Ichthyophthirius multifiliis – a review

Teresa Leão1, Pedro Cairrão1, Ana Calado1,2, Teresa Letra Mateus1,3,4,5

Abstract
Ichthyophthirius multifiliis is a protozoan that is hosted in fish’s skin and actively feed on the fishes. The typical signs of the infected fishes are the white spots on their skin. The most important strategy is the prophylaxis that may include quarantine and vaccines.

INTRODUCTION
Ichthyophthirius multifiliis is an obligatory parasite of the phylum Ciliophora1 (ciliated protozoan) that infects wild and cultured fresh water fish worldwide, especially when at high population densities2. “Ich” (pronounced “ik”) is the largest known protozoan parasite found in fishes and being highly contagious is capable to kill a large number of fish in a short period of time, resulting in high economic losses2. The classical clinical sign of I. multifiliis in infected fishes is a white specked on their skin, like they are sprinkle with salt, commonly called “White Spot Disease”. The aquatic environment (temperature-dependent life cycle), stress and the improper handling favored the access and penetration of the parasite but, the fish susceptibility also depends on the genetic background of the host3. This parasite is thought to be originally endemic from far east and through the importation of goldfish was introduced later in Europe3. According to some authors, Ich can be zoonotic, but further analyses are needed4.

CLINICAL SIGNS
The early response to infection is the increase in the surface mucus production5-6 and even before the appearance of the typical white spots on the skin, infected fish shows non-specific signs of mild skin irritation and remarkable changes on swimming behavior. Then small white spots are typically visible on the skin, which may coalesce, but it can also be observed hosted in the gills, fins and in the oral cavity. The infected fishes commonly demonstrate petechiae on the bases of their fins. After some days, fishes lost their appetite, are lethargic, decrease their activity and gills have a pale and swollen appearance7. The mechanical invasion of the parasite causes erosions that easily develop into ulcers, exposing the deeper tissues to secondary fungal or bacterial infections8. Uncommon but possible to the parasite encyst in the eyeball, so blindness and eyeball turbidity can be present9-10. The total and differential blood cells counts, serum composition (protein, immunoglobulin, osmolality, sodium, chloride and lysozyme activity), Na+/K+ -ATPase gills activity, acid and alkaline phosphatase and B-glucuronidase activity of skin mucus may be altered12. Prolonged course of the disease can induce anemia. The severity of symptoms depends on the fish species and infection grade11.

HISTOLOGICAL FINDINGS
During the invasion, slides made of skin or gills show a marked inflammation and epidermal proliferation. There is an infiltration and migration of leucocytes in the site of infection. Primarily infiltration is composed by neutrophils, lymphocytes and fibroblasts; in later stages there is an accumulation of eosinophilic granular cells and macrophages in the surrounding area of the encysted parasite. In other cases what is shown on the slides are hydropic, vacuolated and/or necrotic cells with picnotic-nuclei12. On histopathology, it is also possible to observe mild congestion and hemorrhage infiltration at fins basis and skin between epidermal or dermal cells13. The migrant parasitic forms usually only stops in the basal membrane of epidermis, so changes are visible on the underlying musculature withth the hyalinization of muscle fibers with prominent destruction of the nucleus13. Furthermore, fishes with melanophores can demonstrate aggregation of this cells around the parasite. Diagnosis by
cytology by skin scrapings of several white spots added of a few drops of water and a cover glass and microscope evaluation is enough to confirm Ich. Adults will be easily recognized due the C-shaped nucleus and thick cilia covering the entire cell. Tomites are commonly mistaken with Tetrahymena11, but tomites are smaller, translucent and moving quickly but rigidity opposed to the rolling movement of mature organism14.

**TREATMENT AND PROPHYLAXIS**

Generally there are two strategies to treat fish with 1. multifiliis, a chemical bath or feed treatment. The best chemi-

tical treatment is malachite green but it is capable to cause cancer, mutation and fetuses problems so it was banned to fish food13. Other alternatives had been explored such as copper sulfate15, sodium chloride16, chloramine-T, potassium permanganate, potassium ferrate15, chlorophyllin17, formaldehyde and hydrogen-peroxide based compounds but none of these therapeutics is both safe and effec-
tive18. When chemicals were shown not being effective the study of medicinal plant extracts received other attention. Tested extracts were from Mucuna pruriens, Carice papaya ya19. Allium sativum20. Magnolia officinalis21. Sophora alopecuroides21. Capsicum trutescens22. Morus alba23 and Psoralea corylifolia23. Medicated feed is a good choice because it is not affected by environment water parameters (pH, conductivity), easy to administer and less stressful, but they depend on the activity of the fish and acceptance uptake of the medicated food. It should be noted that generally fishes lose their appetite24. Quarantine should be done to all incoming fishes, at least, 3 days at 23 to 27o C 23. Vaccination with live parasitic forms confers complete protection against some serotypes of Ich25. It is described that addition of polysaturated fatty acids can stimulate the immune system favoring the resistance to the infection of Ich26.

**REFERENCES**


3. Nigrelli RF, Pokorny KS, Ruggieri GD Notes on Ichthyophthirius multifiliis, a ciliate parasitic on fresh-water fishes, with some remarks on possible physiological parameters (pH, conductivity), easy to administer and less stressful, but they depend on the activity of the fish and acceptance uptake of the medicated food. It should be noted that generally fishes lose their appetite24. Quarantine should be done to all incoming fishes, at least, 3 days at 23 to 27o C 23. Vaccination with live parasitic forms confers complete protection against some serotypes of Ich25. It is described that addition of polysaturated fatty acids can stimulate the immune system favoring the resistance to the infection of Ich26.

**REFERENCES**


3. Nigrelli RF, Pokorny KS, Ruggieri GD Notes on Ichthyophthirius multifiliis, a ciliate parasitic on fresh-water fishes, with some remarks on possible physiological parameters (pH, conductivity), easy to administer and less stressful, but they depend on the activity of the fish and acceptance uptake of the medicated food. It should be noted that generally fishes lose their appetite24. Quarantine should be done to all incoming fishes, at least, 3 days at 23 to 27o C 23. Vaccination with live parasitic forms confers complete protection against some serotypes of Ich25. It is described that addition of polysaturated fatty acids can stimulate the immune system favoring the resistance to the infection of Ich26.

**REFERENCES**


3. Nigrelli RF, Pokorny KS, Ruggieri GD Notes on Ichthyophthirius multifiliis, a ciliate parasitic on fresh-water fishes, with some remarks on possible physiological parameters (pH, conductivity), easy to administer and less stressful, but they depend on the activity of the fish and acceptance uptake of the medicated food. It should be noted that generally fishes lose their appetite24. Quarantine should be done to all incoming fishes, at least, 3 days at 23 to 27o C 23. Vaccination with live parasitic forms confers complete protection against some serotypes of Ich25. It is described that addition of polysaturated fatty acids can stimulate the immune system favoring the resistance to the infection of Ich26.