Research Paper Biology

# Edwardsiella Infection in Some Common Ornamental Species

**Seema S. Korde** Department of Fishery Science, Azad Mahavidyalaya, Ausa, Dist. Latur (MS) India-413520.

**ABSTRACT**

*The present paper highlights on Epizootics of edwardsiellosis, which had a disastrous effect on fish culture, occurred in northern and southern in turbot in recent years. Four outbreaks occurred in both the regions in 2005 and three peaks of mortality at an interval of one month were recorded in northern in 2006. The authors have come across a few cases of mass mortality in stocks, particularly of Indian major carps and Asian catfish, during hatchery rearing operations. This pathogen is also important from a public health point of view, as it is known to produce disease in reptiles, birds, humans and other mammals. In spite of these facts, there is no established successful commercial treatment / control / preventive measure available. In this paper, we present a brief review of edwardsiellosis, exploring the pathogen, its pathogenesis and pathology and the diagnostic and control measures.*

**KEYWORDS : Edwardsiellosis, pathogenesis, mass mortality, Fish species.**

## Introduction

The occurrence of disease is a significant setback for successful aquafarming. Bacteria are the most common pathogens of cultured warm water fish, and cause major losses to the freshwater aquaculture industry in India and elsewhere. They are also the most prevalent cause of morbidity and mortality among wild populations of fish. Out of the most annihilating bacteria, motile *Aeromonads* and *Edwardsiella* sp. are the most significant. *Edwardsiella tarda* is a commonly found pathogen causing edwardsiellosis/emphysematous putrefactive disease leading to mass mortality in various populations and age groups of fish. Fish species commonly affected by edwardsiellosis include carp, tilapia, eel, catfish, mullet, salmon, trout and freshwater ornamental fishes.

Edwardsiellosis is caused by *Edwardsiella tarda*, which affects a wide range of hosts including both freshwater and marine fish (Thune *et al.* 1993). The genus *Edwardsiella,* named after the American bacteriologist P.R. Edwards (1901-1966), was proposed in 1965 (Ewing *et al* 1965) for a group of 37 organisms differing biochemically from other members of *Enterobacteriaceae*. These cultures were principally isolated from faeces, blood, wounds and urine of humans. All of them have been placed into a single species, E. tarda (Ewing *et al* 1965; Meyer and Bullock 1973). [Mc Whorter *et al.*1967) developed a provisional scheme for the O and H antigenic characteristics of *Edwardsiella*. Another species under this genus*, E. ictaluri,* responsible for causing enteric septicaemia, was isolated in 1979 in channel catfish (Hawke 1979*). E. tarda* is facultatively anaerobic and mesophyllous (Holt *et al* 1994), and characterized as cytochrome oxidase-negative, indole-positive and strong $H_2S$ producer in nature; thus the disease is often named emphysematous putrefactive disease.

## Materials and Methods

Common aquarium fishes such as Gold fish (*carassius auratus*), Kissing gouramy {*Xiphophorous helleri* ),Zebra fish [ *Brachidanio rerio*], Guppy [*poecila reticulate*]showing pathological lesions were collected from various aquariums of Latur district of Maharashtra.

Materials were collected aspecially from different organs like skin, gill, kidney, liver, eye and heart in sterile container with liquid medium for primary culture of bacteria.

Materials collected aseptically with the help of a platinum loop from different organs were transferred to nutrient broth and incubated at 30 °C. Growth of bacteria if any, were observed after 24 - 28 hours by noting the turbidity in the broth. Primary cultures were made from the turbid broth by streaking in nutrient agar plates. The colony characters such as shape, size and colour were noted using a binocular microscope and selected colonies were picked up for slant culture. The agar slants were incubated at 30 °C for 24 - 28 hours. Isolates in nutrient agar slants were maintained in the laboratory at 4°C throughout the study period.

Preliminary identification was made on the basis of the colony characteristics. In addition to this, gram staining and cytochrome oxidase tests were done along with comparing the responses to various biochemical tests. Identification tests were confirmed by using an Enterobacteriaceae Computer Kit (Microsoft Corporation, Redmons, WA 98073) and Multiscan (340 / MMC). On the basis of the various biochemical properties, different strains were demarkated with different code numbers.

## Results

### Gross pathology

Zebra fish (*Branchidanio Rerio*) weighing about 40 to 45.70 g and of length 5.90 to 6.10 cm showed severe ulceration with haemorrhagic spots around pelvic fin and snout. Pale yellow colouration on body shows very faint colour as compare to the natural colour. The bands on body they also shows faints colour as well as uncontinuous breaks at the bands scales appeared raised at the inflamed parts on the lateral side of the body. The entire region was noticed exposing the muscles, which appeared lacerated. The ulcerative areas varied in size from 0.5 to 1.3 mm in diameter and 0.5 to 1.3 mm deep with dirty grey slimy deposits along with bluish film on head.

