1.2.6 Enteric Septicemia

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A. Name of the Disease and Etiological Agent

Enteric septicemia, enteric septicemia of catfish, ESC, and "hole-in-the-head disease," is caused by *Edwardsiella ictaluri.*

B. Known Geographical Range and Host Species of the Disease

1. **Geographic Range**
   Found in the contiguous United States, Thailand, and Australia.

2. **Host Species**
   Natural infections have occurred in channel catfish *Ictalurus punctatus*, white catfish *Ameiurus catus*, black bullhead catfish *Ameiurus melas*, yellow bullhead catfish *Ameiurus natalis*, brown bullhead catfish *Ameiurus nebulosus*, danio *Danio devario*, walking catfish *Clarias batrachus*, green knifefish *Eigenmannia virescens*, and blue tilapia *Tilapia aurea.* Experimental infections have been established in salmonids.

C. Epizootiology

Primarily fingerling but also production and adult channel catfish may be affected by the so-called "hole-in-the-head disease," which results from the uptake of organisms from water or mud and subsequent progression of the infection along the olfactory stem to the brain. Such infections are visible as longitudinal lesions between the eyes and occur when water temperatures are 20 to 30°C. Smaller fish contract an enteric form of the disease from ingestion of contaminated tissues. The bacteria overwinter in carrier fish, in the forebrain and hindgut, at very low prevalences (1% or less of the population). The bacterium survives less than eight days in pond water.

D. Disease Signs

Channel catfish infected with *Edwardsiella ictaluri* refuse feed, and swim at the surface with a spiral movement that includes erratic bursts. External lesions include hemorrhage around the mouth, on lateral and ventral portions of the body, and the on the fins (Figure 1 and Figure 2). Pale gills, exophthalmia, and small ulcerations on the body are additional signs. Ulceration in the fontanelle of the frontal bones gives the diseases its common name, "hole-in-the-head disease" (Figure 3). Internally, petechiae are noted throughout the visceral mass and in the peritoneum and musculature. Red and pale mottling of the liver (Figure 4) due to granulomatous inflammation and hemorrhage (Figure 5) is common. Ascites and enlargement of the liver, kidney, and spleen are sometimes observed (Figure 6 and Figure 7). Fish overwintering with *E. ictaluri* may show small white ulcerations on the body surface. These are probably disease survivors and the ulcerations are probable sites of healing (Figure 8). Danios infected with *Edwardsiella ictaluri* swim erratically in a spinning motion. Gross lesions have not been described in these fish.

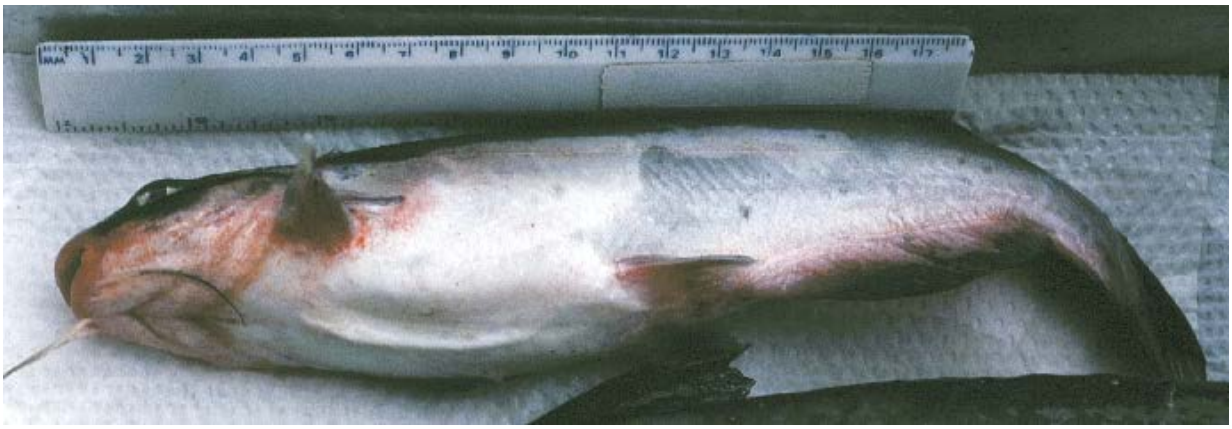

Figure 1. Channel catfish with petechial hemorrhages of the skin.

