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A REPORT ON TRICHINOSIS,

AS OBSERVED IN DEARBORN CO., IND., IN 1874.

BY GEORGE SUTTON, M. D., AURORA, IND.

Reprinted from the Transactions of the Indiana State Medical Society, 1875.

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The recent discovery that a minute parasite communicated to the human system, through one of our principle articles of food, is capable of producing the loathesome, obstinate and fatal disease now known as trichinosis; the minuteness of this parasite; their rapid development in numbers and rapid diffusion throughout the muscular system of a living body; the obstinancy of the disease which they produce, resisting at the present time all remedies suggested for its cure; the probability that the disease arising from this parasite is of great antiquity, causing the ancient Jew to prohibit the use of pork, without knowing that a parasite within this meat was the cause of disease; the probability also that this parasite is producing disease at the present time in our own country, even in our own state, to a much greater extent than is recognized by physicians, and the comparatively little attention that has been given in this country to trichinosis and trichina, are sufficient reasons, we think, to make the subject one of more than usual interest to the physician and well worthy of careful investigation.

The object of this report is more to present facts relating to trichinosis and trichina as they came under my own observation, than to reiterate what is known and described in our medical books and periodicals on this subject. Although the report is necessarily imperfect, arising from the fact that the true character of the disease was not suspected for nearly two weeks after it had been treated; still we believe the facts presented are of value, and even the fact that the disease was not at first known, is important, as showing the possibility that trichinosis under its various forms may be treated for other diseases. Trichinosis has been so recently recognized, its discovery dating back only to 1860, that much obscurity still attends it and every additional fact connected with the disease, particularly if observed within our own state, even if not fully reported, is worthy of being brought before our society.

From microscopical examinations of pork brought to my office, by our farmers for examination during the last year, we have become satisfied that a large portion of the hogs of our country are affected with this parasite. I think it highly probable that when the fact becomes more generally known, that so large a per cent. of the pork is affected with trichina and capable of producing so loathesome a disease as trichinosis, that it will have an influence upon the sale of one of the principal productions of the West, affecting the agriculturalist and even, to some extent, the commerce of our country.

We had read of trichinosis prevailing in Germany, and even in different portions of the United States, but had regarded the disease as foreign to our section of country and one of rare occurrence.

We had not realized the fact that the seeds of this malady were around us, diffused through an article of our daily food, and liable at any time, under favorable circumstances, to develop this disgusting disease. But that such was the case we were made fully aware during the month of January, 1874.

A widow by the name of Trenant, residing in Aurora, Indiana, and one of her children were suddenly taken unwell with diarrhœa and vomiting. Her other two children were also taken unwell the next day with similar symptoms.

The sickness assuming a serious character, and the whole family, consisting of the mother and her three children, being confined to bed, excited the sympathy of our citizens. She was a member of the German Methodist Church, and members of her church went to her assistance, attended to her family, nursed them during the day and night. Cases of sickness immediately followed amongst those who had been in attendance on the family, all having a similarity of symptoms; still the disease was not regarded as contagious or arising from local malaria, as there was another family living in the same house enjoying good health, and all the surrounding neighbors were healthy. The disease was treated at first by the attending physician, Dr. Lamb, of Aurora, as typhoid fever.

About ten or twelve days after Mrs. Trenant and her family had been ill one of her neighbors, and member of the same church, an intelligent German, Mr. Adam Whehe, noticed that this sickness arose only amongst those who were having their meals at Mrs. Trenant's house, and knowing that she had been using the fresh meat of two hogs which she had had butchered only a few days before the commencement of her illness, was the first to suggest that the pork these patients had been eating was the cause of this sickness. He had been informed by the man who assisted the butcher in killing the hogs that the lungs of one of them presented some appearance of disease, and directed the attention of the attending physician to what he supposed was the cause of this sickness. Dr. Lamb, after hearing these facts, was inclined to regard the disease as arising from septicœmia, but thought it possible that trichina might be the cause of the sickness. During this uncertainty, the Doctor invited me to see these patients with him. This was January 23d, fourteen days after the Trenant family had been taken sick. After hearing the facts relating to these cases, and the fact that one of the hogs had been sick a few months before it was killed, it appeared to me highly probable that these were cases of trichinosis. To assist us, however, in our diagnosis, I suggested that we make a microscopical examination of the pork which these patients had been eating. Having a good microscope, I had some the meat sent to my office for examination. My son, Dr. W. E.

Sutton, being in the office at the time it was brought in, soon detected the trichina. I also, on my return, detected them in great numbers, and we found that portions of the meat contained over eighty thousand to the cubic inch. Mrs. Trenant was now informed of the poisonous character of the pork, and its use was at once discontinued. It had been daily placed upon the table for those in attendance on the family up to this time.

