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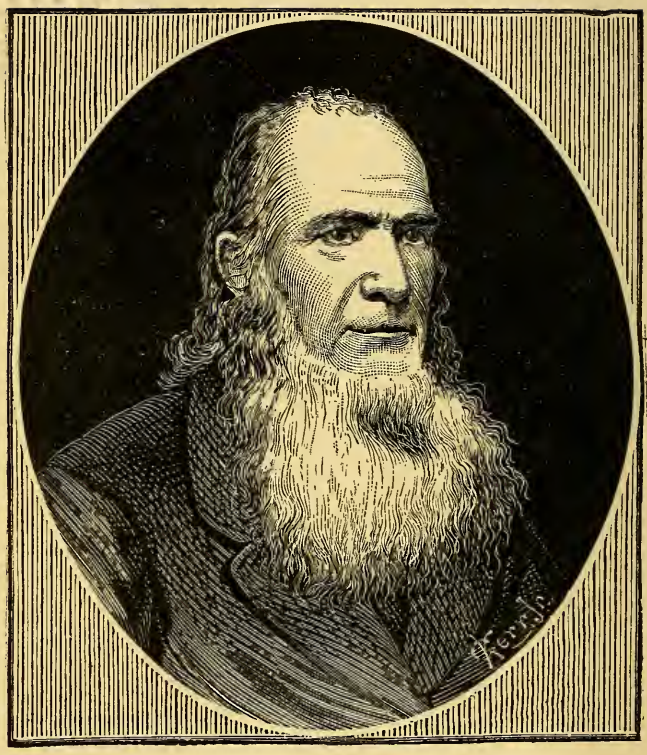

James A Reason

A TREATISE ON THE HOG:

HIS

HABITS, BREEDS, MANAGEMENT, AND DISEASES.

WITH ESPECIAL REFERENCE TO THE

DISEASE CALLED HOG CHOLERA.

TOGETHER WITH A

CHAPTER ON TRICHINA.

By JAMES A. REASOR,
OF JEFFERSON COUNTY, KY.

LOUISVILLE, KY:
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Entered according to act of Congress, in the year 187[illegible],

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PREFACE.

After many years of study and labor, and much perplexity, the author offers the results of his experience and investigations to the public. He has used his best endeavors to make the work interesting to the reader, by going somewhat at length into the history of the hog; and, as he hopes, profitable to the raiser by calling his attention to the proper management of this valuable animal, both in health and in disease. Although much has been written on the subject of breeds and breeding, the author has also given his observations and experience on the subject, in the hope that they may be found of service to the reader.

But the chief object of the work in its inception was to give a thorough and complete account of that terrible disease amongst the swine known as "hog cholera." On this subject great labor, time, and expense has been bestowed. To the investigation of this disease many weary hours of study have been given, in order to determine the nature of the disease and the true causes producing it. Great painstaking and many tedious experiments, under many discouragements, were found necessary.

The author believes that he has finally discovered the true sources of this dreaded malady. He believes that if his instructions are faithfully carried into practice that hog cholera will become a rarity.

This may seem to be strong, confident language; and nothing could induce him to utter it but a consciousness of its truth.

A short chapter on diseased meats, and one on that terrible little animal the *trichina spiralis*, and many recipes for the various diseases of the hog, and the names of the medicines most employed in the treatment of the hog, and all that is really important on these subjects, have been added, together with a short dictionary of words not in common use.

The author feels that no apology is needed for the appearance of a book on the hog and his diseases, as he is satisfied that such a work is demanded; but perhaps an apology is needed for the manner in which the duty has been performed. He lays no claims to scholarship, and is perfectly aware that it has many defects, for which he begs the indulgence of the reader.

The author avails himself of the occasion to express his thanks to his many scientific friends of the medical profession for their kind assistance in making post-mortem and microscopic examinations for him, and in an especial manner desires to express his acknowledgments to the following authors, from whose valuable works he has made extensive quotations; viz., Youatt, Beaty, Martin, and also to Virchow and his able translator, Rufus King Brown, M. D.; and to Dr. J. D. Jackson and Professor Dalton, from whose works on the trichina he has derived the greater part of the chapter on that subject.

With these remarks, explanatory of the scope and objects of the book, the author offers it to the public, with the sincere hope that it may satisfy the expectations of its readers.

LOUISVILLE, KY., JUNE 1, 1870.

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TREATISE ON THE HOG.

CHAPTER I.

HISTORY OF THE HOG.

Law of the Jews—The Romans gave great attention to them—The Gauls produced the finest swine—The Jews gave attention to raising swine—Highly esteemed by the English—Staple article of food—Brought to highest state of cultivation by the English—Value of his flesh to the world—Easily raised and very prolific—His commercial importance—Not a native of cold climates—Class of animals to which he belongs—States most interested in him—Importance of thorough knowledge of his habits—Cleanliness—Sagacity—More choice than any other animal in selecting his food—His viciousness—All depends on proper management—Flesh used for various purposes.

The history of the hog is exceedingly interesting. Youatt says: "As far back as the records of history enable us to go, the hog appears to have been known and his flesh made use of as food. Fourteen hundred and ninety-one years before Christ, Moses gave those laws to the Israelites, which have occasioned so much discussion and given rise to many opinions."

Pliny informs us that the Romans gave much attention to swine, and that they fed them on dried figs, and drenched them to repletion with honeyed

wine, in order to produce a diseased and monstrous-sized liver. "The *Porcus Trojanus*, so called in allusion to the Trojan horse, was a very celebrated dish, and one that eventually became so extravagantly expensive that a sumptuary law was passed respecting it."

Varro states that the Gauls produced the largest and finest swine's flesh that was brought into Italy; and, according to Strabo, in the reign of Augustus they supplied Rome and nearly all Italy with gammons, hog-puddings, hams, and sausages. This nation and the Spaniards appear to have kept immense droves of swine, but scarcely any other kind of live stock.

Thus it will be seen that among the ancients the hog was held in high esteem. "In fact the hog was held in nearly as high esteem among the early nations of Europe, and some of the ancients have even paid it divine honors." "In the island of Crete it was regarded as sacred. This animal was always sacrificed to Ceres at the beginning of harvest, and to Bacchus at the commencement of the vintage, by the Greeks, probably because this animal is equally hostile to the growing corn and the ripening grape."

The Jews, the Egyptians, and the followers of Mohammed, appear alone to have abstained from it. But although the Jews abstained from eating

the flesh of the hog, yet they gave much attention to rearing of swine for profit. Allusions are found in the New Testament which go to confirm this, and nothing in the Mosaic law prohibits them from doing so.

Martin says: "At what period the hog was reclaimed, or by what nation, we can not tell. As far back as history goes, we find notices of this animal, and of the uses of its flesh for food. By some nations it was held in abhorrence and prohibited as food, while among others its flesh was accounted a great delicacy."

Youatt, in his valuable work on the hog, says: "From the earliest times in our own island (England) the hog has been regarded as a very important animal, and vast herds were tended by swineherds, who watched over their safety in the woods, and collected them at night under shelter. Its flesh was the staple article of consumption in every household, and much of the wealth of the rich and free portions of the community consisted in these animals."

In all nations, with a few exceptions, this animal has received attention, either for food or for profit. In England, above all other countries, the hog has been brought to the highest state of perfection by a wise course of breeding and management, and our

finest and best breeds in this country have been imported from England.

The value of the hog to the world can scarcely be overestimated. Its flesh constitutes one of the great staple articles of food for the millions of all countries. The hog is easily reared, and is among the most prolific of animals, even under adverse circumstances, and with good treatment and proper management is the most profitable animal in existence.

It is difficult to understand what the poor would do for this kind of food but for the hog. It furnishes the most abundant and consequently the cheapest animal food. Its flesh and its products are almost, if not absolutely, necessary to every household in America. In various forms its flesh is shipped to nearly every seaport in the world, and is the source of immense wealth, both personal and national. It forms part of the mess of the soldier, the sailor, the farmer, the mechanic, the laborer, the high and the low, the rich and the poor, the prince and peasant; its flesh is the most appetizing food in the world; its fat supplies fuel for our bodies, and the waste caused by the laborer in his daily toil.

Perhaps the flesh of no other animal is so universally relished as that of the hog; nor is the flesh of any other animal used for so great variety of purposes.

One of the greatest boons to the New World was the introduction of the hog into it. It is not a native of this continent, belonging, as naturalists inform us, to the order *Pachydermita*, genus *Suida* or *Sus*. This order of animal is only found in a tropical climate; thus the elephant, rhinoceros, and hog are found existing naturally in the same country and climate. Being a native of a high southern climate, it follows that he is obliged to be acclimated in our northern states before he could become profitable, and even then is by no means as prolific and profitable as in the milder regions of our middle and southern states; and this observation is borne out by the fact that the number reared in the latter section is greatly in excess over that of the northern section. The number of hogs reared in the State of Georgia, in the year 1860, was one fifteenth of the whole number reared in the United States; viz., 2,036,116 (Patent Office Report, 1860). One of the chief products of Kentucky, Tennessee, Illinois, Indiana, and Ohio consists of hogs, yielding these states annually many millions of dollars, besides furnishing their millions of inhabitants with the greatest abundance of animal food. The Patent Office Report for the year 1866 shows that there were in the United States about 35,500,000 hogs; in 1867, from the same source, we learn that there

were 30,000,000, estimated to be worth about $134,111,424; this estimate is doubtless rather below than above the truth.

The number reared annually has varied very much, owing to a variety of causes, but chiefly in consequence of disease brought about by bad management, and the severe winters in our northwestern states, where these animals are raised in great numbers.

An animal so exceedingly valuable ought to command the earnest attention of every one, whether he be a consumer, speculator, or producer.

It must, however, be confessed by those who are at all acquainted with the facts in the case, that no animal of half its value receives so little care and attention from his master and owner as the hog. This arises from the fact that it is thought by many that the hog really requires but little attention; anything is thought to be good enough for him. He is regarded (as he is) as an omniverous animal, and is consequently made a scavenger for town and country. Nothing is thought to be too filthy for him to eat, and scarcely any attention is given to his comfort, and the wintry winds and pelting snows mercilessly beat upon him. The horse, the cow, and the sheep are provided with a shelter from the cold blasts of winter, though better able by nature

to endure it than he; yet the poor hog is left to provide for himself a bed, and sometimes even food, as best he may; hence they crowd together in the vain effort to keep warm, while many of them perish either from cold or suffocation. Many farmers do not know, or if they do know it ignore the fact already stated, that the hog has been transplanted from a warm, genial climate, and is therefore illy prepared to endure the extreme cold of the northern section of our country. Thus it is that hundreds of thousands of these valuable animals are annually swept away by disease and exposure.

If the humanity of those who rear them can not be touched, their cupidity, it would seem, ought to prompt them to a more rational course. To the author it seems simply certain that nearly all the diseases to which the hog is subject is due to mismanagement on the part of the raiser. The testimony on this point is ample, and will be fully set forth in the proper place. The above declaration is not hastily made, but after much study and observation; not confined to his own neighborhood and county, but from somewhat extensive travel and inquiry in several of the best hog-growing states of the Union.

It is of the greatest importance for every hog-raiser to make himself acquainted with the nature

and habits and peculiarities of this animal, in order that he may understand how to manage it, so that he shall derive both pleasure and profit thereby.

There is another view of this matter most important, to which the author begs to call the attention of the reader; viz., the importance of healthy meats. There can be no question that diseased food, whether animal or vegetable, must produce like results in those who consume it. Can any one doubt, for example, that hogs infested by those terrible little animals, trichinæ, or those suffering from that great scourge, "hog cholera," so-called, can be eaten without producing, in numerous instances, disastrous results? The very thought of introducing this kind of food into the stomach is revolting and disgusting in the extreme. There can be no doubt that this poisoned material in these choleraed hogs is injurious; some of our low forms of disease are no doubt produced in this way. It must be confessed that farmers are not *all* scrupulous about sending these diseased, dying animals to market. Who can pretend to estimate the ill consequences of this wickedness to those who consume this decaying, poisoned flesh? Hence the importance of being able to determine which is sound and which diseased. In another place this question will receive due attention.

In all civilized countries, the great question, How shall the poor be furnished with cheap, wholesome food, has commanded the attention of the wise and good. A large majority of the human race may be said to be poor; it is therefore an important question. The flesh of the hog furnishes one of the great staple articles of food to all classes, particularly in this country.

For several years past meats of all kinds have been very dear, so much so that the poor have found it difficult to get it at all. This has been in a great degree due to the scarcity of hogs, and this scarcity was due to the immense number of these animals that have perished by disease. This scarcity, and consequently high price, must continue so long as these animals are swept away by disease and bad treatment, and the mouths of the poor go unfilled except by inferior or diseased meats.

Much might be said in regard to the varieties of this useful animal. There has been much discussion as to the best breeds of the hog; doubtless each have their good points. It is not the purpose of the author to settle these disputes; he does not undertake to decide which is the best, but would simply say that much depends upon the object the raiser has in view. Some supply the daily market of our cities. When this is the design, the smaller

variety will best suit; but if for packing or for bacon, then the larger breeds are unquestionably best. But, after all, each raiser must decide this question for himself. This question will perhaps be more fully discussed as the work proceeds.

It may not be out of place here to allude to some of the traits and peculiarities of the hog. The author acknowledges himself indebted to Youatt, Martin, and others for much of interest on these points. "Too low an estimate is placed upon the sagacity of the hog," says Youatt. "It is supposed to be a sluggish, stupid, filthy animal; on the contrary, he has repeatedly shown himself to be exceedingly sagacious, and often quite intelligent. Many anecdotes illustrative of this could be related. But it is true that his chief business is to eat, sleep, drink, and grow fat. All his wants in this respect, in his domesticated state, are cared for (or ought to be), and his world is limited to the precincts of his sty or the farm-yard; yet, in this state of luxurious ease, individuals have shown extraordinary intelligence."

As to his filthiness, it will be interesting to those who have given but little attention to the habits of the hog, to quote the words of one or two of the best writers and observers on this point. Youatt says: "It may appear absurd to claim cleanliness as a

swinish virtue; but, in point of actual fact, the pig is a much more cleanly animal than most of his calumniators give him credit for being. He is fond of a good, clean bed, and often, when this is not provided for him, it is curious to see the degree of sagacity with which he will forage for himself." "A hog is the cleanest of all creatures, and will never dung or stale in his sty if he can get forth," says a quaint old writer of the sixteenth century; and we are very much of his opinion. But it is so much the habit to believe that this animal may be kept in any state of filth and neglect, that "pig" and "pig-sty" are terms usually regarded as synonymous with all that is dirty and disgusting. His rolling in the mud is alleged against him as proof of his filthy habits; if so, the same accusation applies to the elephant, the rhinoceros, and all other of the *Pachydermata*. May it not rather be for the cooling of themselves and keeping off flies, as we admit it to be in the case of the animals above mentioned? Savages cover themselves with grease in hot climates in order to protect their skins; may not instinct teach animals to roll themselves in mud for a similar purpose? Pigs are exceedingly fond of comfort and warmth, and will nestle closely together in order to obtain the latter, and often struggle vehemently to secure the warmest berth.

Every one knows with what sagacity pigs provide for an approaching cold "snap." When storms are overhanging, they collect straw in their mouths, and run about with great activity, as if warning their companions to prepare for the approaching storm. Hence has arisen the common Wiltshire saying, "Pigs see the wind." Virgil, in enumerating the signs of settled weather, notices this peculiarity in swine—

> "Now sows unclean are mindful to provide
> Their nestling beds of mouth-collected straw."

"In their domesticated state," says Youatt, "swine certainly are very greedy animals. Eating is the business of their lives; nor do they appear to be delicate as to the kind or quality of the food which is set before them. Although naturally herbivorous animals, they have been known to devour carrion with all the avidity of beasts of prey, to eat and mangle infants, and even gorge their appetites with their own young."

All this is accounted for by another writer, whose views commend themselves to the common sense and justice of all.

Low, an able writer, says: "Instances have occurred in which a sow has been known to devour her young; but rarely, if ever, does this happen in a state of nature. It is not unreasonable to believe that

when an act so revolting does occur, it arises more from the pain and irritation produced by the state of confinement and often filth in which she is kept, and the disturbances to which she is subject, than from any actual ferocity? for it is well known that a sow is always unusually irritable at this period, snapping at all animals that approach her. If she is gently treated, properly supplied with sustenance, and sequestered from all annoyance, there is little danger of this ever happening. Roots and fruits are the natural food of the hog, in a wild as well as in a domesticated state, and it is evident that, however *omnivorous* this animal may occasionally appear, its palate is by no means insensible to the difference of eatables; for whenever it finds variety it will be found to select the best with as much cleverness as other *quadrupeds*."

"In the peach-tree orchards of North America," says Peunaut, "where hogs have plenty of delicious food, they have been observed to neglect the fruit that has lain a few hours upon the ground, and patiently wait for a considerable time for a fresh windfall."

According to Linnæus, "the hog is more nice in the selection of his vegetable diet than any of our other domesticated *herbivorous* animals." This great naturalist states that the hog is more choice in his

selection, than either the cow, goat, sheep, or horse. This is shown in the following table:

The cow	eats	276	plants	and rejects	218.
The goat	"	449	"	"	126.
The sheep	"	387	"	"	141.
The horse	"	262	"	"	212.
The hog	"	72	"	"	171.

Thus it will be seen that the hog is a much more choice animal than many persons would have been willing to admit.

These animals have also a very keen sense of smell, and are thus enabled to discover roots, acorns, earth-nuts, etc., buried in the ground; "and in Italy are employed in hunting for truffles that grow some inches below the surface of the soil."

"The last charge which we shall attempt to refute," says Youatt, "is that of intractability." All the offenses which swine commit are attributed to an innately bad disposition; whereas they too often arise solely from bad management or total neglect. Would horses or cattle behave one iota better were they treated as pigs too often are? They are legitimate objects for the sport of idle boys, hunted with dogs, pelted with stones, often neglected and obliged to find a meal for themselves, or wander about half starved. Can we wonder that under such circumstances they should be wild, unmanageable brutes?

Look at the swine in a well-regulated farm-yard; they are as peaceable and as little disposed to wander or trespass as any of the other animals that it contains. Here, as in many other things, man is but too willing to attribute the faults which are essentially of his own causing to any other than their true source.

Martin says: "It has been usual to condemn the domestic hog in no very measured terms as a filthy, stupid brute, at once gluttonous, obstinate, and destitute of intelligence. Against this sweeping censure we beg leave to enter our protest. With regard to the filthiness of the hog in a state of confinement, every thing will depend on the trouble taken by its keeper. He may allow the sty or the yard to be covered with filth of every description, as disgraceful to himself as it is injurious to the animals. In this case the hog is the sufferer, for naturally it delights in clean straw, luxuriating in it with evident pleasure; its twinkling little eyes and low grunt expressing its feelings of contentment. In fact, the hog, so far from being the filthiest, is one of the cleanest of our domestic quadrupeds, and is unwilling to soil the straw-bed of his domicile if anything like liberty be allowed him." The above quotations will commend themselves as simple statements of facts. It is with the hog, as with other domestic animals, "like master like stock."

The viciousness, filthiness, and other bad qualities of the hog are in a great measure due to their bad management, and absolute neglect of the wants which they can not supply themselves; for, as has already been shown, in a state of nature before they were domesticated, none of these exceedingly bad qualities were found to exist among them, and must therefore be justly attributed to the treatment they have received in their domesticated state.

One of the prime objects of the following pages is to fully set forth, that everything depends upon the management of this excellent animal; that he can not be made healthy and profitable, and at the same time give to the world sound, healthy, abundant, cheap food, unless this matter is understood by those who are his managers and owners. The health and happiness of millions depends upon the manner of his handling.

The author may be permitted to say that filthy, stupid, and intractable as he is thought by many to be, there is no way of truly estimating his value to the world. His flesh, lard, oil, hide, hair, bristles, and bone are all used, some for food, and other parts serve to supply indispensable wants of civilized humanity. It is pleasant to know that this much-abused animal has had a few admirers in the literary world, for even poets, both ancient and modern, have

not overlooked him. The reader will no doubt be amused with the following witty and sensible piece copied from the "Louisville Real Estate Bulletin:"

THE HOG. By J. C. Milne.

We sing the Hog!—not those in common sties,
But that which roamed unpenned in Paradise,
And furnished—next to that "best gift," dear madame—
An extra spare rib for old Father Adam.
But if you doubt, when Eden's garden fair
Bloom'd fresh and lovely, that the pig was there,
You 'll certainly allow (please do n't forget)
He went with Noah in out of the wet;
Yet there are some who this fact would dispute,
And out of that old ark would crowd the brute!

Said my friend Dean to me the other day,
(My friend, the treasurer) in his Tauntin' way,
How can you prove, sir, that in Noah's boat
The hog was gathered with the sheep and goat?
Of that, quoth I, one can not be mistaken,
For was n't it then that Noah saved his bacon;
And did he not, though on the surging brine,
Have his Ham there whene'er he chose to dine?
Dean ceased to bristle—'lowed 'twas even so,
The "critter" figured at that cattle-show!

O, much abused and much despised beast!
Men slight thee most who know thy merits least;
Who would make light of thee should try thee first,
Then with thy praise they inter-lard their verse.
Without thy presence at the festive board,
Tickling the palate of creation's lord,
In bake or fry, or even in a stew,
Pray what could we or our good housewives do?

Sore grief would seize on many a bosom stout,
If perchance the hog should once "step out,"
And life become, 'mid all its varying scenes,
Like Sunday morning without pork and beans!

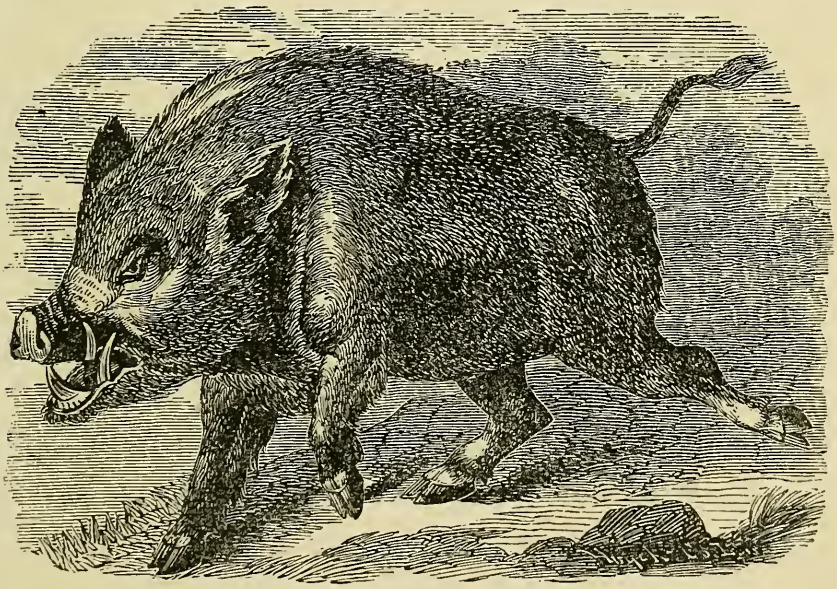
On beef and mutton Englishmen expand,
But pork 's the crowning glory of our land;
Pigs are true patriots—in the Buckeye State
They die to make her Cincinnati great.
Pork to the Jew is every way unclean,
Howe'er prepared, with or without his bean.
Though Paul felt free from Moses here to swerve,
The Jew still deems it binding to observe.
We go with Paul, as every one supposes,
As for the Jew, why—he may go to Moses!

CHAPTER II.

THE WILD BOAR.

Description of him—Goes in search of his food at night—Sense of smell—Manner of defending herd against enemies—Their age—Solitary habits when old—Habits of the female—They farrow but once a year—Laws to protect the boar for the chase—Hogs introduced into America—Number and value in the United States.

It is generally agreed that all our domesticated hogs, of every variety, have sprung originally from



WILD BOAR.

the wild boar. This animal, in his native state, is an exceedingly wild, intractable beast, and one of the

most vicious and dangerous of all the wild animals of the jungles and forests of India and other countries. The preceding cut gives a very good idea of the wild boar, and needs but to be seen to convince one of his ferocity. "This animal," says Youatt, "is generally of a dusky brown or iron-gray color, inclining to black, and diversified with black spots or streaks. The body is covered with coarse hair, intermixed with a downy wool; these hairs become bristles as they approach the neck and shoulders, and are here so long as to form a species of mane, which the animal erects when irritated. The head is short; the forehead broad and flat; the ears short, rounded at the tips, and inclined toward the neck; the jaws armed with sharp, crooked tusks, which curve slightly upward, and are capable of inflicting fearful wounds; the eye full; neck thick and muscular; the shoulder high; the loins broad; the tail stiff, finished off with a tuft of bristles at the tip; the haunch well turned, and the legs strong. A full-grown wild boar in India averages from thirty to forty inches in height at the shoulder. The African wild boar is about twenty-eight or thirty inches high. The wild boar is a very active and powerful animal, and becomes fiercer as he grows older. When he exists in a state of nature, he will usually be found in moist, shady, and well-wooded situations, not far remote from streams of water. In

India they are found in the thick jungles, in plantations of sugar-canes, rice or rhus, or in the thick patches of high, long grass." *

"In England, France, Germany, Italy, and Spain their resorts have been in the woods and forests. They seldom quit their coverts during the day, but prowl about in search of food during twilight and the night. Their acute sense of smell enables them to detect the presence of roots or fruits deeply imbedded in the soil, and they often do considerable mischief by plowing up the ground in search of them, particularly as they do not, like the common hog, root

*"The wild hog delights in cultivated situations, but will not remain where water is not at hand, in which he can quench his thirst and wallow at his ease; nor will he resort a second season to a spot that does not afford ample cover, either of heavy grass or underwood jungle, within a certain distance of him, to fly to in case of molestation, and especially to serve as a retreat during the hot season, as otherwise he would find no shelter. The sugar-cane is his great delight, both as affording his favorite food and yielding a highly impervious and unfrequented situation. In these the hogs and breeding sows especially commit great devastation; for the latter not only devour but cut the canes for a litter, and to throw up a species of hut, which they do with much art, leaving a small entrance, which they can stop up at pleasure. Sows never quit their young pigs without completely shutting them up. This is, however, requisite for a few days, after which the little ones may be seen following their mother, at a good round pace, though evidently not more than a week or ten days old." (*Williams's Oriental Field Sports.*)

up a little spot, here and there, but plow long continued furrows."

The wild boar, properly so called, is neither a solitary nor a gregarious animal. For the first two or three years the whole herd follows the sow, and all unite in defense against any enemies, calling upon each other with loud cries in case of emergency, and forming in regular line of battle, the weakest occupying the rear. But when arrived at maturity, the animals wander alone, as if in perfect consciousness of their strength, and appear as if they neither sought nor avoided any living creature. They are said to live about thirty years. As they grow old, the hair becomes gray, and the tusks begin to show symptoms of decay. Old boars are rarely found associating with a herd, but seem to keep apart from the rest and from each other.

The female produces but one litter in the year, and her litters are much smaller in number than those of the domesticated pig. She carries her young sixteen or twenty weeks, and generally is only seen with the male during the rutting season. She suckles her young for several months, and continues to protect them for some time afterward; if attacked then she will defend herself and them with exceeding courage and fierceness. Many sows will often be found herding together, each followed by her litter of young

ones, and in such parties they are exceedingly formidable to man and beast. Neither they nor the boar, however, appear to want to attack any thing; but only when roused by aggression, or disturbed in their retreat, do they turn upon their enemies, and manifest their mighty strength with which nature has endowed them; otherwise they pursue their way in a kind of solitary, savage majesty. Occasionally, when two males encounter each other, a fierce and furious battle will ensue, especially if this happen during the rutting season, when their passions are inflamed.

"When attacked by dogs, the wild boar sullenly retreats, turning upon them, from time to time, and menacing them with his tusks; but gradually his ire rises, and at length he stands at bay, fights furiously for his life, and tears and rends his persecutors. He has even been observed to single out the most tormenting of them and rush savagely upon him.

"Hunting the wild boar has been a favorite sport in almost all the countries in which this animal was found, from the earliest ages. The wild boar formed part of the sports, pageants, and wild-beast shows and fights of the Romans."

During the middle ages hunting the wild boar formed the amusement of the nobility in most European countries. The dogs provided for this sport were of the slow, heavy kind, anciently known by

the name of the 'boar-hound.' None but the largest and oldest boars were hunted, and these afforded a very exciting and often dangerous sport, lasting for many hours; for when first the animal was '*reared*' he contented himself with slowly going away, just keeping ahead of his pursuers, and apparently caring but little for them, and pausing every half mile to rest himself and give battle to his assailants, who are, however, too wary to advance upon him until he becomes tired; then he takes his final stand, and the dogs and hunters surround him, and a mortal combat ensues, in which the beast eventually falls a victim.

"Many of the forests in our own country (England) were infested by wild boars. The Anglo-Saxons seem, from the rude frescoes and prints which are handed down to us, to have hunted this animal on foot, with no weapon but the boar-spear, and attended by powerful dogs; and apparently with such success that at the Norman Conquest William I. thought it necessary to make some strict laws for the preservation of the beast of the chase. The period for hunting the wild boar among the Anglo-Saxons was in September. Howell Dha, the celebrated Welsh lawgiver, gave permission to his chief to chase the boar from the middle of November until the end of December."

These animals continued to linger in the forests of

England and Scotland for several centuries after the Norman Conquest, and many tracts of land have derived their name from this occurrence; while instances of valor in their destruction are recorded in the heraldic devices of many a noble family.

Fitzstephen, a writer of the twelfth century, informs us that wild boars, stags, fallow-deer, and bulls abounded in the vast forests which existed on the northern side of London in the time of Henry II. The learned Whittaker informs us that this animal roved at liberty over the woods of the parish of Manchester for many centuries after the Romans departed from that station, and hence the name of Barlow (*boar*-ground) came to be assigned to a district in the south-western portion. In Cumberland the appellation "Wild Boar's Fell" still points out the shire of Stainmore, in Westmoreland, and those extensive woody districts which once existed in Hertfordshire and over the Chiltem Hills were formerly peopled with wild boars, wolves, stags, and wild bulls.

Many ancient Scottish writers too speak of the existence of this animal in the woods of Caledonia. In the county of Fife there exists a tract of country formerly called *Muckross* (which, in the Celtic, signifies Boar's Promontory). It is said to have been famous as the haunt of the wild boar. One part of

it was called the Boar Hills, which name has since been corrupted into Byro Hills. It lies in the vicinity of St. Andrews, and in the Cathedral church of that city two enormous boar's tusks were formerly to be seen, chained to the high altar, in commemoration of an immense brute slain by the inhabitants after it had long ravaged the surrounding country.

In America, Australia, and the Polynesian Group, the hog was unknown originally in a natural condition; but having been turned out everywhere by the early navigators, who discovered the coasts and islands of the Pacific, he has propagated his species so rapidly in these mild and moist latitudes that he is now everywhere abundant, both in confinement and in a state of nature.*

Swine were probably introduced from Spain into Hispaniola, by Columbus, in 1493; into Florida, by De Soto, in 1538; into Nova Scotia and New Foundland, in 1553; into Canada, in 1608; and into Virginia, in 1609, where they multiplied so rapidly that in eighteen years the people were obliged to palisade Jamestown to keep them out.† From these points the hog has been carried to all parts of North America, and although he thrives best in a warm, genial

*New American Cyclopedia, Vol. III.
†New American Cyclopedia, Vol. III.

climate, yet, like man, he becomes accustomed to all climates and countries.

The generative power of this animal is truly astonishing; it is, indeed, one of the most prolific of the animal creation. Vauban tells us that a single sow, with only six young at a time, in ten generations, will produce 6,500,000, of which 500,000 may be deducted on account of accidental death.*

Sweeping over a long period, from the time they were first introduced down to the year 1856, and notwithstanding the vicissitudes of disease and bad management through which they have passed, there were in that year the enormous number of 40,000,000 of these animals in the United States alone, the value of which, at seven dollars a head, would amount to $280,000,000. If this animal, whose flesh, fat, hair, and bones are so valuable, can be improved even to the amount of one dollar for every animal, what an immense sum will be realized to the farmer! †

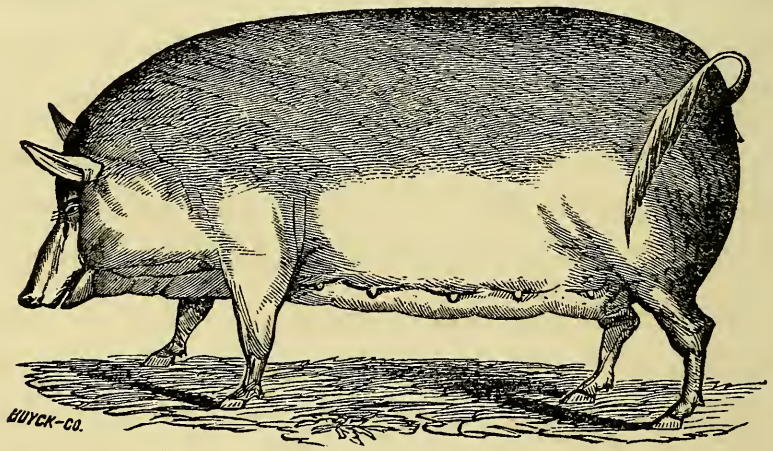
*New American Cyclopedia, Vol. IX.
†New American Cyclopedia, Vol. IX.

CHAPTER III.

DOMESTICATION—DIFFERENT BREEDS.

Different breeds crossed and recrossed to improve the stock—Names applied to the breeds produced—First improved breeds imported to America a present to Washington—Caution against imposition in selecting blooded hogs—Improved breeds at county fairs—Selection of breeds—Color, etc,

From the wild hog already spoken of the domestic hog, wherever found, has sprung. But at what



THE IMPROVED HOG.

time cross-breeding for the improvement of the wild animal began we are not certainly informed. We are told "that the ancient Romans made the art of breeding a study."

England seems to have taken the lead in the improvement of the various breeds of swine. The swine-raisers of the different provinces of England have selected the fine-boned hogs of China to cross with the larger breeds of England and other countries. In fact, they have selected and crossed and recrossed the different breeds from different countries, and have been remarkably successful in producing hogs that yield the most pork and lard with the least possible amount of food. In this way the various names have arisen. As each province or shire or county produced a new variety, a new name was given; thus we have Berkshire, Suffolk, Essex, etc.

Few breeds of the present day have the names of their native country, and show few if any marks of the original stock. We have no accurate knowledge in regard to the breeds first brought to America, or their history afterward; only that they increased rapidly, and from the abundance of herbs, roots, nuts, etc., they kept in such good condition that they made good pork and bacon with but little if any additional food.

The first hogs of the improved kind brought to this country, of which we have any exact account, is the Woburn or Bedford, which were sent by the Duke of Bedford to General Washington as a present,

and were produced at Woburn, England, by a cross of the Chinese boar and a large English hog.*

While we would encourage the raising of the improved breeds only, we wish to caution buyers against imposition. It is now a very common thing to see advertisements of blooded hogs for sale, and often too at very high figures. Many of these advertised hogs are all that is claimed for them no doubt, while others are very far from it, and are little if any better than a cross with the common rough hog, but kept in fine condition, and sold under false representations to persons at a distance, or to those who know but little about stock, and are unable to judge whether the animal has the points of the improved hog or not. In order to illustrate this the author will, he hopes, be pardoned for relating the following anecdote.

A prominent Kentucky farmer took a great fancy to the Chester white hog, now so popular with many farmers. He went to an adjoining state and purchased a young boar; the pig was in splendid condition—was, in a word, fat and fine; he prepared suitable quarters for his pigship's accommodation and comfort. Our friend took great pleasure and pains to show his new purchase to his admiring neighbors; he grew eloquent in his description of

*New American Cyclopedia, Vol. IX.

the little boar and the results to follow in the improvement of his herd, and how much better this animal was than his old common kind. Some of his auditors were, however, rather skeptical in regard to the matter. Our friend had some nice young boars which to our skeptical friends bore a marvelous likeness to his new Chester boar—they were the same size, color, and in many respects favored the new comer. Some young men who had heard him descant on the beauties of the new boar for a week or two, determined to test the matter, and they were mischievous enough to catch one of the young boars of the old stock and put him in the place of the Chester, and put him with the herd, first putting a mark on him by which they would easily recognize him. The owner continued to boast of his Chester boar and show him to his friends without noticing the change; when informed of the trick he could scarcely be made to believe that he could have been so deceived. Now the plain fact in the case was he had been deceived; he had only a good common boar, and no Chester white at all; and did not, in fact, know enough about the essential features of that animal by which he could have easily determined the point; thus he had relied upon the *name* and not upon the *qualities* of the hog. In this way doubtless many farmers are deceived. The author

hopes the anecdote just related may furnish a hint to badly-informed buyers of stock for breeding purposes.

Upon this point Beaty gives the following good advise: "I would now desire to caution the reader against being led away by mere name in his selection of a pig. A pig may be called a Berkshire, or a Suffolk, or any other breed most in estimation, and yet may in reality possess none of this valuable blood. The only *sure* mode by which the buyer will be able to avoid imposition is to make name always secondary to points. If you find a pig possessed of such points of form as are calculated to insure early maturity and facility of taking flesh, you need care little what it has seemed good to the seller to call him, and remember that *no name can bestow value upon an animal deficient in the qualities to which I have alluded.*" *

It is a fact, as the author has many times verified, that hogs of the same name differ widely in different localities, and indeed many of these were no better than the common hog.

For the last half century pork has formed *one* of the *principal* articles of commerce, and the production of this article has given employment to millions of laborers. The *great object* in this matter of breeds, and the improvement of breeds of hogs, has been to

*Agriculture and Domestic Animals.

secure such as were hardy, and such as would make the *most pork and lard with the least amount of food.* With this object in view, the American farmer has perhaps tested most of the best breeds known without coming to any definite conclusion as to which is the best adapted to this very important purpose. This fact has been fully tested at the various state and county fairs, where the different breeds have competed for the prize; for at one or another of these fairs all of the improved breeds have taken the premium; so that no *one* of these breeds has been by anything like general consent decided superior to all the rest. So that, after all, each one must determine for himself which one of the most esteemed breeds he will raise, remembering that early maturity and facility of taking flesh are the great desiderata, and not the name, to be observed in making choice for breeding.

