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**A Survey Study of the Intestinal Worms and Ciliates of the Hog
(*Suis domesticas*)**

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A SURVEY STUDY OF THE INTESTINAL WORMS
AND
CILIATES OF THE HOG (SUIA DOMESTICA)

By

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of the
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in
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for the
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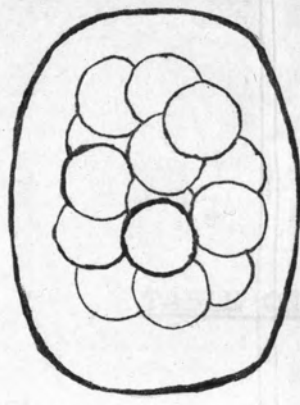
Introduction

The purpose of this survey study was to ascertain the variety and extent of intestinal worm and ciliate parasites of hogs slaughtered in packing houses of the Milwaukee area.

The fecal material was procured from the Cudahy Meat Packing Plant of Cudahy, Wisconsin. The specimens were taken from the lower bowel of freshly slaughtered hogs and transferred to clean unmarked milk bottles. Prior to examination the bottles were kept at a temperature of approximately 32 degrees F. in the refrigerator.

METHODS

It was decided that it would be wise to utilize modern concentration techniques previously found effective in uncovering both light and heavy worm and protozoan infections. The method used was that of Faust, E.C.; Tobie, J.E. et al, 1938 (1). The concentrate was then stained after the method of D'Antoni, J.S. 1937 (2), which lent contrast to the material for more ease in identification.



EGG OF OESOPHAGOSTOMUM DENTATUM



EGG OF ASCARIS LUMERICOIDES (var. suum)



BALANTIDIUM COLI

TABLE ONE

Species found	Number found	% of total
ASCARIS LUMBRICOIDES (var. suum)	28	40%
OESOPHAGOSTOMUM DENTATUM	16	22.85%
BALANTIDUM COLI	19	27.14%
NEGATIVE SAMPLES	25	36.66%
TOTAL NUMBER EXAMINED	70	100%

ASCARIS LUMBRICOIDES, LINNAEUS, 1758 (var. suum)

The eggs of Ascaris lumbricoides (var. suum) are oval with a thick transparent shell surrounded by an external albuminous coating which is coarsely mammillated. They measure from 50 microns to 75 microns in length by 40 microns to 50 microns in breadth, and are unsegmented at the time of deposition. In the unstained state they are a yellowish or brown color caused from the bile of the intestine of the host but when stained with D'Antoni's iodine they appear a deep brown color.

Embryonic development takes place almost immediately in the egg and if transferred into the food of the hog and ingested they pass to the small intestine where they soon hatch. The larvae then pass through the wall of the intestine and enter the lymphatics system. They are carried to the right heart either directly by the thoracic duct or by transfer to the portal circulation in the liver. From the heart they are carried by the pulmonary circulation to the lungs. They undergo further development and break out of the alveoli and ascend the bronchioles and trachea to reach the epiglottis and are swallowed and pass on to the intestine where they eventually reach the adult stage and lay eggs.

OESOPHAGOSTOMUM DENTATUM (RUDOLPHI), 1803

The eggs of this parasite are typical of worm parasites of the hookworm type. They are ovoidal and approximately 40 to 45 microns in breadth and 65 to 75 microns in length. There appears a definite cell wall with multiple inclusions which in the unstained condition appear as a solid mass, but in the stained material show up as overlapping spheres.

The life cycle of Oesophagostomum dentatum is direct. Eggs are passed in the hog feces and subsequently give rise to an infective larval stage on the pasture land. These are picked up by the hogs when feeding and swallowed. After being liberated from their sheaths in the intestine, Chandler, A.C. 1940 (pp. 388) (3), they do not at once establish themselves in the lumen of the intestine, but burrow into the lining of the large intestine where the host forms a tumor-like capsule around them. The large intestine of a badly infected animal may be covered with nodules about half an inch in diameter. When approaching maturity, the worms escape into the cavity of the large intestine, where the sex organs develop and eggs, closely resembling those of the hookworm, are developed and deposited.

BALANTIDIUM COLI

The cysts of Balantidium Coli are large and spherical attaining a diameter of from 30 to 50 microns. In an unstained preparation it is possible to see the large kidney shaped macronucleus which is darker in color than the surrounding cytoplasm. There is a definite outer wall with a thinner inner wall. When stained with D'Antoni's iodine the cyst becomes a dark tan with the macronucleus showing much darker either centrally or eccentrically placed.

The trophozoite of Balantidium Coli lives in the large intestine where it reproduces by transverse binary fission. Single organisms may encyst and the cysts pass out of the body in the feces. They represent the infective stage which brings about its own infection in the hosts, and the transmission of the species to new hosts, since the cysts are incapable of movement. Ingestion of food or drink contaminated by fecal material containing cysts is the mode of infection. The propagation of swine infections is easy and obviously difficult to prevent. Fortunately, such infections apparently cause little or no pathology in the hog.

DISCUSSION

No trophozoite of Balantidium Coli are reported in this survey study. The fecal material was not immediately examined after procurement and therefore all trophozoites probably assumed a cystic form on refridgeration.

No known pathology has been noted in the hog for Balantidium Coli, but if transferred to man it may cause serious complications.

As it has been mentioned by Augustine, et al, 1929 (4), Ascaris lumbricoides (var. suum), frequently gives rise to an infection in hogs called " thumps ", serious enough to cause stunting of growth resulting in loss of quantity and quality of pork production.

The nodular disease in hogs is a result of the pathology induced by infection with Oesophagostomum dentatum (Rudolphi), 1803. According to Augustine, 1929 (5), this disease is more or less injurious according to the severity of the infection and causes the condition known as " knotty guts ". This condition is due to the production of thickened areas by the worms encysted in the intestinal walls. Such defects render the intestine unsuitable for use as sausage casings, thus causing considerable economic loss to the meat packing industry.

SUMMARY

A survey study was made of the incidence of intestinal worms and ciliate infection in the hogs slaughtered at the Cudahy Meat Packing Plant, Cudahy, Wisconsin. It was found that 40% of the 70 samples examined contained eggs of Ascaris lumbricoides (var. suum), 22.85% of the 70 samples examined contained eggs of Oesophagostomum dentatum (Rudolphi), and 27.14% of the 70 samples examined contained cysts of Balantidium Coli.

CONCLUSION

It is evident from this brief survey that hogs brought in for slaughter at local packing plants often serve as hosts for at least two varieties of intestinal worms and one intestinal ciliate. The existence of the percentages of infections shown above, particularly with the two worm species could be construed as a potential source of damage to pork by loss of weight, stunting of growth, and following, a degeneration in the quality and quantity of pork.

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M. J. Bandy

Date _____