The hogs were killed on the morning of the fifth of January. The meat was cut up and salted, and sausage made the same day. I was particular to ascertain in what manner this meat had been used, and obtained the following facts: The pork, which had all the appearance of being perfectly healthy, having a thick layer of fat over the hams, was cut up, salted and placed in a barrel in the usual manner. None of this salted meat had been used. The spare-ribs, backbones, trimmings and the sausage were the only meat used up to the time of the sickness. Two kinds of sausage were made—one the common meat sausage, the other what the Germans call liver worst. The meat sausage was made in the usual way—lean portions of the back, tenderloin, trimmings from the hams, etc., were chopped up fine, highly seasoned with salt, pepper, sage and other herbs, and forced, uncooked, into the prepared intestines of the hog. The liverwurst was made from the liver, lungs and fragments of meat—this was boiled or cooked, then chopped up fine and highly seasoned with onions, sage, pepper, salt, etc., and also inclosed in skins. These sausages were immediately hung up in the smoke-house, and kept over a dense smoke for several days. From the day the hogs were killed the meat had been used, fried and cooked in the usual manner. On the evening of the ninth, four days after the hogs were butchered, portions of this smoked meat-sausage, which, by this time, was well smoked, were placed upon the table uncooked, and eaten, a mode of using this form of sausage common to the Germans. Whether it was eaten by all the children is not now known, as no attention at that time was directed to the subject. That night, about six or eight hours after the sausage had been eaten, Mrs. Tre-

nant and her son Henry were taken unwell; other cases of sickness followed, all traced afterwards to eating this meat.

The discovery of the parasite created an excitement in the city and neighborhood. People crowded to my office to see the trichina, and meat was daily brought in for examination. We soon found that a considerable portion of the pork of this locality was infected with the parasite.

The patients had been ill over fourteen days, the disease was new and seemed to baffle all treatment. Some of the patients appeared to be daily growing worse. At this time, January 25, it was the request of the elders of the church that I should take charge of some of these patients. This was also agreeable to the wish of Dr. Lamb, but, instead of taking charge of patients separately, we agreed to attend the cases together, which, by so doing, would enable me to see all the patients from day to day, and take notes of their symptoms and the treatment adopted. The disease not being regarded at first as anything unusual, no notes were taken of the early symptoms, and I can only give a general outline of the symptoms at first presented, with the treatment.

After I saw the patients I kept a daily record of each case which, to give in full, would make this report so voluminous that I could not bring it before the Society. I will, therefore, merely give a summary of the symptoms and treatment of each patient.

Mrs. Trenant, age forty-one, had been daily eating the cooked pork from the time the hogs were killed, January 5th up to the 9th. That evening, January 9th, the two kinds of sausage uncooked were placed upon the supper table; Mrs. T. ate a portion of the uncooked meat sausage to try its flavor. About five or six hours afterwards she was attacked with vomiting and purging. The next morning, January 10th, Dr. Lamb was called in. The doctor informs me that she then had diarrhœa, discharges thin and yellow, occasional vomiting, low fever, coated tongue; these symptoms continued up to the 24th, and were treated upon general principles with "tonics, alteratives, diuretics and sedatives."

At this time I saw the patient. As we had detected trichina in the meat they had been using, and regarding this sickness as arising from trichina, the symptoms were now more closely observed. There was diarrhœa alternating with dysenteric symptoms, discharges mostly thin and yellow, occasional vomiting, coated tongue, red around the edges, temperature ninety-eight and one-half, varying to one hundred, pulse ranging from eighty-five to ninety-five, small, thirst, no appetite, tenderness over the bowels, but little if any pain, except slight soreness of the muscles of the extremeties, urine healthy, although rather high colored, skin occasionally moist, at other times dry with increased temperature, mind clear, but there was much anxiety, which partly arose from the illness of her family. She complained of great weakness. As we could find no satisfactory treatment recommended in our medical works for trichinosis, we concluded to try different remedies upon the different patients. In this case we continued the quinine and also gave anodynes as the diarrhœal symptoms required. We also gave a solution containing the sixteenth of a grain of corrosive sublimate every four hours, thinking that it might possibly distroy the parasite. This course of treatment we continued until February 1st, six days, when we discontinued the corrosive sublimate, as there was no marked improvement in the case, and continued the quinine stimulants and also gave anodynes, as the diarrhœal symptoms required.

The appetite slowly returned, the diarrhœa and dysentery gradually subsided, and seven weeks from the time she was taken unwell, this patient was decided convalescent, and has since entirely recovered. There was in this case but little œdema and only slight soreness of the muscles. The prominent symptoms were those of gastro-enteritis.