The chief points which characterize such a pig are the following: In the first place, sufficient depth of carcass, and such an elongation of body as will insure a sufficient lateral expansion. Let the loin and breast be broad. The breadth of the former denotes good room for the play of the lungs, and a consequent free and healthy circulation essential to the thriving and fattening of any animal.* The bone

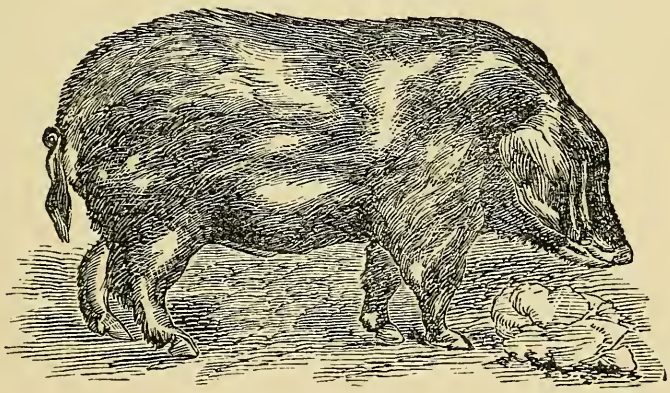
*Beaty on Agriculture and Domestic Animals.

should be small and the joints fine; nothing is more indicative of high breeding than this; and the legs should be no longer than, when fully fat, would just prevent the animal's belly from trailing upon the ground. The leg is the least profitable portion of the hog, and we therefore require no more of it than is absolutely necessary for the support of the rest. See that the feet be firm and sound; that the toes lie well together and press straightly upon the ground; as also, that the claws are even, upright, and healthy. *

Many say that the form of the head is of little or no importance, and that a good pig may have an ugly head, it being no affair of anybody but of the animal himself who has to carry it; but I regard the head of all animals as one of the very principal points in which pure or impure breeding will be the most obviously indicated. A high-bred animal will invariably be found to arrive more speedily at maturity, to take flesh earlier and with greater facility, and altogether to turn out more profitably than one of the questionable or impure stock; and such being the case, I consider that the head of the hog is by no means a point to be overlooked by the intended purchaser. The description of head most likely to promise, or rather to be concomitant of

*Beaty on Agriculture and Domestic Animals.

high breeding, is one not carrying heavy bone, not too flat on the forehead, or possessing a too elongated snout; indeed the snout should, on the other hand, be short, and the forehead rather convex, recurving upward, and the ear should be, while pendulous, inclining somewhat forward, and at the same time light and thin. Nor would I have the buyer even to pass over the carriage of the pig. If this be dull, heavy, and dejected, I would be disposed to reject him on suspicion of ill health, if not of some concealed disorder actually existing, or just about to break forth; and there can not be a more unfavorable



UNIMPROVED HOG

symptom than a hung-down, slouching head, carried as though it were about to be employed as a fifth leg. Of course, if you are purchasing a fat hog for slaughter, or a sow heavy with young, you are scarcely to look for much sprightliness of deport-

ment; but I am alluding more particularly to the purchase of young stores, the more general because the most profitable branch of pig management.*

As to color, the author does not conceive it necessary to say much. In a general way, he believes that colored hogs are more hardy, and less liable to diseases of the skin than white, and that color should no longer be considered particularly characteristic of fine blood. If the hog is intended for home consumption, perhaps white should be chosen, on account of apparent cleanliness, but if for sale color is of but little consequence. There must of necessity be a diversity of taste and opinion on this subject, as every good breed has its advocates and admirers, regardless of color or other peculiarity.

*Beatty's Agriculture and Domestic Animals.

CHAPTER IV.

BREEDING.

Objects to be attained—To secure healthy and prolific hogs—Selections of breeders—Pigs inherit qualities of parents—Fecundity of breeders—In-and-in breeding—Proper age of breeders—Directions and advice of raisers—Time the sow carries her young—Abortion—Sows devour their young—Treatment of sows while suckling—Weaning—Proper time for farrowing.

It is no part of the author's intention to attempt to give any special directions on breeding, or cross-breeding, with a view to the improvement of our already excellent varieties of hogs, for he is free to confess that this matter has not sufficiently engaged his attention; but to give his experience and observations, extending over many years, with the view mainly of producing at the same time both healthy and prolific hogs. The author begs to call the reader's especial attention to the following observations, for they embrace, not only his own experience, but also the experience of those deserving of the highest respect. Youatt, Beaty, and others will be quoted.

This matter of breeding can not be too closely studied by those who would succeed in hog culture.

Many evils and great losses have resulted from inattention to this matter. Most of these evils may be obviated by careful attention to a few well recognized principles of breeding. The farmer has a right to expect the *greatest* and *best* yield of the fruits of the ground, when he has given every attention to the preparation of the soil, and due diligence to the cultivation of his crop; it is no less true in regard to his domestic animals. It is a law of Nature that "*like* shall beget *like*," so that if impure or imperfect seed be sown, the farmer can not expect a good crop nor a good article of grain. So too perfectly healthy, thrifty animals can not be produced from unhealthy and imperfect parents. The first point therefore to be attended to is the selection of the male and female intended to be kept as breeders, and to those points characteristic of good breeders, the reader's attention is now directed.

It is a generally admitted fact in the principles of breeding that the offspring usually inherit the bodily and constitutional qualities of one or both parents; and in swine it is the boar whose qualities chiefly predominate in the offspring; hence, it will be necessary most carefully to select the male animal.*

"In the breeding of swine, as much as in that of any other live stock, it is important to pay great at-

*Youatt.

tention not only to the breed, but also to the choice of individuals. The sow should produce a great number of young, and she must be well fed, to enable her to support them. Some sows bring forth ten, twelve, or even fifteen at a birth, but eight or ten is the usual number, and sows which produce fewer than this must be rejected. It is, however, probable that fecundity depends also on the boar; he should, therefore, be chosen from a race which multiplies quickly."*

In selecting the parents of your future stock, you must diligently bear in mind the precise object you may have in view, whether the rearing be for pork or bacon, and whether you desire to meet the earliest market, and thus realize a certain profit, with the least possible outlay of money, or loss of time; or whether you mean to be contented to await a heavier, although somewhat protracted, return.

If bacon and the late market be your object, you will do well to select the large and heavy varieties, taking care to ascertain that the breed has the character of being at once possessed of those qualities most likely to answer a heavy return sure—namely, growth, and facility for taking fat. If, on the other hand, your object be to produce pork, you will of course find your account in the smaller varieties,

*Thäer.

such as arrive with greatest rapidity at maturity, and which are likely to produce the most delicate flesh. In producing pork it is not advisable that it should be too fat without a corresponding proportion of lean, and on this account I would recommend that you rather take a cross-breed sow than a pure Chinese stock, from which the over-fattening results might most naturally be apprehended. The Berkshire crossed with the Chinese is about the best porker.*

In selecting the breed of hogs to raise from, the following rules should be observed, for upon them the success of the raiser will greatly depend: 1. If the object be to raise such as will be best adapted to packing, and such as will best suit the views of "pork packers," the large breeds, such as will mature in from one to two years, will be preferable, as the packers greatly prefer large hogs, and will pay a higher price for such than for the smaller variety. 2. If the object be to supply the city or butchers' market, the small, fine-boned varieties will unquestionably be the best for the reason that they mature early and take on fat with greater facility, indeed may be fattened on less food and at any age. 3. But if the object be to raise for pork and bacon for home consumption alone, we prefer a cross between the two extremes.

* Beaty—Youatt.

The boar and sow should both be selected from healthy parents, and they themselves be without blemish or defect of any kind, and at the same time well adapted in regard to size and form to produce such animals in every particular as the raiser contemplates. The boar and sow should not be near of kin, or as Bailey expresses it, "breeding within too close degrees of consanguinity, or, as it is technically styled, breeding 'in and in,' is calculated to produce degeneracy in size, and also to impair the animal's fertility."

A good-sized sow is generally considered more likely to prove a good breeder and nurse, and to farrow more easily and safely, than a small, delicate animal. Few of our domestic animals suffer so much from being bred in and in as swine. Where this system is pursued, the number of young ones is decreased at every litter until the sows become in a manner barren. As soon as the slightest tendency to this degeneracy is observed, the breed should be crossed from time to time, keeping sight, however, while so doing, of the aim in view.* The author wishes to impress upon the reader the prime importance of selecting *none but healthy animals for breeders*; if this be neglected, disappointment will certainly be the result. Closely connected with the latter is

*Youatt on the Hog.

another nearly equally important matter; namely, the too common habit of allowing the animal to breed at too early an age. The boar should not be used as a breeder until he is about ten months old, by this time, if he has been properly kept, his generative powers are sufficiently developed to produce full and well-matured litters. At this age he should be allowed to make but one leap per day, for if he is allowed to run with the sows at will he will soon exhaust his powers as a breeder and produce a puny offspring.

When his qualities as a breeder have been satisfactorily tested in a sufficient number of cases, if his pigs are too few in number or inferior in quality, he should at once be castrated, and his place supplied with another. No boar that has once been the subject of disease of any kind should ever be used as a breeder; they may and doubtless do sometimes fully recover and produce healthy pigs, but it is, to say the least, unsafe to risk it. The boar may be used as a breeder until the sows of his own get are to be used as breeders, when it would not be proper to keep him any longer, as this would be breeding in and in, which we have already condemned. It must not be inferred from the above that the boar has become worthless at so early an age, but it is believed that if he is properly managed his genera-

tive powers remain good up to three or four years of age; indeed some writers affirm that this power is vigorous up to from five to eight years of age. Few persons, however, would be likely to keep a boar as a breeder longer than two or three years, as by this time they become vicious or lazy, and of but little utility as breeders.

The sow should be kept separate from the boar till she is at least ten months old. If she has been well kept, by that time she will be able to bring forth and suckle her pigs. She should have at least ten or twelve teats, be lengthy in the belly, and loose in the flanks. Such sows will usually have more and better pigs than short, close-made ones. In addition to this they are better sucklers; their food goes to milk, whereas in the other fat is produced, and the offspring do not thrive.

There is perhaps as much difference in the breeding power of the sow as of the boar, and when they have been tried twice and are not found to be prolific, or the pigs puny, they should be rejected as unthrifty breeders.

When several sows are in heat at the same time, one or two at the most should be served per day. My experience teaches me that where both sow and boar are in good condition, and the boar is not allowed too frequent intercourse with the sows, that one con-

nection is sufficient to produce full litters, and on no occasion is more than two leaps necessary. If they are allowed to run together at will, the generative power of the boar is greatly impaired by being overtaxed, and the last sows served will have fewer pigs than the first, and these quite inferior.

After conception the sow needs but little more attention than common stock hogs. They should have a free run to grass, woods, range, etc., as exercise at such time is much better for the animal than confinement.

In addition to the food which they are enabled to pick up they should have enough given them to keep them in fair condition, but by no means fat. Care should be taken to prevent worry of any kind either from fast driving or being chased by dogs.

Our observation teaches us that sows will carry their young from one hundred and twelve to one hundred and eighteen days; some writers affirm that the time of carrying their young varies from one hundred and nine to one hundred and forty days.*

"The period of gestation in the sow varies. The most usual period during which she carries her young is four lunar months, or sixteen weeks, or about one hundred and thirteen days. M. Tassier, of Paris, a gentleman who paid much attention to this subject,

* Beaty on Agriculture and Domestic Animals.

in connection not merely with swine but other animals, states that it varies from one hundred and nine to one hundred and forty-three days; he formed his calculations from the attentive observation of twenty-five sows."*

This matter of the time can be ascertained by carefully noting the time at which the sow was let to the boar; in this way a very close approximation to the time when she will farrow may be made. About ten days before the sow is expected to bring forth she should be separated from the other hogs, and if convenient she should have a run to grass, and be regularly though not highly fed. The food should be a nutritious, though unirritating and cooling, kind—such as milk from the dairy, bran-mash, kitchen-slops, etc. These will be quite sufficient as nourishment, and at the same time keep the bowels open. In addition to this there should be an abundance of pure water constantly and easily accessible. In this way fever is prevented at farrowing, which is a very common thing at this time. It would be well to see that the sow is rid of lice if these should be found upon her before the pigs come. Suitable beds should be prepared for her some days before she is expected to farrow; in this way she will have the straw, or whatever material is given her, worked up

* Beaty on Agriculture and Domestic Animals.

and made soft, so that the pigs will not become entangled and get injured or overlayed. When no note has been made of the time when the sow was let to the boar, we are left to mere guessing when the sow will farrow. Of course this will be uncertain; there is indeed no certain rules by which to judge with any degree of accuracy of the exact time. The size of the belly can not be relied upon, as many sows are naturally big-bellied. Perhaps the best sign is where the udder becomes distended with milk, which usually begins in from two to four weeks before the pigs are born. Careful observation in this particular will enable the owner to arrive at an approximation of the time. Young sows should have extra attention at this time, because of their inexperience in taking care of their young.

"On no account should several sows be permitted to farrow in the same place, as they will inevitably irritate each other, and devour their own or one another's young." *

ABORTION.

"This accident is by no means of so common occurence in the sow as in many of our other domesticated animals. There are various causes which will tend to produce it—insufficiency of food, eating too

* Youatt on the Hog.

much succulent vegetable food, or unwholesome and unsubstantial diet; blows and falls will also produce it."* There is another article which will undoubtedly produce abortion—viz., spurred or blasted rye, and a gorge of flaxseed has at least once in the observation of the author produced it, and he has been informed that dog-wood berries produce it. It is well to bear these things in mind and avoid them.

Young sows that get with pig prematurely before the generative organs have fully developed often abort, and in the author's observation this accident is much more common in this class. "The symptoms indicative of appoaching abortion are similar to those of parturition, only more intense. There is generally restlessness, irritation, and shiverings, and the cries of the animal testify the presence of severe labor-pains."*

"Whenever one sow has aborted, the breeder should immediately look about for the causes likely to have induced this accident, and endeavor by removing them to secure the rest of the pregnant sows from a similar fate."

The treatment of a sow after abortion is in most respects similar to that of sows who have brought forth their young at maturity. In the class already mentioned in which this accident happens most

* Youatt on the Hog.

frequently—viz., immature or imperfectly developed sows—scarcely any treatment will avail much. Of course, if they should be unable to bring forth with their unaided powers, assistance should be rendered them by taking away with the hand what it is impossible for the womb to expel. Giving the animal as a drink flaxseed-tea, in which may be dissolved some Epsom salts, and removing everything that could in any manner irritate or disturb the animal, will be about all that need be done. When there is inattention to comfort, especially in winter or spring, no shelter, no beds, and improper food, or it may be no food at all, which is too frequently the case, inflammation of the womb and lining membrane of the belly or other inflammation may be looked for, and much fatality expected.

SOWS DEVOURING THEIR YOUNG.

This is by no means of common occurrence; occasionally a sow will commit the unnatural act. One of the principal causes assigned for it is being irritated while giving birth, and subsequently to it. Be this as it may, the author has never had a sow that destroyed her young that ever failed to do so afterward. He therefore advises that a sow thus acting should not be allowed to breed any more.

TREATMENT OF THE SOW WHILE SUCKLING.

Too many farmers overlook the importance of this part of hog-culture. The sows are permitted, or rather compelled, to roam about in the fields and woods, and wherever she happens to be at the time of farrowing, she selects her place, makes her own bed of such materials as she may be able to gather up, and her whereabouts is often unknown to her owner till, driven by hunger, she "comes up" in search of food. It is frequently the case that the sow remains out till her pigs are able to follow her. Should she go home with too few or inferior pigs she is condemned for being a bad breeder. How can it be expected that she should do otherwise than produce stunted pigs, and these few in number?

But thus it is with many of our western farmers and hog-raisers. It is no wonder that many of these find hog-culture unprofitable. The sow comes up hungry; she has had nothing to eat for a week, or may be more, except what grass or roots she has been able to find in her eager search for food; but finally she is pinched with hunger, and she ventures home and receives a reward for her faithfulness in bringing up eight or ten pigs. She is given as much corn, slops, etc., as she can eat, and this she does ravenously; she becomes gorged; the stomach gets

sick and rejects the food taken, and the whole alimentary canal becomes deranged; the animal not only vomits, but frequently diarrhea sets in, and the poor animal is so disgusted and diseased that her appetite fails, and for weeks she is weak, debilitated, gives but little milk, and the pigs dwindle, become sickly, some of them die, and the rest worthless. The poor sow is pronounced worthless as a breeder. With the above treatment the finest breeders could do no better; the fault lies at the door of the owner. Let the sows be cared for properly before they farrow, and but little trouble of the kind alluded to will be experienced. They should not be disturbed or driven out of their beds till they leave it of their own accord; their food should be of the kind least liable to produce fever, such as slops, bran-mash, milk, etc., gradually increasing the quantity and quality from day to day, till finally, when the pigs are ten to fifteen days old, the sow may be given as much as she will eat, as one of the objects is to produce milk so that the pigs may have plenty; those articles of food calculated to make milk ought to be given. Care should be taken to keep the beds dry and at the same time clear of dust. If the weather be cold, their sties or sheds, or wherever the beds have been made, should be so situated as to protect them from the cold winds and snow or rain, and

there should be no want of pure water and salt. All these little matters are important.

TREATMENT OF PIGS WHILE SUCKLING.

All that is necessary to be done for the first ten or twelve days is to see that the sow cares for them, and that their beds are kept clean and dry, though, as before said, not dusty. If through neglect the sow was lousy before her confinement, the pigs will also become lousy in a very short time. At this age the pigs are very tender, and these vermin not only become very annoying, but actually impede their growth and impair their health, and even occasionally produce the death of the little ones. Strict attention should be given to this matter; the lice should be destroyed by as mild means as will accomplish this object. If the sow should be unable to support the pigs for the first week or two, which sometimes is the case, they should be taught to drink warm milk, and this will not be a very difficult matter if tenderness and care be observed.

In ten to fifteen days the pigs begin to learn how to eat, and should have a separate department, convenient for them to pass in and out at pleasure, and troughs should be provided to suit them. Milk is certainly best for them at this tender age, but where there are very many pigs it may not be possible to

supply them with this article. When this can not be done, cracked corn is a very good substitute; this should be boiled and made into a slop, or even thrown into the trough dry. They will soon learn to eat it, and this should be kept constantly on hand for them. The pigs should be prevented from wallowing in dusty places; they should be allowed free access to water, and have nice clean, dry beds. If these directions are carefully complied with, there is but little danger of disease of any kind among them. Having a good start, they grow up rapidly.

It has been the writer's practice to so arrange it that the first litter shall come early in the spring; this litter should be weaned at about eight weeks old. A few days after the pigs are weaned the food of the sow should be reduced somewhat, so that the flow of milk will be decreased. If, as frequently happens, that the udder becomes full and feverish, and the sow seems to be in pain from it, the pigs may be allowed to suck once a day for two or three days.

In from two to five days the sow usually comes in heat. After she has been bred, she may be put with the stock hogs, and will require but little if any extra attention or care till the time for her to farrow again arrives.

The second litter will come late in the summer or early in the fall; this litter may be allowed to run

with her till she weans them herself, as we do not wish to breed her again till the middle or latter part of November. The writer thinks it poor economy to allow a sow to have more than two litters a year; oftener than this well be found to be too great a drain upon her powers; besides one litter will come in the winter, when it will cost as much to keep them as they will be worth.

For about three weeks after the pigs are weaned they should be fed with good nutritious food at least three times a day; at the same time they should have a run to grass. After this the time of feeding may be reduced to twice a day, morning and evening.

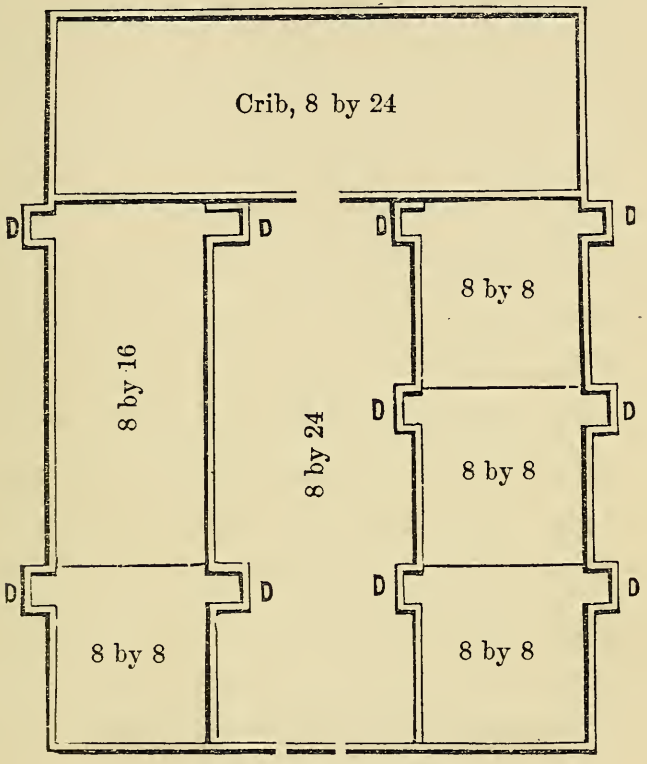
CHAPTER V.

PROTECTION—PLAN OF HOG-HOUSE.

The importance of proper protection of the hog during the winter and early spring—Ground plan of a cheap and convenient house for the purpose, with full description—Advantages at the farrowing and breeding seasons—Directions in regard to castration and speying.

So little attention has hitherto been given to proper protection to the hog, and the importance of it is so apparent, that the author feels that his work would be very incomplete without some directions in regard to it. Nothing that can be done for the hog is of more importance than affording him adequate protection and shelter. It is also important that the houses, sties, etc., should be so arranged as to give at the same time convenience, comfort, and proper ventilation. The author has given much attention to this matter, and the plan he proposes to give has given entire satisfaction to himself and to those who have adopted it. The accompanying cut will fairly illustrate his idea of a house, suitable in all respects for convenience, comfort, and ventilation; especial attention is asked for it.

The following cut represents the ground plan of a hog-house. A house built on this plan and size



PLAN OF HOG-HOUSE.

will be large enough to accommodate from thirty to eighty hogs, depending of course upon the size of the hogs. The sills are twenty-four by thirty-two feet; this gives a corn crib eight by twenty-four feet, and four sties eight by eight feet, which is large enough to accommodate a sow and pigs. The one eight by sixteen feet will give sufficient room to bed a number of common stock hogs. The feed-room, eight by twenty-four feet, is sufficiently large for all

practical purposes; and the doors are so arranged that the hogs in either department may be let into the feed-room, or put outside or let in as may be desired, without disturbing those in any other department.

This building is framed, about seven feet high, with good eaves—*i. e.*, projecting over well. The floors should be composed of good heavy plank; that of the feed-room and crib should be level; that of the sties somewhat slanting outward. A sufficient number of joists should be put overhead to lay boards upon for the purpose of putting away straw for bedding. The door should be about twenty-four inches wide, and should work up and down in grooves between the studding; a board about six inches wide should be nailed across the studding about three feet above the bottom of the door-way; this cross-piece should have holes bored through it to correspond to similar holes in the door, so that the door may be raised to any height desired, and held in its place by wooden pins put through the holes. In this way, if it be desired to let the pigs and small hogs out and keep the larger ones in, or *vice versa*, the door may be elevated or let down, and be held in place by the pins. A door is to be hung on hinges at the end of the feed-room as a passway; this door should be large enough to allow the largest sized

hog to pass through, and arranged so that it may be securely closed when desired.

The outside of this building should be planked up high enough to protect the herd from the winds and snow, leaving an open space at the top to insure ample ventilation. The inside partitions should be just high enough to keep the hogs from climbing over them; in this way it will be found much easier to clean the sties, and remove the old beds, and supply new material. About three feet six inches will be high enough for these partitions. Every part of the building should be composed of heavy, strong material, and put together so strongly as to resist any effort of the hogs to break it down.

The object of this house is not for constant confinement of the hogs, but for the comfort and accommodation of the common stock hogs. When it is the purpose to confine the hogs in pens to fatten them, the sties should be somewhat differently arranged, and the sties should in this case be larger.

The house just described is intended as a place of common resort for the herd, and also to confine the sows about the time of farrowing, and to protect them from the inclemencies of the weather during the first week or two after farrowing, and so that they may be given proper food. This house also furnishes the herd a place to sleep, and thus keeps

them from sleeping and wallowing in dusty beds and manure heaps, where they contract diseases of the skin or of the lungs. Here the animal has a bed of clean, dry straw, free from dust, and protected from the cold, the wind, and the rain; here he can rest and enjoy quiet slumber at night, caring little because feeling nothing of the cold without. He rises from his bed in the morning refreshed, and in no way injured by his companion climbing over him and disturbing his rest; he eats his simple meal and is satisfied. How can he fail to thrive? Try it and see if he does not.

With a house thus constructed pigs can be saved at all seasons of the year, and this is one of the objects to be accomplished by this arrangement. If the pigs are disposed to wallow in the dust, they may be confined in the sty, and the sow allowed to run out, and be let in as often as necessary to suckle them. We insist upon it, that if they are allowed to wallow in dusty beds, they will invariably become diseased. Care should be taken when thus confined to supply them with abundance of pure water. Of course, when the pigs are farrowed at a time when grass is abundant, they should be allowed to run in the pasture along with the sow.

Another advantage afforded by this house is that during the breeding season the boar may be kept in

one of these apartments and let to the sows at will. With this arrangement the hog is made much more gentle and manageable, and unquestionably more profitable, and the raiser derives more pleasure in the business of hog-culture.

CASTRATING AND SPAYING.

At what age of the world the art of castration was first practiced upon domesticated animals we have no means of determining. It was doubtless practiced at a very early day. The Spaniards, the Gauls, and Italians understood hog-raising, and the probability is that they practiced this art.

The objects to be attained are: 1. To destroy the generative powers. 2. To diminish their courage, and thus make them docile and easily managed. 3. To increase the tendency to grow fat, and cause them to arrive at early maturity.

The operation consists in removing the testicles of the male and the ovaries of the female. The art of performing the operation is so generally known and practiced by every hog-raiser, that it is not necessary to go into any lengthy description of it, or to give any particular mode of performing it. Yet a few remarks in regard to the time when castration ought to be performed, and the treatment

of the animal previous to and after the operation, may be found useful.

This operation should be performed in the spring as soon as the weather gets warm enough, and before the flies become troublesome, and in the fall before cold weather sets in; it may, however, be done in the summer if the castrated animals can have a run to fresh running water, in which to bathe and protect themselves from the flies; but on no account should it be performed in the winter or the cold changeable weather of early spring. The operation may be performed on either male or female at any age, though of course the risk to life is greater in old than in young animals.

It is best to castrate the male at from two to six weeks old, as the wound at this age is smaller, and the healing process is more rapid in young than in old animals; they are also much more easily handled.

Spaying the female should be performed at from two to four months old, as the ovaries are not developed sufficiently previous to this time. They should be in good health at the time, and not fat, only in fair condition. They should be put in clean, dry pens, and kept there for twenty-four hours previous to the operation, and should be allowed no food whatever, but should have plenty of water. The object of this is to secure an empty state of the

bowels, which is important, and to be in condition to obviate fever and inflammation. After the operation they should be allowed a sufficiency* of good, unirritating food, and be made, if they do not incline, to take exercise; they should not be allowed to lie around the sty, except enough simply to give sufficient rest. The food should not only be unirritating but rather scant for the first few days. If they are not allowed full feed, they will be apt to take sufficient exercise in making search for food. When, however, as is sometimes the case, they refuse to exercise, they should be driven once or twice a day a few hundred yards. The author's experience is that they do infinitely better when they are made to move about than when allowed to lie in their beds and wait for their food to be given them. If they should get stiff and very sore, take a quill and push it through the cut, between the stitches, so as to promote the flow of bruised blood and water that sometimes accumulates. This will give much relief. This operation may be repeated if found necessary.

CHAPTER VI.

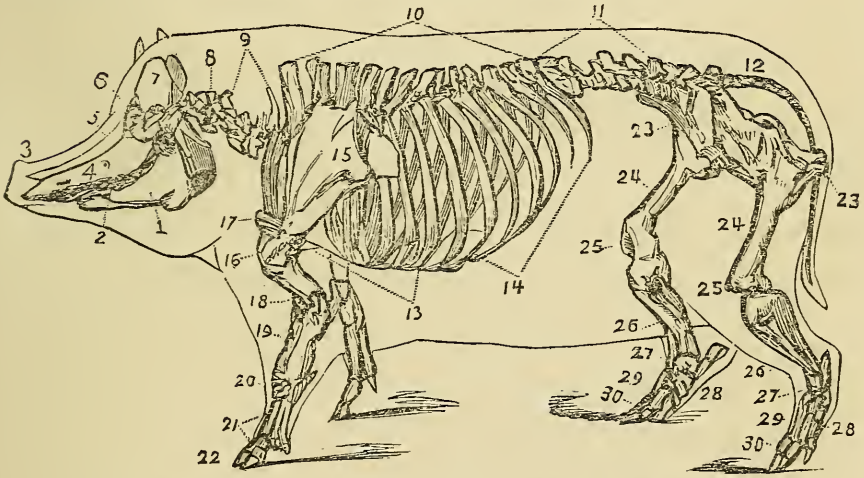
ANATOMY, PHYSIOLOGY, AND DISEASES OF THE HOG.

The head—The nose—Nerves of the special senses—The teeth; their names and number; their importance and function—Lining of the mouth—The brain, larger in proportion to the size of the animal than that of the ox or sheep—Apoplexy, its cause; its treatment—Inflammation of the brain—Epilepsy—Lockjaw, causes of—Diseases of the nose; how produced—The larynx, diseases of—The pharynx—Strangles and quinsy, treatment of—The chest—The lungs, diseases of—Bronchial tubes; their diseases.

It is important, before treating of the diseases of the hog, that the reader should have some knowledge of the structure and relations of the most important parts and organs of the body. Few persons, even those who have given much attention to the rearing of swine, have taken the trouble to inform themselves in regard to the anatomy and physiology of this exceedingly valuable animal.

It is impossible to treat the diseases of this animal intelligently and successfully without a knowledge of his anatomy, physiology, and habits. It is not, however, the intention of the author to enter into a lengthy and minute description of every part of the body, but simply those parts most liable to disease.

For a thorough, scientific description, the author refers to the systematic treatises of Youatt, Martin, and others, on the hog, and from whom, indeed, he has not hesitated to quote, and particularly from Youatt, to whose patient research the world is indebted for the best systematic treatise on the hog in the English language. The following cut is copied from the excellent book of Youatt, and gives a very accurate idea of the skeleton of the hog. It is hoped that this cut will prove profitable and interesting to the reader.



1, the lower jaw; 2, the teeth; 3, the nasal bones, or bones of the nose; 4, the upper jaw; 5, the frontal bone; 6, the orbit, or socket of the eye; 7, the occipital bone, or bone at the top and back of the head; 8, the first bones of the spine; 9, the spinal bones of the neck; 10, the spinal bones of the back; 11, the spinal bones of the loins; 12, the bones of the tail; 13, 14, the true and false ribs; 15, the shoulder-blade; 16, the round shoulder bone; 17, the breast bone; 18, the elbow; 19, the bone of the fore-arm; 20, the navicular bone; 21, the first and second bones of the foot; 22, the bones of the hoof; 23, the haunch bones; 24, the thigh bone; 25, the stifle bone; 26, the upper bone of the leg; 27, the hock bones; 28, the navicular bone; 29, the first bones of the foot; 30, the second bones of the foot.

THE HEAD.

The head presents several points of interest: First, it contains the brain, from which proceed the nerves which supply the organs of special sense, viz., seeing, hearing, smelling, tasting, etc.; second, the cavity of the nose, or *nasal* cavity; third, the teeth, and the spade-bone or snout-bone. The general contour of the head is that of an irregular, flattened cone, terminated below by the snout, which, as we shall see, serves an important purpose.

The hog differs from other animals in the structure of the nose in that he has an extra bone, the *vomer*. It is short, *trifical*, and placed directly before the *nasal-bone*, with which and the edges of the anterior *maxillary* it is connected by strong *ligaments*, *cartilages*, and *muscles*. This bone has been termed the spade-bone, the snout-bone, and by some writers the *vomer*, from its resemblance to a plowshare. By it and its *cartilaginous* attachments is the snout rendered strong, as well as flexible, and far more efficient than it could otherwise be; and the hog often contrives to give both farmers and gardeners very unpleasant proofs of its efficiency by plowing up deep furrows in newly-sown fields, and grubbing up the soil in all directions, in search of his living and dead food. As roots and fruits buried in the

earth form the natural food of the hog, the parts above described serve him a very useful purpose, as it is perfectly adapted for turning up the soil. There is a large *plexus* of nerves proceeding down each side of the nose, and ramifying over the nostril, and in these doubtless reside that peculiar power which enables the hog to detect his food, though buried some inches below the surface of the ground. The *olfactory* nerve too is large, and occupies a middle rank between that of the *herbivorous* and *carnivorous* animals. It is comparatively larger than that of the ox; indeed, few animals, with the exception of the dog, are gifted with a more acute sense of smell than the hog. To the acute sense of smell of the hog are *epicures* indebted for the truffles which form such a delicious sauce, for they are the actual finders. A pig is turned into a field, and suffered to pursue his own course, and watched. He stops, and begins to grub up the earth; the man hurries up, drives him away, and secures the truffle, which is invariably growing under that spot, and the poor pig goes off to sniff out another and another, only now and then being allowed, by way of encouragement, to reap the fruit of his research.*

The cavities of the nose are separated by a partition, and lined by a *mucous membrane*. This mem-

* Youatt.

brane frequently becomes diseased—usually inflammation. This may be known by being changed from its natural healthy color, a delicate pink, to intense redness. There is generally an abundant secretion of mucus, usually a white, glairy, tough kind, or else the membrane, instead of secreting its normal quantity of mucus, becomes dry and cracked or fissured, and bleeds at the slightest provocation. Now the function of this membrane is to secrete mucus, which keeps the parts moist, and serves to protect the deep-seated parts from any irritating matter that may be lodged upon it.

The Teeth.—"The hog has fourteen *molar* teeth (grinders) in each jaw, six *incisors* (cutters), and two *canines* (tearers). These latter are curved upward, and commonly denominated tushes." (Youatt.) Thus it will be seen that the hog, from the character of his teeth, is enabled to eat a great variety of food. He has cutters, tearers, and grinders. Thus he eats grass, grain, roots, fruits, and flesh. He is therefore what is called an *omnivorous* (all-eating) animal, and in this respect, as in some others, resembles man more than any other animal. The teeth are intended to crush the food, and thus prepare it to be mixed with the saliva of the mouth, to form it into a pulpy mass preparatory to its passage into the stomach, where it is digested, and passes on through the *intes-*

tinal canal, to be absorbed and converted into blood. But more of this anon.

THE BRAIN.

"This important organ is not so large as from an external view of the *cranium* (skull) we should be led to suppose. It is, however, considerably larger in proportion to the size of the animal than that of the ox or sheep; being about one five-hundredth part of the weight of the animal, while that of the ox is only one eight-hundredth part, and that of the sheep one seven-hundred-and-fiftieth part." (Youatt)

The hog is subject to apoplexy, and this is not to be wondered at, "as this is a disease," says Youatt, "which is chiefly induced by *plethora*, laziness, want of exercise, high feeding, and such like causes." It is a common habit to feed fatting hogs all they will eat when first put in inclosures, and thus too rapid production of blood and fat is the result, and the animal drops down from apoplexy and dies.

Inflammation of the brain and *spinal* cord, *epilepsy*, and various affections of the nervous system, such as lockjaw, *rabies*, etc., are not uncommon. Since the hog is so frequently exposed to the inclemencies of the weather in winter, and often illy provided with pure water in the heat of summer, it is not to be wondered at that he should be afflicted with these

terrible forms of disease; and it is not at all wonderful that so few should recover, when it is remembered that so little is actually known by the multitude of those who raise them of the nature and habits of this truly valuable animal.

While upon the *anatomy* and *physiology* of the head, it would be as well to consider some of the most important affections of the *mucous membrane* of the nose and throat. When it is remembered that the head of the hog is so arranged that the nose is always pendant, and that the animal is constantly snuffing and turning up the ground, and poking his nose into everything that comes in his way, and thus brought in contact with all sorts of irritating matter that it may chance to meet with, it can be readily understood how dust, sand, and other matters, lodging upon the delicate membrane of the nose and throat, may cause disease, such as inflammation, either from simple irritation or from poisonous matters. This inflammation sometimes results in ulceration, or becoming extended may reach even into the throat.

NASAL CATARRH.

The attention of the reader is next called to nasal catarrh, or snuffles as it is commonly called. The author already many times referred to (Youatt)

has given such an accurate description of the disease in question, that the author begs again to quote his words.

Youatt says: "The disease is characterized by *defluxions* (discharges) from the nose in the first place, and its advance is so gradual as to be almost imperceptible. But it gains ground daily, attacks the *respiratory* passages, cough and sneezing come on, there is evident difficulty of swallowing, and the *respiration* is impeded by the mucus formed. After some time the membrane of the nose becomes thickened, the nostril swells and becomes deformed, and the snout drawn on one side. Blood is often discharged from the nostril, and when this has been the case all the symptoms are abated and the animal seems relieved for awhile. But it too frequently happens that this discharge or *hemorrhage* returns again and again, each time in increasing quantities, until the strength of the animal becomes so undermined that, notwithstanding the utmost care and the most nourishing diet, he dies of exhaustion, or perhaps, as it may be more properly termed, consumption. This disease, which so strongly resembles *glanders* and distemper, is, like them, *hereditary*, and may be communicated from either the male or female parent. It also results from exposure to damp or cold."

The attention of the reader is earnestly called to the last observation of Youatt—viz., that the disease in question may be communicated either from the male or female parent; hence it follows that much care should be taken in the selection of breeders. As it is a law of the Creator that "like shall beget like," so it must be in regard to this matter. Pigs born of a diseased parent can rarely ever be perfectly sound; hence it becomes exceedingly important that in order to have sound, healthy, thrifty hogs, the *utmost care should be observed in selecting from the herd only those, both male and female, that are known to be perfectly sound as breeders.*

Few persons are perhaps prepared for the above statement. The author has for a long time been convinced of its truth, and he has frequently urged upon his neighbors the importance of selecting from their herds the healthiest and best for breeders, and in this way secure healthy, robust pigs. In another place he proposes to urge this matter as one of *vital* importance.

THE LARYNX.

The *larynx* is the instrument of voice. "It consists of *cartilages* united to one another by *ligamentous* substances, by distinct *articulations*, and by a seemingly complicated but really simple *muscular*

apparatus. In form it is an irregular oblong tube, exceedingly flexible, and capable of adapting itself to all the natural or *morbid* changes of the *respiratory* process, and to the production of all the various intonations of sound or voice by which the animal expresses his emotions. It is placed at the top of the windpipe, guards the exit from the lungs, and prevents the passage of food into the *respiratory* canal." The author does not believe it to be necessary to go into a very minute description of this organ. Suffice it to say, further, that this tube, like the nose, is lined by a *mucous membrane*, and is liable to become diseased. It is the seat of serious inflammation, and, as in the human being, very difficult to cure. Inflammation here is known by a peculiar change of the voice, resembling croup, and by difficulty in swallowing, and this is more particularly noticed when the animal attempts to swallow fluids; he will swallow solids with apparent ease, but he strangles and gives signs of suffering when he attempts to take fluids of any kind. The cough is spasmodic, and his voice is hoarse, and, as before stated, resembles croup in the human subject. Unless speedily relieved, the animal dies in from five to ten days, or else it runs into the *chronic* stage, and the animal becomes poor, has a distressing cough, and finally dies from exhaustion. Under very favorable

circumstances a cure may be effected, but it is the exception, not the rule. The means best adapted to relieve the disease is careful nursing, protection from cold and dampness, a purgative of Epsom salts and an ounce of saltpeter, dissolved in a gallon of flax-seed-tea, to be taken as freely as the animal can be induced to drink it; and he should be allowed no other drink until he does drink of this freely. If the animal is fat, the loss of blood might do good. The diet should consist of hot milk, bran-mash, etc. Few farmers, however, will be careful enough to detect the presence of the disease in time to accomplish much good by any plan of treatment.

THE PHARYNX.

While the organs of the throat are under consideration, it might be as well to consider the *pharynx*, as it is situated in such close proximity to the other structures of which we have been speaking. The *pharynx* is a *membranous, muscular*, funnel-shaped bag, extending from the root of the tongue to the *larynx* and *œsophagus*, wide in front, and becoming gradually narrower until it terminates in the *œsophagus*. Its office is to convey the food from the mouth to the upper part of the gullet, and this it performs by means of its lining muscles. The *œsophagus* is the long tube continued from the *pharynx* to the

stomach, and is the canal through which the food passes, after leaving the mouth and *pharynx*, into the stomach. A more complete description of this tube and its functions will be given when we come to speak of the organs of digestion.

