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FURTHER STUDIES ON *PROSTHOGONIMUS*
MACRORCHIS, OVIDUCT FLUKE OF POULTRY, WITH
SPECIAL REFERENCE TO THE EFFECT ON EGG
PRODUCTION IN THE RING-NECKED PHEASANT

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Of the trematode parasites of poultry, members of the genus *Prosthogonimus* are most important as producers of disease. These worms cause irritation of the oviducts of chickens and greatly reduce the production of eggs. Hieronymi and Szidat, 1921,¹ showed that in Germany, *Prosthogonimus pellucidus* was the cause of serious poultry disease. Szidat, 1927,² reported that in the spring of 1926 it was impossible to get fresh eggs in parts of East Prussia due to the devastating effects of *Prosthogonimus* disease. Others have reported the disease from various parts of northern and western Europe. In North America, Kotlan and Chandler, 1925,³ reported a serious poultry malady in northern Michigan and found that it was due to an unidentified fluke of the genus *Prosthogonimus*, later designated as *Prosthogonimus macrorchis*.

Szidat, 1926,⁴ in Germany, and Lakela, 1931,⁵ in Minnesota, found that dragonflies were intermediate hosts of *Prosthogonimus*. The writer, 1934,⁶ described the principal North American species and gave it the name *Prosthogonimus macrorchis*, and implicated it with the production of disease in chickens.⁷ It was found from controlled experiments on chickens that this parasite reduces egg-laying 90%.

The snail *Ammicola limosa porata* was discovered to be the first intermediate host of *Prosthogonimus macrorchis*. Dragonflies of the genera *Leucorrhinia*, *Tetragoneuria*, *Epicordulia*, and *Gomphus*⁸ were found to serve as important intermediate hosts, which carry the organisms to the birds.

¹ Hieronymi, E. and Szidat, L. 1921. Über eine neue Hühneren Zootie bedingt durch *Prosthogonimus intercalandus* n. sp. Centralbl. Bakt. Parasit. 1 Abt. Orig. 86: 236-241.

² Szidat, L. 1927. Die Trematodenkrankheit unserer Legehühner, ihre Erreger and Ihre Verhütung. Arch. Geflügelkunde. 1-2: 153-161.

³ Kotlan, A. and Chandler, W. L. 1925. A newly recognized fluke disease (prosthogonimiasis) of fowls in the United States. Jour. Am. Vet. Med. Assn. 67: 756-763.

⁴ Szidat, L. 1926. Der Uebertrager der Trematodenkrankheit unserer Legehühner, Centralbl. Bakt. Parasit. Abt. 1. Orig. 99: 561-564.

⁵ Lakela, Olga, 1931. Chickens definitive hosts to species of *Prosthogonimus*. Poultry Science. 11: 181-184.

⁶ Macy, R. W. 1934. *Prosthogonimus macrorchis* n. sp., the common oviduct fluke of domestic fowls in the Northern United States. Trans. Amer. Micro. Soc. 53: 30-34.

⁷ Macy, R. W. 1934. Studies on the taxonomy, morphology, and biology of *Prosthogonimus macrorchis* Macy, a common oviduct fluke of domestic fowls in North America. Tech. Bull. 98, University of Minn. Agric. Exper. Sta., St. Paul.

⁸ Macy, R. W. 1939. *Gomphus spicatus* Hagen (Odonata a new intermediate host for *Prosthogonimus macrorchis* (Trematoda).

More recently, the writer, 1939,⁹ found that laying turkeys when experimentally infected with *Prosthogonimus macrorchis* showed typical symptoms and disease previously seen in chickens. From one of the turkeys fed 20 naturally infected dragonfly naiads from Lake Phelan, St. Paul, were obtained twelve days later 236 medium-sized *Prosthogonimus*. The experimental birds ceased laying soon after being infected. At autopsy the oviducts were found to contain hardened masses of chalky-gray yolk material. In the body cavities were large chunks of abortive egg material and much gray pus.

