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A BRIEF DESCRIPTION OF FISH STAPHYLOCOCCOSIS

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Abstract: *Aquaculture is among the fastest growing sectors worldwide and bacterial fish diseases are one of the main obstacles in fish production. Staphylococci are Gram-positive bacteria that are widespread around the world. They can survive in water, soil and air and some of them are opportunistic pathogens of human and animal including fish. In this review, characteristics of the disease, history of the disease, clinical symptoms and pathology in fish, aetiology, isolation and identification of the causative agent, epizootiology, pathogenicity, control and prophylaxis are discussed.*

Keywords: *Staphylococcus*, fish pathogenic bacteria, API-Staph

Characteristics of the disease: Fish staphylococcosis, also known as the “eye disease”, is a bacterial hemorrhagic septicemia caused by the members of the genus *Staphylococcus* (Fam: Staphylococcaceae) in various marine and freshwater fish species worldwide.

History of the disease: After it’s first detection in and 1976 in marine cultured Japanese amberjack and red seabream in Japan, the disease spread worldwide and affected marine (gilthead sea bream, European seabass, tilapias etc.) and freshwater (trout, carp and sturgeon) fish species (Table 1). Previously, fish staphylococcosis was reported from Japan, Taiwan, Malaysia, India, Egypt, Spain, Greece, Bulgaria and Turkey (Table 1).

Clinical symptoms and pathology: Externally, fish staphylococcosis causes hemorrhages and exophthalmos in the eyes, darkening of the skin, hemorrhages or shallow skin lesions on the body, lethargy. Internally, the most common symptom is splenomegaly with accumulation of a bloody fluid in the peritoneal cavity and anemia in the liver. Histopathologically, general cell necrosis, hemorrhages and hyperemia were reported in the eye, kidney, heart, liver and other tissues. Generally, this disease does not induce hemosiderin accumulation in hemopoietic tissues.

Aetiology: Members of the genus *Staphylococcus* (Fam: Staphylococcaceae) are Gram-positive, non-motile, cocci-shaped, facultative anaerobe, oxidase negative and catalase positive bacteria This genus is represented by 37 species and 22 subspecies. They can survive in water, air and soil and some species are pathogenic for human and animals including various fish species (Schleifer & Bell, 2009). After it’s first detection, more than 14 members of this genus were recovered and identified as the primer, seconder or tertiary pathogenic agent in fish.

Isolation and Identification: Staphylococci can grow on general bacteriologic media such as Trypticase Soy Agar or Brain Hearth Infusion Agar. A non-selective medium P-Agar (peptone, 10 g; yeast extract, 5 g; sodium chloride, 5 g; glucose, 1 g; agar, 15 g; distilled water, 1,000 ml – autoclave 121°C/15min) can be used for isolation and pigment detection. Staphylococci grow creamy to yellow, orange or red colonies on these media in 18-72 hours at 18-40 °C (Schleifer & Bell, 2009). Species identity is made on the basis of a variety of phenotypic characters such as colony morphology, activities of various enzymes, production of acid from various carbohydrates, resistance to certain antibiotics, nutritional and oxygen requirements. In addition to the characteristic grape-like clusters, staphylococcal cells can be arranged in single, pair, tetrad or short chains in Gram-stain. Since they are worldwide spread opportunistic human and

animal pathogens, some miniaturized biochemical test strips and serological agglutination kits were developed for rapid identification. A PCR method for the identification of staphylococci at the genus level targeting a 370 bp DNA fragment was also developed by Martineau *et al.* (Table 2). The presence of bacterial cells in the affected fish tissues can be demonstrated by using various tissue Gram-staining methods (Çanak&Timur, 2018).