STRANGLES OR QUINSY.

We now come to consider a disease of frequent occurrence, rapid in its progress, and very fatal in its termination—viz., strangles or quinsy. These diseases (of the throat) are of very frequent occurrence, and as they are rapid in their progress generally exceedingly fatal. They chiefly attack fattening hogs. The glands under the throat begin to swell, and thus affect not only the respiratory organs, but the act of swallowing; impeded respiration, hoarseness, and debility then supervene; the pulse becomes quick and unequal; the head to a certain extent palsied; the neck tumefies and rapidly goes on to gangrene; the tongue hangs from the mouth and is covered with slaver; and the animal gradually sinks. The glands sometimes ulcerate, and occasionally abscesses are formed, and these bursting give relief.

In the commencement of the disease very simple treatment is required, such as cooling medicines, attention to diet, and proper care and protection.

But when the swelling, impeded respiration, and difficult swallowing has come on, recourse must be had to more energetic treatment. "Bleeding and purgatives are first indicated. Setons and punctures of the swelled glands have also been recommended, and in extreme cases there is no reason why we should not have recourse to blisters and external stimulants as *counter-irritants*. A diseased animal should never be allowed to remain among healthy ones, as the malady is so infectious that it may almost be regarded as an *epizootic*." In addition to the above, the author would strongly urge the free use of the nitrate of potash (saltpeter). The dose should be large; say a table-spoonful to full-grown hogs is an excellent means; its action is upon the kidneys and skin, and in this way serves to carry off much of the unhealthy material which would otherwise be retained in the blood. It also acts upon the inflamed surface, and *fluidizes* as it were the tough mucus secreted by the inflamed membrane, and actually *depletes* and relieves congestion. Probably the best way to give it is by dissolving it in flaxseed-tea or water. Too much attention can not be given to warmth and protection from a cold, damp atmosphere. If the affected hogs have not been accustomed to bedding in a house or shelter, which is frequently the case, they ought at once to be pro-

vided with comfortable quarters. This is especially important for the reason that the disease is one of winter and spring almost exclusively. If these means be neglected, all medical treatment will be wholly in vain, and even with the best surroundings treatment is too often inefficacious.

The symptoms and treatment are thus described by Cartwright: He had six pigs attacked at nearly the same period. Their respiration was very quick; they husked and foamed at the mouth; they could not bear to be pressed on the throat, and swallowed liquids with difficulty. To some of them jalap was given, and to others castor-oil and goose-oil. One was blistered under the throat, and all bled by cutting off their tails. They died in the course of eight and forty hours from the commencement of the disease. On examination he found much inflammation under the jaws and throat, and also much swelling, with affused serum. In some of their windpipes and the bronchia there was a great quantity of mucus, but apparently no inflammation.

THE CHEST.

In the human being this constitutes the *superior* and in *quadrupeds* the *anterior* portion of the body. It is separated from the *abdomen* by the *diaphragm*. The latter is of a *musculo-membranous* nature, and is

the main agent in *respiration*. In its quiescent state it presents its *convex* surface toward the *abdomen*. The *anterior convexity* abuts upon the lungs; the *posterior concavity* is occupied by a portion of the *abdominal viscera* (or organs). The *diaphragm* of the pig resembles that of the ox and sheep.

The chest is divided into two cavities by a membrane termed the *mediastinum* (or partition), which evidently consists of a *duplicate* of the *pleura* or lining membrane of the *thorax* (chest). The *pleura* is a *serus* membrane, possessed of little or no sensibility, and acted upon by but few nerves. It is smooth and polished, covers the bony wall of the *thorax* from the spine to the *sternum* (breast-bone), and from the first rib to the *diaphragm*, and dilating and forming a kind of bag, which spreads over and contains the whole of the lung. The lungs form two distinct organs, the right being somewhat larger than the left one. They are separated from each other by that folding over of the *pleura* termed the *mediastinum* (partition), and hence may be said to be inclosed in separate bags, or to have distinct *pleuras*.

Each lung is subdivided. The right one consists of three unequal lobes, the smallest of which is again subdivided into numerous *lobules*, differing in number in different swine. The left lung consists of two *lobes*, and the *fissure* between these is not very deep.

Beneath the left lung the heart is situated, and partially inclosed in another membranous bag, termed the *pericardium*, which closely supports and protects it. The heart has two sides, the one devoted to the circulation of the blood through the lungs, and the other to its circulation through the frame generally. Each side is divided into two compartments—the one above, the other below—which are termed the *auricles* and *ventricles*. The right *auricle*, as well as the *ventricle*, is larger than the left, and its *parietes* (walls) are thinner. Much more might be said about the anatomy of the heart, but this is deemed sufficient for all practical purposes.

The organs should be studied and examined by every one interested in hog raising. This will require some care and patience, but will reward the laborer, as it will give him the best idea he can have of the situation and play of the organs.

In addition to the excellent description of Youatt, the author desires to give as correct an idea of the lungs as possible, inasmuch as he will have use for it in giving his views of an exceedingly important and terrible disease, and upon which he has given much time, labor, and expense.

Let the reader peruse again the description of the chest, its divisions, and the situation of the lungs, so as to have the whole mapped out in his mind.

It will be remembered that the windpipe leads from the *larynx* to the lungs, but that at the beginning of the chest it is divided into two branches—one branch going to the right and the other to the left lung. Immediately after they divide, these two branches enter the *apex* of the lung (for the lung is cone-shaped); the *apex* of the *cone* looking forward and the base looking backward toward the belly. Now, immediately upon entering the lung, these tubes again divide and subdivide, like the branching of a tree, throughout the whole lung from *apex* to *base*, and until they (the tubes) become so small as to be scarcely, if at all, visible to the naked eye. The function of these tubes is to convey to the lungs the *oxygen* of the atmosphere, and to throw off the poisonous *carbonic acid* gas, which, if not thus gotten rid of, poisons the animal. Thus what is called *respiration* or breathing is carried on.

The act of breathing is carried on by the *involuntary* action of certain *muscles* called *respiratory muscles*. These are the muscles of the chest, the *diaphragm*, and the muscles of the *abdomen* or belly. The anatomy of the heart has already been given. It now remains to describe its action, and the great blood-vessels which go to and from that organ; and, as before, the author avails himself of the description given by Youatt.

As before stated, "the heart has two sides—the one devoted to the circulation of the blood through the lungs, and the other to its circulation through the frame generally."

The great artery or *aorta* comes off from the left side of the heart, and it is through this that the blood is sent out through the system.

"The *aorta* of the pig separates almost immediately after its commencement into two trunks, the smaller of which leads forward, and gives forth those *arteries* which in other animals arise from the cross of this *artery*, and the other, which is larger in diameter, inclines backward. These are usually termed the *anterior* and *posterior aorta*. The beating of the heart may be felt on the left side, whence also the pulse may be taken, or from the *femoral artery*, which crosses the inside of the thigh in an oblique direction. In swine, in a state of health, the pulsations are from seventy to eighty in a minute."

Perhaps it might be useful to some readers who have given these matters but little attention to say that there are three kinds of blood-vessels; viz., *arteries*, which carry the blood out from the left side of the heart throughout the whole system; the *veins*, which serve to carry the blood back to the right side of the heart and to the lungs; and the *capillaries* (hair-like vessels,) that carry the blood through the minute

parts, and indeed every part of the body, and are situated intermediately between the ends of the *arteries* and *veins*.

Thus the round of the circulation is made: first, from the heart through the *arteries;* second, through the *capillaries* to the *veins;* third, the blood returning from the *extremities* of the body passes through the *veins* back to the heart from whence it started, thence to the lungs, where it is made fit to return to the left side of the heart, to go the same round again through the system.

Of course the heart, like all the other organs of the body, may become diseased, but its affections are so difficult of detection, and so little amenable to treatment, that it is not believed to be profitable to devote space to a consideration of them.

The anatomy and physiology of the heart is given more for the purpose of understanding other diseased processes, and for the benefit of those who have not had the opportunity of studying these very interesting matters, and of which every man should have some knowledge.

THE BRONCHIAL TUBES AND THEIR DISEASES.

Swine are very liable to attacks of bronchitis (inflammation of the tubes), and also liable to worms in the *bronchia*, both of which affections manifest them-

selves under the form of cough, *inappetency*, and loss of flesh. The former may be subdued by bleeding and cooling medicines, as sulphur, cream tartar, or pulv. *antimonials*.

The latter (worms) almost invariably cause the death of the animal from the irritation they create, and the inflammation which is thus set up. The author is disposed to differ from Youatt in regard to the last observation, and does so with much diffidence. The author has repeatedly seen small thread-like worms in the windpipe and *bronchial tubes* after the animal had become fat, and he further states, what he is aware has been disputed, that he has seen repeatedly the *trichinæ* in the same locality, so pronounced by good microscopists.

Now, if the hog grows fat while these *parasites* exist in the tubes, certainly they are not so fatal as Youatt has been led to believe. That death is the *inevitable result* of their presence in the windpipe and tubes the experience of the author does not permit him to believe. Youatt does not inform us as to the kind of worm to which he alludes; but it is certain, though mentioned by no other writer than the one referred to known to the author, that worms do inhabit the air passages and get into the ultimate tubes and air cells of the lung of the hog. The author's observation teaches him that these worms are almost

exclusively confined to pigs from three to fifteen months old. But let this suffice for the present on this subject.

The writer wishes now to call attention to the efficacy of *muriate of ammonia* in large doses in the treatment of *bronchitis*. Half a table-spoonful of the medicine, finely powdered and dissolved in flaxseed-tea, or indeed as much as the animal can be induced to take, will be found one of the most valuable of all the remedies in use. In addition to this, it is very cheap. It may be given either in solution or mixed with bran or meal. As its taste is very like common salt, it will not be difficult to get the animal to take it. Moreover, it is perfectly innocent. Saltpeter (nitrate of potash), used in the same way, will also give good results. These, with soups, bran-mash, and proper protection, will cure most of the cases of *bronchitis*.

INFLAMMATION OF THE LUNGS.

Simple, uncomplicated inflammation of the lungs is rather a common affection in swine. This disease is more generally known under the term of *rising of the lights*. It is one of the most fatal of all the diseases of the hog. It has been thought by some to be contagious and by others *hereditary*. There is no good foundation for either notion. The same

laws that govern the production of the disease in the horse and in the human being produce it also in the hog.

There can be but little doubt that the disease in question is produced by *atmospherical* changes, or influences which create a tendency, as Youatt says, "to *pulmonary* affections; and these, acting upon a system heated and predisposed to disease by the mode of feeding adopted in most piggeries, give a serious and inflammatory character to that which would otherwise merely be a simple attack of *catarrh;* or it may arise from irritating influences in the food itself, or from damp, ill-ventilated sties. Whatever be its cause, it generally runs through the whole piggery when it does make its appearance." This is perhaps true, for the same cause that has produced it in one case would be very likely to produce it in any number similarly situated. There can be but little doubt that in our western country it is caused by exposure, inattention to proper protection, and insufficient food, both in quality and quantity.

The prominent indications of the disease are loss of appetite, incessant and distressing cough, and heaving of the flanks. The animal can not lie down, or if he does he rises immediately. He seems in great pain, and is restless and thirsty.

"As soon as the first symptoms are perceived the

animal should be bled. The *palate* perhaps will be the best place in this case to take blood from. Purgatives must be given, but cautiously. Epsom salts and sulphur will be best administered in a dose of from two to four *drachms* of each, according to the size of the animal." To these means calomel and nitrate of potash in *alterative* doses—*e. g.*, ten grains of calomel and one drachm of nitrate of potash at a dose, three or four times a day. Attention should be given to keeping the animal warm, and he should have warm slops or bran-mash, or any unirritating food. This will perhaps be the best that can be done.

The free use of the nitrate of potash is particularly urged. It can be easily given, dissolved in flaxseed-tea, particularly if the animal is not allowed water to drink. The *black sulphuret of antimony* in tea-spoonful doses, mixed with the food, given several times a day, will be found very serviceable. These remedies act in a two-fold way, as *expectorants* and on the skin and kidneys, and in this way allay fever, and carry off by the skin and kidneys much *morbid* material. Attention should in all cases be given to these important organs.

The author proposes to give special attention to *pleuro-pneumonia* in its *epidemic* form in another connection.

CHAPTER VII.

THE ALIMENTARY CANAL.

The gullet or œsophagus—The stomach—The intestines, large and small—Inflammation of the bowels; treatment—Colic; treatment—Diarrhea; treatment—Gorget of the maw; cause; treatment—The liver—The spleen—Peritoneum, inflammation of; treatment—Worms in the intestines; varieties; treatment—Kidneys and bladder, diseases of; treatment of.

"THE *gullet* or *œsophagus* is a *musculo-membranous* tube, commencing at the *pharynx*, passing down the throat on the left side of the windpipe, entering the chest in company with that tube, penetrating through the folds of the *diaphragm*, and terminating in the stomach through an *orifice* termed the *cardia*." (Youatt.)

THE STOMACH.

The stomach of the hog is a much more simple apparatus than that of the ox and the sheep; it is a truly *omnivorous* one, and beautifully adapted by its *pyramidal appendage* and *glandular* structure, as well as by the *villous*, *mucous membrane* with which it is

lined, for the digestion of the *heterogeneous* (mixed) food which it is destined to receive, being perhaps more analogous to that of the horse than to any other animal. In form it is *globulous*. Its large blind cavity is very voluminous, and is surmounted in front by a horn-like appendage. The narrow, large portion which shuts on the *pylorus* greatly resembles this hood-shaped appendage. On each side of the *cardia* are two *transversal* folds, and the *cardia* itself is half way between the *pylorus* and the large cavity.

The stomach has three coats—the outermost or *peritoneum*, which constitutes the common covering of all the *intestines* (bowels); the muscular or *fibrous* coat, which acts upon and mingles the food, and prepares it for digestion; and the mucous or *villous* coat, which is peculiarly developed in the pig, and into which opens the mouths of numerous little vessels conveying the *gastric* juice to the semi-digested food, and by its action converting it into a *pultaceous* fluid, commonly called *chyme*.

It will be seen by this very short but clear description of the stomach that the middle coat or layer is a *muscular* or *musculo-fibrous* layer, and it is by its action that the food, after reaching the stomach, is mixed with the *gastric* juice by the contraction of its *fibers*, and thus the pulpy mass is dissolved

by the *gastric* juice, and passed into the bowels to undergo a further process by being mixed with the intestinal juices, such as the bile and the *pancreatic* juice; and thus, as it passes along the canal, the *nutrient* parts, or such as are fit to make blood, are absorbed and converted into a fluid fit to be circulated through the system for its nourishment. And this brings us to the next section of this great canal.

THE INTESTINES (BOWELS).

The intestines of the hog bear a stronger resemblance to those of the human being than we find in any other animal. They are sixteen times the length of the body of the animal, and the proportions of the small *intestines* to the large are as three to one. They are composed of four coats or layers. The outer or *peritoneal* one is formed of that membrane which invests and retains in its proper position every portion of the contents of the belly. The second layer is *muscular*, and by its action propels the contents of the stomach gradually onward. The office of the third is to *lubricate* the innermost coat, and for this purpose it is supplied with numerous *glands*, surrounded by *cellular tissue*. The fourth or lining coat is soft, *villous*, and in a healthy state always covered with mucus. The food, having been sufficiently converted into *chyme* by the action of

the stomach, is gradually propelled through the *pyloric orifice* by

THE DUODENUM,

Or first *intestine*, where it is submitted to the influence of two fluids—that secreted by the *pancreas* and by the liver—and the combined action of which separates the nutritious from the worthless portion, causing the former to assume the appearance of a thick whitish fluid, and the latter that of a yellow pulpy substance. It next passes into

THE JEJUNUM AND ILEUM,

Where it undergoes still further alteration, and where a considerable portion of it is taken up by the *lacteal* vessels, which open into these two small intestines, and is conveyed away to nourish the frame, and become mingled with the blood and supply the waste in it. These *intestines* are of equal *diameter* in the pig throughout their whole extent, and the termination of the *jejunum* and the commencement of the ileum is by no means distinctly defined; the latter is, however, longer than the former, and opens into

THE CŒCUM,

With a valvular opening close to the aperture into the *colon*. The *cœcum* is a kind of bag, supplied with

numerous *secretory glands*, which furnish it with a fluid which once more acts upon those portions of the digested food which reaches it, extracting from them any nutritious portions which may chance still to remain.

The matter, having reached the base of this *intestine*, is returned by the muscular action of its inner coat, and being prevented by the valve from re-entering the *ileum*, passes into the

COLON (OR LARGE GUT),

The largest of the large *intestines*, some of the convolutions of which equal the stomach in size, while others are as small as the small intestines. Here the watery parts of the mass are extracted, and the *residuum* or harder *fæcal* portion is retained for a while, and finally expelled through the *rectum*.

It will be readily imagined that this complicated process must occasionally become deranged by various causes, and that hence will arise different diseases of a more or less serious nature. This is, however, less the case in swine than most of our other domesticated animals, from the circumstance of their stomach and intestines being prepared by the softening power of their highly *mucous*, *villous* lining for the reception and digestion of a *hetorogeneous* mass of food which to other animals would be actually poisonous, rendering

it evident that, although the hog in a state of nature is an *herbivorous* animal, he was also destined to become *omnivorous* for the service of man.

Having now considered this great canal into which the food of whatever kind must pass, and having gotten some knowledge of its anatomy and functions, we come to consider the diseases to which it is liable. These are few in number, but some of them very grave in character and results. From the great variety of material which the hog is known to take into his stomach, and the bad and even disgusting quality of some of it, it is not wonderful that his stomach and bowels should sometimes become diseased. The first of these diseases to which we wish to call attention is

ENTERITIS OR INFLAMMATION OF THE BOWELS.

This disease consists in inflammation of one or more of the coats (or layers) of the *intestines*, and is capable of being produced by various irritating causes, as the foul air of badly ventilated sties, unwholesome food, etc.

The symptoms are dullness, loss of appetite, *constipation*, spasms or *convulsions*, continued restless motion—either to and fro or round and round—staggering gait, and evident symptoms of suffering. The most successful treatment is warm baths, dry

litter, and general warmth and comfort, and internally purgatives and *enemas* (injections). Castor-oil, calomel, or rhubarb are the best purgatives for cases of this nature, and the *enemas* (injections) should be of an *oleaginous emolient* nature; the diet should be restricted to the simplest and lightest food. Oat-meal, skim-milk, or whey are the best things.

COLIC.

"The hog is frequently attacked by this malady, which generally arises from unwholesome food, cold, or wet, filthy sties." Or, to be more specific, it is sometimes produced by allowing the animals to eat too heartily of immature fruits and vegetables, and rotten corn, which it is common for our western farmers to give their hogs. A fermentative process is set up by which gas is set free, and in this way the disease is brought about. The disease is recognized by restlessness, cries of pain, rolling on the ground, etc.

The treatment consists in emptying the bowels by a brisk purgative of castor-oil and turpentine, proportionate to the size of the animal. To a full-grown hog two ounces of oil and half a table-spoonful of the turpentine; in addition, get the hog to drink as freely as possible of water in which bicarbonate soda has been dissolved, with a little ginger. These remedies will generally be very readily taken in some warm

milk. These remedies may be repeated occasionally till the bowels are freely moved.

The above remedies will generally give speedy relief. If, however, they should fail, ten drops of creosote, in milk or some mucilaginous fluid, will be found an excellent remedy.

DIARRHEA.

"This is a disease very common among all our young domesticated animals, and it is also repeatedly met with in older ones; a scanty allowance or unwholesome food will produce it, as will also overfeeding or too nutritious diet." Here also immature fruits and garbage from the kitchen and garden, and unwholesome slops of any kind, are fruitful sources of the disease.

"The disease consists in a frequent discharge of the fæcal matters, in a thin or slimy state, but not actually altered, and arises from inflammation or congestion of the mucous lining of the *intestines*."

The *diarrhea*, in most cases perhaps, is rather due to a fermentation or acid state of the stomach and bowels, and not to inflammation or to simple irritation only. Though when the discharges, instead of being simply the fæcal matter, is mixed with mucus and blood, then it is almost certain that inflammation exists in some portion of the canal. As already

remarked, it may depend upon simple irritation, caused by some irritant article of food taken into the stomach, some article hard of digestion or wholly indigestible. It will generally be found, by careful examination, that the discharges are acid; and, as Youatt very correctly remarks, "What we conceive to be an attack of *diarrhea* is often only an effort of nature to throw off some offensive matter, and will cease of itself in the course of twenty-four hours." But when it goes on longer than this, or for any considerable length of time, it must be taken seriously in hand, as otherwise it will weaken the animal and impair its value.

"The best remedy for it is the compound commonly called calves' cordial; viz., prepared chalk, one ounce; powdered catechu, half an ounce; powdered ginger, two drachms; powdered opium, half a drachm. Mix and dissolve in half a pint of peppermint water. From half an ounce to an ounce of this mixture, according to the size of the animal, should be given twice in a day, and strict attention paid to the diet, which should consist as much as posible of dry, *farinaceous* food."

The bicarbonate of soda will, in a majority of cases, be sufficient for these cases. It might be combined with a little calomel; thus, calomel, forty grains; bicarbonate of soda, one ounce; to be divided

into four doses—a dose three or four times a day, in bran-mash or corn-meal.

GORGET OF THE MAW.

"This disorder arises from repletion, and is found alike in old animals and sucking pigs. Its symptoms strongly resemble those of colic. The remedies too are purgatives. Epsom salts is here perhaps as good a thing as can be given, in doses of from a quarter of an ounce to an ounce. It might as well be termed *indigestion*, for such it certainly is, the stomach being overloaded with food. In sucking pigs it usually arises from the *coagulation* of milk in the stomach."

This state of things often happens in our western fattening pens from the pernicious habit of over-feeding hogs, when first put in pens, on green or immature corn, till they are actually stuffed to repletion. These hogs, taken from the woods poor, half-starved, are allowed as much corn as they can eat, as the farmers say, "to give them a good start." It is quite astonishing that so few of them suffer. They become *surfeited*, and will sometimes refuse to eat for a day or two till the *surfeit* passes away. Youatt is certainly correct in directing in these cases the speedy action of a purgative, thus relieving the gorged stomach and bowels, and in this way removing the cause of the distress.

Nature frequently comes to the relief of the distressed animal by causing the stomach to throw off its contents by vomiting, and this hint given by nature would seem to indicate an *emetic* if one could be given, and the *instinct* of the animal will often induce him, if put in his way, to take it. For this purpose common salt and mustard might be given.

THE LIVER.

"This organ," says Youatt, "in swine does not appear to be so subject to disease as it is in most of our other domesticated animals." This observation does not seem to the writer to be correct. He is quite satisfied that in America this organ is quite frequently the seat of disease, even after the hog grows fat. At slaughtering time he has often seen this organ diseased, or evidence of disease having existed in it at some time. There are frequently *abscesses* and hard *tumors* in the organ, and some of these *tumors* actually contain *pus* (matter). For the present we shall not go any further into this matter; but, in connection with another disease, will prove from examination made after death that this organ is badly diseased.

This organ is "smaller in swine than in sheep, and larger than we find it in the dog, in accordance with that *anatomical* law which seems to be in force in all

animals—namely, that the size of the liver shall be in inverse proportion to that of the lungs. It is situated in the *anterior* part of the *abdomen* (belly), and its upper surface rests against the concavity of the *diaphram.* Its office is to receive the blood that is returned from the *intestines,* separate from it and *secrete* the fluid termed *bile,* and then forward the residue of the blood onward to the lungs, where it undergoes the usual *aerating* process, and becomes *transmuted* into *arterial* blood."

This fluid or *bile* thus secreted, when in a healthy state, and not in undue proportion, stimulates the mucous membrane and increases the *peristaltic* motion of the *intestines,* excites the secretion of the mucus requisite to preserve these parts in a healthy state, hastens the process of separation of the *nutritious* from the *innutritious* parts of the food, and facilitates the escape of the *fæcal* matters. It also acts chemically upon the various substances which are devoured by the animal, and is the chief agent in *neutralizing* the *acids* which some of these would otherwise create. The liver of the pig has four distinct lobes.

THE SPLEEN.

"In the hog the spleen is very long, and nearly of a uniform breadth and thickness throughout its

whole extent. It lies on the left side of the *abdomen*, and is attached to the stomach by the folds of the *epiploon*. Its texture is almost like that of the sponge in appearance, consisting of innumerable cells of every size and form; yet it is firm to the touch. In color it is a dark, deep, reddish brown."

Nothing is positively known as to the exact function of the *spleen*. Some contend that it plays some important part in *digestion*, but this can not be the case, since animals have lost this organ without affecting the health of the animal in any material sense. The diseases of the spleen are very obscure; it frequently becomes enlarged and congested, but this might be accounted for by its alleged function of diverting from the organs of the *abdomen* and chest the blood which, if no *receptacle* existed, and it were retained by these organs, would result in serious disease. When thus enlarged a plentiful supply of common salt and the potashes are indicated as means of relief.

PERITONEUM (THE LINING MEMBRANE OF THE BELLY).

This portion of the contents of the *abdomen* (belly) is composed of *cellular tissue* and amply supplied with *absorbent* vessels; its office is to separate the different *viscera* from each other; to envelop them, and attach them to, and support them in,

their proper position. It is subject to attacks of inflammation, technically termed

PERITONITIS.

This is a very formidable affection, and is much more dangerous and fatal than inflammation of the mucous membrane. The symptoms are somewhat similar to inflammations elsewhere, as that of the spleen, liver, etc. There is a peculiar expression of pain and anxiety, and great tenderness of the belly; the animal utters cries indicating great pain, and draws himself up in order to relax the muscles and to prevent their contractions, for when these are in action the suffering is increased.

At the beginning the bowels are *costive*, but if the disease is not checked the bowels often become irritable, and a mucous or bloody *diarrhea* sets in which increases the distress of the animal, and serves to still further aggravate the case and exhaust the powers of life, and hasten *disorganization* and death.

The main cause of this terrible disease is unquestionably due to exposure to cold, improper and insufficient bedding, and improper food doubtless comes in for a share of the mischief. No doubt also *speying* and *castrating* are fruitful sources of inflammation of this membrane.

In the treatment of this disease care should be taken not to give irritating *purgatives*. Youatt is correct when he says, "*Oleaginous purgatives are here the only ones which are admissible.*" Castor-oil and spirits of turpentine is by far the best that can be given; the dose of these for a grown hog is, castor-oil one ounce, spirits turpentine half a table-spoonful, to be repeated if necessary. After the bowels have been moved the utmost quietude should be enjoined, and in order to secure this a dose of opium or laudanum should be given, and repeated from time to time till the animal seems easy. The dose of the powdered opium is from two to four grains, and of the laudanum a tea-spoonful. Salt-peter (nitrate of potash) dissolved in flaxseed-tea should be the only drink allowed, and the opium or laudanum might be suspended in this fluid, and will be taken very readily. The food should consist of the most bland and unirritating kind, such as milk, bran-mash, etc. But, from the fact that the disease is not generally recognized in its early stage, the best directed efforts will fail of success, and the mortality will be great.

WORMS IN THE INTESTINES.

We now approach a very interesting and important part of our investigations.

By some by far too much importance has been attributed to these entozoa and by others perhaps too little.

We shall endeavor to describe, as minutely as is profitable, the different kinds of worms that infest the *intestines* of the hog, and the symptoms indicating their presence, and the treatment best adapted to destroy and expel them from the bowels.

Several varieties of worms are found in the bowels of the hog. Among these may be particularly mentioned the following: The common *lumbricoid*, the *ascarides*, and the *tape-worm*.

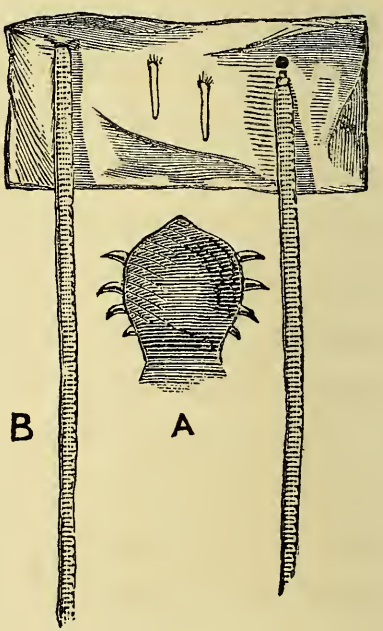
When either of these varieties are found in the bowels in very great numbers (which is frequently the case), they give rise to much irritation, and occasionally to inflammation and death. They may exist in either section of the bowels from the stomach to the *rectum* (or lower end of the canal), but the *ascarides* are most frequently found in the lower bowel, though they have occasionally been found in the small bowels and even in the stomach; they sometimes infest the bowels in great numbers, giving rise to great irritation and distress.

The Tape-worm.—These parasites in their mature state inhabit the bowels of almost all vertebrated animals, but are oftenest found in the intestines of the dog, the hog, and man. The hog is especially

liable to them on account of his habits; being an all-eating animal, he is more apt to devour articles containing the eggs of these parasites. In these transitional stages, the tape-worm occurs as *cysts*, or little sacs in the flesh and organs of such creatures as form the food of their true bearers or hosts. These *cysts*, of which it is thought the measles in swine furnish an example, were not properly understood till about the latter part of the seventeenth century, and in the eighteenth century it was announced by Gotze that their heads resembled those of the tape-worm. In 1844, Steenstrup, Siebold, Dujardin, and Kuchenmeister, the latter certainly the highest authority on questions of this kind, showed conclusively that these *cysts* taken into the stomach of flesh-eating animals ultimated in tape-worm. These are interesting facts, and should be studied and remembered. As an illustration of the foregoing statements, the author refers the reader to the chapter on diseased meats, and to the statement made by Dr. Thomas E. Jenkins. The author has seen and examined the *cysts* above spoken of, and is satisfied that the statement here made is true.

The tape-worm consists of three parts—viz., head, neck, and joints. The head is a minute object, usually square, and provided with varieties of suckers, *discs*, and a sort of crown of horns or hooks, by

which it attaches itself to the walls of the bowels. (See cut on this page.) The neck is slender and marked by transverse wrinkles, which are gradually converted into joints. With age these joints increase in number, and finally become ripe, while new ones are continually given out from the head to supply the place of those discharged. Their growth is rapid, and some species attain a length of one hundred feet, while others are only a few lines long. There are many varieties of the tape-worm, but it would not be profitable to enumerate them in a work of this kind. The practical fact is that the hog is peculiarly liable to this parasite, and that the *tænia solium* (tape-worm) in man and the *cysticercus cellulosæ* in swine are the same. In the hog the author has rarely seen the worm attain a greater length than eighteen inches, and from that down to half an inch.



The accompanying cut will give a very good idea of the tape-worm in the hog. The cut was taken from a section of the gut of a hog. Two large and two small worms are seen with their heads buried in the wall of the gut. The

one on the right (C) is partly detached, and the dark spot just above the head shows the point to which the head was fastened. The left of the figure (B) shows the head entirely buried in the wall of the bowel. The dark figure in the center of the cut, between the two large worms (B and C), marked A, is the head of the tape-worm magnified fifty *diameters*. On each side of the head are the hooks or horns, by which the worm attaches itself to the walls of the bowel. This arrangement of the head will explain why the tape-worm is so difficult to expel from the bowels; in fact, the head is often broken off in our attempts to detach them.

Worms of all kinds multiply with very great rapidity, particularly in hogs that have become poor or diseased.

We may mention also in passing (for we purpose devoting a chapter to the special consideration of this variety of entozoa) the *trichina spiralis*. It is scarcely necessary to describe the common lumbricoid worm so often seen by every one, but would simply say that this variety is the least injurious and the most easily expelled of all the worms found in the bowels.

The symptoms indicating the presence of worms in the *intestinal* canal are quite accurately though very briefly given by Youatt. He says that the presence of worms may be inferred when the animal

eats *voraciously* and yet continues lean and out of condition, coughs, runs restlessly about, uttering squeaks of pain, becomes savage, snapping at his companions, and destroying poultry, etc., that come in his way. The *excrements* are generally hard and highly colored, the eyes sunken, the animal becomes daily more debilitated, and frequent attacks resembling colic tend still further to weaken him. Too often he dies, for before these symptoms have been noticed the evil has generally attained to such a height as to be beyond the power of medicine; for these *parasites*, and the *echenorhinic* especially, multiply with incredible rapidity.

No doubt all the above is true, yet the most reliable sign after all is to see and know that the hog suspected to have worms is actually passing them from the bowels. This is the only positive evidence of their presence, and this can only be determined by careful watching. The tape-worm is frequently thrown off by sections of from a few inches to a foot or more at a time, and this is the time to give remedies to expel them.

TREATMENT.

Very strong purgatives are generally relied upon to expel worms, and are no doubt in most cases sufficient; yet there are objections to be urged to these

drastic purgatives. Much mischief may be done by them, as they are apt to force away with them the lining membrane of the bowel, especially that class of purgatives which act very powerfully upon the large gut.

In most cases, particularly where we have to deal with the common *lumbricoid* or *ascarides*, turpentine will be found an excellent remedy, as it is known to be exceedingly destructive to worms; and, although to many of our domesticated animals a dangerous medicine, it may be administered with perfect safety to the hog. A tea-spoonful may be safely given at a dose. Calomel, from its known effects in this way on the human subject, may also be given with good effect; from forty to fifty grains may be given at a dose, to be followed in from six to twelve hours by a brisk purgative of aloes, or castor-oil will be found efficacious. Common salt in abundance should be given the animal, mingled with his food, or in any other way that he can be induced to take it. Many other medicines, such as worm-seed, arsenic, pumpkin-seed, sulphate of iron, etc., have their advantages, and are doubtless useful.

The author prefers the worm-seed, which may be obtained at almost any drug-store. This seed may be made into a strong *decoction*, and mingled with the food or poured down the animal's throat, but this will

be a very difficult operation. Next to the above he would urge the administration of calomel in the doses already mentioned, and spirits or pure washed oil of turpentine. But all these will sometimes fail to remove the tape-worm. An *emulsion* made by rubbing the freshly-bruised pumpkin-seed in warm water till it becomes as thick as cream, and given freely for a day or two, and then followed by a strong purge of powdered aloes or oil, will often succeed in bringing away the tape-worm. The author urges a trial of this simple means.

THE KIDNEYS AND BLADDER.

The kidneys are situated in the *abdomen*, on each side of the spine, in the *lumbar* region or loins. The kidneys separate or *secrete* the *urine* from the blood, which, if not taken out of it, would poison the animal. It will be readily seen therefore that they perform an important part in the animal economy. When the *urine* is thus separated it passes as it were, drop by drop, through a tube of small *caliber*, which goes from the kidneys to the bladder, into the latter organ, which is so constructed as to retain it till the proper time, when it is expelled from the body.

The bladder, when distended, looks like and is really a bag, large at one end, gradually growing smaller as it reaches its other extremity, and termi-

nates in a narrow channel called the *urethra*, through which it discharges its contents from the body.

The kidneys and bladder "seem but little subject to disease in the hog." The bladder is "protected by the surrounding structures from injuries without, and the hog, not being exposed to those causes which render the horse and dog peculiarly liable to disease of the bladder—viz., speed, long, fatiguing exercise, etc.—seems to be comparatively exempt from it." (Youatt.)

There is, however, occasionally a case of inflammation of the bladder, as evinced by frequent desire to pass *urine*, and a straining in the effort, accompanied with indications of pain. There are also cases in which stone has been discovered after death. But it must be admitted that this is one affection to which the hog is least liable.

The treatment should be very simple. Flaxseed-tea, nitrate of potash, and cooling drinks, and avoidance of heated and irritating food, will in most cases be sufficient to remove the difficulty. A simple saline purgative will generally be necessary. The food should consist principally of bran-mash, and milk or slops.

CHAPTER VIII.

THE SKIN AND ITS DISEASES.

Its structure—Gangrenous erysipelas—Lice; how to destroy them—Leprosy; its history; treatment—Mange; its cause; treatment—Measles; its nature; cause; treatment.

"THE skin of the hog," says Youatt, "like that of most other animals, is composed of separate parts or layers. The first or exterior of these is the *cuticle* or scarf skin, which covers the whole surface of the body, and protects the more sensitive parts from the injuries which might result to them from immediate contact with external agents. It is a thin, tough, *callous texture*, perforated with innumerable holes or pores, through which pass the hair and bristles, and whence *exude* those *transpirations* by means of which the body throws off all impure vapors injurious to the system. Chemical analysis has proven it to be chiefly composed of *gelatine*, and consequently tougher and denser in the hog and other of the *pachydermita* than it is in the horse, ox, and most of our domesticated animals."

Beneath this is the *rete mucosum*, a soft expansion of *tissue*, which overspreads and can with difficulty be separated from the layer below it. Its purpose appears to be to protect the termination of the blood-vessels and nerves of the skin, which it in a measure envelops or covers. This layer determines the color of the body and of the hair.

The third and undermost part is the *cutis vera* or true skin, an elastic *tissue* composed of innumerable minute *fibers*, crossing each other in all directions, fitting closely to every part of the frame, yielding by its elasticity to all the motions of the body, and interposing its dense, firm structure between the more vital parts of the system and external injuries. Innumerable blood-vessels and nerves pass through it, and appear upon its surface in the form of *papillæ*. It is in fact far more sensitive than the *muscles* or flesh.

The skin varies in density in different breeds of swine. In some of the large old breeds it is thick, coarse, tough, and almost as impenetrable in comparison as the hide of a rhinoceros; while in many of our smaller breeds, and particularly in those which have a considerable admixture of Asiatic blood, and in the Chinese pigs themselves, it is soft, fine, and delicate, and bears no slight degree of resemblance to the skin of the human being.

"It is not to be wondered at that a structure so delicately organized as the one we have been describing should be subject to disease. In the hog it is peculiarly so. Many of the most serious maladies to which he is subject have their seat in the skin. It were a point well worthy of study to inquire into the reason of this fact."

The foregoing is certainly the best description of the anatomy of the hog yet presented. Perhaps sufficient stress has not been put on the *physiology* of the skin. The function of the skin is of the first importance to the health of the animal. As has been intimated by Youatt, much of the impure material of the system is thrown off by means of the skin, which, if not so disposed of, would cause disease. The free action of the skin is essential to the relief of disease of whatever kind. As the good physician gives especial attention and care to the action of the skin in the treatment of diseases to which the human body is subject, so he that would treat the diseases of the hog successfully must understand the importance of this structure in health and disease. The skin is highly endowed with nerves, and hence sensation in its greatest intensity and acuteness is found in this structure. Being highly organized, having innumerable blood-vessels, it follows that the diseases of the skin are among the most painful to which the hog is

liable. The author can not refrain from saying in this place that it is greatly owing to ignorance on this subject that the poor hog has to suffer. Carelessness in providing for him proper bedding and shelter and attention to cleanliness are the prolific source of many of the diseases of the skin.

