

of the organs in action showed them to be used as intakes for water during inspiration. They are used in this way both while the mouth is so used and also when it is closed tightly. Each of these two internal openings is provided with an independent valve which automatically prevents the regurgitation of water.

Besides these openings the nasal cavity is also provided with the usual anterior and posterior nares. A fuller account of this structure will appear shortly in another journal.

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#### SPECIAL ARTICLES

##### BLACKHEAD, A COCCIDIAL DISEASE OF TURKEYS<sup>1</sup>

IN many districts of the United States, and in Rhode Island in particular, there has been known to exist since about 1894 a highly infectious disease affecting the ceca and liver of turkeys and, to a less extent, of fowls. It is characterized, in the ceca, by inflammation, thickening, occasional perforation of the walls and denudation of the epithelium; in the liver by enlargement and by the formation of cream-yellow spots.

Since the investigations of Theobald Smith, published in 1895, it has been commonly believed that the disease is due to an ameba, *Amœba meleagridis* Smith. The present writers believe they have demonstrated, however, that the disease is caused by a *Coccidium*, which, according to the nomenclature adopted, may be a variety of *Coccidium cuniculi*, and that *Amœba meleagridis* Smith is probably the schizont stage in the development of the *Coccidium*.

The stages of the *Coccidium* most commonly found were the schizonts and the macrogametes or oocytes. The former were first discovered in smears by means of a rose-analino-violet and methylene-blue stain. Later they were recognized in fresh preparations, both within and without the epithelial cells. The macrogametes were most common in the cecal and the intestinal content below the junction of the ceca, and were often present when the cyst stage was absent. Besides these stages

the microgametocytes, the microgametes, the merozoites and the sporozoites were recognized both in fresh preparations and in sections stained with hematoxylin and eosin.

By placing the cecal content containing macrogametes in a solution of 10 per cent. potassium bichromate, the growth of bacteria was stopped and the development into cysts and then into sporozoites could be watched. The cysts are commonly oval, and have an average size of 21 by 14 micra. Cultures containing cysts were also made to develop in 2 per cent. formalin, saturated solution of thymol, 4 per cent. boracic acid, 1 per cent. lysol and 2 per cent. carbolic acid. The organism is common in the soil and is frequently found in apparently normal fowls, which do not appear to be so susceptible as turkeys to this form of the disease.

By means of feeding portions of cecal content or parts of ceca of diseased birds, the disease was produced experimentally in turkeys, chicks and sparrows, but not in guinea-pigs, kittens or in rabbits. In young turkeys the disease is almost certainly fatal; older birds may recover. It is doubtful if death is caused directly by the *Coccidium* in the majority of cases; whether there is a specific accompanying organism pathogenic to turkeys under these conditions, and less so to chickens, has not yet been determined. In cases of perforation of the cecum, death soon follows from acute peritonitis. No method of treatment is at present recognized.

The investigations reported above were made at the Rhode Island Agricultural Experiment Station, in cooperation with the Bureau of Animal Industry, U. S. Department of Agriculture, during the year 1906-7.

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#### THE NATIONAL CONSERVATION COMMISSION

PURSUANT to the recent Conference of Governors in the White House on the conservation of our natural resources, the President on June 8 appointed a National Conservation Commission, comprising Senators and Representatives in Congress, scientific and technical

<sup>1</sup> Abstract of paper read before the Zoologists' meeting at New Haven, December, 1907.