Henry Trenant, aged fourteen years, son of Mrs. Trenant, also ate of the uncooked smoked meat—sausage—on the evening of January 9th. He was taken unwell about the same time his mother was, with symptoms almost precisely similar to those which she had, viz: vomiting and diarrhœa. The physician prescribed for both cases the next morning, January 10th. When I saw this patient fourteen days after, January 23d, he

was pale, countenance sunken, very much emaciated, still had diarrhœa, discharges serous and yellow, operations about every three hours, unless restrained by astringents, occasional nausea and vomiting, no appetite, thirst, tongue red, although not remarkably dry, pulse feeble, one hundred and twenty in a minute—it varied during the day from ten to twenty beats—temperature ranging between ninety-eight and one hundred degrees, mind clear, with remarkable apathy, complains of a feeling of exhaustion—his expression was, "I feel so tired"—tenderness of the abdomen, slight tenderness of the flesh, but no œdema or eruption. These symptoms varied slightly from day to day; sometimes the temperature rose above, sometimes fell below the natural standard.

The doctor was giving him tincture of iron and quinine, and gave anodynes as symptoms required, and as this patient was so prostrated, we continued this treatment, with the addition of stimulants, at the same time ordered light nutriment; but he gradually continued to sink without any marked change in the symptoms, except increasing prostration. The mind continued clear to the last, and he died on February 6th, after a sickness of four weeks.

Minnie Trenant, daughter of Mrs. Trenant, age seven years, was taken unwell on January 13th. She had eaten of the meat sausage uncooked the day before, but whether she had eaten of it before that time she was unable to say. She was attacked with vomiting and purging, and with Henry and her mother was treated for typhoid fever up to January 24th. At this time the symptoms very closely resembled those of Henry. There was diarrhœa, the discharges every three or four hours, thin and of a yellow color; also occasional vomiting, loss of appetite, redness of the tongue, fever, pulse varying between eighty and one hundred, temperature, however, but little elevated, ranging between ninety-eight and one hundred degrees; mind clear, but an unusual apathy; complains, like Henry, of "feeling tired;" countenance pale, urine natural in quantity but rather highly colored; there was tenderness over the abdomen, and occasionally *difficult breathing.* We put this patient upon small doses of Fowler's solution, two drops every three

hours during the day. This was given in connection with quinine, anodynes and stimulants, as symptoms required, counter irritants to the abdomen; also, we ordered light nutriment, such as milk, soups, etc. We continued the Fowler's solution until February 15th; seeing no benefit from it, this remedy was discontinued. At this time she vomited a lumbricoid. We then put her upon three grains of santonine every three hours during the day. She passed another lumbricoid from the bowels the next day after taking the santonine. This remedy was continued, in connection with tonics and stimulants, up to February 19th, when the santonine was discontinued. She daily became more emaciated and gradually continued to sink. The stomach at last became so irritable that the only remedy administered was a weak solution of morphia. There was no delirium at any time during her illness—her mind was clear to the last. The pulse became almost imperceptible on the evening of the 19th, and she died about 10 A. M. February 20th, having been sick thirty-eight days.

Jacob Trenant, nine years of age, had also eaten of the uncooked meat sausage. He was taken unwell within an hour of the time the last patient was taken sick, about six hours after eating the sausage, with similar symptoms, viz: vomiting and purging, and was treated in the same manner the other patients were up to January 25. When I saw him there was occasional vomiting and diarrhœa; with dysenteric symptoms, tormina and tenesmus, and there was tenderness over the bowels, tongue red and moist; no appetite; fever; pulse ranging from ninety to one hundred, moderately full; skin occasionally moist; temperature but little elevated, ranging from ninety-eight to one hundred; urine rather highly colored; mind clear; complains of the same feeling of prostration; there was more soreness in the muscles than in the other cases.

We put this patient upon small doses of Fowler's solution, also anodynes, quinine and stimulants. We continued the Fowler's solution until the 18th of February, when it was discontinued and the tonic course of treatment was continued—iron, quinine, stimulants and small doses of Dover's powder sufficiently large to restrain the diarrhœa and dysentery. His diet was boiled milk, rice soup, etc. He gradually continued to

improve, and we regarded him as convalescent on the 1st of March. He had, however, occasional attacks of diarrhœa for some time afterwards, requiring anodynes to allay the irritation of the bowels.

Louis Ramstine, aged thirteen, was employed to saw wood for Mrs. Trenant January 20th; during the day he had lunch, and ate of the uncooked smoked meat sausage, the only meat he ate. The next day he was attacked with diarrhœa. This continued for several days before a physician was employed. I saw him, with Dr. Lamb, on the 25th. He was put upon small doses of Fowler's solution, in connection with laudanum and cinnamon water. This treatment was continued until February 11th, when he was convalescent, and the medicine was discontinued. This is the only medicine he took.

