Section 5

Parasites and Parasitic Diseases

Hemosporidiosis
Trichomoniasis
Intestinal Coccidiosis
Renal Coccidiosis
Sarcocystis
Eustrongylidosis
Tracheal Worms
Heartworm of Swans and Geese
Gizzard Worms
Acanthocephaliasis
Nasal Leeches
Miscellaneous Parasitic Diseases

Stained blood smear from a turkey infected with the parasite *Haemoproteus meleagridis*

Photo by Carter Atkinson
Introduction to Parasitic Diseases

“Parasites form a large proportion of the diversity of life on earth.”

(Price)

Parasitism is an intimate relationship between two different species in which one (parasite) uses the other (host) as its environment from which it derives nourishment. Parasites are a highly diverse group of organisms that have evolved different strategies for infecting their hosts. Some, such as lice and ticks, are found on the external parts of the body (ectoparasites), but most are found internally (endoparasites). Some are microscopic, such as the blood protozoans that cause avian malaria; however, many are macroscopic. Life cycles differ greatly between major types of parasites and are generally classified as direct or indirect (Table 1). Direct life cycles do not require an intermediate host (Fig. 1A). For direct life cycles, only a definitive host is required: the species in which the parasite reaches sexual maturity and produces progeny. Indirect life cycles may involve one or more intermediate hosts (Fig. 1B and C). Intermediate hosts are required by the parasite for completion of its life cycle because of the morphological and physiological changes that usually take place in the parasite within those hosts. Wild birds can serve as the definitive hosts for most of the parasites that are discussed in the following chapters. In addition, paratenic or transport hosts are present in some parasite life cycles. The parasites generally do not undergo development in paratenic hosts. Instead, paratenic hosts provide both an ecological and temporal (time) bridge for the parasite to move through the environment and infect the definitive host. Typically, in these situations one or more intermediate hosts are required for development of the parasite but they are not fed upon by the bird. Instead, the bird feeds on the paratenic hosts, which in turn have fed on the intermediate host(s), thereby, “transporting” the parasite to the bird (Fig. 2).

The presence of parasites in birds and other animals is the rule, rather than the exception. Hundreds of parasite species have been identified from free-ranging wild birds; however, the presence of parasites does not necessarily equate with disease. Most of the parasites identified from wild birds cause no clinical disease. Others cause varying levels of disease, including death in the most severe cases. The pathogenicity or the ability to cause disease, of different species of parasites varies with 1) the species of host invaded (infected or infested), 2) the number or burden of parasites in or on the host, and 3) internal factors impacting host response. For example, when birds are in poor nutritional condition, have concurrent infections from other disease agents (including other species of parasites), or are subject to other types of stress, some parasites that do not normally cause disease do cause disease. Lethal infections may result from parasites that generally only cause mild disease.

This section highlights some of the parasitic diseases such as trichomoniasis that are associated with major mortality events in free-ranging wild birds and those that because of the gross lesions they cause (*Sarcocystis* sp.), their visibility (nasal leeches), or general interest (heartworm) are often the subject of questions asked of wildlife disease specialists.

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Quote from:

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<table>
<thead>
<tr>
<th>Type of parasite</th>
<th>Common name</th>
<th>Type of life cycle</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nematodes</td>
<td>Roundworms</td>
<td>Indirect and direct</td>
<td>Most significant group relative to number of species infecting birds and to severity of infections. Unsegmented cylindrical worms. Found throughout the body. Generally four larval stages. Sexes are separate. Most are large in size (macroscopic).</td>
</tr>
<tr>
<td>Cestodes</td>
<td>Tapeworms</td>
<td>Indirect</td>
<td>Flattened, usually segmented worms with a distinct head, neck and body. Found primarily in the lumen of the intestines. Lack a mouth or an alimentary canal; feed by absorbing nutrients from the host's intestinal tract. Most are hermaphroditic (self-fertilization; have both male and female reproductive tissues). Attachment is by suckers, hooks. Large size (macroscopic).</td>
</tr>
<tr>
<td>Trematodes</td>
<td>Flukes</td>
<td>Indirect</td>
<td>Flatworms, generally leaf-shaped (some almost cylindrical). Generally found in the lower alimentary tract, respiratory tract, liver, and kidneys. Complex life cycles; usually require two intermediate hosts, one of which is usually a snail. Hermaphroditic except for blood flukes, which have separate sexes. Attachment is usually by suckers.</td>
</tr>
<tr>
<td>Acanthocephalans</td>
<td>Thorny-headed worms</td>
<td>Indirect</td>
<td>Cylindrical, unsegmented worms. Found in the digestive tract. No intestinal tract; nutrients absorbed through the tegument (similar to tapeworms). Sexes are separate. Attachment by means of a retractable proboscis that has sharp recurved hooks or spines.</td>
</tr>
<tr>
<td>Protozoans</td>
<td>Coccidians, malarias, trichomonads, others</td>
<td>Direct and indirect</td>
<td>Microscopic. Different types are found in different parts of the body. Asexual and sexual multiplication.</td>
</tr>
</tbody>
</table>
Figure 1  Examples of (A) direct, (B) simple indirect, and (C) complex indirect parasite life cycles.
Parasite eggs are passed in feces and hatch in water.

Larvae (miracidium) swims to a snail and penetrates it, undergoing further larval development within the host.

New larval stage emerges from the snail (cercaria) and swims to a new host where it penetrates and encysts.

Other bird species eat the second intermediate host and become infected.

First intermediate host

Second intermediate host

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Figure 2  Hypothetical parasite life cycle illustrating the role of paratenic (transport) hosts.

Infected bird

Bird sheds parasite eggs into the environment in feces

First intermediate host
Eggs eaten by amphipod where first- and second-stage larvae develop

Second intermediate host
Amphipod is eaten by amphibian where infective stages of larvae develop

Paratenic host
Fish eats the amphipod and larvae encyst in body of fish. No further development of the parasite

Birds feed on fish and become infected to complete life cycle