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Isospora buteonis Henry 1932 in an American Kestrel (*Falco sparverius*) and a Golden Eagle (*Aquila chrysaetos*)¹

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ABSTRACT

Isospora buteonis Henry 1932 was considered the probable cause of death in an American kestrel (*Falco sparverius*) and a possible cause of death in a golden eagle (*Aquila chrysaetos*) in the state of Washington, U.S.A. *I. buteonis* has been reported only from the western part of North America. It resembles *I. bigemina* in size, in location and sporulation of oocysts beneath the intestinal epithelium, and in fragility of the oocyst wall.

CASE HISTORIES

CASE #1. A young falconer asked to have a redtailed hawk (*Buteo jamaicensis*), which he thought might have frounse (a falconer's term for trichomoniasis), and an American kestrel (*Falco sparverius*) examined. Wet smears and Giemsa-stained smears of the blood revealed nothing of consequence.

Physical examination of the hawk showed it to be apparently normal. Trichomonads were not observed in wet smears prepared from saline soaked swabs of various parts of the mouth, pharynx, and esophagus. Neither ova nor oocysts were seen in wet smears made from the feces.

The kestrel was emaciated and moribund. It died just as the examination of the hawk was finished. Bacteriological culture attempts were made from blood, lungs, liver and spleen specimens streaked on blood agar plates and incubated in candle jars. Intestinal content was inoculated into selenite broth, which was streaked on SS agar after 18 hours incubation. These culture attempts were unsuccessful. Scrapings from esophagus and intestine were digested with

potassium hydroxide and examined microscopically for fungal hyphae. None were seen.

The intestinal wall from the cephalic end to the vestigial ceca was thickened and white. Microscopic examination of scrapings from the intestine revealed numerous oval bodies, about 10 microns long, each containing many round bodies about 1 micron in diameter and four fusiform (cigar-shaped) bodies about 6 microns long and less easily seen (Figure 1). No metazoan parasites were seen.

These oval bodies were interpreted at first as the oocysts of a *Cryptosporidium*. By use of an iris scissors under a dissecting microscope, an individual villus was snipped off and placed gently in physiological saline solution. Broken pieces of cover slip were placed around it to serve as supports for a cover slip. Microscopic examination of this villus showed that the oval bodies mentioned above were actually in pairs within a very thin membrane (Figure 2). There were a large number of such oocysts within the villus. Villi from other parts of the intestine were similarly parasitized.

A piece of intestine was fixed in

¹This investigation was supported in part by funds administered by Washington Agricultural Experiment Station, Pullman. Project 9073.



FIGURE 1. Sporocysts of *Isospora buteonis*.



FIGURE 2. Oocyst of *Isospora buteonis*.

10% formalin solution, sectioned by the Pathology Department and stained with hematoxylin-eosin. Microscopic examination of the sections revealed numerous coccidial oocysts in the connective tissue cores of the villi (Figure 3).

The kestrel probably died from coccidial infection, for, (1) the entire intestine was severely affected, (2) the

bird was emaciated, much like chickens affected with *Eimeria mirati*, indicating a disease of some chronicity, (3) no lesions of organs outside the digestive tract were seen, (4) no bacterial, fungal, protozoan, or metazoan parasites were observed in selected tissues.

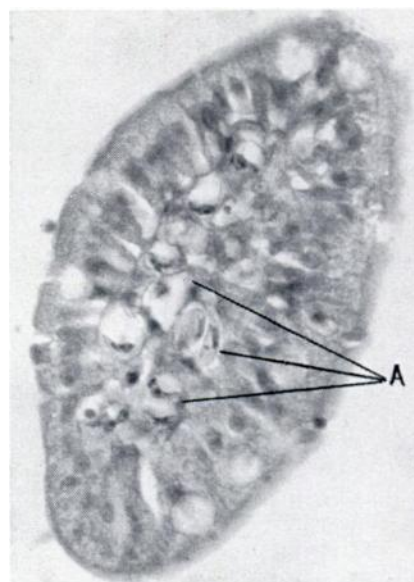


FIGURE 3. Cross section of villus, showing oocysts of *I. buteonis* (A) in core of villus. Contents of oocysts have been shrunk by the sectioning process.

A search of veterinary and zoological publications indicated that Henry described a coccidium of hawks and owls (1932, University of California Publication in Zoology, 37:291-301). Measurements given by Henry for oocyst were 16.0-19.2 μ in length by 12.8-16.0 μ in width; sporocysts 9.6-13.0 μ by 8.0-10.4 μ ; sporozoites 5.0-7.8 μ by 1.3-2.5 μ . Henry described the oocysts as being sporulated in the host and as having a very fragile oocyst wall which ruptured on slight pressure. The sporocysts contained large round granules.

The measurements of our coccidium matched those given by Henry. It had the same type of oocyst wall; it was sporulated in the intestine and it contained large granules. It seems likely that it was *Isospora buteonis* Henry 1932.

CASE #2. A piece of frozen intestine from a golden eagle (*Aquila chrysaetos*) was submitted for study. The bird had been found in moribund condition by a game warden and was described as emaciated. After the intestine was thawed, it was found to be that part from the anal end of the duodenal loop to the cloaca. It contained bodies identical in appearance to *I. buteonis* and large numbers of strigeid trematodes and a few nematodes. Freezing and thawing precluded further identification of these worms. Routine cultures for *Salmonella* organisms were negative. No fungi were seen.

DISCUSSION

In case #1, *I. buteonis* clearly was a pathogenic agent. Henry's view that it was not a pathogenic coccidium was based on lack of severe lesions in birds shot for examination. Any bird still able to fly probably would not have reached the stage of emaciation caused by coccidial inactivation of the intestinal epithelium. The presence of the oocysts below the epithelial cells of the mucosa is unusual for coccidia. *I. buteonis* resembles *I. bigemina* of the dog and cat in this regard as well as in size, sporulation in the tissues, and in fragility of the oocyst wall. Cross-transmission studies should be made to see if the two species may really be one.

It was difficult to ascertain the source of the infection. The bird was said to be about 8 weeks old and to come from a nest near Pullman. Four or five other birds from the same nest were said to have died recently (one of these after being taken to Montana). The kestrel was kept in the same quarters formerly occupied by a raven which had died of an undiagnosed ailment the previous year.

In case #2, the part played by *I. buteonis* in causing the emaciation and death of the eagle is difficult to assess. Many parasitologists ascribe a low order of pathogenicity to strigeid trematodes.

Thus far, cases of *I. buteonis* infection have been observed only in the western part of North America. Since Henry's original report of its presence in California birds (*Buteo borealis*, *B. swainsoni*, and *Accipiter cooperi*) and in Washington birds (*Asio flammeus*), there have been two reports preceding this report. Henry, in a personal communication cited by Boughton (1938, Ohio J. Sci., 38: 149-163), reported *I. buteonis* in *Asio flammeus* in California and in *Bubo virginianus pallescens* in Washington. Boughton erroneously cites Henry's original paper as reporting *I. buteonis* in *Falco sparverius*. Holling and Lowle (1955, J. Parasit., 41:638-639) report *I. buteonis* in *Accipiter gracilis* from Alberta.