Mrs. Beuter, thirty-four years of age, wife of the minister of the German Methodist Church of Aurora. This lady went to the assistance of Mrs. Trenant and her family, and while attending on the sick she ate heartily of both the meat and uncooked meat sausage. On the 15th, the next day after being at Mrs. Trenant's house, she was attacked with vomiting and diarrhœa. A German physician was first called to attend this case, but after a few days attendance he was dismissed and Dr. Lamb was called in. On the 28th I saw her; she then had diarrhœa, also dysenteric symptoms; nausea and occasional vomiting; the discharges were thin and watery, changing to mucus when there were dysenteric symptoms; the tongue was coated, and red around the edges; thirst; skin hot; she was occasionally bathed in profuse perspiration; temperature varying from ninety-eight to one hundred and four; pulse ranging from ninety-five to one hundred and sixteen at this time, generally full; mind clear. It was now ten days from the time she was taken unwell, and her face, limbs and whole body were œdematous; the skin pitted on pressure; there was an intolerable itching over the face, hands and arms, with slight eruption; there were inflamed patches from an inch to two inches in diameter on the chin, side of the face and breast, resembling erysipelas; the conjunctiva was injected; there was hyperæsthesia of the surface of the body, and soreness of the muscles of the

extremities—this painful sensation of the muscles increased to such an extent that she could scarcely be moved.

The Doctor, when first called, gave this patient small doses of calomel and Dover's powder, three grains each; after this he administered a solution of carbolic acid, five drops every three hours; also, small doses of quinine and opium, as symptoms required, to allay the tenesmus. This treatment was continued four days. About this time, her husband, hearing that sulphur was a remedy for this disease, the carbolic acid treatment was discontinued, and the system saturated with sulphur. This treatment was continued three days, when, as it was evident the patient was growing worse, this treatment was discontinued, and the patient was put upon a solution of corrosive sublimate, one-sixteenth of a grain every three hours, and also opium and quinine. This treatment was continued until February 6th, when the mercury was omitted, as no good effects were observed from it. The quinine and opium were continued. She continued to sink. On the morning of the 8th the pulse became almost imperceptible, and she died about 1 P. M.; the mind remaining clear to the last.

When Mrs. Beuter went to attend Mrs. Trenant, she took her little son Charles, two years and a half old. This boy, while at Mrs. T.'s, ate a small portion of the sausage. This was followed, within twenty-four hours, with diarrhœa, but no vomiting. He was treated at first with small doses of calomel and Dover's powder; afterwards with a solution of carbolic acid, two drops of the acid every three hours for twenty-four hours; afterwards anodynes, as symptoms required. He recovered in about twelve days.

Rev. W. Beuter also ate of the meat sausage; this was followed by diarrhœa. This diarrhœa lasted about five weeks, not so severe, however, as to confine him to the house. The only medicines he took were anodynes and mild astringents.

An old washerwoman by the name of Ross was employed to wash the clothing for Mr. Trenant. While at Mrs. Trenant's house she ate of the uncooked meat sausage. This was followed, a few hours afterwards, with vomiting and purging. The diarrhœa continued for several days. A Miss

Davis went to the assistance of Mrs. Trenant; while waiting on her, she also ate of the uncooked meat sausage. In a few hours afterwards she was attacked with vomiting and purging. The attack was mild, and the only remedy she took was strong whisky punch. Mrs. Klinginhoffer, Mrs. Wilkee, and other neighbors who were in attendance on Mrs. Trenant, ate of the pork as well as the sausage; but these persons had the meat and sausage well cooked; no disease followed, or even any derangement of the stomach. These facts show that it was the uncooked meat sausage that produced disease, and that this meat was harmless if well cooked.

Autopsy of Henry Trenant, thirty hours after death, made in presence of all the regular physicians of Aurora and several medical students. The body was remarkably emaciated; *rigor mortis* but slight; no œdema; heart and lungs presented nothing unusual; abdomen collapsed; stomach contracted, containing thick, ropy mucus; the mucous membrane was red, thickened and softened in several places; the lining membrane of the bowels presented marked evidence of disease, portions were intensely injected and patches softened; the ileo-cæcal valve was congested and swollen. In examining the ileum we did not detect the ulcerated Peyer's glands peculiar to typhoid fever. The mucous membrane of the ileum presented the same evidences of inflammation as other portions of the mucous membrane of the alimentary canal; but not the ulcerated patches which we would expect to find in a case of typhoid fever after four weeks illness. We examined this portion of the bowels with much care, as the case had presented some of the symptoms of typhoid fever. The mesenteric glands were generally enlarged, swollen, red and œdematous. The liver presented nothing remarkable; the gall bladder not unusually distended; the spleen, kidneys and bladder were healthy. The brain and spinal cord were not examined, as there had been no evidence of these organs being diseased.

Examinations with the microscope revealed a few trichina in the bowels near the ileo-cæcal valve. After examining the muscles of the leg for hours, we found one in a piece of flesh from the thigh, and also a few in the muscles of

the back. The trichina in this case did not penetrate the muscular system to any great extent; but produced a form of gastro-enteritis, causing death without advancing beyond what we regard the first stage of trichinosis.