It may be urged that some of these diseases of the skin are caused by lice and insects and vermin of various kinds. This is admitted, but it is urged in reply that these are engendered by filth, and most abound where filth most abounds, and where the animal has been fed on unwholesome food. Vermin revel in filth and poverty, and this is not only so in regard to hogs, but in regard to all animals. Some hogs suffer much more than others, in consequence of having thin skins. The white hog, for example, has a thinner and more delicate skin than the common, old-fashioned, black, long-legged, long-nosed, slab-sided

Some skin diseases are *hereditary*, as we shall see, and other points that might be mentioned, and yet my statement is true that it is largely owing to filth and improper feeding that causes most of the skin diseases of the hogs, even those produced by the *acari* or *scabii* and lice. Diseases of the skin would be of comparatively rare occurrence if it were kept in good condition—*i. e.*, kept clean—so that its pores

are open through which the impurities already referred to may find escape. Not only may disease of the skin be obviated by keeping it in a clean, healthy state, but the known sympathy subsisting between the skin and the bowels sometimes causes disease in the latter, such as *diarrhea*, inflammation, etc.; and this also holds good in regard to the kidneys, for when the skin ceases to perform its appropriate function there is additional labor for the kidneys, and thus disease of these organs may result; or the impure material retained in the system by the non-action of the skin serves to produce irritation, and sometimes serious disease in some important internal organ, either of the chest or *abdomen*.

The most important diseases of the skin will now receive attention. The first disease to receive attention is an exceedingly formidable one, though happily not very common.

GANGRENOUS ERYSIPELAS.

The author confesses that he has not met with this, and therefore avails himself of the facts collected by Youatt. He says: "This disease, frequently spoken of by the ancient writers as prevailing to a greater or less extent, and often almost as an *epidemic*, among sheep and swine, is now of rare occurrence. Poulet thus describes the symptoms."

The first of these, which lasts some five or six days, are uneasiness, inquietude, depression of spirits, loss of appetite, and inertness. About the seventh or eighth day these gradually increase in intensity; the limbs totter, the body is alternately hot and cold, the ears droop and are cold, the head appears heavy, the tongue is discolored, the breath *fœtid*, a thick mucus flows from the nostrils, and the whole of the skin becomes tinged with an *erysipelatous* redness, which is most evident under the belly. The animal utters almost incessant screams of pain. This inflammatory state of the *integuments* rapidly merges into decided *gangrene*, and the whole diseased surface becomes of a livid blue or violet hue. The skin is first covered with blisters containing a thin reddish watery fluid, and as these break the *gangrenous*, dark colored scabs are formed. The disease is, however, by no means of so fatal a character in swine as it is in sheep, probably because the former is the stronger animal.

A dose of Epsom salts, cooling drinks slightly *acidulated*, and strict attention to diet and cleanliness, are generally all that will be required. Should the skin appear to be very irritable a little sweet-oil may be rubbed over it, or some sulphur made into a kind of ointment with sweet-oil or palm-oil, but local applications are not generally requisite.

Exposure to great heat or cold, or any sudden transition from one extreme of temperature to another, are supposed by some authors to be the cause of the disease; while others, and we think with justice, attribute it to unwholesome or *putrid* food, and to general inattention and neglect.

LICE.

When swine are allowed to wallow at pleasure in filth and mire, and are confined in filthy sties, or fed on unwholesome food, or allowed to get poor, and the blood impoverished and impure, these *vermin* are quickly engendered, and they multiply with astonishing rapidity. They are excessively annoying, and sometimes even burrow into the skin, and by their irritation and the rubbing of the animal against anything with which he can get in contact sores are formed, and the skin is rendered scabby, and they so worry and fatigue the animal as to utterly prevent them from thriving. (Youatt.) "Eric Viborg states that these *vermin* sometimes burrow their way into the flesh, and come out through the eyes, nostrils, or mouth, or have been known to be *voided* in the *urine*."

It has been alleged by some recent writers for the newspapers that these *vermin* are the cause of what is popularly known as "hog cholera," but this seems

to the author simply absurd. The first step to be taken toward effecting a cure is thoroughly to cleanse the skin from every particle of dirt, and clean out and whitewash the sties and put in fresh dry litter. A variety of remedies have been used to destroy these pests; probably the best is *mercurial ointment*, turpentine, or tobacco-water. Sulphur given internally, and copperas-water both as a wash and given internally, will be sufficient to destroy these *vermin* in every case.

"The preventive measures are, strict attention to cleanliness both in the sties and in the animals themselves. Whenever a pig is observed to be lousy, which will quickly be perceived by his rubbing himself against the gates, trees, and walls, he must be immediately separated from his companions, or else they too will become infested with lice, if they are not already so." (Youatt.)

Parkinson is of opinion that "the cause of *vermin* infesting animals clearly arises, in a general way, from bad feeding, which occasions weakness of the blood; for," says he, "if an animal be ever so lousy, by giving him strong food for a few days, the *vermin* will disappear, probably because the rich blood is poison to them." He considers "that a free access to water for bathing, and also occasional exposure to heavy rain, is not only necessary to the general health

of swine, but a most excellent preventive against *vermin*."

These observations of Parkinson are clearly philosophical and right. That these *vermin* multiply much more rapidly in a debilitated state of the system there can be no doubt; therefore give your hogs plenty of pure water and wholesome food, and these pests can not exist.

LEPROSY.

This disease has apparently existed in swine from the remotest periods, and Tacitus gives it as his opinion that it was because the hog was subject to leprosy that the Jews were forbidden to eat of its flesh. It consists in the development of certain *vesicles* or whitish *granulations* in all parts and portions of the *cellular tissue*, which *vesicles* have been proven to be neither more nor less than a species of worms termed the *cysticercus cellulosæ*, supposed by some French writers to be of the same species as that found in the brain of the sheep. There are, however, considerable differences between the two. The *cysticercus* is found in all the *cellular* tissue and soft parts throughout the whole of the body; in the fat; in the adipose matter; in the *interstices* between the *muscles;* in the *viscera;* and, in short, every crevice into which they can insert themselves."

"The thigh or ham has been mentioned by some authors as the principal seat of these *vesicles*, but they are also found on the shoulder, around the jaws, along the neck and belly, and even underneath and around the root of the tongue, where alone any outward *leasion* indicative of *leprosy* can be in general discovered, and even here they are not constant, but are chiefly evident in those animals in which the disease has attained to a great height. The progress of leprosy is very insidious, and the early symptoms so little marked that a practical eye only can detect them."

The symptoms of this complaint usually commence with the formation of a small tumor in the eye, followed by general prostration of the spirits; the head is held down, the whole frame inclines toward the ground, universal languor succeeds, the animal refuses food, languishes, and rapidly falls away in flesh. Blisters soon make their appearance beneath the tongue, then upon the throat, the jaws, the head, and the entire body.

"The flesh of a leprous pig is said to possess most pernicious qualities, and as doing so, to be independent of our disgust, wholly unfit for human food. The cause of this disease is the want of cleanliness, absence of fresh air, want of due attention to ventilation, and foul feeding." (Beatty.)

We have thus laid before the reader the opinions of two writers as to the cause of this loathsome affection. Happily the disease is of rare occurrence; indeed, the author is not aware that a well authenticated case has ever been seen in America; but if the theory of Beatty be true, and is to be received as the correct one, then surely no reason exists why we may not have the disease, since the conditions mentioned by him as producing it are so often met with. The author inclines to the theory of Youatt, for the reason already given, that if a want of proper cleanliness and want of pure air and bad feeding were the cause it would be a very common disease in this country. Doubtless these things would serve to aggravate, but, in the judgment of the author, could not produce it.

Perhaps the best plan of treatment, and indeed the only rational one, and so far as the author is informed the only one known to us, is proper attention to cleanliness, cooling drinks, unirritating food, etc. The medicines most relied upon to effect a cure are sulphur, arsenic, and black sulphuret of antimony; wash the animal with soap and water, and keep him in a dry, clean sty.

MANGE.

Mange is a very common affection among swine. The opinion which prevailed, that the disease in

question was caused by filth or some impure state of the blood, has given place to a more rational and scientific solution.

It is generally admitted that the disease is caused by a certain minute insect called *acari*. "It is," says Youatt, "identical with the *scab* in sheep and the *itch* in the human being." As far back as the twelfth century these *acari scabii* were discovered by an Arabian physician; subsequently they were noticed and described by several German and Italian writers; and in 1812 and 1814 Herr Waltz, a German *veterinarian*, and M. Gohier, an eminent French *veterinary surgeon*, found these insects in, and gave drawings of, and described those peculiar to almost all our domesticated animals.

The microscope in modern times has cleared up all doubts on this question as to the existence of these insects, and it has been demonstrated beyond question that they do produce mange in swine, scab in sheep, and itch in the human being.

Youatt thinks that the hog is not so liable to this disease as the sheep, the horse, and the dog; however this may be, it is certainly a very common affection in the hog. "In swine," he says, "the pustules are usually developed under the arm-pits and on the interior of the thighs. They at first consist simply of red spots, *vesicles*, or pimples, but these

gradually become connected together by minute burrows or furrows existing beneath the skin, and eventually unite in the form of large scabs, which the animal, irritated by the itching, rubs into large blotchy sores."

When the mange is recent, a pretty strong *decoction* of tobacco or *digitalis* will often prove an efficacious wash for the diseased parts. When, however, the disease has lasted for a long time, and has baffled all other remedies, and has degenerated into scabs and sores, a *solution of arsenic,* in the proportion of one ounce to a gallon of water, or perhaps, what is better, sulphur and *mercurial* ointment in the proportion of one *ounce* of the former to a *drachm* of the latter, carefully and thoroughly rubbed together, and then rubbed into the skin, must be resorted to. (Youatt.) Soot boiled in water till a strong decoction is made has been found very efficacious. *Creosote* has also been used. If the animal is fat, cooling purgatives should be given; and for this purpose *saline* purgatives are the best. *Two ounces* of Epsom salts in a warm bran-mash, to be given to a hog of average size, increased or diminished according to the size of the animal. The salts ought to be previously dissolved in warm water before mixing it with the bran-mash. (Beatty.) He also advises the following to be given in every meal after purging: One table-

spoonful of flour of sulphur, of niter (saltpeter) as much as will cover a sixpence (a tea-spoonful), for from three days to a week. When the fiery red places disappear, and the scales fall off, and the *pustules* are no longer formed, then the disease has given way, and the remedies may be discontinued.

The *black sulpheret* of *antimony* and the nitrate of potash—a half tea-spoonful of the former, and a tea-spoonful of the latter—given in the food three times a day internally, and one of the ointments already mentioned rubbed on externally, will relieve the most obstinate case, provided proper care be given to cleanliness, food, fresh air, exercise, etc. The last mentioned are all important, and no good will result from medicine where they are neglected. Though the foregoing observations are strictly true, both as to the nature of the disease and its treatment, yet something further appears to the author necessary in this connection to make the matter understood and to render it practical, and adapt it to the actual condition of things as they exist in the southern and western portions of our own country. It is well known that a large majority of farmers give but little attention to sties and houses for their hogs; the animal is therefore left to his own ingenuity, and whatever resources may be in his reach, for bedding, shelter, and often for food itself. They

generally have access to old, half-decayed straw-stacks, and refuse from the stable reeking with noxious gases; they bury themselves in these places, become heated, the pores of the skin closed, and often a dark, tenacious coating is seen adhering to the skin, under which these little *acari* of which we have been speaking find a congenial soil and hiding-place, and soon begin to manifest their presence. There can be but little doubt that the conditions above stated give the best possible condition for the production of the disease. Is it not highly probable that in these old straw-stacks and heaps of stable refuse these insects are hatched? And thus in these hot-beds the disease is developed.

The author is satisfied that the dark *gelatinous* coating already referred to has much to do in protecting the *acari*, and therefore strict attention should be given to its removal with strong soap and warm water. When this is carefully done, local remedies such as have already been advised reach the disease, and of course are more effective.

MEASLES.

"This, although a skin disease, is rather *subcutaneous*, consisting in a multitude of small, watery *pustules* developed between the fat and the skin, and indeed scattered throughout the *cellular tissue* and

adipose matter. It has been regarded by some writers as a milder form of *leprosy*, and so far as our limited knowledge will allow us to judge, this supposition appears by no means an erroneous one."

The external appearances are reddish raised splotches or patches, more particularly seen in the arm-pits and the inside of the thighs at the first, and afterward on other parts of the body, or it may cover the entire surface. The symptoms are general disturbance of the system, quick pulse, heat of skin, cough, discharge from the nostrils, loss of appetite, *nausea* (sick stomach), puffiness or swelling of the eyelids, and *congestion* of the blood-vessels of the eye itself, feebleness of the muscles, particularly of the hinder extremities, and the formation of blackish *pustules* under the tongue. Eventually the skin usually comes off in patches.

Beatty thus describes the disease: "Redness of the eyes, foulness of the skin, depression of spirits, decline or total departure of the appetite, small *pustules* about the throat, and red and purple eruptions of the skin. These last are more plainly visible after death, when they impart a peculiar appearance to the grain of the meat, with fading of its color and *distension* of the *fiber* so as to give an appearance similar to that which might be produced by puncturing the flesh."

It is a question of interest whether the disease in swine is identical with that in the human being. The features of the two are in some respects alike, but very dissimilar in other important particulars. The fever, the redness and puffiness of the eyes, the running of the nose, etc., are identical, but the eruption certainly differs in some essential items. But it is not our purpose to discuss this matter here, as it has perhaps but little practical bearing on the matter in hand. It is often a troublesome disease to get rid of, and this is particularly true if the disease has been badly managed in the beginning. This affection is not confined to any particular class of hogs, but all are alike liable to its ravages. Nor has the condition of the animal as to fat anything to do with it, since both fat and poor hogs are the subjects of it.

The probability is that the disease is *contagious*, as indeed are most of the diseases of the skin. Beatty thinks that the disease is caused by dirt, combined with the common fault too little thought of, namely, giving the steamed food or wash to the pigs at too high a temperature. This may be to some extent true, yet it is difficult to believe that this could do more than produce simple inflammation by scalding the parts with which this heated matter was brought in contact, and in this way redness and even

ulcers and scabs on the skin might be produced. It is to be remembered that the eruption is preceded by certain signs which plainly indicate constitutional disturbance, such as running of the nose, redness and swelling of the eyes, and fever; then follows the eruption, and then decline of fever, and shedding of the skin (scarf skin)—all these in regular order. It can not be doubted that filth and other local irritating surroundings aggravate the disease.

The cause must be sought for behind these mere local matters. Is it a blood disease; or, as Youatt suggests, may it not be *hereditary*, or be caused by "a variety of the *cysticercus?*" These are questions yet undetermined, but the author inclines to the latter opinion, and believes that the time will come when the microscope will demonstrate its correctness.

As to the question of the propriety of making food of the flesh of measly pigs, there ought to be but one answer. It ought never to be done, as *there can scarcely be a question that it is unwholesome, not to say disgusting, and may be poisonous.* The manner of determining this, as well as other diseased meats, will be treated of in another part of this work.

The disease in question is but seldom fatal, and can only prove so when improperly treated and the animal badly managed. By exposure to cold and

dampness, the animal may contract some other disease, as inflammation of the lungs or bowels, and be carried off, but this can only result from inattention to the actual wants of the animal in a state of disease.

The treatment is very simple, consisting of cooling drinks, low diet, and mild purgatives, and some simple remedies directed to the skin and kidneys, such as Epsom salts as a purgative, sulphur and nitrate of potash to act upon the skin and kidneys, and if the cough is very distressing, *sal ammoniac* (*muriate ammonia*) in tea-spoonful doses, mingled in the food (the muriate of ammonia must be finely powdered) three or four times a day. The following receipts will show how much of each article is a dose: Pulverized muriate of ammonia, one ounce; divide into eight parts; one of these will be a dose. This article is cheap and in no way dangerous. Nitrate of potash, one ounce; flour of sulphur, half an ounce; divide into eight parts—one of these parts three times a day, in bran-mash or flaxseed-tea. A little oil or grease of any kind may be rubbed on the sores or tender places, to shield them and allay itching and irritation. Good, wholesome food, protection from cold and damp places, pure water to drink, and perseverance in the simple medicines suggested, will cure a vast majority of cases.

CHAPTER IX.

CHOLERA.

Difficult to manage—Very mysterious—Conflicting views concerning it—Epidemics—Name cholera improperly applied—Its fatality—Supposed loss by its ravages—External appearances of the disease—Symptoms of the disease—Symptoms numerous—The premonitory symptoms to be particularly noticed.

THE disease now under consideration is confessedly the most fatal, wide-spread, and difficult to understand of all the diseases to which the hog is subject. Perhaps no disease among our domesticated animals has been so terribly fatal or more difficult to manage as hog cholera—so-called. Indeed the disease seems to have been veiled in mystery, and the most conflicting views have been advanced at various times and by various writers and observers in regard to it, both as to its nature and cause; and, like the great epidemics that have swept away the human species from time to time that even the most scientific have widely differed as to their cause, so it is not wonderful that there should be different theories and specu-

lations in regard to the great epidemics that have swept away millions of this lower order of the animal creation. We are not able to trace the history of this disease with any degree of accuracy further back than the year 1854, though there can be little doubt that the disease existed long anterior to this date, though not so wide-spread, and perhaps under a different name. Certainly at no time since 1854 has there been a time when the disease was not doing its fatal work in some section of our country.

As to the name "cholera," it is difficult to say why it should have been so designated, since but few of the symptoms peculiar to that disease are present in this. The name is singularly inappropriate, as but few if any of the signs marking that disease, and from which it takes its name, in the human subject, could be affirmed of the disease of the same name in the hog; but since this is the name by which it has been designated and by which it is generally known, the author does not intend to offer a different one.

From 1856 to 1858 the excitement became general throughout the country. Many farmers almost abandoned hog raising, while some of the distillers preferred to lose their slops rather than risk their means in the purchase of stock hogs to consume it, while the consumers feared to buy the pork for the reason that it might produce disease. During the years

1856 and 1858 the disease assumed the form of a wide-spread epidemic throughout nearly the whole of the hog-growing districts of the United States. It was not confined to any particular locality or any particular class of hogs, but all classes were alike sufferers, and many thousands perished, and the loss to the owners was enormous.

A few brief quotations from an able article by Dr. Sutton, of Dearborn County, Indiana, may not be out of place as showing the fatality and the excitement consequent upon it in that locality: "In this section of country it has been extremely fatal. Over portions of Dearborn County it spread from farm to farm, and some of our farmers lost from seventy to eighty out of the hundred of their hogs. At the distilleries the mortality has been very severe. I received information that more than eleven thousand died at the distillery in New Richmond in the summer and fall of 1856. The owners of the distillery at Aurora inform me that they have lost between six and seven thousand. A gentleman informs me that he lost in 1856, at Ingraham's distillery in Cincinnati, from the 1st of August to the 24th of October, 2,408. Another gentleman informs me that at the distillery in Petersburg, Kentucky, he lost from the 1st of June up to the 18th of October, 1856, 2,576. It was not, however, more fatal in the distil-

leries than on the farms, in proportion to the number attacked." *

As an evidence of the extent to which this disease devastated the herds of swine in the year 1857, the number of hogs reported in all the places where the business of packing was carried on in the West, in 1857, was 1,818,468, and the previous year (or 1856) 2,489,502, showing a deficiency in 1857 of 671,034. This deficiency may be in part accounted for by the shortness of the corn crop, but the great bulk of the deficit must be attributed to the ravages of this dread disease. In some of the southern states the disease was wide-spread and very fatal, and few counties or even neighborhoods in Kentucky escaped. It would be simply impossible to ascertain the precise loss in this country, or even a close approximation to the loss, by this great destroyer of the hog. We believe, with Dr. Snow, that the number reaches not only thousands, but even millions. The writer has taken much pains to gather information on this interesting question, and the estimates of different persons in various parts of the country have been sought and obtained. These of course do not agree, as might be expected, since in some localities the disease was more wide-spread and fatal than in others, but none have estimated the loss to be less than

* North American Medico-Chirurgical Review, May, 1858.

twenty per cent.; in many instances the loss was fifty per cent., and in some places as much as eighty per cent. Now, in order to avoid exaggerations, we propose to put the loss at twenty-five per cent. (which in fact is below the actual loss), and put the value at five dollars per hog, which is certainly not extravagant, and we have most astonishing results. Six states, the most noted for the number of their hogs, are taken for illustration. These estimates as to the number raised by each state are taken from the agricultural report of the Patent Office for the year 1867. The following table will show the results, and to which attention is now invited:

States.	No. Hogs.	Loss.	Value $5.
Indiana	2,555,811	638,952	$3,194,760
Illinois	2,272,640	568,160	2,840,800
Ohio	2,206,177	551,544	2,757,720
Kentucky	1,884,284	471,071	2,355,355
Tennessee	1,312,556	328,139	1,640,695
Virginia	1,055,945	266,486	1,332,430
Total	11,287,413	2,824,352	$14,121,760

In a more general way, let us suppose that there were, in 1856, 40,000,000* hogs; the loss was say one fifth by cholera, which would be 8,000,000. Let us suppose them to be worth seven dollars per head; thus the loss would be in one year $56,000,000.

*New American Cyclopedia, Vol. IX.

This valuation it will scarcely be contended is too high; indeed the valuation per head, in 1865, was $8.55. The above figures will serve to show the immense importance of hog culture in the United States, as well as the tremendous losses sustained both to the public and private wealth by this terrible disease. But we may even reduce the figures to $20,000,000 loss per year in the whole United States for a period of ten years, and we have the enormous sum of $200,000,000; or even reduce it to half the above and it is still appalling. To the writer it is simply astonishing that so little attention has been devoted by scientific men and legislators to the protection of this valuable animal, from which is derived the greater part of the animal food consumed by the people of this country. When the cattle plague visited this country some few years ago the excitement ran high, and thousands of dollars were voted by legislative bodies and expended in investigating and experimenting to determine the nature, cause, and treatment of that dreadful scourge, that its ravages might be stayed and eradicated altogether, and much success attended these labors. It was a wise expenditure of money and time, as the results proved. But as yet little if anything has emanated from our learned legislative bodies, either state or national, looking toward encouragement to

those who might be willing to investigate this dreadful scourge among swine.

The author does not wish to weary the reader by any further multiplication of facts in regard to the importance of the matter in hand, but would now invite patient and careful attention to the observations and experiments to be detailed in regard to the nature and causes of the disease in question. Unless the reader can divest himself of prejudice, and is willing to give the matter a careful and patient examination, all his efforts will be of no avail. The author wishes to state in advance that he lays no claim to learning, but proposes simply to give the results of his observations in a plain, common-sense way, avoiding technical language as much as possible.

Without further delay let us consider the symptoms or, as physicians say, the rational signs of the disease. These are numerous, and many of them well marked, but it must be remembered that all the symptoms as herein mentioned are not found in every case of cholera. Some may be wanting, but in the main the symptoms here detailed will be recognized by all who have given the disease any attention.

First of all there may be noticed a kind of langour or indisposition to move. The hog does not manifest his usual energy and cheerfulness. He

will lie down most of the time, and when he does move it seems to be with an effort. There is a stiffness and an inertness which is quite observable. His appetite is poor; he does not eat with his accustomed greediness, and finally refuses food altogether. His thirst is very great; he drinks large quantities of water, and seems never satisfied with drinking. He may have fever; his *urine* is scanty and high-colored; sick stomach is a common symptom, though by no means invariable; he may have *retching* and vomiting—sometimes this is quite distressing—which in most cases depends upon inflammation of the stomach. The matter vomited varies in appearance; it is sometimes simply mucus, and sometimes mucus and bile mixed, and occasionally the mucus is mixed with blood, giving the appearance of brick-dust. If the hog has eaten anything, this is thrown up in a sour state and undigested. *Diarrhea* is an uncommon symptom, though often wanting. Many hogs die of this disease without either vomiting or purging. The matter purged may be watery, dark, and offensive, or mucus and blood, resembling *dysentery* or flux, attended with griping and straining, and sometimes with protrusion of the large gut. There is in almost every case in poor hogs more or less cough, sore throat, wheezing, heaving of the flanks, and difficulty of breathing. The cough begins as a

mere hacking when they arise from their beds in the morning; the cough increases day by day till it becomes quite distressing, accompanied with thumps or throbbing of the sides. The hog staggers, rests his nose on the ground, and there is frequently bleeding of the nose. Soon he lies down, and is unable to get up; the breathing becomes more and more difficult, and soon death closes the scene.

The skin is almost always diseased. There is redness of the skin, heat, dryness, and roughness of the hair. There are hardened places of variable sizes, ranging from the size of a dime to that of the bottom of a pint cup, and even larger. These hardened places break, particularly on the legs, feet, and ears, and become running sores, and are a great source of annoyance, and serve to debilitate the animal. These sores, particularly on the legs and feet, become sloughing sores, or, as they are termed, *gangrenous* sores, and so great becomes the destruction that in extreme cases the flesh drops off the bone, and even the feet rot off. Lice are frequently found in great numbers; they burrow in the skin and are a source of much irritation and discomfort. Occasionally the appetite remains good and the digestion tolerable, and the hog gets fat, but suddenly he gets sick, has cough, may vomit a few times, and the owner is much astonished to see him tumble over and die. This

usually results from congestion of the lungs. Fat hogs frequently die suddenly in the way already mentioned. There can be but little doubt that in these cases of sudden death of fat hogs the seeds of the disease existed in them previous to their becoming fat, but the digestive organs remained free from disorder, and that to the lungs we are to look for the cause of the death.

The writer would ask particular attention to the *premonitory* signs of the disease, as it is at this stage that treatment is most successful, and not only is this true, but it is equally important to the purchaser of stock hogs to make himself familiar with the very earliest symptoms of the disease, as it will save him from much loss and trouble. Long before the most destructive and severe symptoms set in, the signs already detailed are present. At the risk of appearing tedious, the following synopsis of these early symptoms are again repeated. They are: First, languor, dullness; second, failure to a greater or less extent of the appetite; third, great thirst; fourth, scant, high-colored urine; fifth, cough on rising out of their beds; sixth, hanging of the ears and resting the nose on the ground; seventh, dryness and redness of the skin.

These symptoms may be noticed by the careful observer for a considerable time before those of a more

violent kind come on, and when present should warn the owner or purchaser that very soon the graver symptoms will appear, unless proper means are at once employed to arrest the disease.

CHAPTER X.

POST-MORTEM APPEARANCES.

The heart—Windpipe—Lungs—Liver—Gall-bladder—Stomach—Bowels—Kidneys and bladder.

Being only a plain farmer, the writer can not of course be expected to go minutely into a description of the diseased organs, but simply to relate in a plain, concise way the changed appearances as they presented themselves to him in numerous bodies examined, and a comparison of the observations of others with his own. These examinations embrace all the important organs of the body, particularly the lungs, the heart, stomach, bowels, liver, and bladder.

THE HEART.

As this is the great organ of the circulation, it is chosen for the beginning. This organ sometimes, nay, often presents evidence of disease. It may be enlarged or shriveled and smaller than the natural size. Its substance is sometimes in a state of softening, and it is paler than natural, or it may be in some

cases much darker. The sac surrounding the heart —the *pericardium*—is frequently filled with a fluid, or from an inflammatory condition of this sac may be adherent at some point. In either case the heart's action is perverted. There is found in some cases a blood clot in the cavities of the heart, or it may be a tough, *fibrinous tumor*.

WINDPIPE AND LUNGS.

It may be truly said that these organs are always found diseased in hog cholera, certainly in every case examined by the writer; indeed, the air passages throughout present evidences of inflammation. There are in many cases ulcers on the *nasal mucous membrane*, and in nearly if not all there is inflammation of this *membrane*. The natural pink color of the *nasal membrane* is changed to a purplish or red; sometimes this redness is intense. The *membrane* is thickened and covered with dry ulcers, or it throws off a *glary*, tough *mucus*, sometimes mixed with *pus*. The upper part of the throat and the *larynx* (upper part of the windpipe) is generally much inflamed, and the *mucous membrane* thickened and ulcerated, which accounts for the loss of voice so frequently noticed. This *membrane* is sometimes so much *disorganized* that it may be easily torn with the finger nail.

It is by no means uncommon to see in the *larynx* and windpipe large numbers of thread-like worms—some white, others reddish in color. The writer obtained the aid of a microscope, and by the kindness of two of his scientific friends* it was clearly demonstrated that these worms were none other than the *trichina spiralis*. (This matter will be treated of in another place more fully.)

The windpipe is always inflamed, presenting much the appearance of the *larynx*.

The lungs present the most astonishing amount of disease, and evidences of inflammation and other changes are found in every case. There has been no case examined by the writer or any one else who has written upon the subject, or with whom he has communicated, that does not bear testimony to this point. Both lungs are generally diseased, though one lung generally more than the other. The left lung is oftenest the seat of disease.

First of all, on opening the chest, it will generally be found that the *pleura* (investing membrane) is adherent to the lung, and requires some force to break them apart; or the adhesion may be to the ribs. This indicates that there has existed inflammation of this *membrane*, by which means the adhesions were produced. There is also an enlarged

* Dr. Thomas E. Jenkins and Professor J. L. Smith.

appearance of the lungs—not collapsed, as is the case in a healthy state of the organ after death. Upon making pressure with the finger the lung is found to present a solid feeling to the finger, and there is not that elasticity of healthy lung structure. A lumpy, hardened feeling will be observed. These tumors or lumps are of various sizes. The air-cells and *bronchial* tubes are filled with bloody mucus and *pus*.

Now if an incision be made through the substance of the lung, numerous *tubercles* and small *abscesses* are cut through. These *abscesses* contain a yellowish matter, and in some of them a cheese-like substance is seen. Parts and sometimes the whole of one lung is found *hepatized* (liver-like.) This *hepatized* part will not, like healthy lung, float on water. These little *abscesses* sometimes contain a dark and exceedingly offensive material.

If the animal should live for a short time longer, the *hepatized* portion becomes softened, and is expectorated, and a cavity is left. The author pretends not to be a competent judge, but he believes he has repeatedly seen *tubercular* matter in the substance of the lungs. This *tubercular* matter is in various stages of development, from the exceedingly small bodies of the size of millet-seed to that of an ounce ball; some of them hard, and some in a softened

state, cheese-like in consistence, and even soft, as thick *pus* or matter.

THE LIVER.

This organ is often though not always diseased, nor does it present the same diseased appearance in every case. The organ may be shriveled, or, on the other hand, increased in size. It sometimes presents to the eye a lighter hue than in health. In some cases its surface presents an uneven, hardened, lumpy appearance, and when cut *sacs* or *cysts* are observed, from the size of a pea to that of a hen's egg or even larger. These *sacs* are filled with a fluid, clear like water; these are usually near the surface of the organ. Others are found more deeply, and contain a yellowish substance somewhat heavier than water. In some cases there are *abscesses* of various sizes seen, containing *pus*, which is sometimes thick and yellow or brownish, and sometimes of lighter color and thinner. The structure or substance of the liver presents a coarse, *granular* appearance, with a pale, striped, grizzly look. These stripes are not confined to the surface, but run through the substance of the organ.

The *gall-bladder* is filled to bursting in some cases; in others almost empty. The bile in some cases is thick, almost like tar in consistence.

THE STOMACH.

This organ is, as before stated, frequently in a state of inflammation, and the *mucous membrane* softened. The color may be a light red, or very dark red or purplish hue. In many cases, however, the writer found the stomach perfectly healthy in appearance.

THE BOWELS.

The bowels, though by no means as frequently affected as some of the organs already described, are sometimes the site of serious inflammation throughout their whole length, and to such an extent as to produce softening and ulcers. In some cases the inflammation spends its force upon one or other section of the organ. The seat of the inflammation may be confined to the large gut, in the *sacs* of which is found a yellow, jelly-like substance which seems to adhere with considerable tenacity to the *mucous membrane*, but which may be scraped off; this is also sometimes seen in the stomach. When ulcers are seen, they are usually (though not confined to that section of the bowels) in the small bowel. When inflammation does not exist, the *sacs* of the large bowel are filled with dry dung. The membrane that holds the bowels in place (the *peritoneum*) is

frequently found in an inflamed state, and adherent to the bowels. The *peritoneum* is often found studded with *tubercles* in various stages of development. The small bowels contain the yellow, tenacious mucus before mentioned, and in addition large numbers of worms, either the common lumbricoid or the tape-worm. The tape-worm may be found with his head buried in the walls of the bowel, and when pulled away leaves a sore as large as the thumb nail. Undigested food is frequently found in both the small and large intestines. *Pus* is also seen mixed with mucus, and a frothy material, the nature of which is not known to the writer. In many hogs that have died from cholera no disease whatever is found either in the stomach or bowels. When this is the case the bowels are constipated. But in those cases in which the bowels are inflamed, and in the condition already described, the animal has *diarrhea* or *dysentery*, attended with straining and *protrusion* of the gut.

THE KIDNEYS.

Though not so frequently found in a diseased state, yet they have in some cases presented very marked changes, and it may be peculiar diseased appearance. This change was presented in the form of masses having a reddish cast and a fatty feel, and the organ itself being paler than natural. In other cases there

was a jelly-like substance, resembling clotted blood, surrounding the organs. These unnatural growths were filled with sores and *pus* or matter. On cutting the kidneys open worms were found, but this is not at all uncommon, and is therefore not peculiar to this disease. The *urine* is frequently changed in appearance from the healthy character. It frequently contains *pus* and mucus and other material. When the *urine* becomes clear the case generally terminates favorably.

THE BLADDER,

Like the kidneys, is often found diseased, but is in many cases, like the stomach and bowels, perfectly healthy. In those cases where disease is found it is on the inside, and particularly at the neck of the organ, but the walls are sometimes greatly thickened, as the result of inflammation. This inflamed surface may be the site of ulcers from which *pus* is secreted or formed. As before stated, the *urine* in these cases is mixed with matter, and a whitish substance supposed to be *albumen* and *mucus*. The organ is sometimes elongated, presenting the appearance of a long, narrow sac, of not more than half its natural diameter, and sometimes firmly adhering to the *peritoneum* or lining membrane of the belly, where it covers the bladder and *cysts* containing a fluid, and sacs containing *pus* were found surrounding it.

CHAPTER XI.

REPORT OF PHYSICIANS OF COLES COUNTY, ILL.

Report of Dr. W. M. Allen, of Jefferson County, Kentucky—Views of Dr. Sutton, of Indiana—Mr. Higgins, of Maryland.

THE following cases were examined in the presence of the physicians whose names are appended, and the notes were taken by them and are strictly correct. It will be perceived that these examinations were made in Coles County, Illinois, where the cholera was raging at that time, and carried off great numbers of hogs.

Following these cases, we call attention to the reports of Dr. Allen, of Jefferson County, Kentucky, and particularly to the case to which we have before referred, as one illustrating the chronic form of this disease. This case is interesting, and shows how the disease may be propagated, and a debilitated, diseased offspring produced.

This important matter is only alluded to in this place, as it is the purpose of the author to give particular attention to it in a different connection.

Particular attention is therefore called to the report of Dr. Allen, that the reader may better understand the reasons that have led to certain conclusions.

REPORT OF ILLINOIS PHYSICIANS.

"The following is a brief report of *post-mortem* examinations held on hogs affected with the disease called cholera, at Milton, Coles Co., Ill., May, 1867:

"CASE No. 1.—*Heart and Membrane.*—The *pericardium* contained from two to three ounces of *serum*. The heart flaccid, walls thinned, *endocardium* rather pallid.

"*Lungs.*—The right lung adherent to the ribs; both lungs *hepatized* in lower portion, *infiltrated* with *purulent* matter, interspersed with small, thread-like worms from one to two inches in length. Upper portion of lung engorged with bloody, *muco-serous* fluid. The mucous membrane of the *œsophagus* florid. *The trachæ* and *bronchial* tubes filled with frothy serum, mingled with mucus; *urinary bladder* inflamed, coats thickened, and of a pale yellow or buff color. The neck of the bladder highly inflamed.

"*Stomach* inflamed, containing a number of worms similar to those in the lungs.

"The *fæces* in the *rectum* hard and dry. The small intestines filled with fluid and vitiated bile.

"CASE No. 2.—In this case the lungs were engorged

with bloody serum, *hepatized*, dotted thickly with indurated or tumor-like substances, resembling coagulated blood. Bile filling all the *biliary ducts* of the liver. Stomach highly *vascular*, lined internally with a substance spread over the *mucous membrane*, resembling vitiated bile.

"The *abdominal viscera*, especially the *rectum* and *colon*, adherent to an apparently *adventitious* substance surrounding the kidneys, which was a diseased mass of mottled and various appearance, interspersed with *tuberculous* deposits, and would weigh from one to two pounds.

"Case No 3.—Heart normal. *Mucous membrane* of *trachæ* filled with frothy and somewhat bloody mucus, in which were some of the small, thread-like worms. Lungs *hepatized* to some extent. There were many of the same worms in the *bronchia*. The liver was normal. The gall-bladder was filled with thick *gelatinous*, tar-like bile. The *spleen atrophied* in right-hand portion. The *mucous membrane* of the stomach was in part reddened, and the rest pale and *corrugated* in large, worm-like folds. The small *intestines* were engorged with *lumbricoid* worms, which were in turn filled with small worms of the same species.

"Case No. 4.—In this case the lungs presented a dark, mottled appearance, engorged with dark-colored blood, showing congestion of these organs. The

stomach highly *vascular;* the *trachæ* filled with a frothy, bloody, *muco-serous* fluid; the liver contained a number of *tubercles.* All the hogs examined had *tubercles* in various organs—lungs, liver, kidneys, etc.—in various stages of development.

"*External Appearances.*—The animals affected presented a very red appearance of the skin, especially about the throat, and general *emaciation.* They were affected by cough, wheezing, difficult breathing, and had but little appetite for food.

"In the first case examined the lungs were filled with *tubercular* deposits, some of which were in a state of *suppuration,* which last contained the small, thread-like worms. The hogs examined were affected with *cholera,* which is very prevalent here.

"We, the undersigned, practicing physicians of Milton, Coles County, Illinois, hereby certify the above to be an abstract of the notes taken at the examination of cholera hogs held by James A. Reasor, assisted by us, in which we have described the appearances presented as nearly as we could with the appliances at hand. We regret that we had not a glass of sufficient power to show the appearances more minutely.

H. L. Stewart, M. D.,
Chas. M. Odell, M. D.,
Geo. W. Brewer, M.D.,
Thos. M'Commuck, M. D."

The following is a description from memory of a post-mortem examination of a fine young Chester boar that was affected, to all appearances, precisely as many others were, of which no examinations were made.

"Refusal of food; short and difficult *respiration*, with every indication of a *pleuritic* stich; great prostration, with a disposition to lay on the belly, with the feet drawn under. The skin on the chest and belly red. Some shivering. The breathing rapidly became more difficult and labored till he died, which was about fifty or more hours after the attack was noticed.

"Upon examination, twenty-four hours after death, found the bowels healthy; *peritoneum* healthy; nothing the matter with the *viscera* below the *diaphragm*. The *pleural* sacs full of water, and great inflammation of the *pleural membranes*, with shreds of false *membranous* attachments. The *pericardium* full of water, and that membrane in the same condition as the *pleural*. The heart shriveled and small. The right lung completely *hepatized*, whilst the left was considerably so. The large *bronchial tubes* full of tough mucus of a brick-dust color, with some froth, etc.

"The windpipe looked healthy, but was pretty well filled with tough, white mucus. It was clearly a case of *pleuro-pneumonia* with *pericarditis*.

"The affected hogs had been kept separated from the other hogs, and this one was taken from the lot as soon as it was ascertained that he was sick. It was the second attack that he had had, the first time only slightly. This attack followed a cold, wet spell of weather, in which their bed became muddy, and in which they persisted in sleeping.

W. M. ALLEN, M. D."

The following is a report of the appearance of the body of a hog upon examination made by Dr. Allen, in our presence, and written out at our request.

This hog had what is usually termed hog cholera last autumn, about the last of September (1866), and was, like many others that had it, inclined to be shy, keeping away, so that there was no very good opportunity of observing the disease.

