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Fish health: what is a diagnosis

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FISH HEALTH: WHAT IS A DIAGNOSIS?

Effective treatment and control of fish diseases requires an accurate diagnosis. In simplest terms, diagnosis of disease is the ability to distinguish one disease from another. Although this sounds easy - it is not. Diagnosis is complex because it requires an evaluation of both clinical signs and laboratory examination to identify pathologic changes and etiological (causative) agents.

A clinical diagnosis is based on the observable evidence of disease. When we "listen to our fish" we are observing clinical signs. Examples include feeding behavior, balance, movement, color, reflexes, place in the water column, respiratory rate, and gross lesions. Clinical signs are often the same for several diseases. Therefore, by themselves they seldom supply enough information to identify specific diseases. For example, if rapidly breathing fish in a heavily-loaded raceway are showing increased mortality, how can the clinical sign of increased breathing lead to a diagnosis? The rapid breathing indicates that these fish are trying to get more oxygen. However, since there are several reasons for fish to increase their breathing rate, identifying a specific one may require some effort. Here are a few possibilities:

- o Low level of oxygen in the water.
- o Damaged gills, preventing movement of oxygen from water to the blood (gill diseases, etc.)
- o Decreased ability of the blood to pick up oxygen (nitrate toxicity)
- o Decreased ability of the blood to distribute the oxygen to the body (i.e., anemia - many causes)
- o Decreased blood circulation (heart disease - many causes)
- o Increased oxygen demand by the body (feeding, exercise, etc.)
- o Psychogenic (weasel in the tank)

Above list illustrates why clinical observation may not necessarily supply enough information to identify the specific reason(s) for increased breathing and/or mortality. We must go further. A more precise diagnosis can be made with laboratory examination. Laboratory diagnosis are conveniently separated into etiologic diagnosis, the causes of the disease (typically, bacteria, virus, parasites, toxicant, nutrition or genetic), and a morphological diagnosis which is a description of the type and the extent of the damage to the fish.

Morphological diagnosis: This is a diagnosis based on the changes which occur in organs and tissues during the development of a disease. It is a description of the damage to the fish's tissue and the fish's attempt to repair the damage. And since tissue damage is often unique for specific diseases a morphological diagnosis can be very helpful in identifying the cause.

Etiological diagnosis: This is a diagnosis of disease by identifying disease agents in the sick fish. Historically, fish diagnosticians have concentrated on the identification of bacteria and viruses. And, although only a few diseases are caused by bacteria and viruses, isolation and identification of a specific disease agent is an important step in arriving at an accurate diagnosis.

Identification of a disease agent, however, is not synonymous with establishing an accurate diagnosis. We must still separate out secondary opportunistic and latent infections. These are all situations where a disease agent may be isolated from a diseased fish yet the agent isolated is not responsible for the disease. For example, it is possible to isolate the common fish pathogens responsible for bacterial kidney disease, furunculosis vibriosis, infectious pancreatic necrosis, infectious hematopoietic necrosis, costia and ichthyophthiriasis from healthy fish or fish which have died from other causes. Therefore, we must be careful when interpreting data from etiological investigations that the clinical and pathological evidence supports the etiological diagnosis. Otherwise we are likely to be treating the diagnosis - not the fish!

Another major problem is the inherent lack of accuracy in most diagnostic tests. Tests may fail to detect the presence of a disease agent when the disease agent is indeed present (false negative) or the tests may indicate that a disease agent is present when indeed it is not (false positive). In day-to-day diagnostic work the presence of false positives and false negatives are more of a nuisance than a major problem. This is because we usually work with more than one specimen and do more than one test. However, for screening and certification purposes the presence of false negatives and false positives are very important.

Source: Brad Hicks, *Canadian Aquaculture*, July-August 1988.