

Chapter VIII

Fish Health Management

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Due to the difficulties in diagnosis, implementation of appropriate treatment and identifying causes, fish disease is a major problem faced by producers. The economic consequences for fish farmers are significant either through the loss of production (mortality and low growth) or the cost of treatment.

Generally, stress may decrease the threshold of fish resistance and is considered to be one of the main causes of fish disease in intensive culture systems. However, fish stress in culture could be avoided in many cases. Much work has demonstrated that healthy fish cannot be seriously infected by pathogen, while weak fish will be easily infected (Woynarovich and Horvath, 1980).

It is important to remember that the stress may also reduce feeding and can seriously affect the spawning success for brooders (Chapter III).

THE ORIGIN OF STRESS

Water quality

Inadequate rearing water quality (high organic matter content, presence of ammonia or nitrite, low dissolved oxygen concentration, inappropriate pH, quick and high variation of temperature, etc.) force fish to maintain their metabolic balance, weakening them and resulting in disease susceptibility.

Water pollution from chemical sources could also be the cause of sudden and apparently unexplained mortalities, and susceptibility to disease, particularly when fish are reared in open water or with water from a river or reservoir.

Rearing conditions

In intensive culture, stocking densities are often high with respect to carrying capacity of the rearing structures. Therefore, fish are readily exposed to stress caused by the confinement, thus increasing the susceptibility of the fish to pathogen infection. High stocking density is also favorable in spreading of diseases, as close contact between individuals facilitate the transmission of pathogens.

Bad management of routine activities and feeding could also cause weakness through undernourishment or unbalanced water quality.

Handling

Capture, handling and transport could affect gonad maturation and growth and may cause diseases (Chapter III).

CONTROL AND PREVENTION

The behavior of the fish has to be observed carefully. If visual observation reveals some abnormal fish behavior, further evaluation should precisely determine whether it is due to the presence of pathogen or to poor water quality conditions. This examination has to be carried out as soon as possible to avoid further negative effects to the cultured fish. If pathogens are involved, treatment has to be administered immediately while looking for the origin of the infection.

Several methods should be used to prevent and control infection by pathogens:

- before using them, rearing structures have to be cleaned, disinfected and dried; drying of earthen ponds after harvesting fish has to be carried out regularly;
- routine disinfection of equipment will greatly help to prevent pathogen contamination;
- keep the cultured fish in optimal rearing conditions (right stocking density, good water quality, appropriate feeding procedure);
- preventive anti-parasitic or anti-fungus treatments should be administered regularly;
- fasting day before handling and transportation of fish;
- vaccination of fingerlings will be also effective to stimulate immune response and to prevent infection and spread of disease.

Methods for disinfection

- Earthen pond

The pond should be completely emptied and then kept drained for 5–7 days. If the bottom could not be completely drained, spread quicklime at a rate of 200 – 250 g.m⁻².

- Smaller structure

Concrete tank, fiberglass tank or aquarium can be disinfected with formalin or chlorine bleach.

- Equipment

All other materials (landing net, bucket, plastic pipe, etc.) could be disinfected by dip for 20 – 30 seconds in a solution of 6 ml of chlorine bleach in 1 litre of freshwater.

CHOICE AND GENERAL ADVICE FOR FISH TREATMENT

Observation of fish behavior will lead farmer to make a rapid diagnosis of the disease required to prescribe a course of treatment. This therapy should be quickly administrated, well targeted and given at the right dose in order to stop disease development.

The choice of chemotherapeutic agents should be based on the following criteria:

- not prohibited;
- right drugs for the right disease (requires knowledge of the drug and its dosage);
- easily available and cheap;
- does not affect humans consuming the fish.

Three methods have been used administering therapeutic drugs to *P. djambal*: by injection, blended with feed or mixed with water (De Kinkelin *et al.*, 1985). These methods are used to control the spread of pathogens and reduce the intensity of the infection. However, each drug has specific use recommendations made by the manufacturer.

