

FIRST FINDING OF PARASITIC LESIONS CAUSED BY *Henneguya zschokkei* (Myxosporidia: Myxobolidae) IN FROZEN MARKET SALMON IN MACEDONIA

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Abstract

The paper refers to the parasitological lesions finding in frozen market salmon imported to Macedonia.

Microscopic examination revealed the presence of *Henneguya zschokkei* Gurley, 1894. The aim of this paper is to warn veterinarians and inspectors who perform the supervisory activities over imports of fish, and ultimately the consumer about the possible presence of parasitic lesions in the muscle of imported salmon, which is caused by myxosporidia *Henneguya zschokkei*.

Key words: Salmon, parasitic lesions, *Henneguya zschokkei*.

1. Introduction

Henneguya salminicola Ward, 1919 was first described in 1919 by Dr. H. B. Ward from cysts found in body musculature of a silver salmon (*Oncorhynchus kisutch* Walbaum), taken from the Stickeen River in South-eastern Alaska. Ward [2] described the cysts as "pyriform, fairly uniform in size, and hard to the touch, measured 3 to 6 mm in diameter and were found everywhere through the muscle mass. Zschokke and Heitz [2] had previously encountered cysts measuring 3 to 5 mm in a silver salmon during a parasitological survey of salmonid fishes of the Kamchatka Peninsula. Myxosporidian spores within the cysts were identified by these workers as those of *Henneguya zschokkei* Gurley, 1894, although they gave no details as to the spores found and it seems quite probable that Kudo [2] was correct in his assumption that these spores belonged to the same species which was later described by Ward as *Henneguya salminicola*.

Salmon become infected as juveniles, and carry the infection over the marine period. Heavy infections pose a problem for salmon fishery, rendering the fish unmarketable. Because of the milky fluid (spore suspension) oozing from cysts opened during filleting, the infected fish are described as being in a "milky condition" (Lom and Dyková [4]).

Buchtova *et al.* [3] have been worked on possible presence of parasitic lesions in the muscle of salmon imported market, which is caused by myxosporean *Henneguya zschokkei*. They bought the fish in the shop and it was quick-frozen, vacuum-packed. During processing, they found in muscle whitish bodies spherical to oval shape with a diameter of 3-5 mm. They made more detailed examination to avoid accumulation of the natural components of muscle (fat and connective tissue) and it turned out to be caused by intravital lesions that resemble cysts and contain a dense mass of milky spores. It was confirmed that this is a dispute myxosporean *Henneguya zschokkei* Gurley, 1894.

McClelland *et al.* [8] found spores of *Henneguya salminicola* in human stool specimens from patients with diarrhea in Canada. *Henneguya* spores detected in feces are that they may be intestinal flagellates. The spores' superficial resemblance to human spermatozoa resulted, in one instance, in an incorrect report, leading to suspicion of sexual abuse. *H. salminicola* spores and human spermatozoa can be differentiated on the basis of size, morphology, and staining characteristics. Laboratory personnel who perform microscopic examinations of stool specimens for ova and parasites should be aware that spores of *H. salminicola* may be seen from time to time. From the morphological

description Lebbad and Willcox [7] noticed that their examples from human feces are from the same species as previously described, although in Sweden they are called *Henneguya zschokkei*. Most specimens have come from northern Sweden, and the fish usually involved seems to be the fresh- and brackish-water salmonid whitefish (*Coregonus lavaretus* group). Other fishes in which *H. zschokkei* has been observed include salmon, pike, perch, catfish, bream, and char.

2. Materials and Methods

Examination was carried out on Atlantic salmon (*Salmo salar* Linnaeus, 1758) which was brought to Hydrobiological Institute in Ohrid by consumer, who has bought the fish in the shop in Ohrid.

Protozoa were observed in a native smear. A small amount of muscle mass with whitish cysts was collected with scalpel and put on a slide, on which we have already put a drop of water or saline, and spores were observed and measured under microscope (firstly at 20, then 40 x).

The keys of Bauer [1] and Lom and Dykova [4] were used for determination of parasite species. The following articles help us in our work as well: Hristovski *et al.* [5, 6], Stojanovski *et al.* [9, 10] and Barskaya *et al.* [12]

3. Results and Discussion

Henneguya zschokkei (Gurley, 1894) is a myxosporean parasite of Pacific salmon (*Oncorhynchus nerka*, *O. keta*, *O. tshawytscha*, *O. gorbuscha*, *O. kisutch*) and rainbow trout migrating forms *O. mykiss*, which occur mainly around the Pacific coast of North America and Asian coastal waters. It is originally described from freshwater whitefish in Europe, but it also occurs in salmonids and various other species of non-salmonid freshwater fish (Boyce *et al.* [2]). Infection by *H. zschokkei* which has been reported mainly in salmonids of the free water in the Atlantic salmon (*Salmo salar*) in intensive systems (floating cages) is much less chance of infection.

