FISHERIES SESSION

THE USE OF PMA IN TREATING COLUMNARIS

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An unusual outbreak of disease among trout occurred at the North Carolina Wildlife Resources Commission's fish hatchery, Marion, North Carolina, this past summer. *Cytophaga columnaris* is a relatively common disease of warm-water fishes when subjected to crowded hatchery conditions, but it was amazing to find it to be the apparent cause of high mortality among fingerling brown trout *(Salmo trutta),* and rainbow trout *(Salmo iridius).* The typical lesions and symptomic actions of the fish as described by Davis in his publication "Care and Disease of Trout" (1946), were evident to the naked eye, but the belief that *C. columnaris* was confined to warm-water fishes exclusively, led to considerable time being spent in trying to find another type of organism as the causative agent. On the third day of the outbreak, however, the first typical colony of bacteria, as described by Davis (1922) and Garnjobst (1945), was observed microscopically on the outer edge of the gill cover of a brown trout. Once this first haystack-like clump was noted, and attention was directed to *C. columnaris* as the probable cause, innumerable colonies were readily discerned on nearly all parts of the body of other specimens. The most prevalent locations of infection were the dorsal fins and gills, although all fins and various parts of the body surface showed evidence of infection. As many as seven distinct clumps were observed on a single scale from a two-and-one-half inch fingerling.

An immediate reference to available information concerning the treament of *C. columnaris* nearly caused the abandonment of all hope. From the material available, it was found that only two remedies were even suggested. The first was the use of copper sulphate solution as a dip. This was considered, but was decided against due to the extremely weakened condition of the fish and the extensive areas of damaged sections of the gills. The second was immediate transfer to colder water. This treatment was out of the question because all water at the hatchery was at a minimum temperature of 68°F at the time, and all other hatcheries which had colder water were carrying capacity loads of fish. The problem might have been solved by stocking the affected fish in cold-water streams, but it is against the policy of the Wildlife Resources Commission to stock any open waters of North Carolina with fish even suspected of being diseased.

Pyridylmercuric Acetate (PMA) has proved successful in the eradication of bacterial gill disease and several protozoan parasites according to Snieszko (1949) and others. Also, personal experience in using this drug in the treatment of various diseases indicated some hope for favorable results from its use against *C. columnaris,* although no record was found of previous similar treatments. On the first day that PMA was used, one-third of the affected fish at the hatchery were treated. The solution for the treatment of brown trout was prepared in the

proportion of 1 to 200,000, and a solution of half that strength, or 1 to 400,000, was prepared for rainbow trout. Previous work with PMA indicated that the latter species, unlike other trout, frequently were killed by higher concentrations of the drug. All fish treated were held in the solution until they showed evident signs of distress. This period averaged about thirty-five minutes for the rainbow trout and forty-five minutes for the brown trout.

The results of these treatments were truly gratifying. On the day following this first test, the mortality rate dropped to normal among the fish which had been treated, but remained high among all untreated fish. The next day, all remaining fish were treated in like manner, and in all cases, mortality rates returned to normal within twenty-four hours. The exception to this was a group of fifty brown trout fingerlings, all of which were visibly infected, and which were selected and held in a floating basket for further experimentation. Within two days, twenty-six of these fish had died, and a microscopic examination of three specimens showed definite progress of the infection, even to the point of invading the flesh under the scales of two of them. The remaining twenty-four fish were given a treatment at the rate of 1 to 200,000 for forty minutes. Five specimens of these fish were examined carefully the following morning and although the damaged areas were plainly in evidence, in no instances were colonies of bacteria found to be present.

Since the first outbreak, there have been several recurrences of the disease at the hatchery. After the third such outbreak, it was decided to experiment with various concentrations of the drug. Brown trout were selected as the test animals. These trials showed a definite increase in the value of treatment in proportion to the concentration used. Five lots were treated at the same time at the following rates: A, 1:150,000; B, 1:200,000; C, 1:250,000; D, 1:300,000; and E, 1:400,000. Mortality in all lots returned to normal the day following treatment. The evidence of benefit from higher concentrations showed in the time elapsed before the next outbreak among the individual lots of fish. The first recurrence was evident in lot E, which had been exposed to the weakest concentration, within seven days after treatment. Other recurrences among these groups were as follows: Lot D, 9 days; C, 12 days; B, 15 days; and A, 18 days. After that time all of the affected hatchery stock was treated at the rate of 1:150,000 every fifteen days, and mortality remained near normal. On each occasion, one small lot was left untreated, and in each instance, this one lot showed a sharp increase in mortality within two to four days. On August 19, the water temperature at the hatchery dropped consistently to below 65°F, and no further treatments proved to be necessary.

One further incident should be reported, however. On September 12, it was decided to give one lot of rainbow trout a final treatment with PMA as a precautionary measure prior to stocking the fish in large earthen ponds for the winter months. Since the fish had been subjected to the strong concentrations of PMA all summer, the strength of 1:150,000 was used. Within twenty minutes after application, the fish began to show considerable distress. Fresh water was turned on in full force at once, but this only seemed to hasten the effect and all the fish died within an hour. This experience which was inconsistent with the results obtained during the previous months at the Marion Hatchery, was similar to observations on the use of higher concentrations at U. S. Fish and Wildlife Service stations at Kearneyville, West Virginia, and Cortland, New York. Consequently, great caution is urged in the use of stronger concentrations of PMA in the

treatment of rainbow trout. Why this should occur specifically in the case of rainbows is not known. In the example described, the only observable differences between the fatal and successful use of the drug was in the reduced water temperature and in that the pH of the water had varied from a normal of approximately 6.6 to an unusual 7.4 on the day of treament. In all probability the increased pH was the result of a prolonged period of rain and a great amount of surface water in the hatchery supply. The oxygen content of the water was not measured at the time, but was believed adequate. Brown trout treated in like manner the following day and under similar conditions experienced no difficulty.

From the observations which have been made during the past summer, it might be concluded that outbreaks of *C. columnaris* may be anticipated among trout in warm-water situations; that approximately 65°F is a critical temperature below which the disease is inactive; that PMA will temporarily eliminate the infection; that the length of time between recurrences is directly proportional to the strength of the treatments used; and that under some circumstances rainbow trout are particularly affected by high concentrations of the drug.

LITERATURE CITED

Davis, H. S. 1922. A new bacterial disease of fresh water fishes. Bull. U. S. Bur. Fish., 38: 261-280.

Davis, H. S. 1946. Care and diseases of trout (revised edition). Res. Rept. 12:74-75.

Garnjobst, Laura. 1945. *Cytophaga Columnaris* (Davis) in pure culture. Jour. Bact. 49:113-128.

Sniescko, S. F. 1949. Pyridylmercuric Acetate Tech. Its use in control of gill disease and some external parasitic infestations. P. F. C. 11(3): 153-155.