

HOW TO TELL THE ULCER DISEASE FROM FURUNCULOSIS IN TROUT AND METHODS OF TREATMENT OF THESE DISEASES

S. F. SNIESZKO, Fish and Wildlife Service, Kearneysville, West Virginia
S. B. FRIDDLE, Fish and Wildlife Service, Kearneysville, West Virginia

Proc. Annu. Conf. Southeast. Assoc. Game & Fish Comm. 4:226-229

Furunculosis and ulcer disease are two economically very important and usually fatal diseases of trout. Both diseases have been known for over fifty years. Recently an effective treatment for furunculosis has been developed by J. S. Gutsell at the Leetown Station and experiments are in progress on the treatment of the ulcer disease. Let us review briefly what we know about both diseases.

Furunculosis is known all around the world. It is caused by *Bacterium salmonicida*. It has been carried everywhere with infected eggs or fish. It is primarily a disease of salmonid fishes, but other fishes are also occasionally attacked. It is common among fishes in hatcheries and in natural waters. Eastern brook trout (*Salvelinus fontinalis*) and Atlantic salmon (*Salmo salar salar*) are very susceptible and the mortality rate reaches 100 per cent. Brown trout (*Salmo trutta*) is more resistant and rainbow trout (*Salmo gairdnerii*) is very resistant to this disease.

The losses among Salmon in Great Britain were great and economically so important, that the Government appointed a committee of experts which in five years secured very valuable information regarding this disease. In the United States furunculosis made it impossible rearing of brook trout in hatcheries in which it appeared.

Ulcer disease is less accurately known than furunculosis. It seems likely that there are several types of ulcer disease, each caused by a different pathogen. The form of this disease common in the Eastern United States was first described by Fish in 1934. Frequently it has been confused with furunculosis because some of the symptoms are similar. Sometimes trout suffer from a mixed infection with bacteria of ulcer disease and furunculosis. Bacterium which causes the ulcer disease, or red spot, of brook trout has recently been isolated and described at the Leetown Station; it is *Hemophilus piscium*.

SYMPTOMS

Furunculosis

Technically, the term "furunculosis" with reference to fish is a misnomer, for the lesions of this disease are not analogous to furuncles as they occur in the human subject. These latter are essentially inflammatory and suppurative foci in the skin; the so-called furuncles of fish are areas of necrosis in which there is no outstanding leucocytic infiltration. The pus-like discharge from these areas is not true pus, but consists of liquified necrotic tissues showing microscopically muscle fibres, blood cells and bacteria.

The symptoms of the disease are not always obvious and those lesions present may be masked with fungus growth. In the case of fingerling trout usually the only evidence of a lesion from the exterior are irregular dark blotches just beneath the skin on one, or both sides, of the body. These blotches ordinarily are situated between the dorsal and pelvic fins and in young trout are probably the most characteristic symptoms of the disease. Furunculosis is properly described as a general infection in which focal lesions may or may not occur, according to the rapidity of its progress.

There are two main types of the disease; one which runs a rapid course, death occurring with no external signs and termed "acute"; the other, termed "subacute" is slower in its progress, focal lesions developing in the muscles of various parts of the body. Numerous variations from these two extremes of course occur, including the carrier state which may last for a considerable period of time.

The disease is of septicaemic nature, bacteria being carried to all parts of the body in the blood stream. There is focal destruction of the dermis, capillary blood vessels disintegrating resulting in admixture of blood cells with necrotic tissue. There may be multiple abscess-like cavities under the skin, sometimes of large extent containing an opaque reddish liquid. These cavities may be closed or open on the surface and some may penetrate into the body cavity. The kidney is frequently affected, and this organ may become necrotic and semi-fluid. There may be marked congestion of blood vessels of the abdominal cavity and hemorrhages in the peritoneum, in the region of the swim bladder. The lining of the intestine and the pyloric region of the stomach may be inflamed and there is often a discharge of blood and mucus from the vent.

Ulcer Disease

The first recognizable symptoms of ulcer disease are raised, somewhat tufted, white spots consisting of fine shreds of superficial skin layers which Fish named "epithelial tufts." These tufts may appear on any part of the body, even on fins, but in most cases the first ones are found in the body proper. They are usually first noticed when about 1 mm in diameter and may be as much as 3 or 4 mm across before the corium is penetrated and a recognizable ulcer is formed. A casual inspection might lead to the conclusion that these tufts are small patches of fungus.

The pathology of ulcer disease differs from furunculosis in several important points. Borderline cases may be found, however, particularly in fingerling trout which are exceedingly hard to diagnose accurately without resorting to bacteriological examination.

