

# Trematode Metacercariae and Sporocysts

## I. Causative Agent and Disease

Trematodes or flukes are members of the phylum Platyhelminthes and the class Trematoda. Adult worms of the subclass Digenea are endoparasites occurring in all classes of vertebrates and use invertebrates as the first and second intermediate host and rarely as the final host. A metacercaria is the encysted juvenile trematode usually occurring in the second intermediate host that requires ingestion by the final host to become an adult worm. A sporocyst is formed as part of the trematode developmental cycle in the first intermediate host. Depending on the trematode species, sporocysts and metacercariae are found in the tissues of a variety of intermediate hosts including bivalve molluscs. Low numbers of encysted metacercariae in most molluscs generally cause no overt disease but when present in significant numbers can cause general debilitation, behavioral changes favoring predation, tissue destruction and host death. Sporocyst stages are overtly destructive causing parasitic castration, weakness and gaping of valves with gradual destruction and replacement of molluscan tissues resulting in eventual mortality of the host. There are several different trematode families utilizing marine molluscs as intermediate hosts, most notably the family Bucephalidae and the genus *Bucephalus*.

## II. Host Species

Various species of digenetic trematode sporocyst and metacercarial stages occur in many marine bivalve mollusc species worldwide including oysters, clams, scallops, mussels and cockles. In Alaska, sporocysts of unidentified trematodes have been observed in blue

mussels and razor clams while unidentified encysted metacercariae have been observed in blue mussels, basket cockles, littleneck clams and weathervane scallops.

## III. Clinical Signs

Clinical signs of trematode sporocyst infestation may include increased flesh yield regarding initial sporocyst development that ultimately results in poor growth and debilitation in later stages, weakness in valve closure, reduced byssal thread production in mussels, infertility (parasitic castration), chalky shell deposits, induction of pearl formation reducing marketability and bivalve mortality. Encysted metacercariae most often are benign depending on the trematode species and intensity. However, some investigations have shown metacercariae to cause shell gaping and deformities, production of pearls and chalky shell deposits, behavioral changes that favor predation, reduced tolerance to stress, and host mortality in heavy infestations. Metacercariae and developing sporocysts may be observed in various bivalve tissues during routine histological examination.

## IV. Transmission

Trematode life cycles involving marine molluscs generally include two intermediate hosts and one definitive host (only two hosts for Sanguinicolidae) with several possible combinations of pathways that include gastropods and bivalves (or other invertebrates) for intermediate hosts and fish, birds or bivalves (or other invertebrates) as final hosts. Trematodes of the family Bucephalidae are of great importance because their larvae affect numerous commercially

important mussels and oysters and food fishes such as flatfishes and cods. The pathway for *Bucephalus* sp. typifies the family and begins in a bivalve followed by a fish then on to a second fish as the final host. Eggs in the alimentary tract of the final predatory fish host are deposited with feces in seawater and hatch into ciliated miracidia that parasitize the first intermediate bivalve host. Once in the bivalve a miracidium develops into a mother sporocyst that produces more sporocysts that eventually produce cercariae released from the host. These cercariae drift with the currents and parasitize the second intermediate fish host and encyst as metacercariae. The encysted metacercariae find their way to the gut of the final host fish when the second intermediate fish host is eaten. Metacercariae become adult trematodes in the gut of the fish where eggs are produced to begin the cycle again. Encysted metacercariae found within bivalve host tissues indicate members of other trematode families that may follow different life cycle pathways of having a bivalve mollusc as a second intermediate host rather than a fish.

#### **V. Diagnosis**

Wet mounts of fresh tissues may show the encysted metacercariae (Gymnophallidae are unencysted) which can be extremely difficult to find if in low prevalences. Sporocysts of some trematodes may be grossly orange in color within the bivalve tissues and differentiated by species based on the morphology of the cercariae. Sporocysts and encysted metacercariae can also be observed in tissue sections during routine histological examination. Sporocysts may extensively infiltrate host tissues, exhibit dichotomous branching and are strongly basophilic containing germ balls and cercariae. Metacercariae may exhibit trematode features such as oral and ventral suckers and appear in various tissues

as small foci having varying degrees of encapsulating host fibrous tissues and inflammatory cells.