Epizootiology and pathogenicity: This disease was reported to affect fishes from the juvenile to brood stock stages from January to October, with a water-temperature range of 10 °C to 32 °C. The course of the disease was rarely report to be latent, but generally causes mortalities, occasionally up to 50%. In some cases in which the staphylococci were detected as the primer agent, their pathogenic status were confirmed with experimental in vivo pathogenicity assays. The pathogenic status of various staphylococci were also proved by the profiling of cell wall proteins by using SDS-PAGE. The presence of some cell wall proteins associated with biofilm ability and act as blood transferrin receptors give ability to staphylococci a pathogenic status (Hussain *et al.*, 1997; Çanak, 2017).

Control & Prophylaxis: Various chemicals, such as erythromycin, amoxicillin and trimethoprim-sulphamethoxazole were successfully used in the control of the disease and besides, vaccination trials were also performed. There is no commercial vaccine licensed for fish-staphylococcosis.

Table 1. History and distribution of fish staphylococcosis cases

Country	Fish	Bacterial agent	Refference
Japan	*S. quinqueradiata* *C. major*	*S. epidermidis*	Kusuda & Sugiyama, 1981
India	*H. molitrix*	*S. aureus*	Shah & Tyagi, 1986
Spain	*Scophthalmus maximus*	*Staphylococcus sp.*	Novoa *et al.* 1992
Taiwan	*Ctenopharyngodon idella*	*S. epidermidis*	Wang *et al.* 1996
Spain	*Sparus aurata*	*Staphylococcus sp.*	Balebona *et al.* 1998
Taiwan	*Oreochromis spp.*	*S. epidermidis*	Huang *et al.* 1999
Spain	*Oncorhynchus mykiss*	*S. warneri*	Gil *et al.* 2000
Spain	*Pagrus pagrus*	*S. xylosus*	Padilla *et al.* 2001
Turkey	*Oncorhynchus mykiss*	*S. aureus; S. epidermidis*	Timur & Akaylı, 2003
Turkey	*Sparus aurata*	*S. epidermidis*	Kubilay & Uluköy, 2004
Turkey	*Dicentrarchus labrax*	*S. epidermidis*	Timur *et al.* 2008
Taiwan	*Acipences schrencki*	*S. lugdunensis*	Renhue, 2009
Turkey	*Oncorhynchus mykiss*	*S. hominis* subsp. *hominis*	Turgay, 2009
Malaysia	*Oreochromis niloticus*	*S. aureus*	Atyah *et al.* 2010
Egypt	6 marine fish species	*S. aureus*	Moustafa *et al.* 2010
Turkey	*O. mykiss; D. dentex*	*S. cohnii* subsp. *cohnii*	Akaylı *et al.* 2011
Greece	*Diplodus puntazzo*	*S. capitis; S. epidermidis*	Yiagnisis & Athanassopoulou, 2011
	Sparus aurata	*S. cohnii; S. warneri; S. lentus; S. schleifer*	
	Dicentrarchus labrax	*S. auricularis; S. cohnii; S. epidermidis; S. hominis; S. schleifer; S. warneri; S. xylosus*	
Malaysia	*Oreochromis niloticus*	*S. aureus*	Naijah *et al.* 2012
Turkey	*Sparus aurata*	*Staphylococcus sp.*	Çanak & Akaylı, 2013
Turkey	*Oncorhynchus mykiss*	*S. warneri*	Metin *et al.* 2014
Egypt	*Oreochromis niloticus*	*S. aureus*	Soliman *et al.* 2014
Turkey	*Sparus aurata*	*S. hominis*	Korun *et al.* 2015
Bulgaria	Hybrid sturgeon	*S. warneri*	Rusev *et al.* 2016
Turkey	*C. hemistiktos*	*S. aureus*	Çolak & Çanak, 2017
Turkey	*Dicentrarchus labrax*	*S. epidermidis; S. capitis* subsp. *capitis; S. lentus; S. hominis subsp. hominis*	Çanak, 2017
	Sparus aurata	*S. capitis subsp. capitis; S. aureus; S. sciuri* subsp. *sciuri*	
	Diplodus puntazzo	*S. capitis* subsp. *capitis*	

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