In the first place, with ulcer disease the lesions are clear-cut, the whole picture being typical of a sloughing necrosis progressing from the external surface inward. Often, exposed muscle tissue appears firm and healthy, but this is by no means constant as inflammation may extend for some distance around the ulcer. A characteristic of ulcer disease is that the edges of the jaws and the roof of the mouth are very often attacked. All the soft tissue over a large area of the roof of the mouth may be eaten away and ulcers at the edges of the jaws often progress very rapidly, especially on the lower jaw where the bones may be eaten through. Small ulcers frequently develop on the fins and these attack the fin rays as well as the soft tissue. Often a group of rays is punctured midway, or even closer to the base of the fin.

BACTERIOLOGICAL EXAMINATION

Since furunculosis and ulcer disease have some symptoms similar, or occur occasionally together in the same lot of fish, the isolation and identification of the causative pathogens can only assure the correct diagnosis. *Bacterium salmonicida* can be isolated by inoculating bacteriological media with blood or kidney tissue of the diseased fish. On a medium introduced at the Leetown Station *Bacterium salmonicida* grows well in 24 hours at about 20°C (65°F) and in 2 - 3 days produces characteristic brown pigment. *Hemophilus piscium* will not grow on this medium. For the cultivation of *Hemophilus* we developed a special medium in which it grows abundantly. Results of bacteriological examination are very important because they facilitate the selection of a proper treatment.

TREATMENT

Furunculosis

Treatment for furunculosis was discovered by J. S. Gutsell at the Leetown Station in 1946. He found that sulfamerazine, one of the sulfa drugs, can be successfully used for the treatment of this disease. Additional studies carried on at the Leetown Station, and some other laboratories, make it possible to recommend the following treatment for furunculosis:

1. Treatment should be started as early as possible, because fishes in the advanced stage of the disease cannot be saved.
2. Bacteriological examination of the diseased fishes should be carried out as soon as possible. Other diseases, which in their symptoms may be similar to furunculosis, may be refractory to the sulfonamide treatment. In case of mixed infections in which *B. salmonicida* is also present, treatment with sulfonamides should be given.
3. Treatment should be started before the results of bacteriological examination are known. If bacteriological examination reveals infection with pathogens which are known to be refractory to sulfonamides, treatment should be discontinued and other measures tried.
4. Results presented in this paper show that the absorption of those sulfonamides which are most effective in treatment of furunculosis, is somewhat slower in fishes. Therefore, the initial dosage should be high and continued for three or four days. Information on hand indicates that during the initial treatment, trout should receive 20 to 25 grams of sulfamerazine and 10 grams of sulfaguanidine per 100 kilograms of fish per day. (Per 100 pounds of fish 10 gram suflamerazine and 5 grams sulfaguanidine.)
5. After four days of initial treatment the dosage may be reduced by 25 to 50 per cent, depending on the efficacy of the treatment. Provided that there are not complications, it should be completed in two weeks.
6. During the time of treatment all dead, sick, and undersized fishes should be removed as often as practicable to avoid the spread of the disease.
7. Treatment should be repeated if the disease reappears. There are indications, however, that a very prolonged treatment with small doses or periodical "prophylactic" treatments may result in the appearance of drug-fast strains of bacteria which are more difficult to deal with.

8. It is very important that the drugs should be well mixed with food and fish should be fed expertly using no more or less food as will be readily taken by fishes. Fish should be fed at least twice daily. No food without drugs should be given during the time of treatment.
9. For additional recommendations, see papers by Gutsell and Snieszko (1949), and by Flakas (1950).

Ulcer Disease

Many treatments were tried for the ulcer disease but with little or no success. Sulfonamides seem to be also ineffective. The experiments which are being carried out at Leetown indicate that "Terramycin," one of the newest antibiotics, gives very promising results. So far, this drug is too expensive to make treatment economically sound. If, however, price of Terramycin will approach the present price of Penicillin, its use for routine treatment of ulcer disease might be practical. One should stress here the fact that trout with advanced ulcer disease refuses to take food. Therefore, any treatments which involves feeding of food containing drug can be given only if fish still eat. Trout which refuse to eat can not be saved.

ADDITIONAL SOURCES OF INFORMATION

- Fish, F. F. 1934. *Trans. Am. Fish. Soc.* 64: 252-258.
Flakas, K. G. 1950. *Trans. Am. Fish. Soc.* 78: 117-127.
Gutsell, J. S. 1948. *Trans. Am. Fish. Soc.* 75: 186-199.
Gutsell, J. S. and S. F. Snieszko. 1949. *Trans. Am. Fish. Soc.* 76:82-96.
Snieszko, S. F., J. S. Gutsell, and S. B. Friddle. 1950. *Trans. Am. Fish. Soc.* 78: 181-168.
Snieszko, S. F., P. J. Griffin, and S. B. Friddle. 1950. *Journ. Bacteriology.* 59: 699-710.
Wolf, L. E. 1939, *Trans. Am. Fish. Soc.* 68: 136-151.
Wolf, L. E. 1941. *Trans. Am. Fish. Soc.* 70: 369-381.