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CIRCULAR NO. 3.

United States Department of Agriculture,  
BUREAU OF ANIMAL INDUSTRY.

**A NODULAR TENIASIS IN FOWLS.**

In the spring of 1894, a fowl (*Gallus domesticus*) died at the experiment station of this Bureau with a disease characterized by nodules or tubercle-like bodies in the intestinal wall. Upon closer inspection the lesions were found to be in the

sub-serous and muscular coats, and not, to any appreciable extent at least, in the glands. In the intestinal contents there were a large number of small tapeworms, many of which were firmly attached to the mucosa. Later in the season about twenty fowls from the same flock were used for experimental purposes, and upon post-mortem examination were found to be more or less affected with this disease. In addition to these, one of four fowls which were examined from a flock of poultry on a farm adjoining the experiment station was found to be infested with tapeworms and the intestinal wall studded with nodules. A fowl received from Newbern, N. C., and one from Tacketts Mills, Va., were similarly affected.

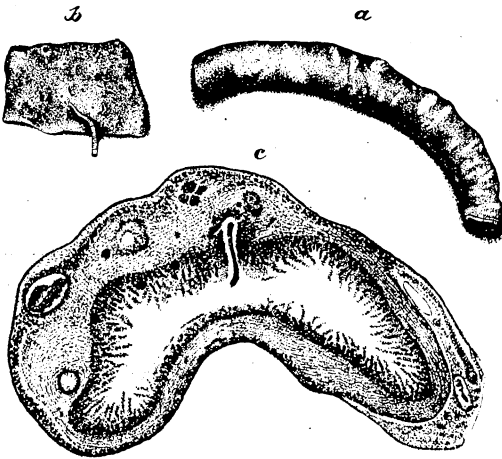


FIG. 1.—(a) Piece of the intestine of a fowl showing the nodules (reduced one-third). (b) The mucosa of the intestine showing ulcerated areas; also several small and one larger tapeworm attached to the intestine (reduced one-third). (c) A cross-section of the intestine illustrating the thickening of the wall due to a large number of the nodules; also a portion of a tapeworm which has penetrated the mucous membrane, magnified (original).

Although but one fatal case came under my observation, the extent of the lesions in several of the fowls examined indicated that sooner or later many of them would undoubtedly have succumbed to this disease. The close resemblance of the nodules to tubercles renders necessary a somewhat detailed description of the lesions and of the means by which this disease can be readily differentiated from tuberculosis without the aid of laboratory facilities.

DESCRIPTION OF THE DISEASE.

The fowl which died apparently from this disease was much emaciated, and the lesions were restricted to the intestinal wall. In the fowls used for other purposes, there were no observable symptoms by which the nodular affection could be detected prior to post-mortem examination. Diphtheria was the immediate cause of death of the fowls from North Carolina and Virginia. All of the fowls examined, affected with this disease, were from one to three years old.

The nodules were invariably more numerous in the lowest third of the small

intestine. They occasionally appeared, however, in small numbers in both the duodenum and colon. The larger and to all appearances older nodules were found in the ileum near the cæca.

In the badly affected portion the nodules gave the appearance of closely set protuberances, varying in size from barely perceptible areas of elevation to bodies 4 mm. ( $\frac{1}{4}$  inch) in diameter. In some instances they appeared to overlap one another. When separated by a band of normal tissue, they were round or somewhat lenticular in form. In the latter case the long diameter was usually transverse to the long axis of the intestine. The larger nodules were of a pale or dark yellowish color, while the smaller ones varied in shade from the more highly colored areas to the neutral gray of the normal serosa. To the touch they gave the sensation that would be expected if the sub-serous and muscular coats were closely studded with small, oval, solid bodies. The mucosa presented similar elevations. Attached to the mucosa over the nodules were a number of tapeworms. There were also in the more advanced cases a variable number of small (0.5 to 1 mm.) areas over the larger nodules in which the mucosa had sloughed leaving small ulcerated depressions.

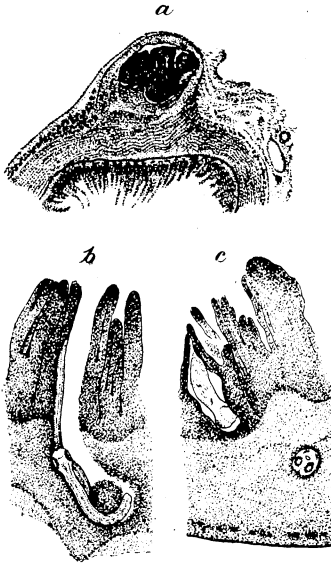


FIG. 2.—(a) A cross section of a nodule containing a sequestrum situated in the outer or longitudinal muscular layer, (circular layer of the muscular wall not affected). (b) A section showing a tapeworm and a necrotic mass within the muscular wall. (c) A portion of a cross section of the intestine showing the head of a tapeworm within the muscle and one lying between the villi with its head resting on the basement membrane of the mucosa, magnified (original).