Sometimes *H. zschokkei* was identified as a different species (*H. kolesnikovii* or *H. tegidiensis*), usually due to slight morphometric variation of the spores.

According by Stone *et al.* [11] *Henneguya salminicola* Ward, 1919 is very similar, perhaps identical. According by Lom and Dyková [4] *H. salminicola* is obviously another synonym of *Henneguya zschokkei*, and it infects five species of Pacific salmon common to North America and Asian Coast.

H. salminicola produces cysts in the muscle of infected fish. The cysts vary from 4-15 mm in diameter, and are filled with masses of spores and debris of destroyed muscle (Boyce *et al.* [2]). The cyst wall is host

connective tissue resulting from the host's immune system's attempts to isolate the parasite. When located in the superficial musculature the cyst may be detected externally as rounded swellings. In other cases the cysts cannot be seen externally and will not be detected until the infected flesh is exposed, such as during filleting. The cysts are white and so stand out in contrast to the pink flesh. In Pacific salmon species the majority of cysts are found in the musculature between the dorsal fin and the caudal peduncle (Boyce *et al.* [2]). *Henneguya zschokkei* spore and whitish cysts in the muscle of salmon are shown in Figure 1. Because of the presence of cysts, portions of the catches of salmon, particularly chum and coho, may be rendered unsuitable for marketing.

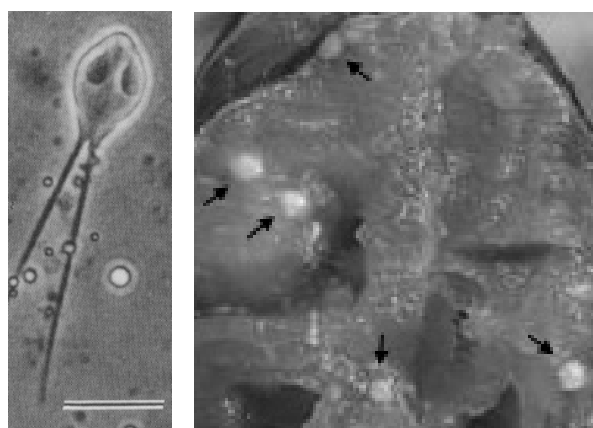


Figure 1. *Henneguya zschokkei*: spore (left); whitish cysts in the muscle of salmon (right)

In our case study, consumer bought the fish in December 2007 in the shop in Ohrid, a part of one of the larger retail chains in Macedonia. It was quick-frozen, undivided, Atlantic salmon (*Salmo salar* Linnaeus, 1758). During cutting of thawed fish flash for cooking, he noticed whitish bodies in the fish flash. Muscle sample was sent to the Hydrobiological Institute in Ohrid for examination. A great number of whitish cysts spherical to oval in shape with diameter 3-4 mm were found, and they were filled with masses of spores and debris of destroyed muscle were situated everywhere through the fish muscle mass. It was confirmed that this is a dispute myxosporean *Henneguya zschokkei* Gurley, 1894.

According to our microscope measurement, length of the whole parasite is 46,95 μm ; spore body length is 14,80 μm and width 9,90 μm ; tail length 33,13 μm and width 1,57 μm .

4. Conclusions

- By this short contribution we want to may attention to veterinarians who perform the state supervisory activities over imports of fish and their

treatment at home, inspectors of the Ministry of agriculture, forestry and water management and ultimately the consumer about the possible presence of parasitic lesions in the muscle of salmon imported market, which is caused by myxosporean *Henneguya zschokkei*.

- In terms of food safety, myxosporean infection is not transmissible to humans. Even after the ingestion of viable spores of infected flesh (raw or inadequately cooked flesh) is not anticipated the emergence of foodborne diseases. In terms of processors is the presence of *H. zschokkei* dispute in muscle assessed as undesirable because it reduces the technological and organoleptic quality of final products whether they are marketed in the form of chilled, frozen (fillets, portions, shoes) or treated (oil, canned).
- For the general public is invaded salmon flesh completely unacceptable, and as shown in the case described, the presence of *H. zschokkei* dispute also raises the resistance of informed consumers. The result is a loss of consumer interest in salmon, which is generally considered one of the best fish market, and possibly focus on a selection of other species of marine or freshwater fish. Worse option is to search other types of food, which negatively affects the already very low level of fish consumption in Macedonia (long-term about 2 kg/person/year).
- *H. zschokkei* is therefore of concern, because it can lower the market value of infected fish, although it doesn't cause morbidity.
- Chances of controlling *Henneguya* are remote, because the control of parasites of wild stocks of fish is rarely possible.
- The best prospect for obtaining *Henneguya*-free salmon seems to be through selection of fish from stocks known to be uninfected or having a very low frequency of infection.

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