Injection

Generally used for broodfish, this technique is practiced when there are no other available methods. Actually, handling fish for the injection increases stress. However, it is the only way to treat valuable fish reared in cage or in pond, and which refuse to eat. Injection of drugs makes sure that the medicine penetrates the body.

The drugs used for injection are antibiotics, vaccines or vitamins and are injected intra-muscularly or intra-peritoneally.

Blended with feed

This method does not stress fish. It is generally used to administer antibiotics and vitamins powder. During the treatment, the daily feeding rate of fish has to be decreased to 1% per day to make sure that all feed distributed is entirely ingested. The blending in feed is done as follows:

- daily quantity of feed is calculated (1% of the biomass) and weighed;
- daily quantity of drug is calculated from the total biomass and weighed;
- calculation: Total fish biomass (kg) x dosage of the product (mg per kg of fish per day);
- place together in a small container;

- mix food and product together;
- add 0.1 L of vegetable oil (palm or soybean oil) for 5 kg of feed;
- mix feed and oil together until all antibiotic powder is sticking on pellets;
- distribute the blend slowly to make sure that the feed is entirely ingested.

Mixed with water

This method is generally used to treat ecto-parasites or external bacterial infection. Although simple to administer, bathing with chemotherapeutic agents needs care to avoid risk during the treatment.

Advice for bath treatment

Before anti-parasitic treatments, fish must not be fed.

In order to prevent fish from swimming in dangerous concentration during the treatment, it is not advisable to put drugs directly in the rearing structures. We strongly recommend to take a sample of rearing water (10 L), making a stock solution that will be distributed among the treated structures. The stock solution will help the homogenization of the treatment into the water.

Not all drugs listed below are dangerous for fish at the recommended dosage. However, a calculation error is always possible. For this reason, fish behavior should be checked during treatment. If fish show stressful reactions, the chemical should be rapidly removed by water exchange with clean freshwater. It is also recommended to increase air flow during the treatment because some drugs can decrease the dissolved oxygen in the water.

Before using a new treatment for small fish, it is recommended to test the drug in order to determine lethality of the prescribed dose and tolerance time. For this purpose, some buckets are filled with 10 litres of clean water; the drug is added into each bucket at the dose recommended by the manufacturer. Into each bucket 10 fish are placed. During the test period fish behavior is observed to determine whether they get stressed or die. If the time recommended for treatment does not fit with the condition resulting from these observations the effectiveness of the drug against the pathogen has to be determined.

Difference between disinfectant and antibiotic treatments

Disinfectant

Used for treatment against ecto-parasites, fungi and external bacteria. Administered by bath or dip, they give quick results. One treatment is generally not enough to kill the pathogen. Therefore, it is recommended to

repeat it one or two times on alternating days in order to avoid new developments.

Although numerous chemotherapeutics are available worldwide for aquaculture, formalin is still considered the most common drug to treat external and gill parasitic infestation. Formalin is chosen not only for its efficiency, but also for its availability and low price. Mixed with “Malachite Green Oxalate” (MGO), its wide effectiveness seems to be reinforced.

Regular preventive treatments with formalin are recommended. No resistance was developed by the pathogen for this drug.

Water management

Our experience and various reports have shown that formalin or MGO utilisation in a recycling water system does not affect the biological filter at the dose recommended. As this drug is completely degraded after 26-h at the dose of 25 mg.L⁻¹ in bathing treatment (Tonguthai, 1997), it is not necessary to change water after preventive treatment in a recycling water system. On the other hand, for curative treatment, it is recommended to change water after 24-h of bath treatment in order to remove a maximum amount of pathogen, particularly with *Ichthyophthirius multifiliis*.

In a stagnant water system, as 50 to 75% of the water is changed every 24-h, the routine activities remain unchanged whatever the treatment.

