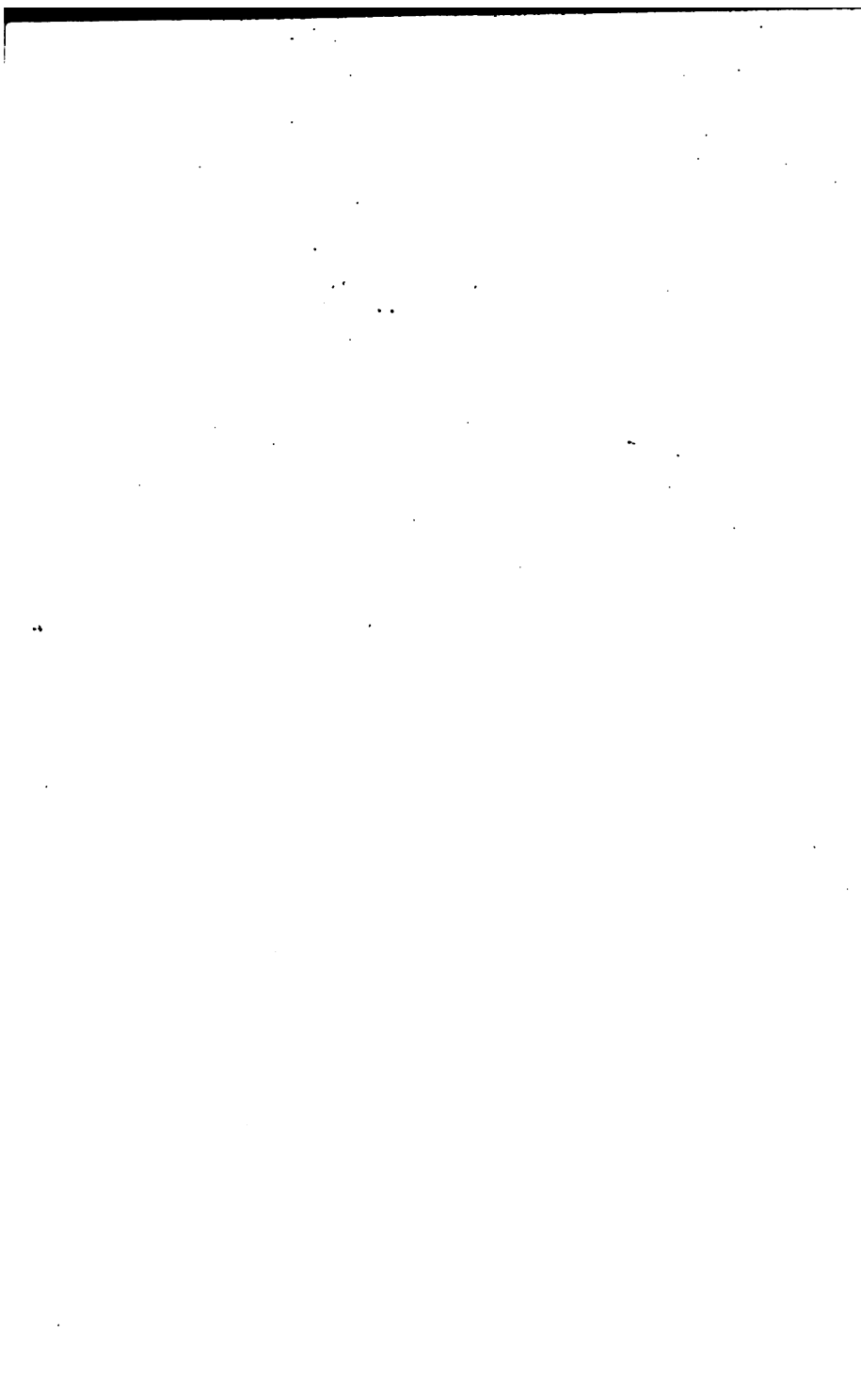
Generally speaking I should say that the same hydrotherapeutic principles apply in the treatment of

contracted kidney as in heart disease. At home cold rubs or luke-warm sitz baths followed by a brisk rub, the water being cooled from 3 to 4 degrees during the bath; brine baths of 30 to 32 degrees with the addition of pine needle extract to stimulate the skin. In watering places simple brine baths, carbonated brine baths, and, in particular, carbonated steel baths. I have studied many patients with contracted kidneys of recent years who took the carbonated baths of Nauheim, Homburg, Kissingen, Soden and Schwalbach and have frequently had occasion to convince myself that these baths exercised a strengthening effect on the heart and on the whole body. I agree with Groedel, however, who warns expressly against sending patients with advanced degrees of nephritis to watering places of this kind. They stand this treatment badly and it seems to agree even less with such cases than with cases of heart disease; and we know that more harm than good is done to the latter class of patients in the last stages of the disease if they are sent to some place where they are expected to take carbonated brine baths.

In regard to muscular exercise and massage the same principles again apply to the treatment of contracted kidney as to the treatment of heart disease. Both these adjuvants to treatment are intended to strengthen the heart and in case it is weakened to raise its functional powers. Some clinicians hold the view that patients with contracted kidney should avoid all physical exercise; this idea is wrong and should be discarded; fortunately modern physicians are beginning to give up

this plan of treatment in kidney troubles just as they have given it up in heart disease, thanks to Oertel. In contracted kidney it is true we must exercise still more care than in heart diseases; for in renal cases we must consider the heart as much as in heart cases proper, and in addition the blood vessels and the kidneys. The exact amount of muscular exercise that is to be permitted in each case must be determined by a study of the individual peculiarities of each patient. The reaction of the heart and, of course, the constitution of the urine are the chief determining factors. Physical exercise influences the degree of albuminuria in contracted kidney as well as in acute and subchronic nephritis, also in juvenile cyclic albuminuria, although not to such a marked extent as in the first named disorders. Rest in bed frequently leads to a considerable decrease in the excretion of albumin, but that does not justify us in keeping patients of this kind in bed; if we were to adopt this plan we would have to keep them in bed for months and years without really benefiting them to any great extent. In patients who are up we also frequently find considerable differences in the amount of exercise they take. The increase of albuminuria is however only transitory if the patients are gradually accustomed to greater physical efforts (by gymnastic exercises, mountain climbing, etc.); in the great majority of cases we will find that the degree of albuminuria drops back to the original level as soon as the heart and the muscles grow stronger. In many cases we may even fail to notice this transitory in-

crease in the excretion of albumen; when it does occur both patients and physicians are apt to be misled and to attach too much importance to it, so that they are in this way prevented from systematically carrying out the exercise treatment; this is always to be regretted, for this method is of the greatest benefit to the muscles, the blood-forming function and the circulation of the blood through all the organs—the kidneys included. Muscular exercise should only be stopped in the terminal stage of the disease, that is, as soon as the function of the kidneys becomes insufficient or the heart becomes weak or other intercurrent complications threaten to hasten the death of the patient. At this stage of the disease there is really no rational treatment of contracted kidneys. We must content ourselves with symptomatic treatment and attempt the fruitless but nevertheless humane task of giving the sufferer as much relief as it is in our power to grant.



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