### Isolation and Identification

In Zebra fish *Edwardsiella tarda* was isolated from skin, body fluid, kidney and liver. Eye, heart and skin lesions of kissing gouramy and kidney, liver, skin lesions of Guppy. Showed presence of bacterial organisms (Table 5.1). Some other bacterial pathogens, which were isolated from the diseased fishes, have not been taken into account in the present study.

### Morphology

The colonies *Edwardsiella tarda* which were isolated appeared green, it forms typical green colonies with black centers on Rimler - Shott agar medium, it is gram -ve, motile, short, rod shaped bacterium (1 µm in diameter, 2 - 3 µm long).

**Table 1: Species source diseased fish and organs from which isolations were made**

| Strain | Fish | Organs | Area of Collection |
|---|---|---|---|
| *Edwardsiella Tarda* | Zebra Fish | Liver | Latur Aquarium |
| | | Skin | Chakur |
| | | Kidney | Ausa |
| | | Eye | Nilanga |
| | Kissing Gourami | Skin | Ausa |
| | | Body Fluid | Latur |
| | | Skin | Latur |
| | | Skin | Ahmadpur |
| | | Liver | Latur |
| | Guppy | Eye | Latur |
| | | Heart | Nilanga |
| | | Skin | Ausa |
| | | Kidney | Chakur |
| | | Skin | Latur |

## Discussion

In fish Edwardsiellosis tarda was first reported as Paracolobactrum anguiillimortiferum associated with red disease of Japanese eel, Anguilla japonica (Hoshina 1962). Thereafter, it has been reported in a number of cultured fish such as eel (*Anguilla japonica*), channel catfish (*Ictalurus punctatus*), mullet, brook trout (*Salvelinus fontinalis*), red sea bream (*Pagrus major*), Japanese flounder (*Paralichthys olivaceus*), Chinook salmon (*Oncorhynchus tshawystscha*) (Meyer and Bullock 1973; Uhland *et al* 2000; Sano *et al* 2001), turbot (*Scophthalmus maximus L*.) (Nougayrede *et al* 1994), Asian catfish (*Clarias batrachus*) (Sahoo *et al.* 1998), climbing perch (*Anabus testudineus*) (Sahoo *et al.* 2000), tilapia (Clavijo *et al.* 2002) and oyster toadfish (*Opsanus tau*) (Horenstein *et al.* 2004). Matsuyama *et al.* (2005) found differences in the pathogenecity of motile and atypical (non-motile) *Edwardsiellosis tarda* examined in Guppies, Angel fish and tropical fishes.

*Edwardsiellosis tarda* has long been considered as an unusual human pathogen. It is primarily associated with gastroenteritis, wound infections such as cellulites or gas gangrene and generalized infections in humans with impaired immune systems (Thune *et al.* 1993;Plumb 1999; Srinivasa Rao *et al* .2001; Nucci *et al.* 2002). The extraintestinal manifestations of infection include biliary tract infection, bacteraemia, skin and soft tissue infection, liver abscess, peritonitis, intra-abdominal abscess, and tubo-ovarian abscess (Wang *et al.* 2005). It has also been reported to cause myonecrosis, puerperal intrauterine infection, septic arthritis and empyema (Ashford *et al.* 1998; Slaven *et al.* 2001; Mikamo *et al.* 2003; Mizunoe *et al.* 2006). Many systemic diseases such as septicaemia, meningitis, cholecystitis, endocarditis, liver abscess and osteomyelitis have also been reported (Janda and Abbott 1993). Such observations have raised a concern about *Edwardsiellosis tarda* being a significant zoonotic bacterium.

*Edwardsiellosis tarda* infection are mostly found in channel catfish culture systems when the temperature rises, there is overcrowding and the organic load is high, although mortality often remains low and the infection becomes chronic (Meyer and Bullock 1973; Noga 2000). This may be true for the other freshwater fish culture systems also. Matsuoka (2004) found that fish challenged with *Edwardsiellosis tarda* shed bacterial cells into the water before and after death, which may play an important role in the spread of Edwardsiellosis among cultured fish.

## Conclusions

*Edwardsiellosis tarda* has long been considered as an unusual human pathogen. It isprimarily associated with gastroenteritis, wound infections such as cellulites or gas gangrene and generalized infections in humans with impaired immune systems. *Edwardsiellosis tarda* infection are mostly found in channel catfish culture systems when the temperature rises, there is overcrowding and the organic load is high, although mortality often remains low and the infection becomes chronic.

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