Antibiotic

Never to be used for preventive treatment, antibiotic is administered to fish for controlling bacterial diseases through injection, bath or blend in feed. It is important to point out that:

- bacteria are sensitive to specific antibiotics;
- bacteria become resistant to drugs when antibiotic therapy is not well targeted or not administered for the proper time.

In order to avoid such problems, it is the best to first identify the species of bacteria and then do a sensitivity test to antibiotics before selecting and using the drug. However, obtaining such results takes 6 – 8 days and these analyses are not necessarily available close to fish farms in Indonesia. Therefore, in case of bacterial disease, it is preferable to use a wide spectrum antibiotic such as Oxytetracycline (Terramycin) rather than losing the production.

Antibiotics should be used at the right dose and for sufficient duration in order to ensure the total elimination of bacteria. Antibiotic therapy should be administered for 6 – 8 days and could be repeated after one-week break in order to avoid a new development of pathogen. Aborting treatment before the

6th day risks creating bacterial immunity, even though mortality may have decreased and fish health improved rapidly.

The final very important point is that antibiotic residues in the flesh could affect human consumers. In fact, depending on temperature and the type of antibiotic, fish are free of residues about one month after the end of treatment. During this period, fish should not be sold for human consumption.

Water management

The use of Oxytetracycline in a recycling water system does not affect the biological filter at the recommended dosage. Nevertheless a slight slowing down in nitrification efficiency is observed after 5 days (Blancheton and Melard, 1990). As the fish daily feeding rate is considerably reduced during the treatment, this temporary reduction in efficiency of the biological filter has no consequence on the fish culture.

It was demonstrated that the half-life of this antibiotic is 128 h at 15°C (Blancheton and Melard, 1990); we can assume degradation is faster in a tropical climate (27 to 31°C). As antibiotic purchase is very expensive for farmer and dry season sometimes imposes water rationing, a procedure for long term bath in recycling water system could conserve both antibiotic and water. The following procedure and doses could be applied without changing water over 7-days:

- 20 mg.L⁻¹ for the first bath treatment;
- 48 h after, give a dose of 15 mg.L⁻¹;
- 48 h after the second dose, give a dose of 10 mg.L⁻¹;
- 48 or 72 h after the third dose, water should be changed completely.

The same procedure and dosage could be used in stagnant water with water changed every 48 h when water is not restricted. However, during treatment the daily feeding rate should be decreased to 1% of fish biomass per day.

PATHOGEN FOUND ON *P. DJAMBAL*

So far, three main pathogens has been found to infect *P. djambal* in culture conditions. The following give elements to identify them, clinical symptoms, prevention and efficient treatments and their dosages.

Bacteria: *Aeromonas hydrophyla*

Short rods, 0.7-0.8 x 1.0-1.5 µm, motile, with single polar flagellum, gram negative.

Not visible with the naked eye, this bacteria is the most common cause of hemorrhagic septicemia, the infection generally follows stress.

Prevention: maintain good conditions of rearing and avoid unnecessary stress of fish.

Clinical sign: abnormal behavior; swim slowly; refuse to feed; hemorrhage; discolored and eroded fins; skin lesion sometimes reaching deep into the muscle.

Treatment: antibiotic such as Oxytetracycline administered by injection, bath or orally.

Dosage: **Never stop** the treatment before 6 – 8 days, if necessary it could be repeated after a one-week break.

- 10 – 20 mg.m⁻³ (ppm) of active substance, in bath for 24 hours,
- 50 – 75 mg.kg⁻¹ of fish per day, blended in feed, taken orally,
- 50 mg.kg⁻¹ of fish per day, by injection for brooders.

Protozoa: *Ichthyophthirius multifiliis*

Body of mature stage is round with a diameter of 500 – 1000 µm, covered with cilia, macronucleus large and horseshoe-shaped. External parasite, visible to the naked eye. Called “Ich” in Indonesia, young parasites colonize gills or insert themselves under the mucus layer. This parasite is the most dangerous for fingerlings and can lead to mortality up to 100% in the case of heavy infection.

