toxin soon follows and increases in amount. It should be noted that the antitoxin is not specific for type as the toxin used in the tests was produced by Type V bacillus while the animals were carrying Types I or II. The sera of control animals bled at the same time as those that carried the bacilli as well as animals in which tetanus bacilli failed to become established in the digestive tract failed to show either agglutins or antitoxin.

138 (2370)

Schistosomiasis japonica: Egg deposition and the subsequent pathology in the intestines of experimentally infected dogs.

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Dogs were infected with the cercaria of *Schistosoma japonicum* either by subcutaneous injection or by immersing the dogs in infected water. Eggs were first recovered from the feces of one heavily infected dog on the twenty-seventh day after infection, and from other dogs at various intervals up to about forty days. The dogs were sacrificed at various intervals after the appearance of eggs in the feces, from the twenty-eighth to the seventy-seventh day. Portions of intestine were excised, often while the dog was still alive under ether anesthesia, and were fixed in Zenker's solution or 10 per cent formalin. Blocks were embedded in paraffin and sections were stained with hematoxylin and eosin. From five dogs, killed on the 28th, 33rd, 40th, 63rd and 65th days after infection serial sections were cut from the blocks of tissue which showed the most intense pathology. I wish to emphasize here two features of the pathology which have not been described previously.

1. *The earliest position of deposited eggs.* On the twenty-eighth day after infection nearly all the deposited eggs were in the stroma of the mucosa; a few were in the submucosa. The eggs were in large or small groups containing up to 200 eggs in one group. The eggs of each group usually radiated out into the

mucosa from a single point in the submucosa, and in many cases it could be seen that all the eggs were within distended venules and copillaries. They often extended nearly to the surface epithelium of the mucosa.

Male and female worms, always *in copula,* were found in distended veins in the submucosa. At this early stage there was no hemorrhage into the tissues and practically no tissue reaction about the deposited eggs. It is inferred from these findings that the male and female worms remain together during egg deposition, that the female worm protrudes its head forward into the smaller venules and that it often expels most of the eggs from its uterus within a very short time. (The uterus of this worm, when full, usually contains between 200 and 300 eggs.) The eggs are apparently deposited directly into the vessels of the mucosa, from which point they can reach the intestinal lumen very quickly. This may occur either by means of a rupture of the distended mucosa or by lysis of the tissue due to toxins secreted by the eggs.

2. *Epithelial Proliferation into abscesses in the submucosa.* In sections from the dogs killed 40, 63 and 65 days after infection, abscesses had developed about the eggs in all coats of the intestine, and in each dog there was a tendency for the intestinal epithelium to proliferate into the abscesses in the submucosa. In the 65-day dog some of these abscess cavities were completely lined by intestinal epithelium. In others the epithelium had advanced from the mucosal outlet of the abscess part way around the cavity. The contents of abscesses were being discharged through the lumens of the glands whose epithelium had proliferated inward. No large outlets for submucosal abscesses were seen. This proliferation of epithelium usually occurred where the submucosa was thickened, either because of intestinal rugæ or because of the inflammatory reaction.

The mucosa was often swollen also in such places because of the presence of eggs deposited in it. It is probable that this epithelial proliferation into the submucosa is an important factor in the formation of intestinal papillomas, which are almost constantly found in late stages of schistosomiasis. The thickening of the submucosa and the egg deposits in the mucosa must contribute also to the papilloma formation. Ferguson[1] has de-

[1] Ferguson, A. R., *J. Path. and Bact.,* 1911, xvi, 76.

scribed epithelial proliferation into the submucosa in the bladder in human cases of schistosomiasis hematobia, and considers it a factor in papilloma formation in that viscus.

ABSTRACTS OF COMMUNICATIONS.

Minnesota Branch.

Fifteenth meeting.

Minneapolis, Minnesota, January 9, 1924.

139 (2371)

The possible rôle of constant bioelectric currents in growth.

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In a previous note[1] it was stated that the threshold density of an electric current necessary for inhibition of growth in the ends of Obelia internodes turned toward the cathode was very nearly equal to 66 microamperes per square millimeter.

This threshold inhibition is reversible.[2] For orientation of the axis of growth a threshold current density of only 6 to 13 microamperes per square millimeter of cross section is necessary. This is therefore only about one-tenth as great as the current density threshold for inhibition. We may translate this result into its equivalent of threshold of applied difference of electric potential.

The living tissue of the stem and pieces of stem in Obelia have also been shown to be the seat of a relatively constant electric potential.[3] More recently this potential has been measured by the use of a suitable type of electrode.[4] The results show that a difference of potential exists between the inside and outside of

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[1] Lund, E. J., PROC. SOC. EXP. BIOL. AND MED., 1923, xxi, 127.

[2] Lund, E. J., *J. Exp. Zool.*, 1923, xxxvii, 69.

[3] Lund, E. J., *J. Exp. Zool.*, 1922, xxxvi, 477.

[4] Lund, E. J., PROC. SOC. EXP. BIOL. AND MED., 1923, xxi, 128.