

Fish and Shellfish Diseases in Culture Systems

II. Heterotrophic bacteria and kinds of infections

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"While infection leads to indisposition
hygiene curtails infection"

The world is facing an acute shortage of food as terrestrial resources are not adequate to meet the increasing needs of the human populations. So, to augment the food production, a suitable alternative is sea food, fish being the best and probably a cheaper source of animal protein than egg, milk and meat. But, here again, the capture fisheries are not sufficient to satisfy the growing demands of the starving population. Hence, aquaculture of fish and shellfish is being made simple and popular, as one of the ideal and attractive sources of supplementing the food production, even among the people in the rural areas through fisheries development and extension programme.

But, for successful management of these aquaculture practices, a thorough knowledge of at least the common diseases that can occur in these animals is absolutely essential in order to control by treatment and take suitable prophylactic measures.

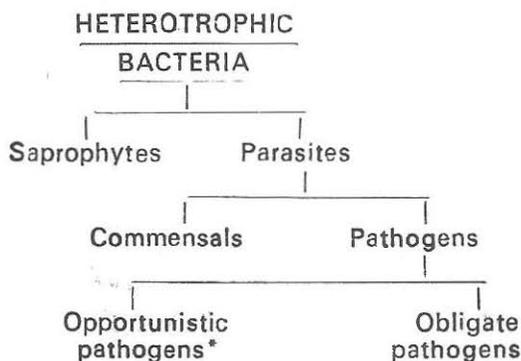
Among diseases, bacterial diseases are the most frequent and harmful in the cultivable organisms. So, this article is intended for providing a better understanding of infections caused by bacteria as investigations in ichthyopathology has been very sketchy in India.

Bacteria, procaryotic microorganisms of the kingdom, PROCARYOTAE, have always been an object of attraction for researchers because of their activities, both harmful and beneficial. Of several groups of bacteria, heterotrophic bacteria (those which obtain their energy by breaking down suitable organic nutrients) are quite important from the point of view of fish diseases. These organisms are widely distributed in nature and live in any diversified situations.

This dynamic group of organisms can be tentatively classified into saprophytes and parasites based on their mode of living. *Saprophytes* subsist on dead and decomposing organic matter, whereas, *parasites* depend on other live hosts for their existence.

Parasites are again divided into commensals and pathogens. The commensals form the normal flora of the healthy host and usually associate in harmony (eg. luminescent *vibrios*) while those organisms that provoke disease and harm the host are called *Pathogens*. Those bacteria, which may cause disease to the host, according to the suitability of the situation in and around them, are termed as *opportunistic pathogens* (eg. *Escherichia coli*). An opportunistic pathogen can be either a commensal or a saprophyte. The agents which mostly cause disease as a result of infection in the host are called *obligate pathogens* (eg. *Aeromonas salmonicida*) (Table 1).

TABLE 1



(* At times, saprophytes and commensals become opportunistic pathogens)

Sometimes, even saprophytic organisms (eg. *Bacillus subtilis*) may also cause disease when host's vitality is reduced and such organisms are called *Opportunistic pathogens*.

As infection leads to disease, it would be useful and interesting to note the various types of infections.

Infection is the lodgement and multiplication of a parasite in or on a host. A material contaminated with a

microbe(s) is designated as *infective*. Take the case of bacterial flora of fish. Normally, the slime, skin, gills, stomach or intestines in a fish will be infected and the bacterial load ranges between $10^3 - 10^6$ per gram weight although the flesh and body fluids of newly caught healthy fish are considered to be sterile. However, it is not necessary that an infection, if noticed, should always result in disease, as outcome of a disease is normally dependent on various factors such as the virulence of the attacking agent, host's genetic factors and host's environmental conditions.

Based on the source of infection, it can be mainly divided into two: *endogenous infection* if the host is infected with an agent from the host's body itself, and *exogenous infection* if the infection is due to an agent purely from outside.

Further, an infection can be classified in various ways based on the time and type of infection.

The initial infection in a host with a parasite is *primary infection* and subsequent infection by the same parasite is termed as *re-infection*.

At a time when a host's resistance is lowered by a pre-existing disease and other parasite initiates infection, this condition is called *secondary infection*. But, *cross infection* occurs when a host is already suffering from a disease and again a new infection takes place from any external source. If the infection is only in a localised area in a host, (eg. gill rot), it is known as *focal infection* or *focal sepsis*, but if the attack exists internally or including external, then the situation is *systemic infection* (eg. furunculosis)

In a host, if the clinical symptoms as a result of infection, are not apparent in helping to diagnose a case then it is denoted as *inapparent infection* and *atypical infection* when the typical clinical symptoms are not manifested. If a parasite remains quite for some time in a host and initiates the clinical symptoms only when the host's resistance is lowered, the situation is known as *latent infection*.

A stage of mere existence of bacteria in the blood is said to be *bacteremia*, while in *septicaemia* the bacteria exist and continue to multiply in the blood. *Pyæmia* is a situation in which pyogenic bacteria cause septicaemia and abscesses in the body.

A condition in which the organism remains localised in a host and releases its toxin in the blood stream is called *toxemia*. Any human-induced infection resulting from diagnostic and other therapeutic measures, is expressed as *iatrogenic infection*.

An ailment is said to be *contagious* when it is transmitted by direct contact and *infectious disease* if the pathogen is acquired by sources other than direct contact.

Based on the spread of infection, diseases may be classified as *enzootic*, when the disease is present only in a localised area; *epizootic*, when the disease is present almost throughout an area; and *panzootic*, when the disease spreads all through the world. ●

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