Autopsy of Minnie Trenant, thirty-six hours after death. Present all the physicians of Aurora. But slight *rigor mortis*, unusual emaciation, the whole abdominal surface discolored, the heart and lungs healthy, diaphragm inflamed, presenting red patches and adhesions to the liver; the stomach congested, presenting a deep red color; the mucous membrane softened in several places and covered with a thick, ropy mucus; the small intestines were highly injected and bound together by adhesions, which, however, were easily separated. On opening the bowel the mucous membrane presented evidence of inflammation similar to that seen in the post-mortem of Henry Trenant. It was highly injected and presented patches that were softened. The mesenteric glands were enlarged. The liver presented no remarkable appearance of disease; neither did the spleen, pancreas, bladder, womb, or ovaries.

By microscopical examination we failed to detect trichina in the bowels; but after careful examination we found a few in the oblique muscles of the abdomen, and also a few in the muscles of the thigh. It is evident, as in the case of Henry, that the trichina did not spread through the muscular system in very great numbers. They appear to have produced irritation and inflammation of the intestinal canal, mesentric glands, peritoneum and diaphragm. I have regretted that we did not examine the coats of the stomach and mesenteric glands in these post-mortem examinations with more care and a higher power, as it is more than probable that we overlooked the young parasite.

When Mrs. Beuter died, I was informed that a *post-mortem* examination would not be allowed; but as this case was one in which the symptoms of trichinosis in all its stages had been well marked, I was extremely anxious to procure a piece of the flesh for examination; I finally succeeded. Mr. Beuter allowed me to take a small piece of the muscle of the leg (gastrocnemius). In cutting through the skin I found the cellular tissue infiltrated

with serum and whole surface of the body was œdematous. On making a microscopic examination of the muscle, trichina were detected, even in greater numbers than we found them in the pork. Their number, when considering the shortness of time in which they must have been developed, were truly wonderful. We estimated them at more than one hundred thousand to the cubic inch. It appeared almost impossible to divide some portions of this flesh into pieces so small that evidences of trichina could not be detected in them. There were but few of the trichina encysted, and many of them were seen to be in motion —coiling and uncoiling.

The discovery of such vast numbers of trichina in human flesh increased the interest in the subject. The office was visited daily by our citizens, most of whom had an opportunity of inspecting, for the first time, trichina in motion—as the specimens which had been exhibited before in the pork, presented the parasite in a spiral form and without motion.

About a week after Mrs. Beuter had been buried I was able to procure another piece of flesh. A report was in circulation that the grave had been opened, the body taken up and carried away by physicians from a distance. To ascertain whether there was truth in the report (as Mr. Beuter felt very distressed), I accompanied him to the cemetery. We had the grave opened, and finding that the body had not been disturbed, he allowed me to take another piece of flesh from the calf of the leg. This was taken from the gastrocnemius of the opposite leg from which the first piece of muscle was taken.

This flesh, also, when examined with the microscope, was found to be filled with trichina, most of which, when a strong light was thrown on them, showed evidence of motion.

The general symptoms in this case, when viewed in connection with the immense numbers of trichina found in the flesh, settled the question beyond all doubt, that this patient died from trichinosis, and showed also most clearly the terrible consequences which sometime arise from eating trichinous pork.

I purchased some of the pork of Mrs. Trenant, for the purpose of testing its poisonous effects. A dog was procured, tied

to a kennel and fed in moderate quantities, both on the salted meat and sausage. Within twenty-four hours after eating this meat he was evidently unwell, frequently vomiting, and also had diarrhœa. He lay coiled up most of the time and refused to eat. These symptoms lasted about forty-eight hours. On the third day after he had apparently recovered, we fed him again on this meat and sausage; vomiting and purging was again produced. He was fed on this meat occasionally for more than a week, when the food seemed to be tolerated to some extent, and the only effect it produced was a slight diarrhœa. In nine weeks from the time the dog was last fed with the meat he was killed, but after a most careful microscopic examination, we failed to detect trichina in his flesh. We examined the muscles of the legs, back, abdomen and tongue. I examined the flesh of another dog that was known to have eaten large quantities of trichinous pork. This dog was owned by one of our farmers. A hog had been killed for family use, which was found on examination to be filled with trichina. Several weeks after the dog had eaten this meat, he died from some unknown cause. A piece of his flesh was obtained, but after a careful examination I failed to detect trichina.

These facts are in accordance with the observations of those physicians who tell us that trichina may be redeveloped within the alimentary canal of the dog and not penetrate his muscular system. I will merely mention as a digression that I made examinations of the flesh of a few other animals. It is stated by writers on trichinosis, that the flesh of cats, rats, mice, moles and hedge hogs, sometimes contain trichina. We examined the flesh of four cats, all of them presenting the appearance of being diseased before they were killed. Three out of four were found to be swarming with trichina, and the trichina from one of them were seen to be in motion. We examined the flesh of forty-two rats, all apparently healthy when caught—no trichina were found. Also the flesh of eight moles, they appeared healthy when killed—no trichina were found. We merely present the facts as they occurred in our investigations, but not as evidence, that trichina are never found in flesh of these animals.