The first thing noticed was a refusal of food, standing aloof from the others at feeding-time, finally refusing to come up at all, but remaining hid in the briars and weeds. He walked with his legs drawn under, and stepped very short, as if the *abdomen* was very tender. He remained in this condition nearly two weeks, when he gradually recovered.

I did not at any time observe with this hog or the others any purging or vomiting; but, to the contrary, the *evacuations* were healthy. This hog was turned

into the corn-field with the fatting hogs, and seemed quite well, eating heartily, but never became fat enough to butcher, and was turned out with the sows and pigs to winter. This spring he became lame with enlarged hock-joints, and the *testicles* very much enlarged; also bumps nearly as large as an egg appeared upon his body; and though he ate freely, yet he got very poor.

When *castrated* the *scrotum* was found to contain a large quantity of *inspissated pus*, and the *testes* were firmly adhered to the surrounding *tunic*. He was killed on the 15th of May, and the body examined on the 16th. In cutting through the skin the first thing noticed was the escape of *pus* from a vein, mixed with blood. The bladder was found firmly adhered to the *peritoneum* anteriorly, and surrounded with *cysts* or sacs of *pus* of cheesy consistence. It was also very much elongated and thickened, presenting a long, narrow sac of not more than half its natural diameter.

The *omentum* (that *membranous* curtain that hangs down over the bowels, and which is a continuation or loose end of that delicate membrane which lines the inside of the belly, and is reflected over and constitutes the outside covering of the bowels, called *peritoneum*) was found stuffed between the stomach and the bowels, and firmly adhered.

The bowels generally healthy, except some adhesion posteriorly. The right kidney surrounded with *pus*, the left one healthy.

The stomach, except about one third of the *mucous membrane*, which was of a brown, dirty color, with a patch of the *membrane* an inch or more in length, entirely destroyed as if by violence, there being no appearance of *suppuration* or *pus* in the stomach anywhere, nor any unusual thickening of its coats.

The liver was found to be of natural size, but *indurated* (hardened), and the lower half of an ashy gray color upon being cut, while the upper part was full of *tubercles*.

The *pleuræ* (those *membranes* which line the inside of the chest, and which are reflected over on the lungs on the outside, thus forming a sac on each side) adhered in several places on each side, requiring considerable force to sever the attachments, indicating the previous existence of great inflammation.

The lungs generally healthy, save an unusual redness of the outside or *pleural* covering. The windpipe healthy. The heart and its appendages healthy. No worms found in either the bowels or lungs, as is not unfrequently the case. The blood *coagulated*. No examination was made of the brain. The hock-joints surrounded with sacs of *pus* too thick to dis-

charge without pressure when cut. Lumps of the same on his sides.

This case was primarily one of *peritonitis*, involving the bladder also, and *pleuritis*, or inflammation of those membranes just described. How much the lungs may have been involved we can not tell, as recovery from *pneumonia* may be so complete as to leave no traces behind it. We think that in the majority of cases there is *pneumonia;* especially is this true in those cases that die suddenly. We are of opinion that when the attack has been severe in the outset, the hog rarely if ever entirely recovers, but that sooner or later (sometimes months) local inflammation and *suppuration* appear, sometimes attacking one organ and sometimes another, generally the joints and feet; sometimes the feet slough off.

It not unfrequently occurs that in butchering we find lumps or *cysts* of *pus* in the *muscles*, or in the liver or lungs, or in one or all of them at the same time. These *cysts* are often very large, and the *pus* is of a cheesy consistence, and manifests very little disposition to point to the surface and discharge. This pus is taken into the circulation by absorption, producing that poisoned condition of the system known among medical men as *pyæmia*. Hogs in this condition can never, in our opinion, be considered fit for food.

If this disease continues to spread through the hog-producing districts of the country, the farmer will be compelled to look to some more reliable source of revenue, and the community to a more wholesome article of food.

Before leaving this part of the subject, it is but just and proper to give the views of several able writers.

Mr. J. Higgins, State Chemist of Maryland, who has carefully investigated the disease, describes the symptoms as lassitude, loss of appetite, hoarseness or husky grunt approaching to a cough, slight *diarrhea*, yellowish urine, *paralysis* of hind legs or small of the back, tottering gait, and speedy death.

Dr. Sutton, of Aurora, Ind., gives a more detailed account of the symptoms, which may be summed up as follows: Debility, drooping of the head, and soon after diarrhea, the discharges being yellow when the animal was fed slop, and dark-colored when corn constituted the chief food. Frequently there was vomiting; sometimes bloody *evacuations*, with *tenesmus* resembling dysentery. In some cases there was cough and difficult breathing; in others, inflammation of the throat; loss of voice; swelling of the tongue; bleeding from the nose, which might be swelled; swelling and inflammation of the legs, eyes, ears, or some other parts of the surface. Sometimes there

were *gangrenous* spots on the legs, belly, sides, etc. Some became *delirious*, others blind, and nearly all attacked died in from two to five days. "These symptoms," says Dr. Sutton, "were combined in almost every variety."

Mr. Higgins found in the cases examined by him an apparently healthy condition of all the organs except the lungs and *bronchial tubes*, and these were affected in different degrees by inflammation from simple engorgement to complete destruction of the lung *tissue*. He did not find any well-defined abscesses in any of the lungs. The left upper lung, according to his observation, was generally the most affected of the two. He examined the blood of healthy pigs and that of those about to die of this disease, and found the proportion of *fibrin* in the healthy as 2.33 to 1000, and the diseased 5.60 to 1000, with a larger but less firm and brighter clot than in healthy blood.

Dr. Sutton examined forty-seven hogs that died of this disease, and found no two precisely alike. He found in all a diffusive form of inflammation in some organ or *tissue*, seemingly of the *erysipelatous* kind. In different cases this inflammation was found upon the skin and *subjacent tissues*, which were of a dark purple color, and *infiltrated* with *serum*. In most of his cases the *mucous membrane* of the stomach was

inflamed, bright red, and tumefied. Blood was sometimes found in the stomach, which was occasionally filled with it. If there had been diarrhea or dysentery, the *intestines* were more or less marked by inflammatory action in various parts in different cases. Sometimes the bladder participated in the inflammatory condition, and blood was occasionally found effused into it. In eighteen cases the *peritoneum* was inflamed, and in some of them adhesion between the different *contiguous peritoneal* surfaces had taken place. To quote his language: "Suffice it to say that I found the liver, the lungs, the *pleura*, the *peritoneum*, the *mucous membrane* of the *bronchia*, the *trachea* and *larynx*, all at different times bearing marks of inflammation; frequently one or both were engorged or *hepatized*, and adhering to the ribs."

Other observers corroborate the observations here mentioned, and some give the additional fact that in their cases large numbers of *intestinal worms, resembling the ascarides* or the *lumbricoids*, were found in the small intestines, not far from its connection with the stomach, and in some of such cases, if they did not cause, they at least greatly added to the inflammatory condition.

The above quotations have been taken from the Agricultural Report of Indiana.

It will be seen that these observations coincide

with our own in most particulars, and certainly in the essential points.

We call the reader's particular attention to one point in the statements of Dr. Sutton and Mr. Higgins; viz., that in nearly all the cases examined by them they found inflammation, or evidences of it, in the air passages and in the lungs. We have not, in a single case now remembered, or of which we have notes, seen a case in which there was not either simple inflammation, engorgement, or *hepatization*. We venture the assertion that there can not be a case found after death in which the windpipe, *larynx*, *bronchial tubes*, or the lungs are not diseased.

We hope these facts will be kept in memory, for they point, it seems to us, unerringly to the cause of the disease attempted to be established in these pages.

The author would say, before concluding this chapter, that he can not agree with Dr. Sutton and others that hog cholera is a contagious disease, as he has as yet seen nothing to convince him that it is so. Many carefully conducted experiments and close observation are necessary to establish this theory. As before stated, the author has given especial attention to the disease in all its phases, and observations and experiments have led him to the conclusion that it is not contagious. It was for a long time believed

that Asiatic cholera was contagious, but certainly the great majority of the medical profession at this day do not believe in the theory of contagion so far as this disease is concerned, and so too in regard to many other diseases. The experiments of Dr. Sutton and others are deserving of attention, and should receive the thanks of the farmer and the medical profession. It is a fact that goes to show that the disease is not contagious, that no one has received any injury whatever by making examinations of the bodies of hogs that have died of hog cholera. Dr. Sutton examined forty-seven, and received no injury; Dr. Snow also examined many without injury; and the author has examined more than two hundred hogs that had died of cholera, and though his hands were chapped, and the skin rubbed off, and although he handled the diseased organs freely and repeatedly, yet in no instance did he receive any injury or irritation or local disease whatever. He therefore concludes that it is a doubtful theory.

But, whether the disease is contagious or not, it is certainly safe and proper to separate the healthy from the diseased hogs; for in so doing a better opportunity is given to prevent the former from taking the disease, and a better chance to treat those that are already diseased. Practically, therefore, it is of

little consequence whether the disease is contagious or not. Let this suffice on this point, as it would not perhaps be profitable to discuss this matter at length. The great point, after all, is to treat subjects of this kind in a plain, practical way.

CHAPTER XII.

CAUSES PRODUCING CHOLERA.

Experiments — Observations in pens — Long attention given to its study.

In the two preceding chapters a brief description of the diseased appearances of hogs that had died of cholera have been given. This description embraces as minute and correct an account of the changes produced by the disease, both external and internal, as it was possible to give. It will be seen by the careful reader that these diseased appearances vary very materially in different cases examined, but while this is true, some *particular changes and evidences of disease are found in nearly every case.* This variety already referred to has given rise to many opinions and theories as to the cause or causes of the disease in question. While it is not the wish or intention of the author to enter into a discussion of the various theories, yet he believes it proper to give the views of a few of the best writers, and this will best be done by giving their own language.

The first of these writers to which he calls attention is Dr. Sutton, of Aurora, Indiana, who seems to have given the disease much attention, and, like all the rest, seems in doubt in regard to the nature of the disease, but gives his opinion pretty emphatically as to its cause. He says:

"At first I was inclined to believe this malady to be a form of *pleuro-pneumonia*, but after I became better acquainted with it I found that the inflammation was not uniformly confined to any organ. In a number of instances the mucous membrane of the *bronchia* was deeply inflamed, and the inflammation extended to the *trachea* and *larynx*. In several instances the *larynx* was inflamed, resembling *laryngitis*. One animal that had great difficulty in breathing, and could make no noise, I had knocked in the head, and on examination I found the mucous membrane of the *larynx* and *epiglottis* inflamed and swollen; also the tongue was swollen. There were evidences in several instances of *pericarditis*, which had produced adhesions between the heart and *pericardium*."*

Dr. Sutton therefore thinks it impossible to give the disease a name which will express its nature. The cause he believes to be atmospherical poison, and that the disease is a true *epizootic* or *epidemic*,

* North American Medico-Chirurgical Review, May, 1858.

and in this view Dr. Snow, of Providence, Rhode Island, concurs, though Dr. Snow does not seem to agree with Dr. Sutton that it is contagious. He says, after declaring cholera and yellow-fever non-contagious:

"So I firmly believe it will soon be with reference to this and other similar diseases among animals. They are not contagious, and the belief that they are so is productive of great injury in the adoption of measures for their prevention." (Patent Office Report, Agriculture, 1861.)

The name of cholera is certainly very inappropriate. Dr. Snow says: "This is a general disease of the whole system, resulting from some poisoning of the blood;" and then adds: "The name of hog cholera is therefore entirely improper, as it represents only one of the several prominent symptoms. The disease might as correctly and as incorrectly be called a *pleuro-pneumonia*." It is a fact, as the writer has already shown, that there is little if any resemblance to cholera in the human subject, as the *diarrhea*, upon which true cholera depends for its distinctive feature, is in many cases of so-called cholera in the hog entirely wanting; but, as before stated, the writer does not propose a new name, since the disease is now so generally known by that name.

The important question now presents itself, What

is the cause of hog cholera? To an answer to this question we now propose to call the earnest attention of the reader. Many attempts have been made to answer this important question, and, as we have shown, these answers have been conflicting, and therefore can not all be true, nor indeed does the writer believe any of them to be correct.

The following notions have from time to time been entertained; viz., first, atmospheric poison; second, worms; third, lice.

As to the first we actually know scarcely anything at all. No one, scientific or otherwise, can by any process determine what poison the atmosphere carries, nor from whence it emanates. It is simply an acknowledgment that we do not know what does produce the disease. This has been the cry for ages in regard to every disease which has prevailed extensively. It has been sufficient to say that a disease has been produced by atmospheric poison. That poisons may be conveyed in the atmosphere is not denied, but that this is an explanation in the case in question is denied.

In regard to the other two, it is simply absurd to suppose that they do more than act in a secondary way; but they can not produce the results observed, for if they were the true cause of the disease they would be found in every case after death, which is

by no means true. Then the question still recurs, What is the cause of the disease?

Many experiments and years of close observation have convinced the author that what is *called hog cholera* depends for its production upon three *principal* causes, and that all others are simply secondary or merely exciting, not producing causes. These are:

First. *Dust* and gases arising from decaying vegetable matter and animal refuse. These produce *irritation* and *inflammation in the air passages, and even penetrate into the small bronchial tubes* and *air cells;* thus *congestion and inflammation* are produced. Hence the disease has been more wide-spread and fatal in years of drought.

Second. *Exposure to cold. Pleuro-pneumonia* is produced in this way, and often speedily carries off many hogs; and this is particularly the case with pigs. Their powers of resistance are less than older hogs, and they fall an easy prey to exposure. This illustrates a fact frequently noticed in those that have died from this cause, that the disease is *essentially* an *inflammation of the lung and its covering, the pleura,* while the other organs are found in a healthy state. Still this form of disease is known by the name of cholera by almost every one.

Third. The disease is propagated from diseased parents. This is much more common than many

persons will be willing to admit; but the author believes that he can show this point to the satisfaction of any one. The disease, in fact, becomes *tubercular*, and this *tubercular constitution* is as *certainly communicated* to the offspring of the *hog* as it is to the offspring of the *human species*.

Doubtless the foregoing views will appear absurd to many persons, but the writer begs such persons to examine the evidence and the facts which he now proposes to present, in substantiation of the three positions taken, before deciding the point.

In the fall of the year 1858 the writer bought a lot of stock hogs, apparently in perfect health and very thrifty, and put them in a clover-field which he intended breaking up in the following spring; they were fed twice a day regularly; they seemed perfectly well, when suddenly, without any visible cause, they began to be sick and to die rapidly. Some remedies suggested by a neighbor were used with apparently good results in a few cases, but most of them died. Those of his own raising, however, although treated in precisely the same way, escaped the disease. The writer determined to give the matter a thorough examination. The bodies of all that died were examined. In many of them worms were found in the large intestine, and still more in the small gut, and in some of them worms were

found in the stomach. There was more or less inflammation both of the stomach and bowels. These worms in some of the bodies examined were found in large numbers, and the conclusion arrived at was that these worms were the cause of the disease, and that if the animal could be relieved of these *entozoa* the disease would be cured. Vermifuges, such as turpentine, arsenic, etc., were given, and successfully so far as destroying and expelling the worms was concerned, but the hogs still continued to die. It was plain that the cause had not been discovered. Finding the diseased animals infested with lice, the conclusion was that these vermin might be the cause. These were easily destroyed, and still there was no abatement of the disease. Careful nursing was now resorted to, such as cleanliness and proper protection against the inclemencies of the weather. For this purpose suitable sheds or houses with plank floors were prepared for them. Clean, dry beds were provided for them, and changed as often as necessary; these beds were composed of good, dry straw. This was evidently a step in the right direction, for the animals became apparently healthy, while the hogs of our neighbors who neglected these measures continued to sicken and die. Now, certainly the proper preventive means had been discovered by which this terrible scourge might be kept at bay. In the spring

of 1859 the writer purchased another lot of stock hogs that seemed to be sound. These hogs were turned in the fields with those of his own raising, and all fared precisely alike, but in a short time these also began to show signs of disease. The supposition began to be very strong that these hogs had the disease lurking in them at the time they were purchased, and upon inquiry it was found that they had been fed the previous winter on dry corn alone, with no grass or slops, and had been kept in a barn-yard, where they wallowed and made their beds in the dust and manure from the stables, and that some of the lot of which these were a part had actually died of cholera.

All treatment seemed to be unavailing, though everything that promised to be of any service was tried. They began to vomit and purge, and death speedily came to their relief. As before, their bodies were opened and carefully examined, but neither worms in the bowels nor lice on the surface were found. The stomach and bowels were in a state of inflammation. The liver was badly diseased; lumps were seen which were supposed to be *tubercles*, or perhaps abscesses. There were whitish stripes and spots over the surface of the liver and through its substance. The lungs contained the same sort of lumps or *tubercles*, some of them in a softened state

and containing matter yellowish in color, while others were black and exceedingly offensive to the smell. The greater portion of both lungs was in a solidified or *hepatized* condition; in some cases this solidified part had a reddish and in others a grayish color. Of course the worm and louse theory was out of the question, and was abandoned, as these were only incidental and in no way causative; but that these vermin do much mischief is certain, and that, in rare cases, they cause the death of the animal is possible, but that they are the cause or a cause of this disease is simply absurd. The fact that if they are the cause of the disease they would be found invariably after death is quite sufficient.

Having his mind directed to a certain agent as likely to be the *main* agent in the production of cholera, the writer now determined to try an experiment. A healthy sow, which a few days before had given birth to eight pigs, was put in a shed entirely dry and dusty. She was fed with the slops from the kitchen and given water regularly. The pigs grew finely, and to all appearance were doing well for some ten or twelve days, when they began to wheeze and cough. In a few days more they lost the use of their legs, and seemed to be totally blind; breathing became more and more difficult, and in a week from the time they began to show signs of disease they

were all dead, and the sow was so much diseased as to do no good afterward. This was in warm weather. The bodies were examined. The lungs appeared swollen, and had the red solidified or *hepatized* look and feel, though not to the same extent as those previously examined. The bowels were inflamed; there were no worms in them. Two of these pigs were killed after they had become so diseased as to make it certain that they would die, for they could neither stand nor suck. They were bled, in order that the blood might not be in the way during the examination. The nose, throat, and windpipe were very carefully examined. Considerable quantities of a foreign substance was discovered, which resembled dust, lodged on the mucous membrane of the air passages, and these surfaces were all in a state of inflammation. The question now arose in the mind of the writer whether it was possible for dust thus taken into the air passages to give rise to those fatal symptoms which had been witnessed in those that had died. But one experiment was not enough to settle this point even in his own mind, so a similar experiment was determined upon.

A dry, dusty shed was selected for this second experiment. In this shed was placed a lot of hogs, and treated as the first had been treated. They were in every respect put in the same conditions as the

sow and pigs had been. The results were the same, though they did not die as rapidly as the pigs had done. The writer has tried hogs of all ages and conditions as to flesh, and the results have been the same invariably, though old hogs were less affected than young ones. At one time the writer had thirty shoats that had been raised with great care. They were pigged on plank floors, and had never bedded elsewhere. At all times great care had been taken to keep their beds clean and dry, by frequently throwing out the old beds and giving them a fresh supply of clean straw, and sweeping out the dust. They were in the very best possible condition. Early in the spring they were taken out of their pen and put where they could bed in dust, and were suffered to remain there about four months. When the weather got warm they began to die; the most of them died just as they lay down to rest on their bellies. They did not appear to have moved after lying down, and must have died without a struggle. A few of this lot escaped, and were fattened and killed; but, although they got fat, when slaughtered the lungs and liver showed unmistakable evidences of disease.

About the 1st of May a lot of about thirty pigs were allowed to bed where they chose. The sows selected their beds, and all seemed to be doing well. Before the pigs were weaned the weather became

very warm and dry, and they bedded under some shade-trees, near where they were fed, and wallowed in the dust much of the time. One day a neighbor passing by remarked, "You have a fine lot of pigs." We answered, Yes, but that they would have cholera shortly. He seemed surprised, and said they seemed so thrifty and fine-looking, he thought we would certainly be mistaken. We remarked that they were already diseased, and would show symptoms of it very soon, and that the disease would be fully developed by the time cold weather began. On the approach of cold weather they began to wheeze and cough, and most of them had thumps. After several of them had died, the rest were put in pens with plank floors, so arranged as to serve for bedding and feeding.

Almost every medicine reputed to cure "hog cholera" was given, but without benefit. It was now determined to try strict attention to the preparation of their food. Corn-meal and wheat-bran, equal parts, were well cooked, and a little salt and wood-ashes added to the food thus cooked. Charcoal was kept by them, so that they might use it at pleasure. In a few days after this treatment was commenced they began to improve, and in a short time not a trace of the disease was observable, except in one animal. This one grew as rapidly as any of them, and looked as

well as any of the lot, but breathed with some difficulty. This one was fed the next fall, and took on fat as well as the rest, but still breathed badly. During the first severe cold weather they were fed in the morning as usual, and nothing unusual was noticed; but in about twenty minutes the writer's attention was arrested by a noise among the herd, and on investigation he found the hog that had all along breathed so badly was down and struggling, and in a dying condition. He took his pocket-knife and bled the hog, and after he was dead took off the hide, and took out the bowels, lungs, and liver, and proceeded to examine them.

The stomach and bowels were healthy, as might have been expected. The lungs seemed swollen, and had a red appearance on the outside, and on being cut into a number of *abscesses*, some of them very small, others as large as a hen's egg or larger, were seen. The rest of the lung was filled with clotted blood, mixed with a frothy, sticky mucus, or *muco-purulent* matter.

The liver was also larger than natural, and *abscesses* were found through the substance of the organ, and also hardened spots or lumps. Now it will be observed that though this hog was diseased, yet he got fat, and the inference is plain enough that the disease was still lurking in him; and this is true of thousands

of fat hogs that have died in the fattening pens. To show how rapidly and well this hog had taken on fat, it will only be necessary to state that thirteen gallons of white, beautiful lard was obtained from his body. This lard could have easily been sold in the market as a No. 1 article.

A neighbor of mine was noted for his "good luck" in hog raising, and had never been troubled with cholera. Some time in the month of August his hogs began to show signs of disease. One of the first signs noticed was lameness, and tumors on the legs; this was followed by dullness and loss of appetite, and in a few days from the time the disease was first noticed the hogs thus affected died. After some eight or ten had died, the writer was passing and was requested to examine the herd, for there were several of them sick at the time. Upon inquiry into the history of their management, he was told that they had been in the habit of sleeping and wallowing under a large crib, which stood high enough from the ground to allow them easy access. There was an abundance of dry dust here, and the hogs had wallowed and slept under this crib much of the time during the summer. The writer informed the owner that the cause of the disease was plain enough; they had contracted the disease in this dust; and advised that the entrance to this dusty

bed be closed at once, and that the hogs be put where they could get plenty of pure, fresh water, and to give them kitchen slops, the surplus milk from the dairy, bran-mash, etc. This advice was carried out, and the result was that no more hogs got sick, and the sick ones that could eat at all got well.

The owner of the next lot of hogs that are now to be mentioned had been greatly troubled with cholera among his hogs for a period of two years, from time to time. It was ascertained that his hogs were sometimes allowed to lie around the barn-yard, and sleep under the sheds, and at other times were turned out where they had no shelter or protection in any way. In order to get rid of this scourge he bought two sows and pigs, amounting to some eighteen or twenty; this was in the fall of the year. He put them where they had a run to grass, and beech and oak mast; in addition they were fed regularly twice a day. A good shed was prepared for them to bed under; this shed soon got dusty, and the sows and pigs slept and wallowed in it. Early in the spring they were attacked with cholera, and the pigs all died.

Numerous observations might be recorded illustrating this point, but the author will give only one more fact, which came under his notice several years

ago, and which will at the same time show, as he has elsewhere intimated, that the disease in question had an existence many years ago, but was not then recognized. The circumstance about to be related occurred in the year 1843 or 1844. The writer raised a fine young sow, which at her first litter brought eight pigs; they were *farrowed* some time in the month of June. Her bed was about one hundred and twenty yards from the house, in the margin of a piece of woodland. A lane ran from the woods through the farm; this lane served as a public highway, and was much traveled at the time. About the time the pigs were old enough to follow the sow the weather became very hot and dry, and the dust became very deep. The sow always came up to the house to be fed. Upon returning to the house one day at noon, our surprise was very great to find several of the pigs dead, lying near the place where the sow was fed. From this point to the sow's bed the rest of the pigs were found, all dead save one. This was certainly very strange and mysterious, at that time, to the writer. The surviving pig lived through the next winter, and kept fat enough, but did not grow to be large. Some time in the spring it was driven some two miles, after which it commenced purging, and died in a short time. The sow had no more pigs till some time during the next summer;

this litter died at nearly the same age, and in the same way. Believing that something was wrong about the sow, she was fattened in the fall and killed. Not till his investigations into the cause of hog cholera has the author been able to explain the mystery of the taking off of these pigs. It is now to his mind all plain enough, and he risks nothing, as he believes, in affirming that in every case where hogs are placed in the conditions and circumstances above detailed, they will as certainly be attacked with the disease popularly known as hog cholera. Many farmers to whom these facts have been detailed, and who have been observing for themselves, have fully concurred with the author in his views. A careful and candid investigation is all that is demanded; or, if any are still skeptical, let them repeat the experiments herein set forth for themselves. Let the hogs experimented on have plenty of dust to wallow in at pleasure, and let them sleep in dusty beds constantly, and you may feed them in any way, or on any kind of food, and sooner or later you will have hog cholera in abundance. The author challenges any one who doubts to make the test for himself. These things being true, how easy it will be to protect this valuable animal from the disease, and save millions of dollars annually to the country.

But, in the second place, we will consider *exposure*

as a cause of the disease. It will not be denied that exposure to cold, and particularly cold rains, and the sudden changes in the temperature in our Middle States from rain to snow, and even to severe freezing, which frequently happens, can not fail to produce disease. If the animal, as is too frequently the case, has little or may be no protection, but is left to shiver in the cold without shelter or bed, and often without sufficient food, certain results follow. What form of disease results from this sort of exposure? A few observations on this point will answer this question.

It will be borne in mind that the hog is not suited by nature to stand the effect of a cold climate as well as a mild or warm climate. It has been shown that this fact, if known by hog-raisers, has certainly not been acted upon; in fact, in many places no protection whatever is given them. In illustration of the effect of exposure to cold as a cause of disease, the author will here detail a circumstance which happened his own herd.

In the fall of the year 1866 his stock of hogs consisted of five young sows and thirty-odd fall shoats or pigs. In order to save these through the winter he prepared an old out-house, which was well adapted to his purpose; it had a good floor, and it was only necessary to cut off and plank up one

corner of the house to contain their food, which consisted of corn. A good supply of straw was constantly furnished them for beds. The corn thus supplied them was not sound, for much of it had fallen down in the field, and became sour and partially decayed; but, as every one knows, this kind of food it is commonly expected that the stock hogs will consume. This defect in the treatment was, however, remedied by a run to grass and mast in a wood near by, and all the slops from the kitchen was given them three or four times a week. They kept in fine condition. About the first of February the writer was called away from home, to be gone ten or twelve days. Almost immediately after leaving home the weather turned exceedingly cold. On his return home he was informed that his hogs had cholera, that one sow had died and three others were sick, and that all the shoats were either sick or dead. Diligent inquiry was made in regard to the matter, and it was ascertained that when the weather turned cold they began to show signs of disease. On account of the severe cold, and the snow which covered the ground, they could no longer get the grass nor mast, and were fed exclusively on the kind of corn already spoken of, which had also become frozen. Upon noticing that they seemed to be in pain, their feet drawn under them, and breathing with difficulty,

they had been turned out of the house and put into a lot where they had no shelter or protection from the biting winds, except some hay given them for beds. On the morning after my return but one of the sows was able to eat; the shoats were all dead, save six, and *they* were so near dead that all efforts were unavailing to save them. These hogs had never bedded on the ground; they were farrowed in the house, and were fed regularly. In addition to this they had grass and mast, and although they were fed on corn only partly sound, yet while the weather remained mild they were healthy; but when very severe weather set in, and they were deprived of the grass and mast, and were fed exclusively on the rotten corn, which had frozen, they became enfeebled and chilled, and were then in this condition turned out of their shelter, and the result was they were placed in the very best possible condition to take *pneumonia* or *pleuro-pneumonia*, which was actually the disease of which they died.

To show how hogs are treated, and how they are exposed, the following communication from an old hog-raiser will show:

"COLES COUNTY, ILLINOIS, May 6, 1867.

"MR. JAMES A. REASOR:

"*Dear Sir*—Having learned that for several years you have been making examinations, experiments,

and investigations of the cause and probable cure of the disease called 'hog cholera,' and that you intend giving the farmers and the public in general the benefit of your researches in the form of a book, I take the liberty of sending you a few lines from the hog-cholera regions of Illinois.

"I propose to give you an outline of my observations in regard to the treatment of the hog in this state, as it has come under my notice at various times during the last sixteen years. I also propose giving you a short history of my own experience in hog raising.

"In the first place I would not have you think me a model hog-raiser; for I, in common with many others, had to make my farm and support my family at the same time; consequently had little time to give the matter that attention which its importance justly demanded. But, whether at home or abroad, I have always observed the hog more closely than any other kind of stock; for upon him I relied as the chief source of my income. Within the past few years, however, the hog has become so diseased that I was forced to turn my attention to something else.

"It is a common practice in this country for farmers to make large ricks of straw in threshing time for the purpose of protecting their hogs, cattle, and other stock from storms, and for the cattle to feed on

through the winter. By the time the hardest part of winter and the cold rains of early spring set in, the cattle have eaten away so much of the straw that the hogs have to bed in the wet, rotten straw and manure, or else make holes under the straw far enough back to be out of the reach of the cattle. When the latter is the case the hogs are deprived of pure air, and these holes become dusty; the consequence is, when spring opens, hogs thus treated come out of these holes and manure piles—if able to get out—drawn up, mangy, and generally affected with a cough and wheezing. Very frequently hogs are confined in a small lot around such straw-piles, and have no food during the entire winter, save dry corn and the droppings of the cattle.

"Other farmers keep their hogs during the winter in a lot in the open prairie, without any bedding or shelter, and many times they are so black with the black mud common to this country that it is scarcely possible to distinguish the animal's true color. I have actually seen hogs come out of a hole of mud and water when the ground was frozen around them. When the bleak winds would strike them they were soon chilled, and had to bed on the frozen ground or return to their watery beds, if they (the beds) were not frozen up before they could get back to them.

"When fattening time comes it is a common practice of farmers to confine their hogs in a lot and give them a wagon-load of corn. When the corn is consumed they are allowed to get squealing hungry before another load is thrown in to them. All sizes are fattened together, and when the largest are driven to market or killed the supply of corn is reduced, and the weather becomes more severe, and those remaining in the pen suffer greatly, and by spring many of them are dead. Those that survive require nearly the whole summer to regain what they have lost, and even then they are not worth as much as they were on the 1st of January before. Some farmers buy large numbers of stock hogs and cattle, and feed them in separate lots, and change them, so as to have the hogs follow the cattle. They are generally fed on corn cut and shocked in the fall, and hauled out of the fields and thrown down on the ground, and without husking the corn. In this way the hogs get something for beds, the corn-stalks and shucks furnishing the material. This, among the large stock-growers, has been thought sufficient, and indeed the most successful manner of raising the hog. But allow me to give a little of my own experience with the hog.

"I generally let my hogs run till fattening time, and then, some week or so before putting them up to fatten, I was in the habit of feeding them morning

and evening, watered them well, and so gradually increased their food till they became fat, and generally had good luck. But finally, about the time the hog cholera broke out in this country, I had a fine lot of about fifty hogs. About fifteen were nice young sows that I calculated to keep as breeders. I had only one sow that had her second litter. There were some thirty or thirty-five that I intended to put into what we call the spring or June market. These hogs all run together, and I had gotten them through the winter, and they looked well. As the cholera had made its appearance in the neighborhood, I was advised to put my hogs up in order to keep them from catching the disease. I finally did as I was advised. I put them in the same lot in which they had been fed during the winter; they bedded in the same beds that they had used during the winter, which was under a large straw-shed. I fed them with plenty of corn and they had abundance of water. On the 1st of April they would have weighed from two hundred to two hundred and fifty pounds each. After they had been confined thus for three or four weeks they began to be slow about getting out of their beds in the morning, and frequently coughed, and grew more and more delicate about eating, and some refused at last to eat at all, and in a few more days they began to die. I doctored them with

various things, but thirteen of them died in a short time. The sows began to bring forth before the right time; only one of them raised her pigs to be a week old. Some, and in fact most, of the pigs came dead; some of them in a state of decay, and almost any way but the right way, except one old sow; she brought forth all right, and she and the pigs remained healthy. I saved a few of those that were diseased, but they never fattened like my hogs had done before. I afterward raised healthy hogs on the same farm and on the same ground.

"Respectfully, WM. B. HAWKINS."

In passing through an adjoining county the writer was requested by a gentleman to look at a lot of hogs that were at that time (January, 1866) suffering with cholera, as he supposed. This herd consisted of about sixty; they were, as our friend told us, in fine condition up to the time they were taken sick. They had been well cared for, and were allowed to run in a lot with a lot of mules that were being fed, in order to eat the droppings from the mules, and where they could have good beds and shelter. Some time in January mules and hogs were turned into a field where there was no shelter for the hogs except an old straw-stack, partly beaten and trampled down and partly decayed. The hogs at once resorted to

this old straw for beds and shelter. In a few days after being put into the field the weather turned very cold, and continued so for some weeks. In eight or ten days after the change in the weather all this lot of hogs, consisting of sixty, were attacked with cholera, except six or eight. They refused food, coughed, had difficulty of breathing, and some of them had thumps, and all that were attacked died in a few days. Many similar cases could be given equally striking and conclusive. Now it often happens that the effects just recorded do not produce such speedy results, but for weeks, it may be, the disease has been creeping on so imperceptibly that it may be overlooked till the more violent symptoms appear. But to one accustomed to notice closely the actions and habits of his herd, it will be seen that the animal loses energy, and has cough, and some of them thumps, and they refuse food, and are thirsty. These symptoms precede the final and fatal termination.

Many of the cases brought on by exposure linger along till warm weather, and finally get well; but great numbers of them have the disease re-awakened by contact with the dust and heat of summer, and are speedily destroyed.

There can be no question that hogs that have had good beds, proper food, and sufficient protection through the winter are better able to resist both the

influence of cold and keep in better condition than those that have been deprived of them.

It is scarcely necessary to attempt to show that hogs given all necessary protection during the winter will in every respect be better off, even though both may be fed precisely alike. They will also be less liable to disease of any kind than those that have been exposed to the inclemencies of a severe winter, and this is particularly true of young hogs and pigs. It happens often that animals *apparently* get well after suffering a long time. And this brings us to consider, in the third and last place, *the transmissibility of the disease.*

It has already been intimated that this disease may be propagated by diseased parents. It often happens that the sow or boar has had cholera, and *apparently* get well, and are kept as breeders; and as certainly as this is done their offspring are much more liable to the disease than the offspring of those that have never had it. It has been clearly demonstrated that hogs are occasionally the subjects of *tubercular* disease, and in many of the animals examined by the author *tubercles* were found in the lungs and liver; and in cases of this kind their history shows that they had lingered for a considerable time before dying. Now nothing is more certainly known than that this disease in the human subject is communicated

from father or mother to the children, and such is also the case with this class of the lower animals. The author has given this matter careful and earnest attention, and has been fully convinced that the offspring of these diseased animals are born with the seeds of the disease in them, and being exposed to the causes already treated of in full, have fallen easy victims. He would not pretend to say what percentage of deaths are traceable directly to this cause, but is perfectly certain that it is very considerable. The case reported by Dr. W. M. Allen, to which attention is particularly called, will illustrate this point. Now pigs begotten of such an animal, it is easy to see, must of necessity have feeble constitutions, and when exposed to the inclemencies of the winter, without adequate protection, or inhaling the dust in the heat of summer, will speedily become diseased, and this class will generally all die. The pigs of diseased parents begin to show disease in a very few days after birth, as a general rule, but may get to be from one to three or four weeks old before giving evidence of the presence of the malady. They frequently show a want of plumpness, seem feeble, and do not grow rapidly; and indeed so feeble are some of them that they live but a short time, and die from *inanition*, or want of the powers of life, and because they can not digest and appropriate

the nourishment taken; in short, die from starvation, although the mother may have a sufficiency of milk. These cases are numerous, and it is a fact that a vast majority of hogs that die of cholera die while pigs, or before they come to maturity, or perhaps it would be more correct to say before they are old enough to be fattened. Even in hogs that have become fat these *tubercles* are occasionally seen, or evidence of having existed. Evidence of this is found in the fact that scar-like or hardened places are found in the lungs after death. The author asks especial attention to the foregoing facts, as he considers them of much importance in the attainment of the great object—viz., of *preventing* the disease.

In conclusion of what he has to say on this branch of the subject, the author wishes to add that not unfrequently the three principal causes—viz., *inhalation of dust*, *exposure to cold*, and *hereditary predisposition*—combine to produce the disease. One of these causes may lie dormant, and never produce an outbreak of the disease. It is easy to understand how, if pigs inherit disease from their parents, that the other two may act as exciting causes, and thus light up the disease which already lurks in them. Too much stress, therefore, can not be given to the importance of *selecting none but those that have never had the disease as breeders*, and this applies to both male and

female. The author firmly believes that if this rule is fully carried out, hog cholera would to a great degree be prevented, if not eradicated. It must not be understood, however, that this *alone* would prevent the disease, but that the observance of the above rule, in connection with proper protection during the winter and early spring, and avoidance of dusty pens and beds in summer, can not fail to prevent the disease, and produce healthy, robust animals.

CHAPTER XIII.

TREATMENT OF CHOLERA.

Prevention better than cure—Early attention important—Feeding—Watering—Bedding—Medical treatment—Recipes.

It will be borne in mind by the reader that the author lays but little stress on the *medical* treatment of hog cholera. His main object is to point out how the disease may be prevented more than how it may be cured, though much may be done to cure the animal after the disease has made considerable headway. When the animal has the disease in its worst form, but little can be done for them in the way of medication. It may be truly said that medicines are of but little use unless it be of a kind that the hog will readily take in his food or drink; for when he has to be forced to take it, it will be found to be a very difficult matter, and next to impossible to do it. The author is convinced that great mischief has been done by patent-medicine venders, who, without any practical knowledge of the disease, and indeed of the nature and habits of the hog, or of the remedies

or rather drugs he employs, dupes the too credulous farmer into the belief that he has a specific "which has never been known to fail to cure any case, however bad." These medicines are too often relied upon, and attention to the *hygiene* of the hog is neglected. Thus thousands of hogs die as well from the medicine as from neglect. The most absurd compounds have been palmed off on the farmer, each having its day, doing its mischief, and passing away.

The *important* matter in the treatment of this terrible malady is to study it, so as to be able to detect it in its very first signs, and before it has taken deep hold upon its victim. When the first symptoms are discovered, it will often be an easy matter to arrest the disease. In fact, if the causes already detailed are the true ones, such measures may be taken as will *prevent* it.