Figure 2. Catfish with larger red-rimmed shallow ulcers, the characteristic "buckshot" lesion (picture by Andy Goodwin).

Figure 3. Channel catfish “hole-in-the-head disease” lesion (Picture by Jon Stein).

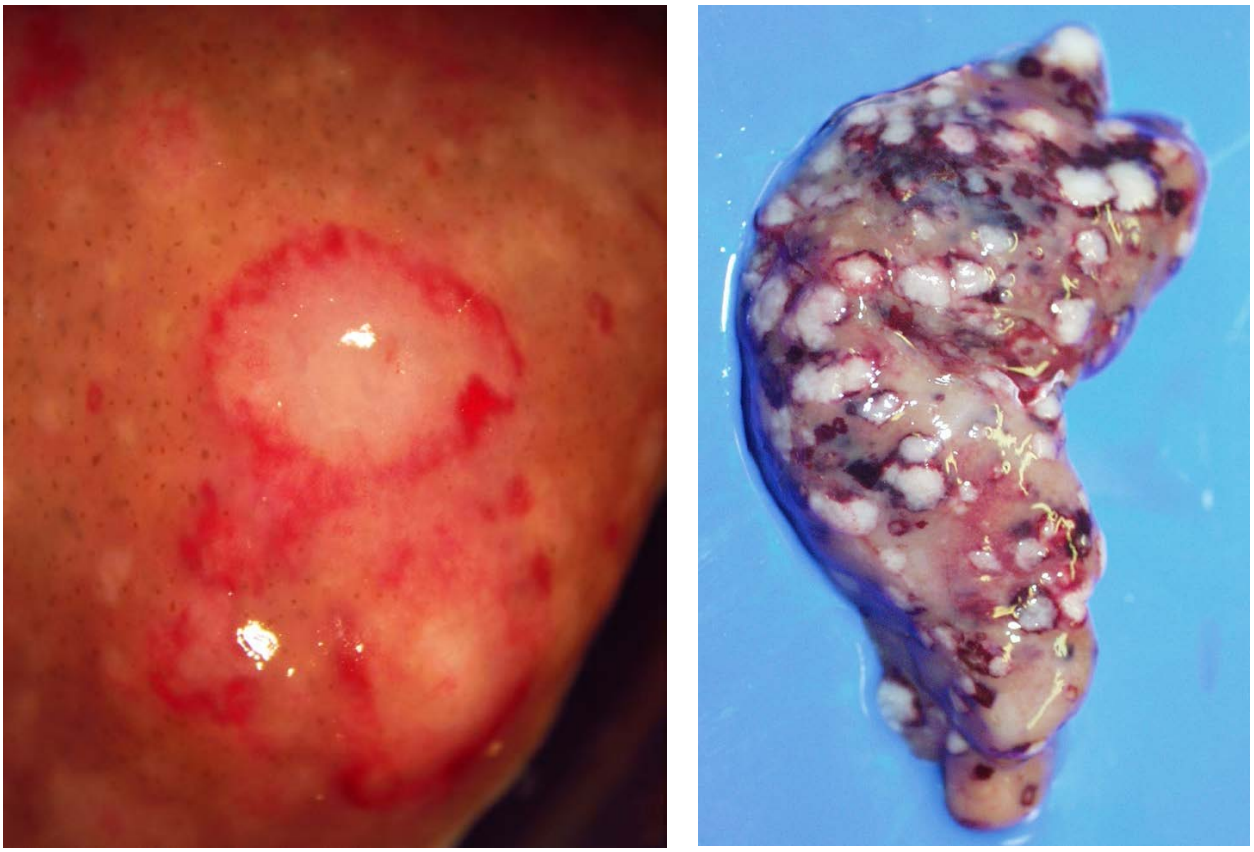

Figure 4. Typical (left) and very severe (right) red and white mottling in the livers of catfish with ESC (pictures by Andy Goodwin).