In reviewing the facts relating to the illness of the Trenant family and their friends, the question arises, were all these cases of sickness produced from eating the trichinous pork?

In the case of Mrs. Beuter the evidence is clear, not even admitting a doubt. In the other cases we think the evidence is also conclusive. There was no local malarial cause on the premises of Mrs. Trenant to produce sickness. Another family living in the same house, also the neighbors living on adjoining lots, were enjoying good health; they had not eaten of this meat. It was only the attendants on Mrs. Trenant who had eaten of the uncooked sausage, several of whom resided in different parts of the city, that were unwell. They were all attacked within a few hours after eating this meat with similar symptoms—of gastro-enteritis—the prominent symptoms presented by the dog that was fed on the meat. Then the fact that trichina were found on *post-mortem* examination, in the alimentary canal of one of the children, and a few in the muscles of the other, are suffiicent evidence, we think, to make the diagnosis clear that all of the patients were made ill from eating trichinous pork; and that the prominent symptoms presented in nine out of ten of these cases were of gastro-enteritis, showing that a severe form of disease may be produced by trichina without the parasite penetrating the muscular system.

These are important facts, as they show that trichinous pork may produce in the human system, a form of gastro-intestinal irritation, diarrhœa and dysentery, both acute and chronic, and may cause death without the muscular system becoming affected; or, in other words, that trichinosis may proceed no further than its first stage of gastro-enteritis.

Since the discovery of this parasite at Aurora, farmers from the surrounding country brought specimens of their pork to my office for examination, and we have found a large number of hogs affected with trichina. During last fall and winter, Dr. Willis E. Sutton and myself examined the flesh from more than one thousand hogs, and have found from four to twelve per cent. affected with trichina—the number of diseased hogs varying in different localities. In some sections of our county but few hogs were affected with this parasite; while in others the

proportion was large. We kept a record of the number examined until it reached five hundred; out of this five hundred, we found forty-eight diseased. In some of them the flesh contained thousands of parasites to the cubic inch.

Hogs fed in our city were generally affected; also, those brought from the valleys of Hogan and Laughery creeks; while we found but few trichina in specimens of meat brought from Kentucky. Old hogs were more frequently affected than young ones, and old sows than barrows.

Doctors Harding and Robbins, of Lawrenceburgh, inform me: "April 27th, 1875. We have microscopically examined specimens from two hundred and forty-five different hogs slaughtered in the vicinity of Lawrenceburgh, and find trichina present in forty of the specimens, making about sixteen and one third per cent. of all examined."

Doctors Gatch and Miller also inform me: "Lawrenceburgh, April 27, 1875. In compliance with your request, we can state that we have examined two hundred hogs killed for pork, and found trichina in thirteen—about six per cent." These gentlemen say: "We believe that they are to be found much more frequently in places where large amounts of corn are cribbed, and rats therefore more abundant, than in places where this is not the case, as most of the cases in which trichina were found were from such places."

Doctor J. V. Stevenson, of Rising Sun, also writes to me that he has found trichina in pork killed in Ohio county.

From these facts there can be no doubt but that trichina may be found in a large proportion of the hogs that are killed in south-eastern Indiana. We see at once the subject is one of importance in showing the possible relation of trichinous pork to the etiology of disease.

We find in the *Cincinnati Commercial*, that the total number of hogs packed in the west during the last winter was five million five hundred and thirty-seven thousand one hundred and twenty-four, and this number does not include those killed by butchers and farmers. Now if four per cent. (which we believe to be a low estimate) of these hogs were affected with tri-

china,we had two hundred and twenty-one thousand four hundred and eighty-four diseased. If six per cent., we had three hundred and thirty-two thousand two hundred and twenty-seven, and at the average of two hundred pounds to the hog, we would have sixty-six millions, four hundred and forty-five thousands, four hundred pounds of diseased meat put upon the market, and every ounce, under favorable circumstances, capable of producing the loathsome disease of trichinosis.

When the fact becomes generally known and fully appreciated by the public that so large a portion of the pork in our market is swarming with worms, and when it become suspected that these parasites are probably the cause of more disease in our country than physicians have generally been aware of, it is highly probable that a feeling of prejudice and disgust may arise against the use of this article of food, which will have an important effect upon the market of one of the principal products of the west. The pork trade is one intimately associated with the prosperity of the western states. It is one of vast magnitude. The *Cincinnati Commercial* informs us that the aggregate gross weight of pork packed in the western cities this last winter was one billion four hundred and fifty-three millions three hundred and fifty-nine thousand nine hundred and ten pounds, and this does not include the large amount of pork packed by our farmers and sold as country meat. The cost of the hogs from which this pork was packed was ninety-seven million three hundred and thirty-eight thousand six hundred and twenty-six dollars, and the value of the pork packed by our farmers, when added, will increase the amount to considerably over one hundred million of dollars. There was packed during the last winter, in Chicago, one million six hundred thousand three hundred and forty-eight hogs; in Cincinnati, five hundred and sixty thousand one hundred and sixty-four; Louisville,two hundred and seventy-three thousand one hundred and eighteen; St. Louis, four hundred and sixty-two thousand two hundred and forty-six; Indianapolis, two hundred and seventy-eight thousand three hundred and thirty-nine, and large numbers in other cities of the west to make the five million five hundred and thirty-seven thousand one hundred and twenty-four.