The first and most important matter to be attended to is the proper treatment and management of the *herd*. In the first place, do not allow them to wallow and sleep in dusty places. This, as we have tried to show, is the main cause of the disease in numerous cases. If they are allowed to sleep under sheds, around the barn or stables or out-houses, or in old decaying straw-stacks, or in heaps of stable refuse, they will be almost certainly diseased sooner or later. The disease may remain latent for some

time, or it may be the symptoms appear so trivial as to give rise to no suspicion of its presence; but upon exposure to a suddenly cold spell of weather the disease is developed, and death swiftly follows. Let the reader make himself thoroughly familiar with the symptoms, and particularly, as we have already insisted, the *very first* symptoms of the disease, and when it is ascertained that your herd is suffering, go at once into a thorough investigation of all the surroundings, and if any of the causes already fully given should be present, set about at once to remove it, for in doing so the difficulty will in great measure be removed.

1. See if their beds and wallowing-places are dusty.
2. See if they have adequate protection from the cold rains, snows, and winds.
3. See that their food is of the proper quality and quantity.
4. See that they have an abundance of pure water.
5. See that they are not crowded together in too great numbers.
6. See that they have no lice; or if so, destroy them at once.
7. Give attention to removing the diseased ones from among those that are healthy; not on account of contagion, but that they may receive special attention.

It will be a comparatively easy matter, by careful attention to the foregoing items, to save your herds from the worst form of the disease.

The author can not refrain from quoting the very sensible and practical suggestions of Mr. H. C. Smith, of Ridge Farm, Vermilion County, Illinois, delivered before the State Agricultural Society of Ohio. Mr. Smith says:

"In the treatment of the diseases of the hog I considered the old proverb especially true—'An ounce of prevention is worth a pound of cure'—because in almost all cases where a hog is once diseased to any considerable extent the cure is worth more than the cured hog. This being the case, it is important that we take especial care to prevent disease among our swine. The hog, if properly treated, is perhaps the least liable to disease of any of our domesticated animals, and his wants are few and simple, but from the nature of his habits his few wants are imperative.

"The disease known as cholera, which has made such havoc among our herds for the past few years, is undoubtedly caused by the filthy and careless manner in which we treat our hogs. We have been driving them to it for years. Each successive generation continued to have its vitality played upon, and its constitution to grow weaker and weaker by continual abuses, until it finally culminated in a dis-

ease that carried off hundreds and thousands of the poor creatures, and thus relieved them from the misery and curse of neglect of their careless owners, and perhaps saved hundreds of human beings from destruction by the use of pork contaminated by corruption and disease. *Our only remedy is in a radical change in the care of our hogs.* By suddenly changing from scant fare of grass, roots, and such other rubbish as the hog can gather up in the streets and lanes, to high feeding of corn or still-slops, the dormant stomach and digestive organs are overtaxed, the food lies undigested in the stomach until it sours and ferments, which produces constipation and irritation throughout the whole digestive apparatus, and by its long continuance the whole system is impregnated with fever and disease. After the disease has far advanced, to attempt a cure will be impossible. After a hog has lost his appetite it is very troublesome to administer medicines to him; but by taking it in time, while he will still eat, and give him some slight purgative and some neutralizing substance, with moderate food of a green, succulent nature, and pure air and free exercise, he will most likely recover.

"I have never had a case of the cholera among my hogs, although it has been in adjoining pastures frequently. My plan of preventing it is, during the grass season, to allow my hogs plenty of grass, feed

regular, and when I want to raise the feed do it gradually; give my hogs plenty of salt, which stimulates the digestive organs, and allow them free access to stone-coal, of which they consume large quantities, and the salt and coal neutralize any acidity that may be created in the stomach before it has time to affect the system."

Thus it will be seen by a little judicious care in the management of the hog the disease may be wholly prevented. Mr. Smith's hogs did not have the disease, although hogs in adjoining fields had it. The above facts can not be too forcibly impressed upon the minds of our farmers and raisers of hogs. Indeed it may be observed with truth that no man is fit to raise animals of any kind unless he first learns how to manage them, both in health and disease.

Now, if the reader will carefully examine the reports so carefully and accurately made by the Illinois physicians, and that of Dr. W. M. Allen, of Jefferson County, Kentucky, and those of the author, the conclusion will be inevitable that no medical treatment can cure hogs thus diseased. They may appear to get well, yet it is questionable whether their flesh is ever fit for food, and for the good of humanity ought to be given to the soap-boiler.

Every hog-raiser should make a habit of inspecting his hogs daily. In this way he will be able to see

any departure from health, and be thus able at once to go to work to relieve them; or if he sees existing those causes which we have so plainly laid down, he can at once set about removing them before his herd has been affected by them.

Now let us suppose that you have given attention to the matters above detailed, and that upon careful inspection you have discovered that some of your herd have lost their appetite; they do not respond to your call as usual; they seem languid; they are hacking and coughing; they breathe more quickly than natural, and they wheeze, and have thumping of the flanks. These symptoms will indicate to you that you have no time to lose if you would save your herd. You ought at once to remove the herd from dust, if in the summer, to a place where they can get pure, fresh water; if in the winter, to a place where they will be protected from the cold, and where they can have good, warm beds; and they should be given warm slops made of wheat-bran or meal, or these two mixed and thoroughly cooked. They should be allowed plenty of salt, and an abundance of stone-coal or charcoal, of which they will often eat greedily. At the same time they should have a good supply of water, for they are generally thirsty. If the dairy furnishes plenty of milk let them have all that can be given them, for they must

be sustained, and if this can not be done death is inevitable. Let nitrate of potash, an ounce to the gallon, be dissolved in the slops or water, and compel them to eat or drink it before they are allowed any more. They should not be allowed to crowd together in large numbers, and their pens or houses should be well ventilated, and they should be so arranged as to carry off the urine. If these matters are promptly attended to, a few days, and sometimes a few hours, will suffice to show an improvement in their condition.

In order to present this matter plainly, so that there can be no possibility of being mistaken, let us present the matter in a little different form. When the early symptoms, the importance of which we have tried to impress, begin to show themselves, the question will of necessity arise, What can have caused the disease? And we will suppose a farmer making the inquiry. Now we propose to ask him a few questions, which it is believed will assist him to a conclusion.

1. Upon what have your hogs been fed?

"Nothing but corn."

2. Was the corn sound?

"No, not exactly. I fed the nubbins and imperfect corn, and in fact much of it was sour and rotten, but I thought it would not do to lose it."

3. Did your hogs have good, warm beds, and a house or shed to protect them from the cold?

"Certainly not. They were allowed the liberty of the field and the barn-yard, and made their beds where they chose."

4. Did they often make their beds in the old straw-stacks, and about the stables in the manure-heaps?

"Yes; they seemed to prefer such places for their beds, and I thought they were comfortable, and so let them alone."

5. Did you give them plenty of salt, and feed them regularly?

"Well, no. I sometimes forgot to salt them, and when the weather was very disagreeable, they were occasionally forgotten."

6. How was it in the summer? Had they a run to grass and water, or were they confined to dry, dusty roads, fields, or sheds?

"Well, my grass was rather poor, and they got but little; and water was rather scarce, and they sometimes actually suffered for the want of it; but it required much trouble to furnish them good, pure water, so I had to allow them to run to a very filthy pond."

7. Did your hogs have cholera last year?

"Yes, but I saved enough for breeders."

8. Did the parents of this herd, both boar and sows, have the disease?

"Yes; and the boar never seemed perfectly well, and after a while dwindled away and died. The sows seemed to have fully recovered."

Any one who has seen how the hog is managed will acknowledge the justice of the above, and in some cases the truth is by no means all told. Can any one be astonished that hogs should die of cholera thus treated? Can any one doubt, after what has been stated in regard to the causes producing cholera, that if these causes should be removed, which it will be seen can easily be done, that the disease must of necessity disappear? We insist, nay, we pray the farmers and raisers of hogs to give the matter a trial.

It is now proposed to be still more definite in regard to the means to be employed to *prevent* the disease.

1. Every hog-raiser should have a good shelter for his hogs to protect them in winter and spring. The size of this house or shed should be in proportion to the number of hogs raised. This house should have a plank floor, so arranged as that it will at the same time serve the purpose of carrying off the dung, urine, and waste slops. It should be planked up high enough to protect the hogs from the cold winds, leaving space above sufficient to insure full and free

ventilation. In the winter the animals should be supplied with straw or other suitable material to make beds of.

2. If lice infest the herd they should be destroyed. For this purpose take of sulphur or tobacco-juice and lard a sufficient quantity, mix well together, and with a mop or brush give the animals a good greasing. Make them move about the house and climb over each other; in this way the medicine will be thoroughly applied in a very short time, and with very little trouble. This simple means has in our hands been sufficient to kill these vermin, and not only that, but also cure mange. This operation should be repeated as often as it is necessary to accomplish the object. The presence of these vermin not only act as an irritant to the skin, but also indicate a diseased or debilitated state of the system.

3. The next thing to be attended to is the state of the bowels. In many cases there are worms in great numbers infesting the intestinal canal; these must be expelled, and such feed given as is best calculated to improve the general health of the animal. For this purpose a very simple and cheap, and at the same time efficient, remedy is the following: Take of corn-meal and wheat-bran equal parts, boil them together till thoroughly cooked, then add salt, soft-soap—made in the ordinary way from wood-ashes—

and powdered sulphur, and a little copperas (sulphate of iron), and mix the whole together by rapidly stirring them. Let this be the only food given them. This, if persevered in for a few days, will act upon the bowels, and if there are any worms they will be expelled. Charcoal in abundance should be given, as it will absorb the gases and correct any unhealthy secretion, and is an excellent disinfectant. If the charcoal can not be obtained, stone-coal will answer the purpose. If farmers will take the trouble to have the slops from the kitchen and dairy and the suds from the wash-house put into a vessel, and to this add a little meal or bran, and some wood-ashes or soda, and give this to his hogs two or three times a week, it will be found an excellent addition to the means already suggested. By attention to the above suggestions the bowels will be kept regular, the digestion improved, and the general health of the hog invigorated.

But in order to make this branch of the subject as complete as possible, we propose giving some space to the views of several writers on this matter of treatment, but do not wish to be understood as indorsing their views or the recipes given, except when the fact is mentioned.

As a preventive, Dr. J. Wallace, in the "Prairie Farmer" for July, 1859, advises giving from five to

ten grains of calomel to each hog two or three times a week during the prevalence of the disease. The reason for the use of this remedy does not seem very plain to the writer of this.

A writer in the "Country Gentleman" has found a drench of alum-water very effective.

Professor J. B. Tanner has communicated the following cure, which he has found very effectual: ashes, 1 peck; salt, 4 lbs.; black antimony, 1 lb.; copperas, 7 lbs.; sulphur, 1 lb.; saltpeter, ¼ lb. Pound these ingredients very fine, and mix them well, and keep some of it in a trough by itself, and each hog will eat what he needs of the medicine from day to day; if predisposed to cholera they will eat it much more freely than if wholly well. If through any cause a hog gets down, pour down him, or in some way get him to drink, in slop, one gill of coal-oil per day.

Another writer recommends cutting off the hog's tail, and giving him an injection of strong soap-suds. This last is almost absurd.

A writer, of Winchester, Tennessee, believes that if the hogs can be kept free from lice they will not suffer from cholera, and he is convinced that sulphur given internally and rubbed on externally will cure them of the pests. He gives the following: Sulphur, two table-spoonfuls; same quantity of sulphate of

iron (copperas); and one pint each of ashes and common salt; mix them well, and give a small portion twice a week. In addition to this, burn their beds, so that the vermin may be destroyed. Keep them free from dust, etc.

Arsenic, blue-stone (sulphate copper), and poke root have their advocates. These medicines are poisonous, and should be used with caution. Madder, black sulphuret of antimony, and nitrate of potash is a very common compound, and in some localities has gained much reputation. The alkalies in the form of potash and soda are used by almost every one, and indeed much good may be done by them. They act upon the skin and kidneys, correct acidity of the stomach and bowels, and in these several ways assist nature to throw off the poison in the blood.

The following is a very good mixture, first suggested by Mr. R. A. Sherrard, of Ohio, and may be used with much benefit: Epsom salts, 1 lb.; powdered sulphur, ½ lb.; powdered copperas, ½ lb.; tartarized antimony, 5 ounces. Mix all together, and give each affected hog one tea-spoonful once a day for a week, then leave off a week, and another week give the medicine, and so on alternately as long as may be necessary. This compound allays fever, and acts upon the bowels and skin, and relieves

inflammation. Care should be taken in giving these medicines. It is best to begin with small doses, and gradually increase till the animal can bear the largest dose. Some authors advise bleeding. This might in some cases be of service in the early stage, but it is troublesome, and of questionable propriety. *Let it be kept in mind that the all-important matter is to look to prevention, and not to medicines, if success would be looked for.*

CHAPTER XIV.

DISEASED MEATS.

Injurious to man—Effect upon dogs from eating it—How diseased meat may be detected—Cysticercus; how known; produce tape-worm in man.

It is self-evident that the health of the individual depends greatly upon the quality of the food taken into the stomach, whether it be of animal or vegetable matter. There can be no question that imperfect and decaying vegetable matter is injurious to health. Why may not diseased animal food also be deleterious? The author is aware that the opinion is entertained that animal food undergoing decomposition is not only not injurious to health, but is much more easy of digestion than the perfectly fresh, untainted flesh. It is the habit, particularly of the French, to allow fowls, game, etc., to become somewhat tainted before cooking it, and it is contended that it is promotive of digestion, and consequently of health. Be this as it may, it is not the object to discuss the matter here.

It is the purpose of the author to set forth, as clearly as he is able to do, the character and appearance of *diseased* meat. This, of course, must have existed before the death of the animal. Now it is certain that diseased vegetables often produce injurious effects—as, for example, spurred rye, or blasted rye—and it is believed to be equally true that diseased animal food will produce like results, and that this is especially true of the flesh of the hog.

It is difficult to determine, for the want of a sufficient number and variety of experiments, what effect diseased flesh produces upon those who have eaten of it; this is a question for the medical profession to determine, and it is a matter worthy the attention of scientific men. Certain it is that few persons would be willing to eat diseased flesh if it were known to be such; and aside from the disgust necessarily created by such an act, none would be willing to run the risk of becoming diseased by it. It is certain that hogs are the subjects of *tubercle*, or consumption; might there not be danger of introducing some of this *tubercular* matter into the system by eating the flesh of hogs affected by this disease, and thus the blood become poisoned by the morbid material, and produce a disease similar to that of the diseased animal?

Numerous cases of disease and even death have

from time to time been reported from eating the flesh of hogs, and it is reasonable to suppose that our low forms of fever and diseases depending upon a poison of the blood for their cause, such as erysipelas, carbuncle, etc., are due to eating diseased meat. So well convinced are the municipal authorities of many of the large cities of Europe of this fact, that scientific men are appointed whose duty it is to examine, as far as practicable, all meats brought to market, that diseased meats may be excluded and guilty parties punished. But we are not without facts to sustain the views here entertained. The following circumstance was furnished by a very intelligent farmer of Shelby County, Kentucky, and is perfectly reliable. Colonel J. Allen says:

"The following fact may be of service to you: In the fall of the year 1858 Mr. Thomas Long, a well-known farmer of Shelby County, Kentucky, had a lot of fat hogs attacked with cholera, and many of them died. A few of the dead hogs were dressed and salted, and put away for soap-making. Some time in February, 1859, this meat was made into soap, except the muscle or lean part, which was thrown aside. Some dogs, six in number, ate heartily of it, and in forty-eight hours thereafter were all dead. No other cause could be found to account for the killing of these dogs, and the conclusion was

that the eating of this diseased meat had caused their death."

To the same effect, George Sutton, M. D., of Aurora, Indiana, in an able article on hog cholera, in the North American Medico-Chirurgical Review, May, 1858, says in regard to eating the flesh of hogs that had died of cholera:

"I have also seen notices in the public papers in this state of persons supposed to have been made sick by eating this diseased meat. Independent of the disgust arising from the idea of eating flesh of diseased animals, what effect would this meat have on health? The following facts may probably be of some interest on this subject. A dog belonging to Mr. Wm. Rickets, of Aurora, was chained to the pens at the distillery, and fed on diseased meat. He continued healthy and grew fat until the sixth week, when he became unwell, vomited frequently a greenish-looking mucus, and died on the third day from the time he first showed symptoms of disease. Two more dogs, both belonging to Mr. Wolf Denderline, of Aurora, were also chained near the pens and fed on diseased meat. One continued healthy until the fifth week, when he became unwell, refused to eat, vomited also a greenish fluid, had diarrhea, and died on the sixth day from the time he was taken unwell. The other dog continued well until

the fourth week, when he was attacked with vomiting—no diarrhea was observed—and on the third day after he died. Two more dogs, belonging to Mr. John Buffington, were chained at the pens and fed on diseased meat. One of them died in the third week, with similar symptoms to the first mentioned. The other became unwell in the fourth week. The owner, thinking that he was going to die, had him removed and fed on different food. He gradually recovered, though it was with difficulty that he could walk for more than a month afterward.

"At first I was inclined to believe that the consumption of this meat would not be directly injurious, but from the effects which we have witnessed upon these dogs it appears highly probable that, used as an article of food, this meat may gradually produce in the human system diseases the source of which would scarcely be suspected."

In view of the foregoing facts, would it not be wise to give attention to this matter? Certainly too little care has been exercised in regard to it. It becomes still more important in view of the fact that some farmers and butchers are not too conscientious to sell meat in the market which they know to have been diseased, simply for gain. The author is satisfied that much of the meat sold in our large cities is infected in some way or other with disease.

It must be remembered, as has been shown elsewhere in this volume, that hogs grow fat even while laboring under the effects of disease, and the butcher may not be aware of the fact that he is offering the flesh of a diseased hog for sale. Yet this fact may be known by an expert; not, however, in all cases, but in those cases most likely to do mischief. The reader is referred to the tenth and eleventh chapters of this work, and earnestly requested to read and study them carefully, in order to see how hogs may be and frequently are diseased, and yet grow fat. It is a matter of sorrow and surprise that animals thus diseased should be sold for food, and yet such is too often the case. Ignorance and greed are at the bottom of great mischief.

There are certain qualities belonging to healthy meats which must first of all be understood before it can be determined that there is any departure from health. The following article from the British Medical Journal, from the pen of Dr. Leathery, which is so clear and concise that the author believes he can not do better than to insert it in this place.

"Dr. Leathery, who has had great special experience during several years in the city of London, describes the following as the characters of good meat:

"1. It is neither of a pale pink color nor of a deep

purple tint; for the former is a sign of disease, and the latter indicates that the animal has not been slaughtered, but has died with the blood in it, or has suffered from acute fever.

"2. It has a marbled appearance from the ramifications of little veins of fat among the muscles.

"3. It should be firm and elastic to the touch, and should scarcely moisten the fingers—bad meat being wet, and sodden, and flabby, with fat looking like jelly, or wet parchment.

"4. It should have little or no odor, and the odor should not be disagreeable; for diseased meat has a sickly, cadaverous smell, and sometimes a smell of physic. This is very discoverable when the meat is chopped up and drenched with warm water.

"5. It should not shrink or waste much in cooking.

"6. It should not run to water, or become very wet on standing for a day or so; but should, on the contrary, dry upon the surface.

"7. When dried at a temperature of 212°, or thereabout, it should not lose more than from seventy to seventy-four per cent. of its weight; whereas bad meat will often lose as much as eighty per cent.

"Other properties of a more refined character will also serve for the recognition of bad meat, as that the juice of the flesh is alkaline, or neutral to test-paper, instead of being distinctly acid; and the muscular

fiber, when examined under the microscope, is found to be sodden and ill-fed."

Parasites are sometimes found in the flesh of fat hogs, particularly the muscles, such as the "*trichina spiralis*" and the *cysticercus cellulosæ*, either of which, if taken into the stomach, will develop these animals, and thus the trichina disease and the tape-worm will be the result. The trichinæ can not be detected by the naked eye in the muscles, or at least rarely so; occasionally, however, little whitish spots may be seen by a sharp, experienced eye, and when so observed, the meat containing them ought to be rejected as food till the flesh is submitted to careful examination by the microscope, by which means the matter is made certain. In the case of the *cysticercus cellulosæ* it is not very difficult to detect their presence. Little round white sacs or cysts are observed in clusters; they are sufficiently large to be easily seen by the naked eye, and are found in the muscles between the fibers, and sometimes in great numbers. These sacs contain the animal, and when taken into the stomach are rapidly hatched, and are soon large enough to fasten their ugly heads into the walls of the bowels, and grow rapidly; hence doubtless originate many cases of tape-worm in the human subject.

In the early part of the year 1870 a very interesting case occurred in the city of Louisville, Kentucky.

The little white lumps were found in a fat hog sold by a farmer to a dealer in the city, and he (the dealer) sold the hog to a green-grocer, to be again sold to the consumers. When, however, the little white sacs were seen, a panic was created under the belief that it was trichinous pork. The following account of the matter will show the facts in the case:

"The hog, to all outward appearances, was perfectly healthy, the fat clear and white, and the lean firm and of a healthy color. Upon cutting into the lean portions of the meat hundreds of small cysts or cells were found, containing a semi-transparent fluid, in the center of which was a white, pearly-looking cell, which, upon being opened, revealed, with the aid of a microscope, what was thought to be the dreaded trichina spiralis in countless numbers.

"A piece of the meat was submitted to Professor Jenkins, who, after a most careful examination, makes the following report:

"LOUISVILLE, January 24, 1870.

"MESSRS. H. WEDEKIND & CO.:

"I have examined two specimens of pork which you left with me on Saturday last.

"The piece which you designated as being a portion of a hog sold to Mr. Miles, on Twenty-sixth Street, I find to be good in every respect.

"The other piece, which you stated was a part of

the animal sold to a green-grocer, on Market Street, between Eleventh and Twelfth, is not good. The muscular parts are filled with innumerable parasites, characteristic of one form of 'measly pork.' These parasites are known by the term *cysticercus cellulosæ*, a being which, in its last and perfect stage of existence, is the *tænia solium* or tape-worm.

"This parasite in the state of *cysticercus cellulosæ* does not generally give rise to much inconvenience to the animal infested with it, except it gets into the muscular structure of the heart; the voluntary muscles of the whole body may be filled with them, and no external appearances or symptoms will indicate their presence. But when flesh so infested is swallowed in a raw or partially-cooked state, the animal into whose stomach such meat is taken will surely be infested with a colony of tape-worms. For this reason such meat as this is extremely dangerous in a community where thorough cooking is not the *universal* rule, since a living *cysticercus* cell is sure to be developed into a tape-worm when it reaches the stomach of a warm-blooded animal, especially of man. There is but one safeguard against them with pork-eaters—that is *thorough cooking* of every species of food into which pork enters.

"In reply to your query as to the presence of *trichina* in this pork, I have to say that, after a very

close and lengthy microscopical investigation of various portions of the meat, I have found none, and, according to authorities on this subject, where they occur at all they occur in vast numbers. I therefore infer that there are none in this meat.

"Yours respectfully, THOS. E. JENKINS,
Chemist and Microscopist." *

Thus, of course, if the appearances above given are noticed, no one in his senses would think of allowing such flesh to be eaten by his family. True, the results mentioned—viz., the development of *tape-worm* in the alimentary canal—may be prevented by "*thorough cooking;*" yet it must be regarded as hazardous even when thoroughly cooked, since a stray sac might find its way into the stomach which had not been killed by the cooking.

Let it be treasured up in the mind of the reader that—

1. If the flesh he is about to buy has a dark red or purple appearance, or when it has, in addition to this, a granulated look, it ought to be rejected.

2. When the meat has an oily look and feel after cooking, it will be safest to reject it.

3. If when cutting up the hog tumors and little abscesses are seen, it ought not to be eaten.

* Louisville Courier-Journal.

4. If the flesh is alkaline or neutral to test-paper, instead of being distinctly acid, it would be best to let it alone.

5. If the purchaser should have an opportunity of examining the lungs of the slaughtered animal, and should find lumps, or tubercles, or ulcers, or cavities, reject such pork.

6. "Measly pork," which is very unhealthy, may be known by observing purple spots or eruptions on the skin, which are plainly visible. They impart a peculiar appearance to the grain of the meat, with fading of its color and distension of the fiber, so as to give the appearance similar to that which might be produced by puncturing the flesh.

Finally, let all meats, especially hog meat, be completely and thoroughly cooked before eating it, for even with the greatest care you may fail to detect disease, and may fail to detect the parasites mentioned, and it may be that thorough cooking may destroy all deleterious qualities; at all events it is the only thing that can in any way do it.

The author is satisfied that altogether too little attention has hitherto been given to this important matter; and that, in consequence of ignorance in regard to the matters contained in this chapter, many cases of disease and death have resulted. The writer believes that in all our large cities in particular, skillful men,

men of science, should be employed to give their entire attention to the examination of meats offered in the markets for sale, and especially should this be done for the benefit of the poor class, who are often compelled to buy inferior, cheap meats, and who are much more likely to be imposed upon than the rich.

The author feels that if his suggestions serve to awaken an interest in the subject which shall lead to a thorough investigation of it, that it must result in good to all concerned.

CHAPTER XV.

TRICHINA SPIRALIS.

Its history—Its effect upon animals and man—Where found—Its propagation.

WITHIN a few years past this little parasite has demanded and received much attention both in this country and Europe, particularly in Germany, where trichinous swine's flesh, eaten in a partially-cooked or raw state, caused the death of many persons. Long before this, however, microscopists had discovered and accurately described them.

Thirty years ago Hilton, an English anatomist, discovered them. Hilton seems to have been the first to investigate them. He supposed them to be animal structures, but did not at once recognize the worm they contained.

In 1835 the celebrated zoologist Owen described this worm, and gave it the name *trichina spiralis*. This name was given it in consequence of its body being small as a hair and curled up spirally. A

number of other observers in England, France, Germany, Denmark, and America announced the fact that the capsules or little white bodies seen in the muscles of animals contained trichina. In animals the observed cases were very few. They were found in the cat, crows, blackbirds, hawks, and other birds, as well as in moles and pigs. (Virchow.)

It must be remembered that the trichina is exceedingly minute. "If we bring," says Virchow, "the trichina, the body of which is curled up, and therefore occupying its least space, in a drop of water on a plate of glass, and place this on a black surface, we see a whitish point; more can not be seen, and therefore it is impossible to recognize that this point is an animal."

Frequently the animal in the muscle is inclosed in a peculiar capsule, a kind of sac without opening, a so-called cyst. This capsule has frequently a considerable size and thickness. So long as it is tender and not fully developed, the naked eye can scarcely see it. If it becomes more developed, and increases in density and thickness, and lime-salts are deposited in it, it presents more obstacles to the transmission of light, becomes opaque, and appears as a small, whitish body.

Although observers disagreed among themselves whether the capsule which envelops the animal is,

either mostly or in part, a part of the animal, it was taken for granted to consider the whole as one, and pronounce only such meat as containing trichina in which the whitish bodies could be observed with the naked eye. This conception could only be correct provided that the capsule was an egg-shell, for if the animals had developed from eggs in the spot where they were found, of course the capsule must have existed from the beginning. This was, however, in a high degree improbable. Later it has been ascertained by a more special investigation that there is no question of an egg in the case.

With the certainty of this fact, the capsule of course has another significance. Either it was a secretion, a product of the animal, or a formation from the part of the human body in which the animal lodges. There was in its history a time when there was no capsule, and the animal consequently was free. But nobody had previously seen them free in the human body. The first observation of this kind was made by Zencker, of Dresden, in a case of trichina disease which resulted in death, and which has since become of great importance.

The following is quoted from Virchow's "Life of the Trichina."

"We now know that a considerable time, at least two months, is necessary to produce a complete

capsule, and that any man or animal who lives so long that the trichina in them becomes inclosed are nearly past all danger. We may therefore safely say that all observations of trichina which up to the year 1860 have been made were of cured cases.

"It is therefore easy to understand that more and more the conviction spread that the trichina was a harmless animal—a mere curiosity. Practical physicians ceased to have any interest in it, and left the anatomist and zoologist to pursue the subject as a purely scientific one.

"Certainly, however, it has a great scientific interest, and to this circumstance it is due that in this case the old saying of the stone that the builders rejected, and which became the corner-stone, was exemplified. What was extraordinary was, where the trichina came from, and how it came into the muscles of living persons, as one could not discover any facts which pointed to propagation, for there was neither found any young, eggs, nor developed genital organs.

"Such cases had been easily disposed of not long ago by the theory that there existed a *spontaneous* generation (epigenesis, equivocal, or spontaneous generation). Among the people generally, as well as a certain number of investigators, the opinion was still held that from certain substances, especially from

excrementitious and putrid things, living animals especially, vermin would arise. In this class was included the intestinal vermiculæ, because it was not understood how they arose in the bodies of living animals, if they had not, as supposed, been created within them. Respecting the trichina this idea did not seem so far wrong, since they were to all appearance entirely sexless, and devoid of all qualities which the course of generation presupposes. In addition is the circumstance that they are found in immense numbers, for in some cases millions of trichina are found in a single person. Such a number of any other kind of the intestinal entozoa have never been found in any one person. Was it not supposable that the trichina arose from some impurity in the system?

"The trichina in these relations resembles certain worms, especially the cysticercus, which are frequent in pigs, and are also found in men. The cysticercus was different from the trichina in this; viz., that they are much larger, for the trichina, even if the capsules be included, form only a small, white point or thin line. The cysticercus attains the size of a pea, and sometimes of a small cherry or bean. To mistake one for the other is not possible even for the inexperienced. The cysticercii are also sexless; they have no eggs, and are often found in great numbers.

They are inclosed in the flesh, and are in many respects like the trichina, and even their origin by spontaneous generation seemed the most probable. The best investigators of the last century, especially the distinguished Pastor Goetze, of Quedlinburg, noticed that the cysticercus had a great likeness of structure with the head of the tape-worm, and these investigators had the two in one genus, that of the teniæ. Still they considered them to be species of the same genus, which compared with each other as donkey and horse, dog and wolf.

"Only further investigations of recent times led to the idea that the relation of these was nearer, and that the cysticercus was a real tape-worm, developed under different conditions from the latter. But the immediate experience of Kuchenmeister, from actual experiment, showed that this conjecture was not wholly true. He found that the cysticercus of the muscle when it is eaten develops in the intestine to a tape-worm. It has therefore lived for a time in the state of the cysticercus, and subsequently assumes that of the tape-worm.

"The question is how the worm came into the first state and into the muscle. In its tape-worm state it produces on its posterior extremity, by growth and casting off, new beings, of which each of itself not only contains eggs, but even produces living young.

These, however, leave the egg state only after they have been discharged from the intestine, and thus, either by eating or drinking, are taken into the body.

"As soon as they enter the stomach the shell opens, and the young, then microscopic, animals are freed, pierce the intestinal wall, and by active and passive movements reach different parts of the body, and there develop into cysticercii. This is a long and in a great degree chance development. The cysticercus is first eaten with the meat containing it, before it changes into a tape-worm, and from this in its single parts is generated eggs, and these must again be taken into the system to become embodied in the flesh and developed into a new being. It therefore not only changes location several times, but a change of generation also takes place, for every member of the tape-worm is a representative of a different generation.

"With these experiences the old doctrine of spontaneous generation of the intestinal worms was shaken to its foundation. If even so large animals as the cysticercus are produced regularly from generation to generation from eggs, to reach by peculiar wanderings the muscle from the intestines, it was easy to suppose that something similar to this might take place in the case of the trichina. Certainty was only to be had by experiment.

"Herbst, in Gœttingen, was the first to institute such experiments. He found that afterward animals which had been fed with meat containing trichina had trichina in their muscles. His experiments, however, were defective. In the first place it was not thereby determined that the trichina which had been fed were identical with those found in human beings. In the next place he had not been able to pursue the history of the case between the time when the trichina entered the stomach and that when they were found in the muscle.

"Was there a change of generation? Were the trichina in the intestine changed into another intestinal worm? Did they produce eggs? Or were the same trichina which had been eaten found in the muscle?

"More experiments, with feeding especially, by Kuchenmeister had no result, but he supposed that the trichina changed in the intestine to another known intestinal worm, the tricocephalus, and that the former was the immature state of the latter.

"This conjecture at first seemed to be confirmed by Leuckhart, in Giessen, who had formerly found, after feeding trichina meat to mice, free trichina in the intestinal mucus. On the 28th of September, 1859, he communicated to the Parisian Academy an account that he had succeeded in producing tricocephalæ in great numbers from trichina.

"I had at the same time arrived at another result. In a dog fed with trichina from a human body, which were encapsuled, I found, three and a half days after feeding, numerous free and full-grown trichina, which had attained to a perfect sexual development. I could distinguish male and female animals, and in the bodies of the latter I found numerous eggs and germ cells.

"On the 1st of August, 1859, I made my first communication on the subject to the Medical Society in Berlin, and a more special communication in my archives. At that time I showed that the capsule in which the animal was found in the flesh was nothing else than a changed muscular fiber—a deteriorated primitive bundle, and therefore the animal had to enter the structure of the flesh.

"These results have been verified by subsequent experiments of feeding, first by Leuckhart and myself, and also by Claus and others. Especially the case, already mentioned, observed by Zencker in January, 1860, gave to Leuckhart, as well as to myself, new material for experiment. The former reported it in a large volume. I communicated my later experiences, first in a short account in my archives, and again in a longer communication to the Paris Academy. The main result of our experiments was that the muscle trichina (muskel-trichina)

given in meat food changed in the intestine only in respect to growth (darm-trichina), and produces eggs and living young in itself, and that these living young, without leaving the animal, immediately pierce the intestinal wall, penetrate the body, and lodge especially in the muscular fibers, and then become encapsuled, to remain there until they are eaten.

"The case of the trichina is in one particular different from that of the tape-worm and cysticercus. The former when *first* eaten produces a new brood, which immediately penetrates the body.

"The former need not be eaten twice, like the latter, to produce a new brood that penetrates the body; the danger is therefore much greater in the case of the former, for the latter never endanger life, while we know a number of cases in which death has been caused by trichina. In other respects the muscle trichina and the cysticercus resembled each other in the fact that not the same animal which is eaten penetrates the body, but the *new* brood generated in the intestine enters the muscles.

"After this general review of the development of our knowledge of the trichina, I will proceed to state the main particulars more precisely.

"1. How do we recognize the trichina in the meat? In the first part of this treatise I have shown that though we can see an isolated worm

under circumstances already mentioned, the trichina itself can not be seen in the meat with the naked eye, and that what we can so see are only the capsules. Let us therefore consider the latter.

"After a young trichina has wormed into a muscular fiber, it moves on apparently for a certain distance. In this process it breaks the finer constituent parts of the fiber, and by this probably partly destroys the fiber. But there is no doubt that it even devours part of the fiber. It has a mouth, œsophagus, and intestines, and in the course of several weeks grows to thirty or more times its original size. Therefore it must take nourishment, and can not obtain this elsewhere than from the elements which surround it. It attacks the muscular substance, and at the same time irritates the surrounding parts. To understand these effects one has to bear in mind the construction of the muscles. Even for the naked eye, muscular flesh consists of small, parallel bundles of fibers, held together by a very filmy texture (bindegewebe). Each fasciculus can be separated, by fine needles, into small bundles, and these again into fibrillæ. Microscopically it is seen that even the single fiber is a structure. Outwardly it has a structureless, cylindrical covering. Within this is the real flesh element, which consists of small granules, which are lengthwise in the form

of minute fibers (primitive fibrillen), and breadthwise in the form of minute disks (fleischscheiben). Between them, at small distances, are certain parts with kernels, the so-called muscular bodies (muskelkorperchen). With a strong magnifying power the single fiber shows itself as a very complex structure, a bunch of small fibers (primitive fibillen) which are held together by a common covering, and this is the reason why German anatomists have given to the fiber the name of primitive bunch.

"The destructive effect of the trichina is mostly on the flesh stuff (fleischscheiben); viz., the primitive fibers and disks. These disappear within the fiber, and the latter shrinks in proportion. The irritating effect appears most on the covering, and on the muscular bodies, particularly the kernels, and most strongly on that part the animal occupies. The covering thickens, the kernels of the muscular bodies increase; these bodies also grow, and between them a heavier substance is deposited, and by and by a denser mass forms around the animal, in which can be seen the outer covering and the interior enlargement. The more the animal grows the more it rolls up, curling in its extremities, and lies like a spiral coil.

"Generally this spiral, in a certain part of its circumference, immediately touches th[illegible]

over and under this place lies the mass which proceeds from the enlargement of the contents. Where they touch the capsule it is from the first thicker and less transparent.

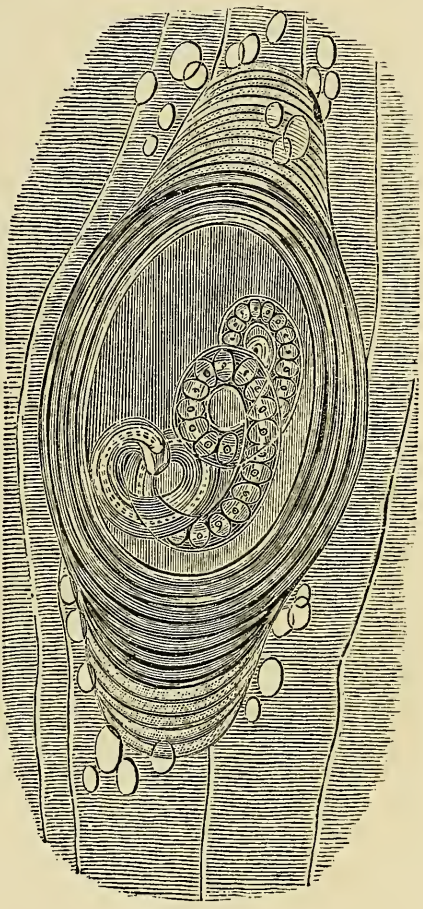


Figure 1.

"These processes take place mainly in the third or fifth week after their emigration. From that time the density of the capsule increases, but the inner part more so than the covering. The middle part of the capsule, where the coiled animal reposes, under a moderate magnifying, appears as a clear, egg-shaped mass (observe the figure 1), in which the animal is distinctly visible. Above and beneath this spot there are usually found two appendages, which appear darker by transmitted light, by reflected light appear whitish. These tapering appendages have rounded-off ends. Frequently they resemble in form the inner canthus of the eye. These appendages differ in length, and sometimes a similar difference in length exists likewise in the end

of the same capsule. In some cases these appendages are entirely absent, and the capsules are either of a simple oval form, or rounded off at the corner, or are indented.

"The above changes require a lapse of months for their development. If such meat is examined with the naked eye, nothing peculiar is discoverable. If a small particle of it is covered with acetic acid or potash, by which addition they become transparent, small, whitish opaque points on the ends of the capsules are visible. But if these are few in number, they are not so characteristic that we can, without the microscope, recognize the dangerous condition of the meat. We must be careful to guard against mistakes. Particles of fat frequent in meat, sections of vessels, nerves, tendons, and parasitical deposits may present the same appearance, and the presence of the capsule only be distinctly seen by a certain magnifying power. The magnifying power need not be high. With a power of ten or twelve we can readily see the relation, and distinguish both the capsule and animal. A somewhat higher power, as 50 or 100, is however more desirable, inasmuch as it precludes the liability to deception. If a still longer time elapses after the animal has migrated, other changes occur in the capsules; the most usual of which is that lime-salts are deposited, when the

capsules are called 'chalky.' Formerly it was believed that the animal itself changed to chalk, but this is scarcely ever the case. Generally this change to chalk begins in the thickened interior, while the exterior remains unchanged. The lime-salts appear as very minute granules, which by reflected light appear white, and with transmitted light appear dark, shady, or altogether black, and if the lime increases it eventually covers the whole animal, and we can not distinguish the latter under the microscope, even if it be entire. It is then encased as by an egg-shell.