With the aid of a grant from the American Association for the Advancement of Science and the Minnesota Academy of Science, and with the cooperation of Dr. William A. Riley and Dr. Gustav Swanson of the Department of Entomology and Economic Zoology at the University of Minnesota, an experiment was completed showing the effect of *Prosthogonimus* infection on the common ring-necked pheasant, *Phasianus colchicus torquatus*.¹⁰

A flock of ten pheasants was separated into two pens with four hens and a rooster in each. On May 8, 1939, each hen in one pen received ten *Prosthogonimus*-infected dragonfly naiads of the genus *Tetragoneuria*. These insects were collected from a local lake where there was an average of eight cysts of *Prosthogonimus* per dragonfly of this genus. During the course of this experiment both infected and control birds had an adequate diet including plenty of grit and water.

Between May 8 and May 15 the infected birds laid a total of five eggs. Their egg production then completely ceased. For the period of the experiment, from May 8 to June 4, the control group laid a total of 25 eggs or five times as many as the number laid by the *Prosthogonimus*-infected birds. It will be noted in the accompanying chart that egg production by the controls increased during the second half of the month when the infected birds laid no eggs.

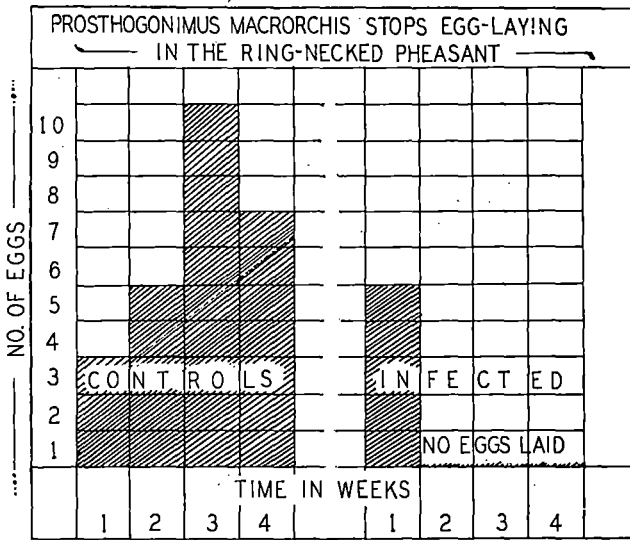
The four infected birds were autopsied June 4, and the oviducts were found to contain a total of 250 *Prosthogonimus macrorchis*, many of which were unusually large. Although the ovary contained many eggs in various stages of development and the oviduct was enlarged to the functional condition in each case, no eggs had been laid for three weeks. In the oviducts there was a great amount of abortive egg material. In three birds the body cavity contained similar egg material and some pus. These findings closely resemble what previously has been found in chickens and turkeys. The birds showed few outward symptoms.

The results of the experiment do not agree with those of Gower, Michigan Department of Conservation, 1939.¹¹ He stated that soon

⁹ Macy, R. W. 1939. Disease in turkeys due to *Prosthogonimus macrorchis*. Jour. Amer. Vet. Med. Assn. 94, n. s., 47: 537-538.

¹⁰ Macy, R. W. 1940. Curtailment of egg production in the common ring-necked pheasant due to experimental infection with the oviduct fluke, *Prosthogonimus macrorchis* Jour. Parasitol. 26: 158. (Research note.)

¹¹ Gower, W. Carl, 1939. Infectivity of *Prosthogonimus macrorchis* Macy for the common ring-necked pheasant. Jour. Parasitol. 25: 447-448.



after feeding to a laying ring-necked pheasant 14 dragonfly naiads of the genus *Tetragoneuria*, presumably containing cysts of *Prosthogonimus macrorchis*, no flukes were found in the birds. One of two additional pheasants to which he fed six and seven naiads respectively yielded a single worm. The other was negative. Egg production was not effected. He concluded that the pheasant is highly refractive to infection by *P. macrorchis*, at least in the oviduct of the laying female.

Gower's conclusions are based on a small amount of evidence, as he realized. Other than the presence of one fluke in a pheasant there is no positive evidence that his birds received cysts of *P. macrorchis*.

In conclusion, the present experiment shows that ring-necked pheasants are fully as susceptible to infection with *Prosthogonimus macrorchis* as the chicken, and that egg laying is greatly reduced by the presence of this parasite in the oviduct.

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DEER INVENTORY STUDIES IN MINNESOTA

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Considerable attention has been focused in recent years on deer problems throughout the country. A variety of problems exists, ranging from deer scarcity to over abundance, and the importance of deer from the standpoint of hunting and recreation has stimu-