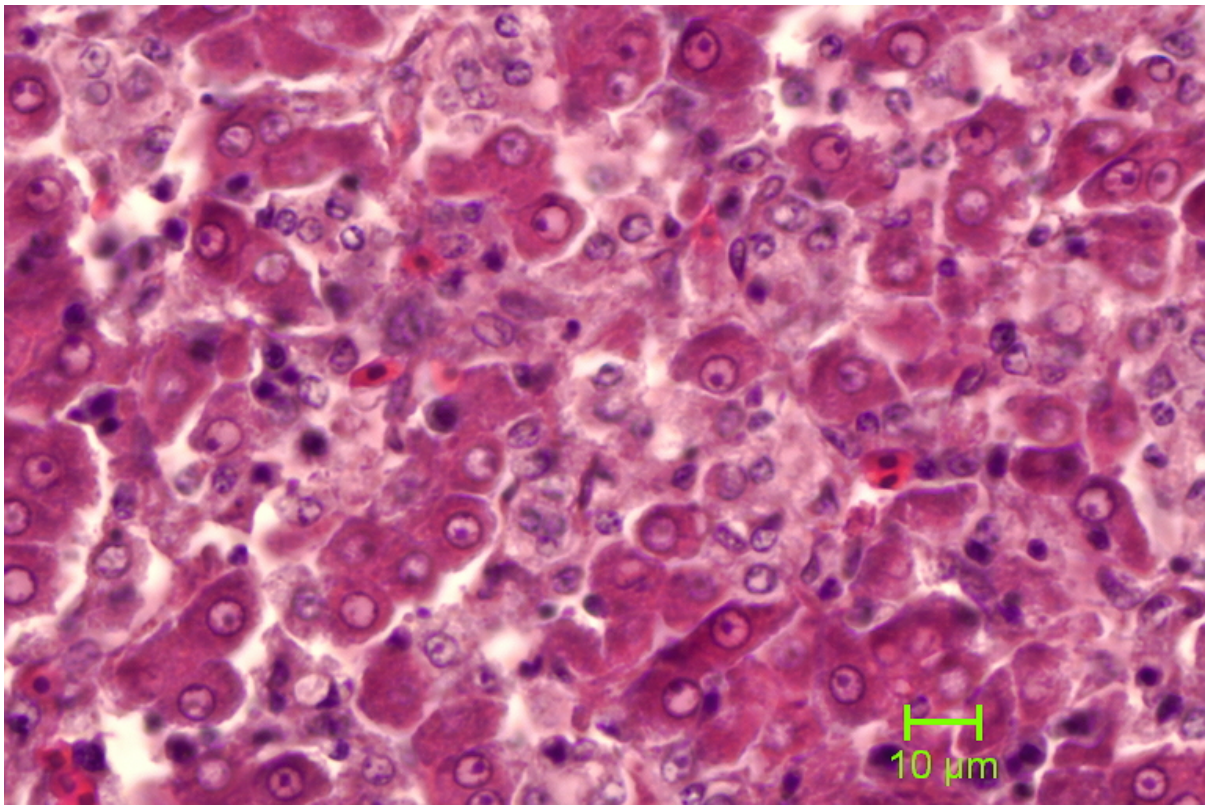

Figure 5. Granulomatous exudate (pale pink cells) in the liver of a channel catfish with ESC (picture by Andy Goodwin).

Figure 6. Channel catfish fingerlings with severe ascites (picture by Andy Goodwin).