"If the human body into which the trichina penetrates is well nourished, another change occurs. Around the capsule, and particularly around their appendages, appear fat-cells. When this deposit of fat attains a certain size it forms around the capsule a lump, which marks the location of the capsule more plainly than it is by the chalky deposit, for from the moment the former attains a certain magnitude the capsule is visible to the naked eye as a white spot, and this is the condition to which all the earlier observations relate.

"In figure 1 this condition of a human muscle is shown. Upon the red surface, striped lengthwise by its bundle of fibers, as it appears to the naked eye, are a certain number of globular or egg-shaped

points, on which, by very careful observation, can be distinguished the less opaque center, indicating the position of the worm.

"If acetic or hydrochloric acid be added to these white points they nearly disappear. But these acids produce precipitates from the meat juice, and cause the entire surface of the meat experimented upon to assume an indistinct and murky appearance. The best plan is to cut out small particles with fine scissors, teaze them out with fine needles, and thus separate the capsule from the meat itself. When this is done on a plate of glass, on a dark surface, one can see the capsule as white grains, and mark the dissolving effect of the acids.

"This mode of investigation is best done not by the naked eye, but by the microscope; nevertheless, to those who are experienced, the capsule in this chalky state is so characteristic that the confounding it with other appearances is impossible. For investigation of meat in such a case it is sufficient to carefully examine the meat, and if white points be noticed, to add the acids, as before mentioned. If they are nearly dissolved by the acids, no doubt remains. If they remain white, it is probable that they are particles of fat, or sections of nerve fibers, or similar structures. Nevertheless, we must remember that lumps of fat may exist near the chalk

capsules, and that therefore the negative success of the experiment is less convincing than the positive. This is especially true in case there are few trichinæ, because these are generally cured, the capsules being chalked and closely encased in deposits of fat. Moreover, the whole appearance is then less characteristic. It is self-evident that the investigation with the microscope alone furnishes a sufficient guarantee.

"I now refer to a peculiar case. Some time ago Meisner found in most of the muscles of the mouse white stripes, visible to the naked eye, and which, on microscopic examination, were seen to be cylindrical tubes, each of which contained a number of long, kidney-shaped bodies, of which it was doubtful whether they were of a parasitical nature, or formed a disease of the muscles.

"Later, Von Heszling found the same structures in the heart of the deer, and also, but more frequently, in that of the sheep. Von Siebold and Bischoff observed them in rats. Lately I received from Messrs. Dr. Grundler and Archidiaconus Ad. Schmidt, of Ascherslaben, pieces of pig's flesh, together with drawings representing the same structures.

"By investigation I have become satisfied that these are essentially the same as those found in the heart of the sheep, and I have no doubt that these are not animal products, but a parasitical

structure; but I am not determined whether, as Von Siebold believes, they belong to the vegetable world, or whether they are animal bodies. They bear a near resemblance to certain forms of zoosperm. Certainly the tubes which contain them present to the naked eye an appearance very similar to the capsules of the trichina, and I mention them here that mistaking them for the latter may be avoided.

"Whether they are dangerous to life I can not decide now, for we have made no observations about it. Further investigations may decide. Suffice it to say that these tubes differ from the trichina in this, that they have never been found encased in the lime deposit, and that the capsule does not pertain to the muscle, and that they do not contain worms, but only the minute egg or kidney-shaped bodies. This discovery shows clearly that the microscope only can determine the facts in any investigation of meat.

"Recurring to the trichina, if we wish to determine their presence, the question confronts us, Where shall we investigate—*i. e.*, from what part of the infested body is the meat for examination to be taken? Even in cases of slight infestation by trichina it is not of serious consequence what part is thus selected from, for they are generally found in all the muscles, from the smallest to the largest; from those of the trunk as well as those of the head and members. One set

of muscular fibers alone is an exception—viz., the heart. Therefore the eating of this last can be done without danger. But though the trichina are spread through all the muscles, yet they seem to be more numerous in some than in others. These are the ends of the muscles—*i. e.*, those portions where the muscle adjoins the tendons and the bone.

"All we have said hitherto relates only to the encapsuled trichina, which are already encased in lime. But how shall we find those which are not in this state, or are in the process of becoming encapsuled?

"Without the microscope this is altogether impossible. To be sure I have seen with the naked eye a full-grown, free trichina, as a white point, but whether this point was an animal I could not with certainty affirm.

"The movements of a free trichina are scarcely recognizable. It never amounts to a change of posture of its entire body. In unusual conditions it moves slightly, but usually this consists of mere diminution and return of the breadth of the coil.

"These changes of movement are so very slight that they are quite invisible to the naked eye. But if the animal be wholly uncoiled it will be invisible, since the very narrow, transparent body interposes little or no obstacle to the perfect transmission of light.

"The best mode of proceeding consists in cutting with a sharp knife a small bundle of meat, putting this on a clean glass plate, add a drop of water, cover it with a very thin slip of glass, pressed down, and bring the whole under the microscope.

"We now speak not of capsules, but of the trichina itself. We therefore describe the animal."

A full-grown, old muscle trichina, as shown three hundred times magnified, is a round worm that is similar in shape to a rain-worm. It has an anterior pointed end in which is the mouth, from which a narrow tube (the *œsophagus*) proceeds. The œsophagus is surrounded by a thick body of cells, which stretch through a great part of the body, and end in a fine intestine. The intestine runs to the posterior end, where it terminates in an orifice.

The trichina is therefore a fully-organized animal of the class worms, the inner structure of which can be well recognized on account of the transparency of its skin. But of course this can only be done with a microscope and a lens of 300 diameters.

It is to be remarked that no species of maggot has any resemblance to it—especially the larvæ of flies have quite a different shape, and are a great deal larger; and if ignorant butchers and others assert that the trichina affair was that of harmless maggots, it is only a sign of exceeding ignorance and levity.

These animals are very distinctly male and female. The following cut, from the pamphlet of Dr. J. D. Jackson, shows the male trichina of the intestines. This specimen is a full-grown male, with the generative organs exhibited at the tail, magnified 150 diameters.

There is a marked difference between the male and female. Besides an alimentary canal, the female has an additional tube opening toward the mouth, which latter is situated at the most attenuated end of the worm, contrary to what the early observers supposed. This tube is the receptacle for its eggs, which are developed in her previous to extrusion; the animal is viviparous, and produces, according to Virchow, 200, to Gerlach 400, and according to Leuckhart 1,000 embryos. The young thus born are without sex. It would seem that re-ingestion by the stomach or bowels is necessary to their development, for if they remain in their encysted state they ultimately perish.

Fig. 2.
A, head; B, tail.

The following cut pretty clearly represents one of the female animals full of eggs, and young trichinæ in great numbers escaping from her sexual organs.

Of course the animal is highly magnified, in order to show the little animals. Attention is especially called to this cut.

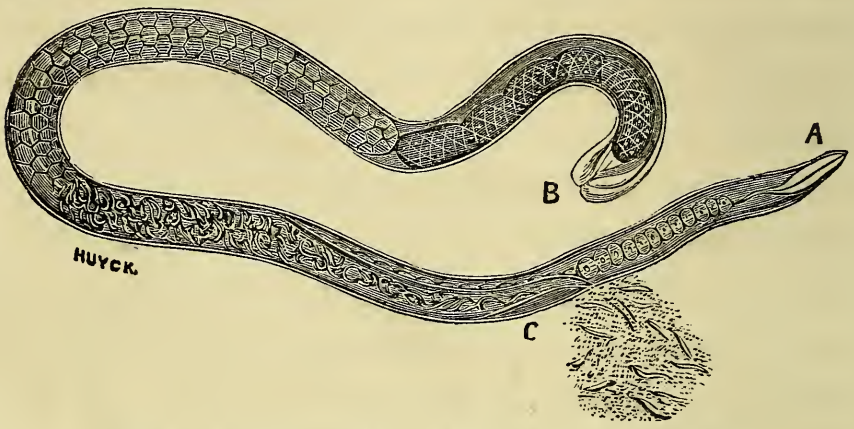


Fig. 3. A, head; B, tail; C, small trichinæ escaping.

The female, as before observed, is much larger than the male, and also much more numerous. By some observers it is stated that there are seven or eight females to one male. Hence the wonderful rapidity with which they multiply. Immense numbers of them may be found within a very small space. Dalton observed twelve trichinæ in a piece of muscle the one twelfth of an inch square and one fiftieth of an inch thick, which would give 7,200 to the square inch; and we ourselves have in a piece of muscle weighing one tenth of a grain been able to distinctly count eleven, giving thus 52,800 to the ounce. A few mouthfuls of food infested at such a rate would afford females enough to generate millions. (Jackson.)

The parent trichinæ after giving birth to their young are expelled from the intestines. About a week usually after trichinous food has been taken into the stomach the young animals have been hatched, and commence boring into the walls of the intestines; though Fiedler's experiments upon rabbits show that the trichinæ may become sexual during the second or third day, and the embryos quit the mother to commence their peregrinations on the fourth day. How do they get into the muscles? This question is answered in two ways. Dalton says they reach their destination by means of the circulation, and has been led to conclude that the cysts are formed within the walls of the capillary blood-vessels. The œdema observed in trichina disease confirms this idea. He says: "It would be difficult to explain on any other supposition, but is easily understood by an arrest of the circulation taking place simultaneously in so many capillary blood-vessels as must necessarily be obstructed when 7,000 trichinæ are contained within the space of a cubic inch."

The foregoing explanation is opposed by Virchow and Leuckhart, who believe that the parasite works its way to its place of destination by vermicular motion, and by boring through the structures with which they come in contact, and finally lodging in

the muscular fiber. This view is confirmed by the fact that we have no record of the animal being found in the blood. When they reach the muscles they commence undergoing encapsulation, and become completely inclosed, and so remain till they are set free by being taken into the stomach of some flesh-eating animal. They do not infest all parts of the body, as none have as yet been seen in the heart, brain, bladder, or in fat. Usually but a single worm is contained in a cyst, though occasionally two and sometimes three or four are found. (Jackson.)

As before stated, when the worm becomes encysted it remains in its dormant state until the death of its host, when, if chance favors its entrance into the stomach of another animal, it begins anew its cycle of development; otherwise it perishes. Scoutetten gives a case where the muscles of a subject, who had been infected thirteen years previously, promptly developed and gave forth young upon being swallowed by a rabbit; and in the London Medical Times and Gazette for June, 1866, is the record of a case from Virchow's archives, in which living trichinæ within calcareous capsules were found in a patient who had been trichinosed twenty-four years previously. (Jackson.)

A rather singular fact has been observed by Virchow and others, that though trichinæ would undergo

development and propagate in the intestines of the dog, they would not penetrate through the intestines and enter the muscles. The hog, of all animals, is the most easily infected, and it is from this animal that nearly or quite all the cases of infection of the human subject have been produced. This is a fact of great importance where the flesh of the hog is the chief article of animal food. It must be kept in mind, however, that other animals are sometimes infected, such as the calf, ox, goat, sheep, rabbit, hare, mice, rats, moles, etc. As yet in none of the barn-yard fowls have the muscular trichinæ been found, though repeated experiments have been made to determine the point. (Jackson.)

After much investigation and many experiments, the conclusion seems to be that of all the animals which come to our table, we need fear trichinous infection from the hog alone. Some cases of infection from eating beef are recorded. Dr. Percy, of New York, has given a case of this kind, and several German observers have seen cases of infection from eating raw beef; but such cases are comparatively rare.

These little animals manifest a wonderful tenacity of life. Leuckhart submitted trichinous flesh for three days to a temperature of thirteen degrees below zero, F.; after which he fed it to a rabbit,

which died trichinosed at the end of four weeks; and it has been ascertained that they will bear for a time with impunity a temperature up to 169° F., but heated above that point they are infallibly destroyed. (Kestner.)

Hertwig boiled trichinous meat, cut in slices the size of one's thumb, for twenty-two minutes without killing the trichinæ, though a continuation of the boiling three minutes longer destroyed them.

Virchow demonstrated the difficulty of destroying them by soaking trichinous meat in a solution of chromic acid so strong as to coagulate the muscular tissue; and yet, after eight days of digestion, on denuding them from their capsules, they showed by their movements that they had not been injured. It has been said that salting may be relied upon as a destructive means. Accurate investigations demonstrated that the effect of salting is so uncertain that it can not be relied upon; a person has been infected by pork which had been submitted to a salting for thirty-five days. Smoking is equally doubtful.

With a view to the destruction of the trichinæ while in the intestines, a great many experiments have been made upon the muscular trichinæ with a variety of medicinal substances, such as arsenic, chloroform, santonine, iodide of potash, chloride of sodium, etc. Some of these medicines have been

sufficient to destroy them, but no practical results so far as destroying them while in the system have been obtained. The only reliance against infection seems at last to be heat; when a piece of meat has been heated in cooking to above 170°, at which the albumen in the worm is coagulated, and in this way, and this way only, is there a certainty that they will be destroyed.

Germany of all countries has suffered most from the trichina disease, for the very good reason that it is a common habit among them to eat raw meat. It is not a matter of very great astonishment that so many of them should sicken and die. Several German writers and microscopists have given earnest and careful study to this little parasite, and the writer feels that he can not do better than give their experiments to show how important it is for every one to be posted in regard to the habits of these worms, and the mischief they have done and are likely yet to do. Virchow, Zencker, and Kuchenmeister, and in this country Leidy, Dalton, and others, have been foremost in these investigations. Virchow says, after giving an account of a number of cases that came under his observation:

"One has to remark here that all these were first recognized by dissection, and while these persons lived no one had a misgiving of their condition. All

the trichinæ found in these cases were encapsuled; they were therefore all cured cases; but they have a weighty significance, as they show that the possibility of a danger we fear in other cases is not far removed.

"But these experiences would not have been sufficient to arouse the general interest if other cases of fresh migration, not encapsuled, and free trichinæ had not been discovered, and if we had not been led by this to investigate the source of these migrations, and if, finally, no epidemic of cases, and cases of death in consequence thereof, had occurred.

"It is the merit of Zencker that he first, in and near Dresden, observed such an epidemic, and also showed in the ham and sausages made from one particular pig the trichina. This pig had been butchered on a farm near Dresden. The butcher, the owner of the farm, and other people had fallen sick, and a previously perfectly healthy servant girl had died. In her body an abundance of trichinæ were found. I received from Mr. Zencker a piece of the ham, as well as a muscle of the girl, and therefore had the opportunity not only to verify his previous observations, but with this material to make a series of experiments on animals, which I will shortly state.

"A rabbit fed with trichinæ from the girl died in a month with its flesh full of them. Some of this

flesh was given to a second rabbit; it also died in a month. With this meat three other rabbits were fed. Of these, two died at the end of three weeks, and the third in the fourth week. To another animal the meat of these was fed. As it ate but little it lived six weeks. In all of these the muscles after death were found filled with trichinæ. Even in the smallest particle of their meat several were found.

"To be certain that this result was in reality due to the fed trichina meat, I examined parts of the muscles of some of these animals before they were fed. I did not find a single trichina, and they have never been found in these animals unless they had previously been fed with meat containing trichinæ. A few weeks after feeding, the muscles of the same animals which I had found free of them were filled with them. Convincing as these experiments of the infection resulting in death were, through five generations of animals, one might still imagine them to be the result of chance.

"To preclude this possibility, there was only to be shown that the migration and infestation really proceeded from the feeding of the animals with trichinæ. This, however, could be demonstrated. It could be proved that the trichinæ in the fed meat became free in the stomach and intestines of the rabbit, and become individuals of both sexes, which in a short

time attained a length of from three to four millemetres, and with the naked eye can be seen as fine, white threads. Eggs are produced in the female, and from these young even in the body of the mother, which about a week later are born, and move about freely in the mucus of the intestine. The trichinæ are therefore animals which beget living young.

"The young are exceedingly minute. They are the smallest of the class of thread-worms known. It is the young which leave the intestine and penetrate the body.

"I have found them in the lymphatic glands of the mesentery, in the peritoneal cavity, and in the pericardium, and in the muscles. In the latter they find the suitable conditions for their further development. Here they increase, and in from three to five weeks attain the size of their parents at the time they were fed.

"The above series of investigations, which I communicated to the Paris Academy of Sciences at their session of July 2, 1860, allow no doubt of the history and importance of the trichina. I have myself repeated these investigations several times, and other observers have done likewise. If we add to these the observations made on men, which increase every year, it must be regarded as folly or criminal to speak of unfounded fear of trichina.

"A whole series of cases, or, as they are called, epidemical, are well established. I refer to the epidemics of Plauen, Calbe on Saale, Quedlinburg, Burg near Magdeburg, Weimar, and Hettstadt near Eislaben, as well as the very curious case which happened on a Hamburg vessel. Several other epidemics which have been probably caused by trichinæ I do not report, because of there having been no microscopic investigation. In the other epidemics there were many cases; twenty to fifty persons were infested; but in the case of Hettstadt one hundred and fifty persons fell sick, several of these very severely, and the number of deaths were above twenty. There is no room, therefore, for doubt. The most reliable observations have been made. I have examined flesh from the cases at Burg and Hettstadt, and found them literally filled with trichinæ.

"It is not the purpose of this treatise to dilate upon the symptoms of the disease in particular. It may suffice to say that the symptoms are various. Sometimes they are irritation of the intestines (intestinal catarrh), dysentery, gastric disturbances, and muscular disease, as weakness, stiffness, pains resembling gout or rheumatism, and a febrile condition similar to that of typhus fever. Sometimes the train of symptoms are acute, and death occurs in the fourth or fifth week. Sometimes they proceed more

slowly, and after weeks convalescence occurs, with chronic disease, emaciation, and loss of strength. In several cases I have examined the dead bodies of those supposed to have been victims of consumption. In these, with very little affection of the lungs, I found many trichinæ, with great decrease of muscular substance.

"To the experienced physician these cases of disease have peculiarities by which they are distinguished from gastric and nervous fevers, from gout and rheumatic affections; but a perfectly reliable judgment can only be found if trichinæ have been found in the meat which was eaten, or in the body of the patient himself; but the latter is only possible if a small piece of muscle be taken by an operation from the body of the patient. Without the certainty of the presence of the animals, we formerly were in doubt as to the nature of the case, and the supposition of poisoning was prevalent.

"Since the year 1860 I and several other observers have endeavored to spread a knowledge of these facts, and to call attention to the danger which might result from an incautious eating of pork. From the beginning the opposition of the butchers was raised, and even now it still exists. I remark, however, that it is precisely these tradesmen who should be most interested in adopting every precaution, for the

danger not only affects their trade, but their personal welfare.

"In some of the epidemics, as well as in a series of single cases—for instance those of Friedrich, Traube, and Tungel—it was just the butchers who were infected by the pig they killed. Of course we have no idea of infection by the skin; but the butchers not only eat of the sausages, but most of them are in the habit of eating a little of the uncooked meat, at the time of cutting it up, as well as that which adheres to the knife during that process—they therefore are the first exposed to the danger; next come the cooks and servants; and lastly the rest of the population. But even after, evil-minded persons spread the assertion that the disease had not even been shown in the pig. This is utterly untrue.

"As I said in a former portion of this paper, Leidy, in North America, sixteen years ago, found trichinæ in a pig. Zencker found them in the ham and sausages of the pig partaken of by the patients and servant girl who died in the Dresden epidemic. He sent me one piece of that ham, and I ascertained that it contained trichinæ.

"The same results have been found in the epidemics at Quedlinburg and Hettstadt, in hams in the former and in sausages in the latter. In Hettstadt it happened that most of the people who were taken ill

had participated in a feast, which took place on the 10th of October of last year. Most convincing, however, is the case described by Tungel.

"The second argument is no more reasonable. The most careful trials with feeding, by Haubner and Kuchenmeister and Leisering, pigs with trichina meat resulted in showing that some of these animals sickened and died, but in their conclusions they state that the pigs so fed presented no peculiar symptoms, such as would be indicative of this disease alone, and furthermore the reports of the cases of epidemics contain no mention of any such peculiar symptoms in the pigs whose meat caused the disease in human beings.* But even if we admit that these peculiar symptoms of infection exist in the pig, these will not be apparent when the pigs are in the market and for sale.

"Such are cases of already cured and encapsuled trichinæ. The real symptoms of disease may have appeared months before, and in single cases very honest owners offering them may acknowledge that the pigs had been sick. But there is no security in

* Dr. Rupprecht, in Hettstadt, wrote me respecting the pig from which proceeded the infection there. It was a two and a half year old mother pig, who appeared to five butchers perfectly healthy; another, and the sixth, bought it. It therefore did not appear suspicious to him, for he and seven members of the family ate the meat and became sick.

these circumstances. If one considers how many pigs come to market, especially in large cities, not only from the distance of miles, but also from more distant provinces and countries, it is impossible to investigate the history of the previous state of health of the animals.

"It has been shown that encapsulation, and the infiltration of the capsule with chalk, does not kill the animals. In most cases in human beings where I found these capsules the inclosed animal was still alive. How long had elapsed since the migration I can not state, for in all these cases the time when they first entered the body could not be ascertained. But it is certain that months must elapse before the deposit of carbonate of lime commences, and it is highly probable that the trichinæ may remain in the body of the human subject in a state of suspended animation, to awake to new activity as soon as they are taken into another body. I have repeatedly, with success, fed such trichinæ to animals. Notwithstanding all argument, and the question is not merely allowed, but enjoined, why is it that the accidents which follow the eating of trichina meat are so various in their degree and significance?

"A ship from Hamburg returned from Valparaiso. Before quitting the captain purchased a live pig. It was slaughtered by the cook on board the ship, on

the 1st of April, 1863. The crew ate thirty pounds of the pork fresh, and the remainder was salted. On entering the port most of the sailors fell sick; most of them slightly so—some, however, severely—and two died. In a sixteen-year-old youth, who died on the 24th, numerous free, living trichinæ were found in the muscles. The salted pork, a piece of which I obtained and examined, contained trichinæ, though dead.

"That trichinæ are found in pigs, and that people who eat this meat fall sick, can no more be doubted. Most people are consoled with the idea that the infection of pigs is not frequent, and that those who have them must evince the symptoms. The first idea may be admitted, but what consolation does it afford those who have the misfortune to eat of the meat of the few pigs which have trichinæ? This question is to be answered definitely.

"The intestinal consequences (gastric fever and dysentery) are consequent upon the presence of the animals therein. The length of this period is indefinite. If after persons have eaten the meat they have severe diarrhea, it may be possible that all the animals are discharged. If not, they grow, move about, procreate, and then comes the morbid irritation; this appears differently in different individuals. Sensitive persons, who are liable to diarrhea, are on

the whole more secure from infestation than persons inclined to costiveness.

"The muscular and febrile symptoms proceed from the penetration of the young from the intestine into the body. But these too vary with individual peculiarities. Certain conditions of the intestine may favor their migration or otherwise.

"I never succeeded in producing the disease in dogs, although the development of trichinæ in their intestines is very complete, for the first I discovered were in a dog. We have as yet no statistics on the subject, as the observations made do not furnish sufficient data. The second idea is still less valid.

"If the migration is in course of progress, the danger is in the ratio of the number of migrating animals. This, however, varies. I have seen cases of human bodies where I could only by a very extended search find about a dozen trichinæ in the muscle. There are other cases of millions. The noticeable effects are produced by the action of the animals on the places to which they penetrate.

"A person who has but a dozen or so will probably never have any perception of it—his health will not be disturbed for a moment. A second, into whose muscles thousands have penetrated, will have all kinds of disagreeable sensations, as pains in the muscles, stiffness, weakness, heaviness in his limbs,

hoarseness, etc.; but he will pass through these symptoms, the migrating animals will become encapsuled, and inclosed with lime. Thus a cure will be effected. A third, into whose muscles millions migrate, will perhaps recover too, but very slowly. He will remain weak, diseased, and very thin; or he may not recover, and may die by advancing disturbance of all muscular activity, especially that of respiration. This is evident if we remember the three cardinal points of the trichina elucidation:

"1. The eaten trichinæ remain in the intestine, and never enter the muscles.

"2. They produce living young, which enter the muscles.

"3. The young which have entered the muscles grow there, but do not multiply.

"The main danger, therefore, is in the production of young by the intestinal trichinæ.

"A grown trichina mother has a hundred of living young in her body, and after these young she always produces more and more eggs. How long she lives and produces young is not exactly known, but at least four or five weeks. It is certain that she is fixed in the intestine and continues to produce new broods of young. If we calculate that one trichina mother has two hundred young, twenty thousand such mothers are sufficient to produce a million of

young, and so many female animals may be contained in a few morsels of meat.

"The more trichinæ that are eaten, and the longer they remain in the intestine, the more young will be produced and the danger increased. I have proved this directly by experiments on animals.

"A rabbit which ate only a small part of meat containing few trichinæ does not become diseased. In the epidemic of Burg this was strikingly illustrated. A woman who ate raw meat on bread died. Her child, which only licked the spoon with which she had spread the meat, was slightly sick."

"It is certain," says Virchow, "that a person as well as a pig can have trichinæ in his body without causing very serious illness or death. That is, however, a small comfort, inasmuch as an absolute preventative against trichinæ can not be found; and inasmuch, moreover, as no special investigation of meat can be extended to all parts of it."

There can be no question that a very large migration of the animals into the human body does produce disease, and in many instances death; and it would seem that this is sufficient to do away with all objections on the part of any to a thorough investigation of meat offered in market for sale; yet there are some who even doubt the existence of the animal.

In discovering that the tape-worm in man came from eating of the cysticercus of pigs, it has been supposed that the Mosaic commandment was given on account of the danger from tape-worms. But tape-worms seldom cause real disease, and are not dangerous in the literal sense, and if the prohibition proceeded from a knowledge of a transmitted malady, the idea of the trichina in connection therewith is more probable. Certainly most men do not sicken immediately after eating trichinæ in meat. Days pass, and suspicion may easily fall on a familiar cause. Still, if numerous persons get sick at the same time, the suspicion will finally be led to the true source.

A remarkable case of infestation is mentioned by Virchow, taken from Herr Langenback, to which the reader's careful attention is invited. It shows how easily one may be mistaken, and how careful should be our investigations.

"Last summer Herr Langenback operated on a man for swelled neck. During the operation the raw muscles were seen to be filled with trichinæ, surrounded with the chalk deposit. When it was inquired whether he had never been sick in a peculiar way he told a strange story. In the year 1845 the members of a commission for inspection of schools in the Lausitz, at a meal, ate ham, sausage, cheese,

etc., at an inn. One member partook of only some red wine. The other seven members drank white wine and ate of the provisions. All seven, in which number was included the relator, fell sick, and subsequently four died. Suspicion was aroused toward the inn-keeper and the meal. Judicial investigation was had, in which the white wine was tested, but without result; but the inn-keeper could not dispel the suspicion excited against him, and was eventually obliged to emigrate.

"In June, 1851, in the neighborhood of Hamburg, a number of persons who had eaten ham afterward fell sick. Three died, and several others were for a long time in a low condition. The judicial investigation was here also without result, and finally ham poison was supposed.

"Parts of the ham remained, and its history could be traced to the butcher. It was then ascertained that the ham had been sold cheaper, on account of its poor quality, but what this inferiority of quality consisted in was not ascertained. Through the carefully-conducted transactions in this case, Tungel proved that the symptoms and the cause were exactly identical with what we know now of the trichina disease.

"More cases might be named, but what is given suffices to prove that the disease has existed before we had any knowledge of trichinæ, and the *need of*

the case is not the malady, but the knowledge of it. Nobody, therefore, should try to hide the danger with such paltry reasoning, when only a conscious insight into the sources of the disturbance enables us to avoid or in a great degree diminish it and its extent."

Nearly all the cases alluded to in the foregoing pages have been confined to Germany; but the cases are by no means confined to that country, and many cases of trichina disease have occurred in this country. Observations recently made in Chicago show that some sections of North America would seem to have the swine inhabiting them as frequently infected as in any part of Germany. By Scoutetten's account, the entozoa is also found in South America. He relates the case of a ship coming into Hamburg from Valparaiso, Chili, with several sailors sick, two of whom died in hospital, with the symptoms of trichiniasis, and the muscles of one of whom were examined, and found infiltrated with living, non-encysted trichinæ. Upon tracing the malady to the source of infection, it was found that a hog had been bought at Valparaiso and subsequently killed aboard ship, and that its flesh—a part fresh and part salted—had been a part of the sailors' diet. Upon examining with the microscope a piece of that which had been salted away, it was found infiltrated with trichinæ.

In the United States, thus far, there have been but few cases of trichina disease recorded. The first of which we are aware as having been fully made out as such in this country were those occurring in the practice of Dr. Schnetter, of New York City, in February, 1864, in the case of a German family who had been eating raw ham, which, upon microscopic examination made subsequently, was found filled with trichinæ, and which resulted in a dangerous infection of the whole family, and the death of one of its members. Dr. Voss, a short time subsequently, was called to see the captain, first mate, and cook of a Bremen ship then lying in the harbor of New York. The symptoms were of an anomalous kind, but such as to induce Dr. Voss to suspect trichinous infection. To satisfy himself he cut down upon the deltoid muscle of the second mate, and upon removing a portion of its tissue, and subjecting it to the microscope, by the calculation of Dr. John C. Dalton, who examined a piece given him by Dr. Voss, it contained a little over seven thousand trichinæ to the cubic inch. Dr. Lathrop, of Buffalo, has also reported a case. Recently in Linn County, Iowa, we have an account of nine persons in a family eating raw ham, with the serious illness of all of them, and the death of five. The cases thus far recorded in this country have been nearly all among the foreign popu-

lation, among whom the custom of eating raw meat prevails.

Dr. Leidy says that the inhabitants of the United States appear to be less infested with entozoa than those of any other part of the world, and accounts for it by the fact that an abundance of wholesome food being at the command of the poorest laborer, there is produced a high organic activity, which is unfavorable to parasitical development. He gives the cooking of food, by destroying the germs of parasites, as the reason for man, notwithstanding his liability to the latter, being less infested than most other mammalia; and very pertinently asks, "Did instinct originally teach him to cook his food, to avoid the introduction of parasites?"

Before closing this chapter the author desires to give his own observations on the subject of trichinæ. Before he had known scarcely anything about these parasites he had observed, while making post-mortem examinations with the view particularly to understand hog cholera, small, thread-like worms in the air passages and in the air cells of the lungs. This fact itself was unexpected, for no one had even mentioned the existence of worms in the lungs, so far as known to him. Having so frequently met with them in hogs that had died from cholera, he was led to inquire whether they also existed in fat hogs slaughtered for

food. Search being made at the butchers' pens where hogs were being killed for the market, they too were found to be infested with precisely the same kind of worms. These worms were about half an inch to an inch or more in length, and were exactly the same size—*i. e.*, they were not larger in one part of the body than another—in fact, hair-like. With the naked eye nothing could be determined in regard to their structure. Not being familiar with the use of the microscope, they were submitted to experts in the use of that instrument. After careful and repeated examinations, they were pronounced to be filled with trichinæ. These young trichinæ were seen escaping in almost countless numbers from the sexual organ of the female, as represented in the cut (fig. 3).

These worms have been observed by others as existing in the lungs, but none, so far as the writer is aware, have had them examined under the miscroscope. They are not confined to the lungs, but are met with also in the bowels. The author does not rely upon his own knowledge upon the matter, but, as before remarked, has submitted them to the best microscopists in his reach, and some of whom, he presumes to say, have few if any superiors in this country as careful and accurate observers; and it is upon their authority that he pronounces that these

worms are the carriers of the dreaded trichinæ. The author is not prepared to state the percentage of hogs that die or are slaughtered infested with these worms, but certainly quite enough of them are so infested as to cause serious fears and earnest attention. It will be a matter of great satisfaction if these worms turn out to be other than trichinæ; but as the matter now stands the conclusion is inevitable that they are, and that the lungs, as well as the intestines and the muscles, are infested by them. The above facts may be easily verified by any one who will take the trouble to look for them. It is possible, nay, highly probable, that in those animals in which the worm is found in the lungs they may also be found in the muscles. The strong probability is that many more hogs are infested by these terrible little parasites than any one has even dreamed. Certainly a large number of hogs are infested with trichinæ.

The great question in view of all this is, what preventive measures can be adopted to arrest the spread of trichinæ. Virchow has given us some excellent advice on this point.

"In the first part I named those animals in which trichinæ had hitherto been found, from which we see that carnivorous and omnivorous animals are mentioned. The mole was named, which most farmers

think to be only a plant and root-eating animal; but it is of importance as a destroyer of grubs, rain-worms, snails, mice, and young rats, as the late Gloger in his valuable writings has explained.

"It is evident that in the common course of affairs trichinæ can only be found in carnivora. For we have seen that the intestinal trichinæ produce living young, which migrate into the flesh, and *only here attain their further development*, and that they can not leave the meat in any other way than after it has been eaten. This regular progression from the intestine into the muscle, and from the muscle into the intestine, is only possible in meat-eaters. Still there are two exceptions.

"In the first place, the plant-eating animals are not so perfectly select in the choice of their nutrition that they might not occasionally swallow meat. If small pieces of meat are placed in the mouth of a rabbit, calf, or pigeon, it swallows them, and upon this depends the possibility of feeding them with trichina meat, of which we have spoken. It might happen, therefore, by accident, that without artificial feeding a plant animal might eat trichina meat. Still, for the consolation of the reader, it may be said that such cases have not been observed.

"There is another way imaginable than the eating of meat by which an infection may occur. Leuckhart

has pointed out this possibility. If, for instance, in an animal the intestines of which contain pregnant trichinæ, and the contents, when expelled, of the intestine of which are eaten by a second, the latter may become infected. It is known that pigs will eat human excrement, and this infection may occur without the eating of meat. Although this kind of infection has not yet been proved, it is very likely that it may occur in pigs; and it can not be denied that there is a possibility of other animals also being affected in this way.

"It is not certain that the trichinæ found in moles, flesh-eating birds, or even cats, are identical with those found in human beings. If we leave out of consideration that in large cities cat's meat is sometimes eaten, the trichinæ found in the former animals are of no interest in our investigation, except that pigs might be infested from them. For this we have as yet no certain data, and it might be a subject of further investigation only for the purpose of ascertaining where the moles get their trichinæ from.

"*I consider it as established that it is only the unclean or carnivorous animals that are dangerous to man, and the most dangerous among these is the pig.* It is not yet known whether the wild boar is liable to infection. *The plant-eating animal can be considered clean* and not dangerous.

"*The main care of municipalities and individuals should be directed to the pigs.* The following points of view are to be considered here:

"1. *The infection of pigs by trichinæ has to be guarded against.* I mention here that an originating of trichinæ in pigs does not occur. Trichinæ are procreated like men, from father and mother. They multiply by legitimate progeny, and their being found in an animal presupposes *infestation* from without—*i. e.*, by means of *food.*

"In all cases of prevention it is necessary to examine the food of the pigs, and to allow them no opportunity to devour refuse animal matters, as such matters are mostly trichina-infested meat, and excrements of individuals infested by trichinæ, particularly human excrements. Feeding of the pigs in sties scrupulously clean (which is really the interest of the owner) would give the greatest security, although of course infections by chance might not be precluded.

"Whether fattening on acorns in forests precludes infestation is not certain; experiences are wanting, and the fact that wild animals have had trichinæ leaves presumed security questionable.

"Careful farmers and raisers of animals will see the importance of the above suggestions. Most of the epidemics of trichina disease have occurred in

districts of Saxony, where it is the rule to feed pigs in sties. We can only recommend the most scrupulous cleanliness.

"2. *All meat ought to be carefully examined.* We said before there is no certain sign of trichina disease in pigs. Nothing will suffice but a careful investigation of the meat.

"Only in a few of those in which the trichinæ is encapsuled and encrusted in lime is the investigation with the naked eye sufficient to detect their presence; most cases require *microscopic examination.*

"For this purpose, though the best instruments are preferable, they are not strictly necessary. Microscopes of medium magnifying power are sufficient; still I call attention to the fact that poor microscopes which pretend a large magnifying are less reliable than good instruments of much less power. I recommend to prepare the meat as already mentioned, and examine it with a low power; if any suspicious point be observed, it should be marked, and a higher power used to resolve it into its particulars.

"Instruments which by their construction for the purpose of demonstration give a diffused light, do not give so sharp a view of the contour of a soft object as is desirable to the unpracticed observer.

"The question arises, *Who* shall investigate the meat?

"I reply: In cities an investigation of the meat should devolve upon the city authorities, and be done by selected physicians, veterinary surgeons, or others acquainted with natural science.

"The most simple way in large cities is to have public slaughtering-houses. Much may be said in recommendation of these, irrespective of trichina meat, and they have been constructed in different places in Germany. By the employment of these houses a source of great uncleanliness in gutters, yards, and houses could be stopped. If a city has these, nothing is easier than to have a microscope there, and allow no pork to leave it for sale until, after proper examination of the meat, testimonials had been given of its wholesomeness. The chief investigator should examine a part of several muscles of each animal, which can be done in ten minutes, and then give his testimonial of the case.

"In small cities, where no slaughtering-houses exist, the appointed examiner should have an opportunity to investigate the meat, and I do not doubt that this is everywhere possible. Even now the butchers at different places—Stedtein, Nordhausen—have made contracts with certain physicians, who on their part investigate the meat and attest to its purity. But this is not sufficient; for it should be undertaken not merely in the private interest of the

butcher, but the public health and welfare is concerned; and for this the state should be, under the circumstances, responsible.

"Besides cities, there are villages, country towns, hospitals, and other institutions, ships, etc., and nothing is easier than to find a suitable person, as a teacher or physician, a clergyman or the master of a ship, to become acquainted with the means of conducting such an investigation. On larger estates it is to be expected that the proprietor or his steward will have sufficient interest to convince himself of the purity of the meat his workmen and families consume; and neither the labor or the price of the means of doing it can be deemed a ground of objection in comparison with life and health.

"Once more I point out that it is futile to say that the cases of disease are too infrequent to justify such expenditure of means to prevent it throughout the land, and indeed the world. What a single person will do for himself is his own affair; but the community is under obligation to prevent dangers which the single individual otherwise may in cases incur; and to assist those who may undesignedly be the means of endangering others, or where it is necessary to control them, that they may be under special requisition to exercise their trade without injury to others. If a butcher of a cow is the cause, even unwittingly,

of hundreds of persons falling sick, and some dying, he can not complain if he is controlled in the same way as a manufacturer who deals in dangerous chemicals.

"The worst is of the small country farmers who neither possess a microscope nor are in the neighborhood of any person who is qualified to make the examination; but certainly the time will arrive when every teacher will possess a microscope. Till then the small proprietors can only be guarded against infection by being very careful about the preparation of their food. This point we will further dilate upon.

"3. *The pork should be cooked very carefully.* In some places pork is eaten raw, scraped. I do not mean merely butchers and cooks, nor merely the use of scraped meat advised by physicians, since they prescribe not raw pork, but beef; but in some places it is a common habit to eat raw pork. In Burg a great many cases of disease and death were occasioned by people eating raw scraped meat on bread for breakfast; cases which are very striking, since sometimes in the same family single members who had eaten of the same meat cooked or fried which others that fell sick had eaten.

"We must therefore recommend *never to eat pork raw;* for even a microscopic investigation will never give an absolute guarantee, since single trichina may

have been overlooked. And if even a few enter the body without fatal results it is still better to avoid all danger. Whoever wants to eat *raw* meat as a regimen or preference should eat beef or mutton.

