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# *Edwardsiella tarda*, a New Pathogen of Channel Catfish (*Ictalurus punctatus*)

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*Edwardsiella tarda*, an enteric, gram-negative bacterium, causes gas-filled, malodorous lesions in muscle tissue of channel catfish. Incidence and epizootiology of the disease are presented.

The majority of bacterial diseases among cultured catfishes are caused by aeromonads, pseudomonads, or myxobacteria (1). In July 1969, a septicemic disease among 38- to 50-cm channel catfish (*Ictalurus punctatus*) on a commercial farm in Arkansas was attributed to an enteric organism later identified as *Edwardsiella tarda*. The genus *Edwardsiella* was proposed in 1965 for a group of 37 organisms differing biochemically from other groups of *Enterobacteriaceae* (2). These 37 cultures were principally isolated from feces, blood, wounds, and urine of humans. All have been placed into a single species, *E. tarda*.

The source of *E. tarda* which infected the catfish is not known. Fecal contamination from humans or other animals may have been the source. Snakes may have served as a reservoir of infection, since cultures biochemically similar to *E. tarda* were isolated from snakes by Sakazaki (3).

Disease outbreaks caused by *E. tarda* have been observed annually in channel catfish since 1969 on fish farms in Arkansas, Mississippi, Louisiana, and Texas. Infections, to date, have been limited to channel catfish, although blue catfish (*Ictalurus furcatus*) and white catfish (*Ictalurus catus*) were also reared on farms having infected channel catfish, but not stocked in the same ponds.

Outbreaks have occurred only in fish larger than 450 g during the period of July through October. Disease outbreaks are most numerous when water temperatures are above 30 C and when high levels of organic fertility are present. Incidence rates in ponds are seldom higher than 5%; when infected fish are harvested and transferred to holding tanks, the disease spreads rapidly through the population. Loss rates may approach 50%.

In mild infections, the only manifestation of the disease is small cutaneous lesions, each measuring 3 to 5 mm in diameter and located on the postero-lateral areas of the body. As the disease progresses, abscesses develop within muscles of the flanks or caudal peduncle. In acute cases, these abscesses rapidly increase in size and develop as large cavities filled with gas and visible as convex, swollen areas. Loss of pigmentation over the lesion is common. If the lesion is incised, a foul odor is emitted. Necrotised tissue remnants may fill up to one-third of the cavity. As the infection progresses, affected fish lose control over the posterior half of the body. The name "emphysematous putrefactive disease of catfish" (EPDC) has been chosen since it aptly describes the gross appearance of infected fish.

The etiological agent of EPDC is a gram-negative, motile, rod-shaped bacterium which may be isolated from lesions or kidneys of diseased catfish. The organism grows slowly on tryptic soy agar (TSA) requiring 48 hr of incubation at 24 to 26 C to form the typical small (0.5 mm), circular, transparent, slightly raised colonies. Tentative identification of four isolates as *E. tarda* was based on reactions obtained in commercially prepared Enterotubes (Roche Diagnostics, Nutley, N.J.). Definitive identification of the isolates as *E. tarda* was provided by personnel at the Center for Disease Control, Atlanta, Ga.

Intraperitoneal injection of $8.0 \times 10^7$ *E. tarda* cells into each of five 5- to 10-cm fingerling catfish, held in 27 C water, killed four of them within 10 days. Similar injections of $8.0 \times 10^6$ or $8.0 \times 10^5$ cells resulted in death of two of five injected catfish at each of the two cell concentrations within 10 days. The above cell concen-

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trations injected in 10- to 13-cm fingerling brown trout (*Salmo trutta*) held in 13 C water produced no mortality within 10 days. Catfish dying from injection of *E. tarda* showed hemorrhages around the head and operculum and in internal organs. Abscesses, as noted in catfish from natural infections, were not seen, possibly because of the rapid course of the disease in injected catfish or due to the small size of fish used in these experiments.

EPDC may be controlled by incorporating Terramycin (oxytetracycline) in the diet at the rate of 2.5 g per 100 lb. of fish per day for 10 days. If infected fish will take feed, they quickly respond to treatment and losses may cease within 48 to 72 hr after medication begins. Recovery and healing of the lesions, however, is a slow process, and several months may be required to repair the damage associated with large lesions. Surviving fish may show signs of past infections by concentrations of fibrous scar tissue and depressions in the peduncle area of the body. Less severely affected fish may heal in 10 days with no outward signs.

Although EPDC does not cause catastrophic losses of catfish, it has a severe economic impact on farms where it occurs. If the disease is not detected prior to harvest, the incidence rate will quickly climb when the fish are held in confinement prior to processing. Should infected fish enter the processing line, the release of gas and liquid elements from lesions will make it necessary to stop processing to permit sterilization, deodorization and removal of infected individuals. Financial losses may be considerable even when only a small percentage of the fish is involved.

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