

these investigations—that the worms, apparently so insignificant in size, and so incomplete in development so long as retained in the muscular system, become further developed when introduced into the intestine of another animal. After a short time the sexual apparatus appears, copulation takes place, the female produces living young, and these young penetrate finally into the muscular tissue of the second animal, and there domicile themselves for an indefinite time. In this way somewhat more definite ideas were acquired with regard to the natural history of the worm, as found in the inferior animals. By a continuation of these experiments, it was found that this infection of the muscular system with trichina may show itself in the pig, the cat, the rat, the mouse, the rabbit, and, I believe, one or two other species of the inferior animals.

So far, nothing more had been learned with regard to trichinosis as constituting a disease in the human subject. The new era in this respect opened with the year 1860. At that time an epidemic of trichinosis occurred in Germany. The members of a family living in Dresden were taken sick with symptoms similar to those of acute rheumatism, mingled with those of typhoid fever. One of them, a servant-girl, died, and on examination it was found that her muscles were filled with trichinae. The attending physician and Professor Virchow tried the experiment of administering the trichinous muscles to a rabbit, and found that the rabbit became infected with the parasite, and died in about four weeks' time. The infected tissues of this rabbit were administered to a second, which became infected in the same manner, and died, like the first, in about four weeks. Finally, a third rabbit was fed with the flesh of the second, with a similar result. These experiments show that the disease, as it exists in the human subject, may be transmitted to the lower animals; that it may be transmitted indefinitely from one animal to another, the parasites passing alternately from the intestines to the muscular system, and again from the muscular system to the intestines. These are the general outlines of the origin and course of the disease known as trichinosis.

Now let us see what are the details of the anatomical structure and physiological development of the worm itself.

I have said that, as you examine the trichinae in those cases where they have existed in the muscles for an indefinite period, where they have become encysted, and the cavity of the cyst has been invaded by calcareous deposit, it is not easy to make out their anatomical structure. But in cases where the disease is recent, and particularly where it can be traced to the recent use of trichinous flesh as food, the anatomy of the worm can be made out with more distinctness. Such a case happened in this city about five years ago. Some sailors, on board ship, were taken sick while in port with symptoms resembling those noticed in the Dresden family, similar to those of typhoid fever and acute rheumatism combined. It was found that the disease originated, in their cases, from eating raw pork or bacon. About the same time other cases of the disease became developed in persons living permanently in the city; and it was found in these cases that the difficulty could be traced to the use of ham imperfectly cooked.

A portion of this ham came into my possession,

and in examining it, I found not only that the meat was trichinous, but also that the parasites were in a decidedly different condition from that which they exhibit in cases of long standing. The first peculiarity was that the cysts in which the worms were contained, instead of having definite and rounded ends, gradually tapered off into long and slender prolongations, the extremities of which could not be reached, being entangled in an intricate manner with the muscular fibres. In these drawings you see represented the cysts containing the trichinae, as found in the ham. (Fig. 2.) In this case the cyst is evidently a hollow, fusiform tube, consisting of a transparent and structureless, but well-developed, membrane, containing the worm coiled up, as you see. From the two extremities of this fusiform cyst run off the prolongations. It is very important to ascertain exactly the structure of these prolongations. It is evident that they are tubular, and that their cavity is nearly continuous with that of the sac containing the worm. Not quite so, however, for it can be seen that a membranous partition runs across where the prolongations begin, so that the worm is enclosed in a distinct cavity; and that the prolongations are tubes of much smaller calibre, but were apparently at some previous time connected with the central cavity. Now this central cavity contains a transparent fluid: the worm is, therefore, lying free in the interior of the sac, not connected with its membranous walls; this can be demonstrated by breaking open the sac by a slight pressure between the glass plates. It ruptures, and discharges the worm, which escapes in such a manner as to show that it lay before perfectly free within the cavity of the sac. (Fig. 3.) The worm still remains coiled up, after its escape, and you will usually find much difficulty in uncoiling it sufficiently to examine its structure. No operation in microscopic anatomy requires more patience than this; for its firm folds must be unwound without rupturing any of its parts, in such a manner as to give you a fair view from one extremity to the other. (Fig. 4.) This done, the trichina, at this stage of development, is found to be a worm one twenty-eighth of an inch in length; its anterior extremity or head is tapering and pointed; the body very gradually enlarges as you pass from the anterior extremity towards the middle, and about the middle acquires its greatest diameter, which it retains throughout the rest of its extent, terminating posteriorly in a round, blunted extremity. The alimentary canal runs longitudinally throughout the whole length of the worm, there being a mouth at the anterior or pointed extremity, and an anus at the posterior or rounded end. About the junction of the middle with the posterior third of the parasite, the calibre of the alimentary canal suddenly contracts, then enlarges again, and afterward remains reduced to about one-third its original size. The only other organ visible at this time, is one which occupies, together with the alimentary canal, the posterior third of the worm; an organ apparently tubular in character, rounded at either end, and filled with rather large and tolerably well-defined cellular bodies. This evidently is the sexual apparatus, such as exists at this time.

The characters which I have given are sufficient to define the encysted trichina as taken from the muscles. Suppose now a portion of muscular flesh, filled with trichinae in this condition, be taken as