The larger nodules contained a greenish-yellow, necrotic substance which appeared, in the advanced stages, as a sequestrum with a roughened surface. On section it had a glistening, homogeneous appearance. Surrounding the necrotic substance was a thin layer of infiltrated tissue. The smaller nodules contained a more purulent-like substance and the smallest appeared to the naked eye as areas of infiltration. Sections of the affected intestine showed upon microscopic examination that the heads of the tapeworms had penetrated the mucous membrane and were situated in different layers of the intestinal wall. They were frequently observed between the villi. As would be expected the heads were not readily detected in the necrotic masses contained in the larger nodules, but were almost invariably seen in the smaller ones. In a few sections the tapeworm could be traced through the mucosa to the nodule in the muscular tissue in which its head appeared. In the earlier stage of the nodular development there is a cell infiltration about the head of the worm. This process continues until the infiltrated tissue reaches a considerable size.

The worms attached to the mucosa were usually small. A larger form was commonly found in the intestinal contents. Although macroscopically they appeared to be different, Dr. Stiles found that they were presumably of the same species.

It appears from the literature that this disease has not heretofore been demonstrated in America. In 1881, Piana\* described a disease of fowls in Italy due to the presence of *Tania bothrioplitis*. His article, however, deals more with the

\* Mem. della Accademia della Sc. Dell' Istituto di Bologna, Ser. 4, 7, 11 (1880-1881), p. 387.

anatomy and classification of the infesting cestode than with the character of the lesions it produced. As he illustrates the nodules and heads of tapeworms in the intestinal wall there can be no doubt of the similarity of the lesions to those in the disease here described. Although fowls and birds are not infrequently infested with tapeworms, the lesions produced by these parasites are, with the exception indicated above, said to be more or less catarrhal in nature.

On account of the unsettled classification of the cestodes of fowls I was unable to determine the species to which the tapeworm found associated with this disease belongs or to identify it with the one described by Piana. The material was referred to Dr. C. W. Stiles, Zoologist of the Bureau, who made the following preliminary report:

"The form agrees with Piana's *Tenia bothrioplitis* of 1881; it is more than probable that this form is synonymous with *Davainea tetragona* (Molin, 1858) R. Bl., 1891; a study of the original types of *Davainea echinobothrida* (Megnin, 1881) R. Bl., 1891, and *Tenia pluripunctata* Crety, 1890, will undoubtedly show that these species are very closely allied to *if not identical* with this form."

#### ECONOMIC IMPORTANCE.

The importance of this disease is much greater than it at first appears as the close resemblance of the nodules to those of tuberculosis renders it of much significance from a differential standpoint. As the intestines are stated to be frequently the seat of the specific lesions of tuberculosis in fowls, it is of the greatest importance that a thorough examination be made before a positive diagnosis is pronounced. There are already several statements concerning the presence of tuberculosis in fowls in which the data given is not sufficient to differentiate the disease from the one here described. A somewhat analagous disease of sheep\* caused by a nematode (*Esophagostoma columbianum* Curtice) has led to the deliberate destruction of many animals, the owners believing that tuberculosis was being eliminated from their flocks. As the inquiry into the cause of poultry diseases becomes more general, it is probable that this affection will be occasionally encountered, and unless its nature is recognized it may in some instances, like the sheep disease, lead to an unwarranted destruction of property.

In addition to its importance in differentiating tuberculosis it is in itself a malady worthy of careful attention. The fact that it has already appeared in two flocks in the District of Columbia and also in the States of North Carolina and Virginia, shows that the infesting cestode is quite widely distributed in this country. It is highly probable that the total loss it occasions both from deaths and from the shrinkage of poultry products, due to the chronic course of the disease it produces, is very large. The life history of the tapeworm will be fully described by Dr. Stiles in a forthcoming report of the Bureau.

#### DIAGNOSIS.

Tuberculosis is, as before stated, the only known disease for which this affection is liable to be mistaken, and it is of much importance that the two diseases should not be confounded. The diagnosis has not in my experience been difficult, as in every case the attached tapeworms were readily detected upon a close examination of the intestinal contents, or of the mucous membrane of the infected portion of the intestine. However, the worms are quite small and could easily be overlooked in a hurried or cursory examination. In case of doubt, if the affected intestine is opened, and the mucous surface washed carefully in a gentle stream of water, the small worms will be observed hanging to the mucous

\* Animal Parasites of Sheep, Bureau of Animal Industry, Department of Agriculture, 1890, p. 165.

membrane. This discovery, in the absence of lesions in the liver or other organs, would warrant the diagnosis of the tapeworm disease. Although much is written concerning tuberculosis in fowls, especially in Europe, the investigations of poultry diseases by this Bureau have thus far shown that it is not common among fowls in this country.

Approved:

J. STERLING MORTON,

*Secretary.*

WASHINGTON, D. C., August 28, 1895.

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