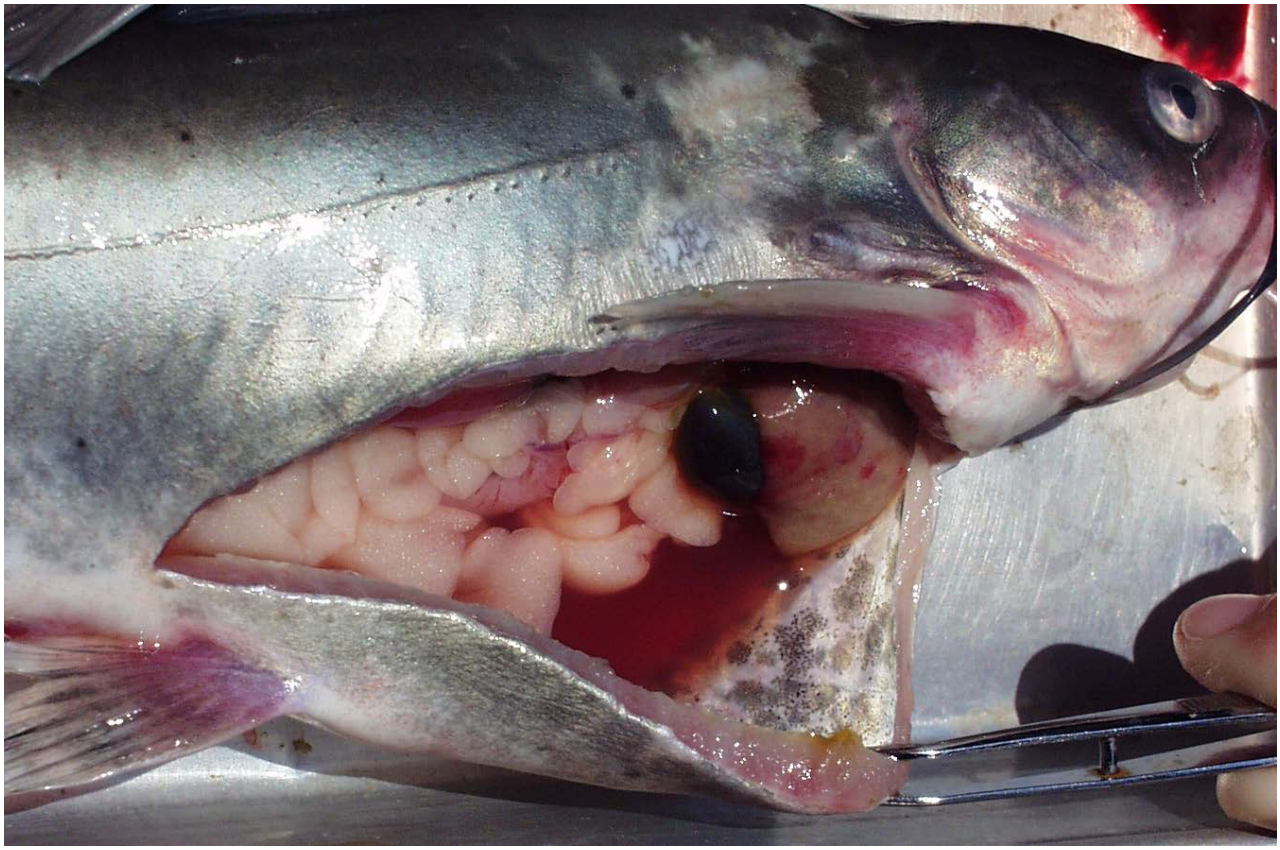

Figure 7. Hemorhagic exudate and hepatic edema in a channel catfish with ESC (picture by Andy Goodwin).

Figure 8. Shallow white ulcers on the skin if a catfish with ESC (picture by Andy Goodwin).

E. Disease Diagnostic Procedures

Diagnosis is based on the observation of characteristic clinical signs and the isolation and identification of the etiological agent. Primary isolation should be made from either kidney or head lesion (brain) inoculated onto TSA, McConkey agar, blood agar, or EIM (*Edwardsiella* isolation medium; Shotts and Waltman 1990), which is incubated at 30 to 35°C for 2 to 4 days.

1. Presumptive Diagnosis

The etiological agent should be a short, gram-negative, cytochrome oxidase-negative rod. No indole is produced in tryptone broth. It grows slowly (2 to 4 days at 25°C) and sparsely at 37°C. It is nonmotile or weakly motile and does not produce H_2S.

2. Confirmatory Diagnosis

A diagnosis is confirmed if the isolate is agglutinated in the slide or microtiter agglutination test with *Edwardsiella ictaluri* antiserum, or by the demonstration of specific fluorescence with the FAT. An enzyme immunoassay (EIA) has been developed (Rogers 1981).

F. Procedures for Detecting Subclinical Infection

Culture from the forebrain and hindgut can be attempted.

G. Procedures for Determining Prior Exposure to Etiological Agent

No procedures have been reported.

H. Procedures for Transportation and Storage of Samples to Ensure Maximum Viability and Survival of the Etiological Agent

See Section 1, 1.1.1 General Procedures for Bacteriology.

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