As deaths from diarrhœa, dysentery and enteritis rank high in the tables of mortality in our census reports, the question arises, to what extent are they attributable to trichina? We see by the census reports, that for the year 1870, there were thirty-one thousand one hundred and fifty-three deaths in the United States from diarrhœa, dysentery and enteritis. No cases are reported of trichinosis or that this parasite is even a cause of disease. But when we take into consideration the fact that it is the custom of a large portion of our German population to eat the smoked pork, such as ham and sausage, uncooked, and, when we become fully aware that a large portion of this pork contains trichina, and that trichina produces diarrhœa, dysentery and enteritis, it appears to me more than probable that this parasite is one among the causes which is producing this large mortality in our country, and has not yet received from the profession the attention which it deserves.

In the Surgeon General's report of the sickness and mortality of the army during the rebellion, we see that there were "thirty-seven thousand seven hundred and ninety-four deaths of white, and six thousand seven hundred and sixty-four of colored troops, making a total of forty-four thousand five hundred and fifty-eight deaths, due to the several forms of diarrhœa and dysentery; which must, therefore, be regarded as the most important causes of the mortality from diseases in our armies." There were discharged from disability arising from diarrhœa and dysentery, seventeen thousand three hundred and eighty-nine men.

When we take into consideration the imperfect manner in which meats are often cooked in the army; the hurried manner in which the meals are prepared and eaten—meat often eaten almost raw during the excitement of battle—the large amount of pork which enters into the rations of the soldiers, with the gastro-enteritis which trichinous pork is known to produce, it makes it more than probable, we think, that many of these cases of diarrhœa and dysentery arose from trichina.

A question of interest connected with this subject, which requires further investigation, is: How do the trichina become so rapidly diffused throughout the muscular system? We are

told by Leuchart, Virchow and Zenker that muscular trichina are freed from their capsules in the stomach and are developed and produce their young in the intestines; that in seven days these young trichina commence their migration from the intestines to all parts of the voluntary muscular system; and that within the voluntary muscles they encapsulate themselves, to remain in a dormant state until the flesh is eaten. If this view is correct, the rapidity of their migration is certainly wonderful. Take, for instance, the case of Mrs. Beuter, which we presented. She was taken unwell on the 15th of January; the first sickness was undoubtedly caused by the liberation of the trichina from their capsules. It would be seven days after their liberation before they produce their young—this would bring the time up to the 22d of January. On the 28th, I saw Mrs. Beuter; her face, body and extremities were then œdematous, and had been so for several days, showing that the trichina had at that time penetrated *every portion of the voluntary muscular system.* Supposing they entered the muscles that day, it would give them less than six days to bore their way through all the opposing tissues and pervade the whole muscular system. The mature trichina are about the thirtieth of an inch in length; the young trichina much smaller. The lower portion of the gastrocnemius muscle, which I examined and found filled with these parasites, estimated at one hundred thousand to the cubic inch, is about three feet from the intestines. Now it must have required these young trichina to have burrowed at least six inches each day through the tissues to have reached this portion of the muscle, making no allowance for obstructions. It appears to me incredible that so small a parasite, and one showing so little evidence of motion, should make such rapid progress through the different tissues of the body. The theory that the young trichina enter and are diffused by the circulation to all parts of the system, accounts for the rapidity with which they find their way into all the voluntary muscles, and also accounts for the œdema by the circulation in the capillaries becoming obstructed, producing a form of thrombus or embolism. Objections, however, may be found to this theory, and the subject requires further investigation to clear up the obscurity by which it is enshrouded.

It will readily be seen that the diagnosis in the first stages of this disease must be extremely difficult, particularly during the gastro-enteric stage. The diarrhœa and vomiting produced from intestinal irritation, whether from indigestible food or from trichina, would have a close resemblance, and after the disease has continued for several days, it still presents difficulties, and no doubt has frequently been mistaken and treated, like the cases we have presented, for typhoid fever, or some other disease which it resembles. But after trichinosis has continued until the trichina have entered the muscles, and we have observed persistent diarrhœa and vomiting, followed by œdema of the surface, pruritis, rash, erythema, sweats, low fever, and but little elevation of temperature, prostration, and during the continuance of the disease, the mind clear, even without inquiring what meat has been eaten, we may reasonably suspect trichinosis, which would be demonstrated by detecting trichina in the evacuations.