After 7 days at 25°C, each *Ichthyophthirius multifiliis* becomes mature and releases small cysts in the rearing water, which sink to the bottom. Then after few hours, they give birth to a thousands of descendants. The latter, called Tomite, infest the fish again. The infectious stage, called “white spot disease” is reached rapidly. Chemical treatments are effective on the free-swimming stage only (Tomite). Multiplication is very rapid below 28°C, but at higher temperatures, the risk of infection is considerably reduced.

Prevention: Good rearing conditions; temperature of rearing water should be higher than 28°C; running water to remove Tomite; preventive bath treatment.

Clinical sign: Appearance of white spots on skin or fins, irritant effect, infested fish become lethargic and do not respond to stimuli correctly.

Treatment: Bath with a stock solution of Malachite Green Oxalate (4 g) diluted in formalin (1 L).

Dosage: This treatment is the most efficient against “white spot disease”; however exceeding the recommended dosage is very dangerous for fish. In case of a new stock solution, it is strongly recommended to test it on a sample of fish first.

- During the first 10 days of larval rearing: 5 mL.m⁻³ for 24 h, once a week, as preventive treatment.



- Over 10-day-old: 10 mL.m⁻³ during 24 h, once a week, as preventive treatment.
- In case of infection: the dosage of 20 mL.m⁻³ should be applied for 24 h, and repeated 3 times after 24-h break (total duration 5 days). During the 24-h break, the water should be changed entirely whatever the rearing method used.

Note: Lethargic or heavily infested fish should be eliminated from the rearing tank in order to reduce infestation.

Monogenean: *Thaparocleidus*

Worm without segment, small size (< 3 mm). External parasite, generally fixed on the gills (Komarudin and Pariselle, 2002).

These species of Monogenean grow in number very quickly in intensive culture (Thoney and Hargis, 1991). The beginning of the infection is invisible with the naked eye. Afterwards, farmers should open the fish operculum to inspect for the presence of Monogenean on the gills. For an accurate diagnosis, farmers could sacrifice some fish and observe gills with a low power stereo-microscope.

This infection causes respiration deficiency for the fish and tends to reduce growth, with evident negative impacts on fish production. Bacterial infection could be a side effect.

Prevention: disinfection of rearing structures; draining of earthen pond or treatment with quicklime before starting a new production cycle; avoid mixing fish of very different size in culture; regular observation of fish behavior; regular preventive treatment.

Clinical sign: at the beginning of the infection, no outward signs; operculum spread in advanced stage; fish gathered near the water inlet or oxygen sources; appetite loss.

Treatment: bath with formalin.

Dosage:

- 25 mL.m⁻³ for 24 h, once a week, for preventive treatment;
- 40 mL.m⁻³ for 24 h in case of infection, need to repeat the treatment once after 24-h break.

EQUIPMENT AND TOOLS

Control and prevention

- 1 Low power stereo microscope (binocular) for accurate observation of parasites (recommended).

- 2 Stock solution of disinfectant and antiparasitic agents (formalin, MGO) for preventive treatments.

Disinfection

- 1 Quicklime, formalin, chlorine bleach.
- 2 Measuring bucket or cup for water volume measurement.
- 3 Syringe for measuring drugs.
- 4 Plastic bucket for mixing drugs with water.

Injection

- 1 Sterile syringe with suitable needle.
- 2 Ampoule of Oxytetracycline in liquid form (injectable antibiotic).

Blending drugs with food

- 1 Balance for weighing food and drugs generally in powder form.
- 2 Syringe for measuring oil.
- 3 Plastic container for blending food, drugs and oil.

Mixing drugs with water

- 1 Balance for weighing drugs in powder form (Oxytetracycline, Malachite Green Oxalate).
- 2 Syringe for measuring drugs in liquid form (formalin).
- 3 Plastic bucket for preparing stock solution.
- 4 Measuring cup for distributing among the structures to treat.

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