Columanaris disease in fishes

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Abstract: Columanaris disease previously referred to as myxobacterial infection and reported by Davis in 1922. It remains one of the most frequently encountered and devastating bacterial disease, cotton – wool disease of freshwater fishes. This disease is also known as saddleback disease, cotton-wool disease and in rot. These names reflect the gross lesions of affecting fish. Columnairs disease is caused by the Gram–negative bacterium (*Flavobacterium Columnare*). Such bacteria can infect fishes of any age, under a variety of water condition and during any season of the year. Acute disease is characterized by an incubation period of season of the year. Acute disease is characterized by an incubation period of les than 24 hrs and the resulting mortalities are seen two to three days post exposure.
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Introduction

Columnaris is a contagious disease that can be transmitted horizontally through direct contact and skin wounds as well as through orofecal route. Due to the ubiquitous nature of the *F.columnare* in freshwater, an injury to the skin or gills of fish with elevation of water temperature may quickly initiate the Columnaris infection. The disease can be clinically diagnosed through its characteristic clinical picture in the affected fish. In scaly fishes, the infection initially appears as milky veiled erosions on the dorsal aspect of fish body which may progress to extensive ulcers as dull whitish or yellow necrotic areas. The infected skin loses its natural sheen and a gray, white or yellowish margin surrounds the foal lesion. The mouth and inner walls of the oral cavity may be covered with a yellowish mucoid material. In scaly- less fishes, the lesions start with simple ulcers which predominately end with extensive saddleback-like ulcers exposing the underlying musculatures. Fin and gill rot is another lesion of the progressive infection in both scaly and scaly-less fishes. The histopathology may provide useful information concerning the severity of infection. The gills showed branchial epithelial cells and goblet cells hyperplasia. These lesions rapidly progress to severe neutrophilic inflammation and gill necrosis. Erosions and ulceration of the epidermis besides necrosis and edema in the underlying muscles were recorded in the affected skin[1-3].

Nowadays, we have the ability to diagnose Columnaris disease by modern molecular methods: such as polymerase chain reaction (PCR) based techniques employing species-specific primers and by DNA sequence analysis[4].

Currently, common control measures of the diseases focused on the use of antibiotics and chemical agents. The potassium permanganate at concentration of 1ppm 12-14H ppm for hours and copper sulfate 1mg/L[5].

Methods and Clinical signs

The examination of 15 (out from 400) Nile tilapia naturally infected with *Flexibacter columnaris* and 10 (out from 200) catfish revealed that some had whitish necrotic ring at the caudal peduncle with fin rot, other revealed sloughing of necrotic tissue until the caudal vertebrae were exposed. Also some had regenerated caudal peduncle. Post-mortem examination revealed no internal lesions[6].

Columnaris disease in catfish began as an external infection of fins, body surface and gills. Fins became frayed (necrotic) with greyish to white margins. Initial lesions on the skin appeared as small, discrete bluish-grey areas that enlarged into depigmented necrotic lesion making infected catfish to loose their metallic sheen. The lesions have yellowish or pale margins with mild inflammation. The mouth covered with yellowish mucoid materials. Gill lesions were white to brown, depending on the presence of debris or secondary fungus. In some instances columnaris disease became systemic with few pathological changes occurring in the visceral organs. Whether or not the bacterial isolated from the internal organs are taxonomically *Flexibacter columnaris* is not clear, but they may be isolated from the kidneys of

more than 50% of catfish necropsied with epidermal *Flexibacter columnaris*[7].

The clinical findings of experimentally infected Armout catfish with *Flexibacter columnaris*, showed enlarged, congested, edematous swelling at eh site of injection. Most of fins showed congestion and hemorrhage especially at the dorsal and caudal ones in addition to whitish grey patches surrounded by haemorrhagic zones and varying degrees of erosions at their tips. More developed cases showed skin eruption leaving large haemorrhagic ulcers[8].

Flexibacter columnaris primarily attacks the external tissues and uninjured tissue also appears to be attacked. The first indication of the infection is generally the appearance of a white spot on some part of the head, gills, fins or body. This is usually surrounded by a zone with a distinct reddish ting, leading to under-running of adjacent skin. Lesions on the end of gills or fins extended principally from the distal end towards the base, and the tissues are eroded and destroyed. Also were covered with yellowish white mucoid exudate consisting largely of swarms of *Flexibacter columnaris*[9].

Flexibacter columnaris from tilapia species *(O. niloticus)* from Abbassa Fish Farm and Sharkia region. Lesions were observed as fin rot in caudal, dorsal, anal, pectoral and pelvic fins. Scale less skin erosions and ulcers were also observed. The caudal vertebrae were seen in some cases, the liver appeared as congested to brown in color[10].

The classical saddle patch lesion on the skin of channel catfish infected with *Flexibacter columnaris*. The superficial layers of the epidermis were absent and bacterial colonies were easily visible on the affected parts. Necrosis of the underlying muscles was also observed[11].

The gill lesion in case of *Flexibacter columnaris* begins as raised whitish plaques of necrosis with a reddish zone of hyperaemia at periphery. Skin lesions developed into yellow orange, hemorrhage, ulceration and necrosis exceeded to the dermal layer with peripheral hyperaemia and hemorrhage[12].

The external lesions in case of columnaris disease, on scaly and scaleless fishes. In scaly fishes, the initial visible lesin appeared on the outer margins of fins as greyish-white discoloration consisting of proliferating epithelium and bacterial cells. Gradually, the lesion spreaded to the body of the fish and appeared to be covered with patches of mucus. A localized lesion often developed on the gills. Soft gill tissue became eroded, showed necrotic gaps. In soaleless fishes, such as bullheads or catfishes, the initial lesions were small and circular with greyish blue centers and red margins surrounded by a ring of inflamed skin. When the disease progressed, irregular areas of skin became necrotic, greyish in appearance with small flakes of tissue dangling in water[13-14].

Treated Columnaris disease. Moreover, Columnaris disease in most effectively treated mainly with tetracycline reported the minimal inhibitory concentration of amoxicillin (0.06μg/ml), oxytetracycline (0.06-0.12μg/ml), oxolinic acid (0.06-0.12μg/ml), norfloxacin (0.12μg/ml) and trimethoprim (>64μg/ml). However, the use of antibiotics as treatment has been problematic by acquisition of genes that result in antibiotic resistant strains of bacteria and residues of antibiotics can diffuse into the aquatic environment. The use of some antibiotic, disinfectant and other chemical agents to control fish diseases in pond have been prohibited because resistance can develop in environmental bacteria, negative effect on human health and restriction for export commodities[15-16].

An alternative methods to prevent and cure fish disease is by using probiotic. Probiotic is defined as microbial cell preparation or components of microbial cells, which have a beneficial effect on the health and well being of the host. Other benefits of probiotic in aquaculture are competitor for nutrient, source of nutrients and enzymatic contribution to digestion and improve water quality [17].

Common probiotic product used in aquaculture such as *Bacillus species* can improve water quality by reducing the number of bacteria pathogens in farm. Furthermore, several researchers have been proved the effectiveness of probiotic in fish and shrimp to resist to pathogen[18].

Probiotic containing in fish food can build up the beneficial bacterial flora in skin and intestine while they grow competitively over certain bacteria. *Flavobacteium columnare* grows by stacking adhesion layer on fish skin and eh consequence of colonization caused skin damage lesion and thus, including fish mortality. However, manipulation of the bacterial community on fish skin may be used in prevention to Columnaris disease[19].

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