"But even the cooking of it does not afford any security unless it is done carefully. In boiling, roasting, frying, or smoking, more or less of the meat may remain nearly raw, and therefore be dangerous. The greatest danger is from ham; especially since it is cured so rapidly. In this case the ham is either not at all smoked, or that for only so short a time that the greatest part of it remains fresh. Sometimes it is merely brushed over with creosote, wood-acid, or some other, which gives it the smoky taste, and is then offered for sale. If it contained trichinæ they remain after this preparation of the meat entirely alive.

"Formerly it was otherwise; then the pigs were killed in the fall; the hams were hung in the chimney or smoke-house, and remained there, to be eaten several months later. Under this treatment the trichinæ are dead and harmless; but then the ham is dry and hard, and is not so savory. Our forefathers did not think this an evil. They knew that a person eats less of this ham, because one is satisfied with less of it. They had the same opinions as the people

of Norway, who do not smoke their meat, but let it dry for six months or a year.

"Such old-fashioned ham is not to be found in trade now-a-days. Even in Westphalia the new method is in use. The requirements of trade do not leave any on hand.

"Whoever cures the ham which he will consume may allow it to remain as long as he pleases, to preclude all danger; and therefore in the country and in small cities, where families cure the hams they consume, less danger is to be apprehended; but those who buy hams have only two possibilities for security. They must have the ham investigated by a microscope; for this it is sufficient to cut out from different places small pieces and have them examined, or they must use only well-boiled ham. In the southern part of Germany only cooked ham is consumed, which explains why until now but few cases of trichina disease have been known. Still they are not wholly wanting. I have several times found at Wurtzburg numerous encapsuled trichinæ in human bodies, and in Tubingen and Heidelberg single cases have been repeatedly observed.

"Next in danger to ham is pork sausage, specially ham sausage; liver and blood sausage should be excepted, if they are carefully prepared. But sometimes fine meat is mixed with the liver and blood,

and experience has shown that such sausages have caused severe disease (Dresden, Calbe, Burg). In Hettstadt it was the so-called head-cheese in which numerous trichinæ were found. In the preparation of sausage a change similar to that in the preparation of hams has lately taken place. Formerly the sausage was boiled more to make sausage soup. The long sausage ("bratwurst") was longer fried, and the smoked sausage was longer smoked, and longer kept. But now-a-days, especially in cities where everything is ready-made for sale, everything has to be made very fast; and sausage has to be fresher or rawer, and more savory, for such is the taste of the consumer. Accordingly it is easily understood that since the preparation of sausage has ceased to be a domestic work, and come into the hands of tradesmen, the danger has increased; and this fact may explain what seems so astonishing to the public; viz., that the trichina disease is so frequent now, if we admit that it *is* now more frequent than formerly.

"But such danger was unexpected. According to an account of Dr. Rupprecht, in Hettstadt sausage was prepared as follows: The pork and its rind were boiled from one and a half to two hours in a kettle, and was then minced and filled; the sausage was then boiled from one half to three quarters of an hour. A portion of this sausage, fried in a pan until

the fat drained off, was eaten by a family of five persons. All of these persons soon fell sick, and one, a young boy, died. It was ascertained that no more of the diseased pig had been eaten by them.

"It is easy to understand that after this and similar experience the population of Hettstadt were panic-stricken, and the municipality, as well as the administration in Merseburg, announced publicly that even boiling of the pork afforded no security.

"I will return to this point presently, but meantime remark that Dr. W. Muller ascertained on inquiry that in making the sausage of the boiled meat and rind, *raw* minced meat was added; and the sausage was afterward scalded, but not really boiled. These facts suffice to show the insecurity of eating sausage, especially pork, of which it is not known to the consumer how it was prepared. And the question arises whether the so-called sausage-poison, as in the case of ham-poison, can not be explained by the presence of trichinæ.

"In Swabia many cases of poisoning by sausage have been recorded, wherein chemical analysis failed to detect any poison. But I revert to the boiling and roasting. It is certain that a trichina exposed to the boiling point, 80° Reamur, invariably dies. This is even the case in a temperature which will coagulate the white of an egg—50° to 60° Reamur.

But it is equally certain that frequently the former temperature is not reached in boiling and roasting, or if reached, not the whole of the meat is exposed to it. This is certainly the case when large pieces are boiled or roasted; and we even see in cut slices that some is half or wholly raw. The blood and albumen have not coagulated as in the case of boiling heat. The parts are yet soft, fresh, and red. The same is the case of chops. There can be no doubt that the trichinæ in the inner part of the meat have not been reached by a killing temperature; and by *such* broiling, roasting, or frying the danger is not prevented.

"About these relations (of heat to animal life) direct experiments have been made. Kuchenmeister found that large pieces of meat which had been put in a kettle after a boiling of half an hour attained a temperature of 48° Reamur. Inside it had only 44°. After boiling longer than half an hour, the meat had a temperature of 62° to 64° outwardly; and after being cut up and put to boil they attained inside, after one hour's boiling, a temperature of from 59° to 60°; fried sausage and chops reached a temperature of 50°; Frankfort sausage, 51°; roast pork, which was inside bloody, had 52° Reamur. These numbers are not fixed for all cases, and it will often happen that the temperature of the meat and sausage remains several degrees under these stated numbers.

"Fiedler found that trichinæ can bear a temperature of from 30° to 40° Reamur, and that even in that of 50° to 52° Reamur they do not die immediately, although they may not live long afterward.

"From this record it is evident that the common boiling or frying of sausages, as well as the preparation of chops and rare-roasted pork, scarcely reaches the temperature which will kill the trichinæ. I conclude with the results of trials which Kuchenmeister, in conjunction with Huebner and Liesering, made.

"1. The trichinæ are killed by longer immersion in brine of the meat, and by twenty-four hours' hot smoking of sausages.

"2. They are not killed by three days' cold smoking, and it seems the boiling of meat for making sausages does not certainly kill them.

"3. A long-keeping of cold smoked sausages seems to destroy the life of the trichina.

"Let every one now reflect how the foregoing facts shall influence him. My task was not so much to cause fear and to agitate the community more than it already is, but rather to show the means of shielding themselves from unquestionable danger."

The foregoing may be very properly and profitably added to the remarks of Professor Dalton, of New York, as it strengthens and corroborates the views and observations of Virchow already so extensively

quoted. Surely no one will hesitate to accept the testimony furnished by the observations of men of so much wisdom and experience, and whose fame extends to all countries where science is cultivated.

Professor Dalton's views on the subject of prevention are as follows:

"There still remains one question of a very important nature—How great is the liability of the community at the present time to be infected, and what measures can be taken to prevent it?

"The pig seems to be the animal naturally the most liable to trichinosis. He is certainly more liable to this disease than any other animal used for food, neither the sheep nor the ox being subject to it. It has been found in this country, by investigations in Chicago in 1866, that of all the pigs brought to market in that city one in fifty is infected with trichinæ. This shows that we are all in danger of becoming infected by the use of pork, unless measures be taken in preparing the meat to destroy the vitality of the worms. Smoking and salting will not do this effectually. Only thorough cooking is to be relied on as a safeguard. It is remarkable that most if not all of the cases of trichinosis in this country thus far have occurred among the Germans. This is because they have the habit, not otherwise common here, of eating ham, sausages, and even sometimes

fresh pork, nearly or quite in the uncooked state. To kill the worms the ham must not only be salted and smoked, but cooked, and cooked thoroughly. Now if you bear in mind that one pig in fifty is infected with trichinæ, you will perhaps think many times before putting between your lips a piece of pork or ham or sausage in the raw state; you will be certain that it is cooked; and not only that, but thoroughly cooked. One of the worst cases of trichinosis that has come under my observation was caused by eating pork-chops which were rare or slightly underdone. Now these chops were probably well enough cooked on the outside; but on the inside they were red and juicy, and the danger was precisely the same as if the patient had taken the meat entirely raw. In order to destroy the vitality of the trichina, the meat should be subjected to a temperature of 212° F. Now if you boil a ham for half an hour, or even an hour, you do necessarily subject all parts of it to this temperature. In the central parts of the ham the temperature will not rise to that point unless the boiling has been long continued. I speak of this particularly, as it is a very important matter. A temperature of less than 170° F. does not destroy the trichinæ. As shown by direct experiment, therefore, a piece of trichinous meat, any part of which has not been raised to or

above this point, is just as dangerous as if it were taken in the raw state.

"These are the chief points of importance in regard to the trichinæ and trichinosis. The disease is fatal enough, frequent enough, and revolting enough to induce us to take all possible measures to prevent it, and I do not think anything is sufficient for this but a personal examination of every piece of pork, ham, bacon, or sausage used as food, to see that every part of it has been subjected to a thorough cooking process.

"There are other points of considerable interest with regard to the rapidity with which the human subject may be infected, the great number of persons who may become infected by eating the product of a single slaughtered animal, and the degree of fatality attending the disease. Enough, however, is known to convince us that the affection is a very frequent one, and liable to be exceedingly fatal, or if not fatal, to produce prolonged and exhausting disease.

"Much would be effected if all pork offered for sale in the market could be subjected to inspection; and this has been done in some parts of Germany. Pork being liable to infection not only with trichinæ, but also with cysticercus, producing tape-worm in the human subject, such inspection would undoubtedly prove very useful. Still it would not afford

complete protection unless carried out with an amount of detail which would in all probability prove practically unattainable. The only absolute protection therefore must be that exercised by the individual himself. He must see that he never uses for food any kind or preparation of pork in any form not so thoroughly cooked as to destroy every possible vestige of parasitic life.

There can be but little doubt that persons have been infested by these parasites, and have sickened and died, and the cause of death wholly unrecognized. The symptoms attending infestation by trichinæ are in many respects similar to those of rheumatism, typhoid fever, and other diseases, and can easily be mistaken for one or the other of these ailments. No one can contemplate without a shudder the terrible suffering of a person infested by millions of these little animals boring away at his very vitals. How important, in view of all that has been said on this exceedingly important subject, that every hog-raiser in particular should use every precaution to prevent the spread of trichinæ. Much may be done to prevent their spread. A recapitulation of the means best calculated to accomplish this will close this chapter.

1. Let every animal substance be burned or destroyed, so that hogs may not be able to get it to

eat; such as fowls, moles, cats, rabbits, and in particular other hogs that have died either by accident or disease.

2. Do not allow hogs to eat the excrements of other hogs or those of the human being, for in this way they may become infested.

3. In regard to flesh eaten by man none is perhaps to be feared except the flesh of the hog. Still carefulness in regard to eating the flesh of any animal raw should be observed.

4. *The only safety, by the general agreement of all observers, is to thoroughly cook the flesh, whether it be fresh or salted.* This applies particularly to hog meat.

5. The trichina is exceedingly hard to kill, and no degree of heat short *of* 170° *F. will be certain to destroy them, and this will not do it unless it is kept up till the meat is cooked through and through,* as the muscular trichinæ may be lodged deep down in the muscles.

6. Salting and smoking of the meat can not be relied upon to destroy them; hence raw ham, however well salted and smoked, should never be eaten under any circumstances.

7. Sausages should be very carefully and thoroughly cooked, as many of the cases of disease have been traced to eating this article. Not the

smallest particle should be allowed to enter the mouth while the sausage is being made, for a very small particle, even so small as not to attract attention, may contain a great number of trichinæ.

8. It is believed that one pig out of every fifty is infested; therefore there is constant danger of becoming trichinosed, as one trichinosed pig is sufficient to infest a whole neighborhood of both animals and men.

9. As has been shown, the lungs of both diseased and apparently healthy hogs are frequently found to contain trichinæ. They should never be allowed to be eaten either by animals or human beings, but should be destroyed or buried where they can not be gotten by dogs or hogs.

10. Whenever there is the slightest suspicion that a piece of meat is infested, it should, if possible, be examined with the microscope.

The foregoing synopsis is believed to contain the essential matters to be observed. It is hoped that the discussion of this important subject may result in a more correct understanding of what the trichina really is, and thus lead to more carefulness on the part of the raiser and consumer of the hog.

The author can not conclude this chapter without an expression of his thanks to Dr. J. D. Jackson, of Kentucky, Prof. John C. Dalton, of New York, and

more particularly to Prof. Virchow, of Berlin, Prussia, and to the able translator of Virchow's "Life of the Trichina," Rufus King Brown, M. D., of New York, from whose translation extensive quotations have been made.

CHAPTER XVI.

MEDICINES.

The indiscriminate use of medicines in the treatment of the diseases of our domesticated animals is greatly to be deplored.

The most absurd mixtures and compounds are given the poor animals, some of which contain not only poisonous articles, but also medicines which are wholly incompatible. This is particularly true in regard to some of the compounds sold as specifics for hog cholera, concocted by persons wholly unacquainted with the properties of the medicines which they prescribe. The venders of these specifics will gravely affirm that these compounds contain articles hitherto unknown, and that they have never been known to fail to cure hog cholera—it matters not how bad the case. It is to be deplored that hog-raisers are but too willing to be duped by these sharpers. Men wise enough in regard to other matters suffer themselves to be overreached in this. Thousands of hogs are killed annually by these villainous compounds. The writer knows whereof he affirms,

having repeatedly seen and tested many of these vaunted cures. These medicine-venders do much harm, and particularly by preventing the farmers from looking into the cause of the malady, and by determining this to remove it. They too readily give heed to the exaggerated accounts of cures by these quacks. So they content themselves with buying the medicine, and depending upon it, for it is easier to do that than give themselves the trouble to examine and determine the cause of the disease; thus they lose their money and their hogs also. Let the farmer reflect that no one medicine or specific can be depended upon to cure hog cholera, and the sooner this is learned the better. It ought to strike every thinking man that no single remedy can be applicable to the treatment of even the same disease in all its stages, and in all conditions of the animal.

The treatment must of necessity be varied to suit the conditions of the animal, and the stage of the disease in which he is found to be laboring. Since in the disease called hog cholera we have some cases in which diarrhea is a prominent symptom, and others in which exactly the opposite conditions obtain, it is folly to suppose that the same remedy will suit both conditions. In some cases we have a high grade of inflammation, in which case we must use such medicine as will combat that state of things. In other

cases there is great debility—loss of power. In such cases tonics and food of a nourishing and even stimulating kind are called for. Let the farmer exercise a little common sense in this matter, and all will be well.

The object of this chapter is to give in a condensed and convenient form the most reliable remedies, accompanied with a short account of the action of each article and recipe.

It is intended to make this chapter very practical and plain. Only such medicines as are easily obtained, and at the same time cheap, and easily administered, will be given. As hog cholera has received by far the most attention, and as the author believes deservedly so, he proposes to begin with the remedies most relied upon for the cure of that disease first, but begs again to remind the reader that his chief reliance for doing away with that terrible disease depends mainly upon the proper management of the hog rather than upon any medicines that may be given, let them be ever so good. But much may be done to relieve the sick animals, and even to cure them. The following remedies have been tested, and are the best that have yet been suggested.

Let us now enumerate the remedies which have proven most successful in the treatment of hog cholera, which is considered of chief importance.

The reader should examine carefully the chapter on the treatment of the disease, particularly respecting the measures there recommended as preventive means, for they are of the greatest importance. In addition to the means already recommended, the state of the bowels, kidneys, skin, and the cough should be carefully noted before any medicine is given.

1. For common diarrhea the following will generally be sufficient:

Pulverized charcoal	½ pound.
Carbonate of soda	½ pound.

Dose table-spoonful, given three times a day, in milk or bran-mash.

2. In unusually severe cases of diarrhea give the following:

Creosote	½ ounce.
Laudanum	4 ounces.
Bicarbonate of soda	½ pound.
Flaxseed-tea	1 gallon.

Mix, and give a table-spoonful three or four times a day.

3. The following recipe is copied from Youatt, and is one of the best for simple diarrhea; viz.:

Prepared chalk	1 ounce.
Powdered catechu	½ ounce.
Powdered ginger	2 drachms.
Powdered opium	½ drachm.

Mix and dissolve in half a pint of peppermint-water. Dose, from one to two table-spoonfuls; should be given twice a day, and strict attention paid to diet.

4. When the bowels are slightly costive, and a simple purgative is desired, use the following:

Epsom salts	½ pound.
Nitrate of potash	2 ounces.
Flaxseed-tea	1 gallon.

Mix in slop, and give freely until the bowels are relieved.

5. When the bowels are very costive, and especially when the dung passes in hard lumps, from half a pint to a pint and a half of strong soap-suds, milk warm, should be thrown into the bowels by injection; this will dissolve the hardened matter and relieve the gut. And give the following purgative twice a day until relieved: Castor-oil, from one to two ounces.

6. If there is cough or difficult breathing, give the following: Muriate of ammonia or nitrate of potash, in table-spoonful doses. Give three or four times a day.

7. For inflammation of the kidneys or bladder, which may be known by the small quantity and high color of the urine, give the following:

Nitrate of potash	½ pound.
Flaxseed-tea	3 gallons.

Give freely in milk or slop.

8. For inflammation of the bowels and lining membrane of the belly (peritonitis) give the following purgative:

Castor-oil	1 ounce.
Spirits of turpentine . . .	½ ounce.

Give in milk twice a day.

9. For worms in the kidneys give the following: Copperas in tea-spoonful doses, twice a day, in slop or meal; or spirits of turpentine, in tea-spoonful doses, twice a day, in milk.

10. For worms in the bowels give the following: Spirits of turpentine. Dose, a tea-spoonful. Give three times a day, in milk.

Or calomel. Dose, from forty to sixty grains. Give at night, in corn-meal; and in the morning give a brisk purge of castor-oil or Epsom salts. Repeat as often as necessary.

Or worm-seed. This medicine is familiar to almost every one, and is one of the best; it may be given in decoction or in the form of oil. The decoction may be made as follows: Worm-seed (bruised), one pound; water, two gallons. Boil down to one gallon, in a covered vessel; mix the decoction with four gallons of milk. Sufficient for twelve hogs.

Or common salt, 1 part; ashes of hickory-wood, 2 parts. Let this be kept constantly by the herd, so that they may take of it at pleasure.

11. For tape-worm give the following:

Pumpkin-seed	2 pounds.
Hot water	1 gallon.

Rub in a mortar until a creamy or rather consistent mixture is formed. This should be given freely; can not well give too much. It has much reputation in the destruction of the tape-worm.

12. For quinsy, muriate of ammonia, a table-spoonful every four or five hours. Blue-stone (sulphate of copper) is said to be good given in small tea-spoonful doses.

13. For the destruction of lice use the following: Mercurial ointment or sulphur ointment. Either of these well rubbed on the surface once or twice will suffice.

14. For mange: Mercurial ointment, 4 drachms; sulphur, 4 ounces. Make into an ointment and rub on.

A simple means, which has proven to be an excellent preventive to any kind of bowel disease, and especially when cholera is prevalent, is the following:

Provide a tub or barrel which will contain say forty gallons; into this let the suds of the wash-room and the kitchen slops be poured, and to this add: Wood-ashes, ½ gallon, or soda, 1 pint; soft-soap, ½ gallon; copperas, ½ pound; common salt, 1½ pints; pulverized charcoal, 3 pounds. Wheat-bran or corn-meal a sufficient quantity to make a tolerably consistent slop.

This may be given three times a week. At first it may not be relished, but the hogs will soon become fond of it, and even eat it greedily. This will, with other proper attention to cleanliness, protection from

cold, dust, etc., generally be sufficient to keep the herd healthy; by it the digestion is improved, worms in the stomach and bowels will be destroyed, and the skin kept in good order.

Among the medicines that have been used by the farmers for cholera, and vaunted as certain cures, are the following: Arsenic, catechu, calomel, coal-oil, madder, indigo, logwood, sulphur, turpentine, nitrate of potash, soda, potash, etc.

Calomel and worm-seed, combined with some simple ingredients to prevent detection, and put up in liquid form, has been extensively sold in some localities at ten dollars per gallon. A composition of arsenic, blue-stone (sulphate of copper), and powdered poke-root has been extensively advertised and sold at five dollars a pound. This last compound is a very dangerous one, and has no doubt killed its hundreds.

This one is better, and less dangerous: Black sulphuret of antimony, sulphur, and soda or potash. This medicine has been sold at the moderate (?) price of two to three dollars per pound. The following recipe has been extensively sold at from five to twenty-five dollars: Calomel, worm-seed, black antimony, and sulphur. These ingredients to be mixed together, and given in the food.

The prices asked and obtained for the above recipes are simply outrageous; all the medicines of

which they are composed are very cheap, ranging from three cents to twenty-five cents a pound, and thus the farmer is imposed upon without getting the benefits he had a right to expect from the representations made by the venders of them.

A LIST OF MEDICINES.

ALOES.—This is a purgative, and for this purpose alone is it used for animals. Dose from twenty to forty grains.

ARSENIC.—Given for skin diseases and worms. Should be given with great caution. Dose from five to ten grains.

ALUM.—An astringent, not often used for diseases of the hog. Dose, five to ten grains.

ANTIMONY.—Only one of the preparations of this medicine is used for the hog—the black sulphuret. It acts on the skin and allays fever. Dose from one to two drachms.

CALOMEL.—Acts on the liver, and in large doses is a purgative. Dose from twenty to sixty grains.

CATECHU.—An astringent, used for diarrhea. Dose from ten to forty grains.

CHARCOAL.—Used as a disinfectant, and for diarrhea, etc.

CHALK, PREPARED.—Sour stomach and diarrhea.

GINGER.—A stimulant, used for colic, diarrhea, etc. Dose, a tea-spoonful.

INDIGO.—For worms. Tonic.

IRON SULPHATE.—Tonic. Dose from five to ten grains.

JALAP.—A purgative. Dose ten to forty grains.

LOGWOOD.—An astringent, used occasionally for dysentery and diarrhea. Dose ten to twenty grains.

MADDER.—Action not certainly known. Dose ten to forty grains.

MERCURIAL OINTMENT.—Used as an external application to destroy lice, and for diseases of the skin.

MURIATE AMMONIA.—An excellent medicine. Acts on the

glands, on the kidneys, and on the skin, and is one of our best remedies for coughs.

Oil, Castor.—An excellent purgative. Dose from one to two ounces.

Oil, Worm-seed.—A destroyer of worms. Dose, half a table-spoonful.

Oil, Sweet.—Used in making ointments.

Opium.—Used to allay pain and check diarrhea. Dose, one to three grains.

Potash, Nitrate.—Acts on the skin and kidneys, and allays pain. A most excellent remedy.

Potash, Sulphate or Acetate.—Acts on the skin and kidneys.

Salts, Epsom.—An excellent cooling purgative. Dose from half an ounce to an ounce.

Soda, Bicarbonate.—For acidity of stomach and bowels. Dose from a tea-spoonful to half a table-spoonful.

Sulphur.—Acts on the skin, and used for the destruction of lice and other skin diseases.

Turpentine, Spirits or Oil.—Acts as a purgative, and also upon the kidneys; used for a variety of purposes.

Worm-seed.—Well known as a destroyer of worms. May be given in powder or decoction.

The above list comprises nearly all the medicines used in the diseases of the hog, and it is not thought profitable to extend it. Other remedies may be found in the body of the work.

Of all our domesticated animals the hog is perhaps the easiest to administer medicine to. He is an all-eating animal, and will readily eat almost anything in milk or good slops. It is usually best to have all of the food well cooked that is eaten while taking the medicine, and for some days afterward, as it is

much easier digested; and in this way it greatly aids the action of the medicine.

It is poor economy to neglect sick hogs until they refuse to eat; but when this is the case, if they are at all familiar with the slop trough, they will often drink sour buttermilk when everything else is refused, and in this way medicine may be given. But when the hog refuses to eat and a drench is resorted to, instead of setting the hog on end or turning him on his back, and a stick put into his mouth, and then pouring the medicine down him, sometimes into his stomach and sometimes into his windpipe, and in this way strangling the hog instantly, which is often done, take a cord of sufficient strength, loop it around the upper jaw above the tusk, see that the tongue is not fast in the cord, draw the cord over a pole placed overhead for the purpose, and elevate the head so that the medicine will not run out of the hog's mouth, but not high enough to lift his fore feet off the ground. When you have got him thus confined, and after he has quit struggling, give the medicine. But be careful not to put more in his mouth at a time than he can swallow. The animal can not swallow with any certainty when he is in the act of squealing or with his mouth propped open.

GLOSSARY.

There are many words which are not generally understood, and which it was found necessary to use, and particularly is this true of the reports of physicians, and the quotations which it was necessary to make from the writings of others. In order that the reader might have at hand a short explanation of these words and phrases, which he may have trouble in readily understanding, the author has given this short dictionary for the convenience of his readers.

ABDOMEN—The belly.
ABDOMINAL—Pertaining to the abdomen.
ABORTION—Miscarriage, or throwing off prematurely.
ABSCESS—A swelling or cavity containing pus or matter.
ABSORB—To drink in, to suck up, as a sponge.
ABSORBENTS—Vessels which absorb or take up.
ACARUS SCABII—An insect not visible to the naked eye; itch insect.
ACID—Sour.
ACID, ACETIC—An acid composed of carbon, hydrogen, and oxygen.
ACID, HYDROCHLORIC—Is muriatic acid and a compound of chlorine and hydrogen gas.
ACUTE—A disease which, with a certain degree of severity, has a rapid progress and short duration is said to be "acute."
ADIPOSE—That which relates to fat.
ADHERE—To stick to, or adhere.
ADHERENT—Sticking to, or adhering to.
ADVENTITIOUS—Accidental.
AERATION—To expose to the air, as the blood in the lungs.
AIR-CELLS—Small cavities or cells containing air.
ALBUMEN—A substance which enters into the composition of all animals and vegetables, and is the chief part of the white of eggs.
ALIMENT—Food, nourishment.
ALIMENTARY CANAL—The alimentary tube, or bowels.
ALKALI—Opposite of an acid; potash, ammonia, and soda are alkalis.
ANATOMY—A description of the body.
ANATOMIST—One versed in anatomy.
ANALOGOUS—Having some resemblance.
ANTERIOR—Before, or in front.

ANUS—The opening at the lower end of the large gut, through which the excrements pass out of the bowels.

AORTA—The great artery which proceeds from the left side of the heart through which the pure blood goes out to every part of the body.

ARTERIAL—Pertaining to the arteries.

ASCARIDES—A small intestinal worm which infests particularly the lower bowel.

ASTRINGENT—Having the power to draw up or contract the flesh.

ATTACHMENTS—That by which one thing is attached to another.

ATROPHY—Wasting or shrinking.

AURICLES—The upper cavities of the heart.

AVIDITY—Greediness, strong appetite.

BACCHUS—The god of wine.

BILE—A yellow, greenish, viscid, bitter fluid secreted by the liver.

BILE-DUCTS—Tubes which convey the bile from the liver to the bowels.

BREEDING, IN AND IN—Male and female near of kin breeding together.

BOWELS—The intestines.

BRONCHIA—The subdivisions of the windpipe in the lungs.

BRONCHIAL—Pertaining to the bronchia.

BRONCHIAL TUBES—Tubes through which the air is carried to the lungs.

BRONCHIAL ARTERIES—Arteries of the bronchia.

BRONCHIAL GLANDS—Small bodies in and around the bronchial tubes.

BRONCHIAL MEMBRANE—Mucous membrane lining the bronchial tubes.

BRONCHITIS—Inflammation of the mucous membrane of bronchial tubes.

CADAVEROUS—Having the appearance of a dead body.

CALIBER—The diameter of a body or tube.

CANTHUS—The corner or angle of the eye.

CAPILLARY—Small, hair-like blood-vessels, between arteries and veins.

CAPSULE—Inclosed as in a box or sac.

CORDIA—The heart, upper orifice of the stomach.

CARNIVOROUS—Flesh-eating; animals that eat flesh.

CARTILAGE—Gristle, a smooth substance softer than bone, and covering the ends of the bones.

CAVITY—A hollow or open space.

CELLULAR—Consisting of cells.

CELLULAR TISSUE—The connecting substance between the skin and the muscles, and between the muscles.

CERES—A heathen goddess.

CHEST—The body from the neck to the diaphragm.

CHRONIC—Disease of long standing, following the acute stage.

CHYME—A kind of grayish pulp formed by the food after it has been for some time in the stomach.

COAGULATE—To clot or thicken, or become like jelly.

Cocoon—An oblong case constructed by an insect to contain its larve.
Cohesion—The act of sticking together.
Collapsed—Fallen together, closed.
Colon—The large intestine or gut.
Cone—A round body tapering to a point, like a sugar-loaf.
Concavity—Hollowness; internal surface of a hollow, spherical body.
Conception—The act of conceiving or getting with young.
Constipation—Filling to hardness the intestines; defective excretion.
Contagion—Diseases which spread by inhalation or contact, as small-pox, measles, etc.
Contaminate—To corrupt, pollute, or poison.
Contiguous—Touching, meeting, or joining, etc.
Convex—Rising on the outer surface, as a cylinder or round body.
Convulsion—Violent contractions of the muscles; spasm.
Corrugate—To wrinkle.
Covert—A thicket or hiding-place.
Cranium—The skull.
Curved—Bending, irregular.
Cuticle—The outer skin.
Cycle—A round of years or period of time.
Cylindrical—Having the form of a cylinder.
Cyst—A bag or tunic.
Debility—Weakness, feebleness.
Defluxion—A discharge of any kind.
Deteriorated—Impaired, made worse.
Diaphragm—A muscle separating the chest from the belly.
Digestion—To dissolve the food in the stomach.
Disinfectant—An agent for removing infection.
Disk—Any body inclining to an oval figure.
Domesticate—To tame or make gentle.
Drastic—Acting with violence. Some medicines are called drastic purgatives.
Ducts—Tubes which convey fluids from one part of the body to another.
Duodenum—The first section of the intestines.
Echenorhinic—A worm found in the liver and spleen.
Elongated—Lengthened.
Emaciation—Lean or thin in flesh.
Emanate—To issue from.
Emolient—To soften; to relax parts that are inflamed or too tense.
Encapsulated—Inclosed in a sac or cyst.
Endocardium—The inside of the heart.
Enemas—Injections.
Engender—To beget, to cause to exist.

Engorgement—The state of being full, congested.
Epicure—One who indulges in the luxuries of the table.
Epidemics—Diseases generally prevalent, but not dependent upon any local or known cause.
Epigenesis—A new formation.
Epiglotis—A cartilaginous substance, oval in form, which closes down upon the glotis while swallowing.
Epiploon—The caul or omentum.
Epizootic—An epidemic amongst animals.
Eradicate—To destroy, put out of existence.
Eruption—The act of breaking out or bursting forth.
Excrement—Matter ejected or discharged from the body.
Excrementitious—Pertaining to the excrements.
Evacuate—To discharge or void from the bowels.
Fœcal—Consisting of the dregs, matter discharged from the bowels.
Farrow—To bring forth pigs.
Fasciculus—A bundle, as a bundle of muscular fibers.
Fæces—The excrements, the dregs of anything.
Fertility—Fruitfulness, the quality of producing in abundance.
Fibrin—A substance contained in the blood; it is white, and one of the solid constituents of the blood.
Fibrinous—Like fibrin.
Fibrous—Composed of fibers or thread-like substances.
Fibrous Membrane—Membrane composed of fibers.
Fissure—An opening or crevice.
Flaccid—Soft, weak, lax, yielding.
Flexible—To bend, to yield, elastic.
Florid—Red or scarlet-like.
Frescoes—Cool, shady, duskiness.
Fundament—Termination of the rectum, the anus.
Gangrene—To mortify.
Gangrenous—Mortification of the flesh.
Gastric—Belonging to the stomach.
Gastric Juice—A fluid produced by secretion in the mucous membrane of the stomach.
Generate—To beget, to propagate, to produce.
Genitals—The generative organs.
Genial—Native, natural, agreeable.
Gestation—The act of carrying the young in the womb from conception to delivery; pregnancy.
Gland—A soft body or lump which secretes fluid.
Glandular—Like a gland.
Globule—Small, round bodies.

GRANULATE—To form into small, grain-like particles.
GREGARIOUS—Living in flocks or herds; cattle, sheep, and hogs are gregarious animals.
HEAVES—To pant, to breathe laboriously; throbbing of the sides.
HEMORRHAGE—Bleeding from a cut or injury, or from any of the organs of the body.
HEPATIZE—Consolidate, liver-like.
HERBIVOROUS—Animals that live on herbs are herbivorous animals.
HERD—A collection of animals when feeding or driven together.
HEREDITARY—Inherited from parents; some diseases are hereditary
HETEROGENEOUS—Mixed.
HUE—Color.
HYGIENE—Healthy, the act of preserving health.
IGNORE—To appear to be ignorant.
IMPERATIVE—Commanding, positive.
INCISION—Cut; a division of soft part with a knife.
INCISOR—A front tooth, cutter.
INDENTED—Depressed, cut into points like teeth.
INJECTION—Liquids thrown into the body by a syringe.
INFECTION—To poison by contact.
INFILTRATE—To penetrate the body through the pores, or directly through the tissues.
INOCULATION—To ingraft; any operation by which small-pox, for example, may be artificially communicated.
INSIDIOUS—Deceitful, sly.
INSTINCT—The law that teaches all animals the art of self-protection and preservation.
INTESTINES—The bowels.
INTESTINAL CANAL—The canal through the bowels.
IRE—Anger, passion.
IRRITATE—To excite, to inflame, redness.
JEJUNUM—The second section of the small bowels.
JUNGLES—Undergrowth, high grass.
LACTEAL—A tube for carrying the chyle.
LANGUOR—Dullness, inactivity.
LARYNX—Upper part of the windpipe, which contains the vocal chords.
LASSITUDE—Weakness, dullness.
LEPROSY—A disease of the skin.
LIGAMENTS—Anything that ties or binds one thing to another. The ligaments bind the joints together.
LOBE—A part or division of the lungs or liver.
LUBRICATE—To make smooth or slippery.
LUNGS—The organs of respiration; in common language, lights.

MALADY—Sickness or disease.
MASTICATE—To chew or grind up between the teeth.
MAW—The stomach, paunch.
MAXILLARY—Pertaining to the jaw, as the upper and lower maxillary bone.
MEDIASTINUM—The division between the lungs.
MEMBRANE—Thin, web-like sheet of tissue.
MENACE—To threaten, to deter.
MOLAR—Grinder, a double tooth.
MORBID—Unhealthy, diseased.
MORTALITY—Subject to death.
MORTIFICATION—The loss of vitality in any part of the body.
MUCUS—The secretion of the mucous surfaces, as the nose.
MUSCLE—The fleshy portion of the body.
MURKY—Dark, obscure, gloomy.
MYSTERY—Hidden, obscure.
NASAL—Pertaining to the nose.
NASAL CAVITY—The cavity of the nose.
NASAL CATARRH—A chronic affection of the nasal cavity.
NATURALIST—One versed in natural history.
NAUSEATE—To sicken, disgust.
NERVES—Organs of sensation and motion in animals.
NEUTRALIZE—In chemistry, to make inert.
NORMAL—Regular, healthy, natural.
NUTRIMENT—Food, nourishment.
NUTRITIOUS—Possessing the power of nourishing.
ŒSOPHAGUS—The gullet, the tube leading from mouth to stomach.
OLEAGINOUS—Having the quality of oil.
OLFACTORY—The nerve of smell.
OMENTUM—The membranous covering of the bowels.
OPAQUE—Dark, obscure.
OVARY—The ovaries are the organs where the ova or eggs are formed in oviporous animals.
OXIDE—A combination not acid of a simple body with oxygen.
OXIDATION—The act of combining with oxygen.
OXYGEN—A colorless gas in water and air.
PACHYDERMITA—Thick-skinned, an order of animals such as the elephant, rhinoceros, and the hog.
PAGEANT—Show, display.
PALLID—Pale, wan, deficient in color, not high-colored.
PALISADE—To surround, inclose, or fortify with sticks or posts.
PANCREAS—A gland situated in the abdomen, and lying across the backbone.

PAPELLA—An eminence similar to a nipple. They are found on the tongue, the skin, etc.
PARALYSIS—Loss of power, palsy.
PARCHMENT—Skin of a sheep or goat, dressed or prepared and made fit for writing on.
PARTURITION—The act of bringing forth or being delivered of young.
PERICARDIUM—The sac which incloses the heart.
PEREGRINATIONS—Traveling from one point to another
PERIOSTENUM—A membrane surrounding the bones of animals.
PERITONEUM—A thin, smooth membrane investing the whole of the intestinal surface and abdomen.
PERITONITIS—Inflammation of the peritoneum.
PHARYNX—The upper portion of the œsophagus.
PHYSIOLOGY—The science of life, or the functions of the organs of the body.
PLETHORIC—A superabundance of blood in the system.
PLEURA—The membrane which invests or incloses the lungs.
PLEURISY—Inflammation of the pleura.
PLEURO-PNEUMONIA—Inflammation of both the pleura and lungs.
PREMONITORY—Giving previous warning or notice.
PRIMITIVE—Pertaining to the beginning or origin.
PROLIFIC—Producing young or fruit.
PROPAGATE—To multiply by successive generations.
PROTRUDE—To thrust out.
PROXIMITY—Being near, next, or nearest.
PULP—A soft mass or substance.
PULSE—The beating of the heart and arteries.
PUNCTURE—To pierce with a pointed instrument.
PUS—Matter secreted by wounds, ulcers in the process of healing.
PUSTULE—An elevation of the skin containing pus.
PURULENT—That which has the character of pus or consists of pus.
PUTRID—To rot or decay.
PYÆMIA—Poisoned condition of the blood by absorption of rotten pus.
PYLORIC ORIFICE—The orifice between the stomach and small bowel.
PYRAMIDAL—Having the form of a pyramid.
QUADRUPED—An animal having four feet.
RAMIFY—To shoot into branches, as the stem of a plant.
RECTUM—The last end of the large gut.
RESPIRATION—The act of breathing.
RETCHING—Straining, to vomit.
RHINOCEROS—A large animal of the pachydermita.
SALINE—Partaking of the quality of salt.
SALIVATE—To produce a flow of saliva or spittle.

Scavenger—One whose employment is to clean the streets.
Secretion—To separate; an organic function which is chiefly executed by the glands.
Scrotum—The bag which contains the testicles.
Serum—The transparent or watery part of the blood.
Sodden—To swell, to be inflated.
Solidify—To make solid or compact.
Spine—The backbone.
Spleen—The melt.
Stomach—The organ of digestion, the paunch.
Subcutaneous—Under the skin.
Sumptuary Laws—To restrain or limit.
Suppuration—Producing matter or pus.
Tenacious—Adhesive, sticky.
Test-paper or Litmus-paper—Used for testing acidity.
Testicles—The seeds of the male, the generative organs.
Tissue—By this term in anatomy is meant the texture or organization of parts.
Tonic—Anything that increases the strength, either food or medicine.
Transmitted—Passed from one to another, or from parent to child.
Transparent—Admitting the passage of light.
Trichocephalus—Long, thread-like worm; generally inhabits the large bowel.
Tubercle—A tumor in the substance of organs; consumption.
Tumor—A swelling or morbid enlargement.
Tunic—An envelope.
Ulcer—A sore discharging matter.
Ureter—A tube conveying the urine from the kidneys to the bladder.
Urethra—The canal through which the urine passes from the bladder.
Uterus—The womb.
Vascular—Full of vessels.
Vender—One who sells.
Ventilate—To admit free circulation of air.
Vermiculate—Resembling a worm.
Villous—A hair membrane covered with soft papilla.
Virus—A contagious matter or poison.
Vital—The seat of life, that on which life depends.
Vitality—The act of living, animation.
Vitiate—To render defective, to destroy.
Voluminous—Large, consisting of a great volume.
Zoologist—One well versed in the natural history of animals.
Zoospenu—A very small animal found in certain plants, and in water.

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