B. Hurkett

# Saprolegniosis in Alberta


## Common name

cotton wool fungus, water mould, sapro

## Scientific name

*Saprolegnia parasitica*, a water mould

## What's Bugging Wild Critters?

Fact sheet #29: Saprolegniosis

## Significance

Water moulds of the genus *Saprolegnia* are common in most if not all freshwater ecosystems around the world. They are occasionally seen on the skin of wild, hatchery-reared, or aquarium fish, especially during spawning or times of stress. Infections can be fatal.

## What? Where? How?

Originally classified as fungi, the many species of *Saprolegnia* recently were re-classified with brown algae and diatoms. Sapro species are the main cause of significant fungal-like infections in freshwater fish and their eggs, and have been associated with mortality in wild fishes and significant economic losses in aquaculture operations around the world. 'Sapro' spores each have two flagellae – the one on the front creates thrust, the one on the back steers. The spores survive in a wide range of temperatures (3 to 33°C).

Water moulds are wonderful opportunists - using powerful enzymes they can pretty well eat anything organic that occurs in fresh water, though they often need previous damage to the skin or gills to establish on live fish. They can attack all life stages from eggs to adults, but in wild salmonids, are generally seen on spawning fish. *Saprolegnia* species also infect a wide range of fishes in farms, hatcheries, and aquaria; were associated with mortality of amphibian eggs, and were found on a few turtles, insects, diatoms, and algae. They may play a role in the global disappearance of amphibians.

The disease (saprolegniosis) is characterized by a tangled mass of fuzzy white filaments that invade the epidermal or outer skin cells. The colonies often look like tufts of cotton wool. Sometimes the white patches turn grey or green if bacteria, algae, or debris get caught up in the filaments. Once out of water, the filaments clump into mats on the surface of the fish.

If the fish is stressed (is experiencing hardship or has a weakened immune system) or has previous damage on the body or fins, sapro can attack, spread quickly, and erode larger and larger areas of skin. In severe cases, the filaments extend into underlying muscle layers and even blood vessels. Infected fish generally die from improper chemical balance in their body fluids and tissues.

## Transmission Cycle

For small 'simple' moulds, they have a very complicated life! *Saprolegnia* spp. can reproduce asexually using spores or sexually using male and female reproductive cells.

Let's take the asexual form first. Spores in the water produce zoospores that encyst to form hardy spores. These disperse and continue to produce even more zoospores until some of them find a place to establish a new colony. Once they find a place to settle down, tiny hairs on the zoospores, sometimes with tiny hooks on the end, latch onto the substrate – whether it is alive or dead – and hold the spore in place.

Now the sexual forms take over. The attached zoospores form a platform on which to produce male and female gametes. These unite and form a fertilized zygote, called an oospore. The colony continues to produce more and more filaments and spreads further and further over the substrate. If it happens to be the skin of a live fish, this results in damage to more and more skin surface.

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## Distribution in Alberta

*Saprolegnia* spores probably occur in fresh water throughout Alberta. Some fishermen report seeing cotton wool fungus on individual fish caught during the spawning period; however, reporting rates may underestimate occurrence.

In one graduate study program, Kerry Brewin found infection rates in spawning Brown Trout were 10 times higher in males and infections were more common in larger fish. This may reflect the higher rate of injury when males fight among each other for females or territory, and higher levels of male hormones can increase the chances of infection in some fishes by decreasing the protective mucous on the skin. Bigger fish are more territorial and more involved in spawning activities, thereby increasing their risk of injury or stress. Similar patterns of occurrence have been seen in other places.

The fungus also can infect dead fish eggs and spread to nearby live eggs. The filaments pierce the egg membrane and the eggs die. This can be a significant problem in fish hatcheries, where large numbers of eggs are held in close quarters. Problems are less likely to occur in wild populations where eggs are more dispersed within the redd, thereby reducing the chances of spreading from dead eggs.

## Public Significance

Humans can not be infected by *Saprolegnia* species. But, in our favour, larval mosquitoes die of infection!

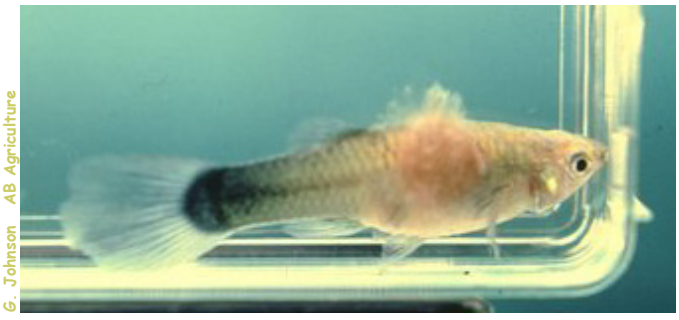
## Importance for Fisheries Management

We don't know how damaging sapro infections are for wild fish. Infected fish are seen occasionally, and they are lethargic and don't swim properly. Severely infected fish usually die. However, Brewin documented that some infected Brown Trout survive and are not infected in subsequent spawning seasons.

Fortunately fish have built-in defences against fungal infections. The mucous coating on the outer surfaces makes it harder for the spores to attach and the constant replacement of the mucous provides excellent protection to the underlying tissues. As well, the mucous contains chemicals that limit growth of the filaments (but does not kill Sapro). Similarly fish scales and skin cells make it difficult for spores to establish. Stress and injury can weaken these defences, allowing the spores to quickly latch on and establish a new colony.

Other factors can affect the natural defence mechanisms of fish. Handling can increase chances of infection, likely due to removal of mucous. Also crowding, parasites and other infectious diseases, water quality, and sudden temperature changes can increase the risk of infection in captive fishes. In addition, spores can be transferred by fish, eggs, water supplies, and equipment.

Extensive mortality associated with saprolegnia infections occurs repeatedly in farmed fish in Europe, Asia, and Australia. In North America problems occur with various farmed species, but particularly on catfish farms during winter months. As far as we know large-scale mortality is rare in wild fish populations.



G. Johnson AB Agriculture

Government of Alberta

April 2010

Wildlife diseases in Alberta: http://srd.alberta.ca/BioDiversityStewardship/WildlifeDiseases/

Pub. No:
I/426
ISSN:
1710-4327
ISBN Print:
0-7785-8917-4
ISBN Online:
0-7785-9013-2

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## Prevention/Control

There really is not much we can do about the wide-spread natural occurrence of *Saprolegnia* spores in waters throughout Alberta. However, we can try to minimize stress or damage to fish handled by humans. Avoid using cloth-mesh nets to land fish and minimize all handling when releasing fish. This will reduce damage or removal of mucous. A good mucous covering helps prevent infection.

In our hatcheries and brood stations, we routinely monitor fish for external damage and try to minimize stress. To control sapro infections, hatchery eggs are treated with a dilute formalin or hydrogen peroxide solution, and infected and dead eggs are removed to prevent spread of the fungus

## Summary

*Saprolegnia is a common water mould found throughout Alberta. It occasionally infects fish, especially salmonids (trout), during the spawning period. Minimizing stress and handling of catch-and-release fishes will reduce the risk of subsequent infection. Fish culture methods are designed to minimize losses in hatcheries.*

## Additional Information

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April 2010