It has been supposed that the epizootic which has been prevailing amongst the swine, known as hog cholera, arises from trichina, and we see it stated in *Flint's Practice of Medicine*, page 501, that "the affection known as hog cholera, is supposed to be trichinosis." While trichinosis was prevailing in Aurora, hog cholera was also prevailing in Boone county, Kentucky, a few miles east of Petersburgh. I at that time procured flesh from six hogs which had died with unmistakable symptoms of hog cholera and after a most careful microscopic examination of this flesh for hours together, assisted by my son, Dr. Willis E. Sutton, we were unable to detect in a single instance trichina.

Several years since, we made a series of experiments with hog cholera, the report of which may be found in the May number of the second volume of the *North American Medico-Chirurgical Review*. From my experience with the two diseases I regard them as entirely distinct. Hog cholera is highly infectious; the latent period of infection is from twelve to twenty days, and like measles and small-pox, is self-limited, and one attack exempts from a second. We have no evidence that trichinosis in the swine is as highly infectious, or that it is as definitely self-limited in running its course, or that one attack

of trichinosis exempts a hog from a second. We think, then, that our microscopic examinations have proven most conclusively that hog cholera does not depend upon trichinosis.

Thus we see the subject of trichinous pork is one of great importance; important in a commercial point of view, important to the agriculturalist; important as an article of food, in affecting the health of the community, and consequently important to the physician; important to the sanitarian; and these little parasites themselves are not only an important, but highly interesting, subject for investigation to the zoologist: for when we consider their minuteness, their wonderful vitality, their rapid development in numbers and rapid diffusion throughout the muscular system, the millions drawing their vitality from the body which they pervade, and then entombing themselves in the muscular system to lie in a dormant state an indefinite period, or until they are again introduced into the stomach of a living animal, the proper habitat for their resurrection, they certainly must be regarded as among the wonderful things in nature, and must become, not only of interest to the naturalist, but well worthy of careful investigation by the medical profession.

From the facts which have been presented we draw the following conclusions:

First. That the cases of trichinosis that came under our observation in the city of Aurora, Indiana, were produced from eating uncooked pork in the form of smoked sausage—a mode of eating this meat common to our German population.

Second. That we reiterate what is already known: that it is only by thoroughly cooking the meat that the vitality of trichina can be destroyed, and that eating smoked or dried pork uncooked, in any form, or the partially cooked ham used in the form of sandwiches, common in eating houses, is attended with danger.

Third. That from microscopic examinations of pork killed in south-eastern Indiana, we have found from three to sixteen per cent. of the hogs affected with trichina—the number of hogs diseased varying greatly in different localities.

Fourth. That over five millions of hogs are slaughtered and packed in the western states, not including those which are put up for family use by the farmers; that if four per cent. of this pork is diseased, which we believe to be a low estimate, we have two hundred and twenty-one thousand four hundred and eighty-four diseased hogs put annually upon the market; or, at an average of two hundred pounds to the hog, forty-four millions two hundred and ninety-six thousand eight hundred pounds of diseased meat, every ounce of which, under favorable circumstances, is capable of producing disease.

Fifth. That from the cases of trichinosis that came under our observation, and the post-mortem examinations, and the effects upon the dog that was fed on the diseased meat, we have come to the conclusion that ninety per cent. of disease produced from eating trichinous pork appears either as gastro-enteritis, or as a diarrhœa or dysentery, and not more than ten per cent. as the fully developed form of trichinosis in which the muscular system becomes affected.

Sixth. That as diarrhœa, dysentery and enteritis rank high as causes of mortality in the United States—these diseases causing thirty-one thousand one hundred and fifty-three deaths in 1870, as shown by the last census reports—and as we have seen that a large amount of trichinous pork, capable of producing these diseases, is amongst the principal articles of food in our country, we think it more than probable that trichina have a much greater influence in the etiology of this class of diseases than has been recognized by the profession.

Seventh. That it is highly probable that when the fact becomes more generally known, that so large a per cent. of pork is swarming with trichina capable of producing disease, that it may have an effect upon the use of this meat, and consequently affect the sale, to some extent, of one of the principal articles of commerce in the west.

Eighth. That as pork is the principal animal food of a large portion of the population of the United States, the subject is of great importance—important to the agriculturist; important to the sanitarian, as affecting the health of the community;

important to the physician, and not only important, but highly interesting as a subject of investigation to the zoologist.

Ninth. That as it is stated in one of our medical text books, that "hog cholera" and trichinosis are supposed to be the same diseases, we have ascertained beyond all doubt, by careful microscopical examinations of the flesh of hogs that had died with unmistakable symptoms of hog cholera, that the two diseases are entirely distinct.