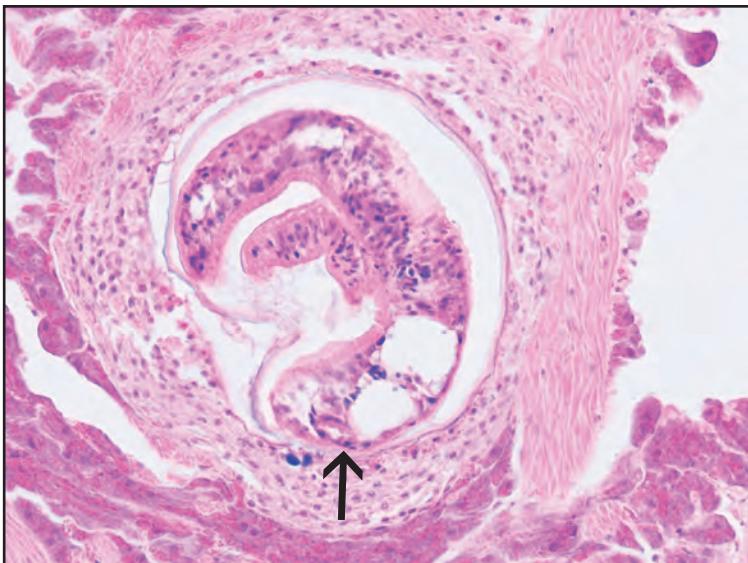
#### **VI. Prognosis for Host**

Effects of encysted metacercariae on the bivalve host vary from none to being responsible for killing young spat. In the Pacific Northwest and Alaska, metacercariae are considered relatively harmless to bivalve hosts except when encountered in significant numbers. Sporocysts may cause severe tissue damage and debilitation resulting in parasitic castration and bivalve mortality.

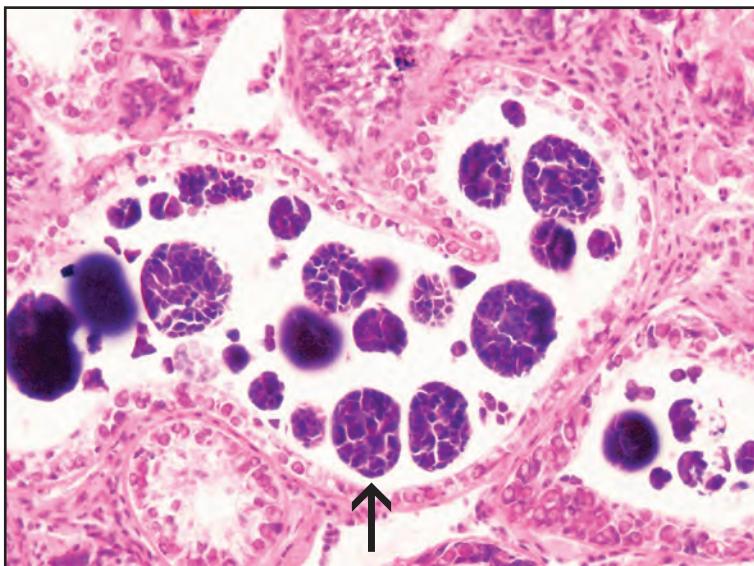
#### **VII. Human Health Significance**

Trematodes in the family Echinostomatidae parasitize birds as the final host. Echinostome metacercariae, such as *Himasthla* sp., found in bivalve tissues consumed raw have been implicated in human gastrointestinal disturbances.

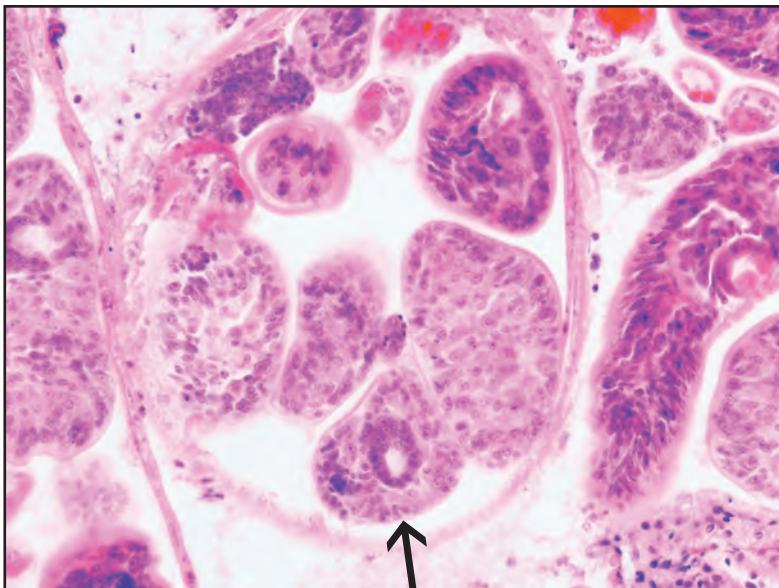
## Trematode Metacercariae and Sporocysts



Histological section of encysted trematode metacercaria (arrow) encapsulated by host inflammatory cells and fibrous tissue within the connective tissues of blue mussel



Histological section of a *Bucephalus*-like trematode sporocyst containing germ balls (arrow) in the connective tissues of blue mussel



Histological section of a different type of sporocyst containing cercariae (arrow) in razor clam

*Bucephalus* sp. Life Cycle

