WHIRLING DISEASE (Myxosoma cerebralis): CONTROL WITH ULTRAVIOLET IRRADIATION AND EFFECT ON FISH

Author: HOFFMAN, G. L.

Source: Journal of Wildlife Diseases, 11(4) : 505-507

Published By: Wildlife Disease Association

URL: https://doi.org/10.7589/0090-3558-11.4.505

WHIRLING DISEASE (*Myxosoma cerebralis*): CONTROL WITH ULTRAVIOLET IRRADIATION AND EFFECT ON FISH

G. L. HOFFMAN,[1] U.S. Fish and Wildlife Service, Fish Farming Experimental Station, P.O. Box 860, Stuttgart, Arkansas 72160, USA

Abstract: Water contaminated by *Myxosoma cerebralis* was disinfected with ultraviolet irradition to control whirling disease. Irradiation at 18,000 microwatt seconds/cm^2 (MWS/cm^2) reduced infectivity of *M. cerebralis* by 31-86% and 27,650 MWS/cm^2 reduced infectivity by 86-100%, even in the presence of a small amount of silt.

INTRODUCTION

Since its introduction to North America about 1957, whirling disease (WD) of salmonids has spread to nine states.[1] With the cooperation of state and federal agencies and private fish culturists, the rate of spread of the disease has been reduced during the last six years. However, since the possibility for further spread continues to exist, better control and eradication methods are needed.

Ultraviolet (UV) irradiation was reported as a possible method of controlling WD in contaminated water. In the United States, 35,000 microwatt seconds (MWS)/cm^2 successfully disinfected water,[2,5] and in the U.S.S.R. UV also showed promise for WD control.[3] The present report concerns a continued search for the minimum effective dosage, which has not been determined.

MATERIALS AND METHODS

Two experiments were prepared as described by Hoffman.[2] Eight 150-liter stainless steel tanks each received 100 liters of contaminated water daily followed by running spring water as needed. The water in tanks 1 and 2 was irradiated with 18,000 MWS and the water in tanks 3 and 4 was passed through a 25-μm filter and treated with 27,650 MWS. Dosage was determined as in Hoffman (1974).[2] Water in tanks 5 and 6 was untreated; water in tanks 7 and 8 was passed through the same 25-μm filter used for tanks 3 and 4. Each tank was stocked with 100 two-week-old Nasuah strain rainbow trout (*Salmo gairdneri*).

In both sets of tests a small amount of visible silt which did not depress the UV-sensor needle was accidentally pumped through the equipment and into the tanks during the first four days of the test. The filter used for the 27,650 MWS series should have removed all particles larger than 25 μm.

Negative control fish were reared in spore-free spring water. Fish were examined for spores by the digest method.[4]

RESULTS AND CONCLUSIONS

Reduction of infectivity was 31% to 86% at 18,000 MWS and 86% to 100% at 27,650 MWS (Table 1). Negative control fish reared in spring water were free of WD and spores. I cannot account for the low survival rate (23%, tank 3) in one lot of fish receiving UV-treated water.

[1] Work performed at the Eastern Fish Disease Laboratory, Kearneysville, West Virginia.

TABLE 1. Effect of ultraviolet light on **Myxosoma cerebralis,** as indicated by the survival and weight gain of 2-week-old rainbow trout. Each tank was stocked with 100 fish; duration of exposure was 6 weeks.

Dosage and tank number	Clinical signs (percent)	Survival, number or percent	Spores		Average weight, grams ②
			Number fish sampled ①	Percent with spores	
18,000 MWS					
1	1	86	16	69	8.8
2	0	57	14	14	9.6
27,650 MWS					
3	0	23	18	0	8.0
4	0	92	22	14	8.5
Untreated positive controls					
5	100	48	14	100	4.1
6	100	58	15	100	4.2
7	100	23	18	100	3.1
8	100	79	20	100	4.9

① Number sampled exceeds the 95% confidence level for 10% incidence. (5.

② Difference in weight of fish in treated and untreated water was significantly different as determined by Chi Square ($P = 0.025$) in all samples.

At 4½ months post-exposure, fish receiving treated water were 1.8 to 2.6 times heavier than diseased controls; most of the controls had gross signs of WD (Table 1).

Since silt may have interfered with the effectiveness of UV in this experiment it would be advisable to repeat the study with silt-free water.

Until a lower dosage can be conclusively shown to control WD, 35,000 MWS should be considered the lowest effective level.[2] The marked reduction in both incidence and severity of infection observed in lots reared in water treated with successively higher dosages of UV supports the earlier determination that 35,000 MWS is adequate.

Acknowledgements

Mrs. M. Markiw determined presence of spores and M. W. Hill, both of the Eastern Fish Disease Laboratory, prepared the equipment and cared for the fish.

LITERATURE CITED

1. HOFFMAN, G. L. 1970. Intercontinental and transcontinental dissemination and transfaunation of fish parasites with emphasis on whirling disease (*Myxosoma cerebralis*). Pages 69-81 in S. F. Snieszko, ed. *A Symposium on Diseases of Fishes and Shellfishes*. Spec. Publ. No. 5, Am. Fish Soc.
2. ————. 1974. Disinfection of contaminated water by ultraviolet irradiation with emphasis on whirling disease (*Myxosoma cerebralis*) and its effect on fish. Trans. Am. Fish. Soc. 103(3): 541-550.
3. IVANOV, A. P., R. YA. KOSYREVA and N. L. NECHAEVA. 1968. Implementation for health of salmonids in fish culture in southern U.S.S.R. (in Russian). 1972. Food and Agriculture Organization of the United Nations, Symposium on the Major Communicable Fish Diseases in Europe and Their Control. FI:EIFAC 72/SC II-Symp 18).
4. MARKIW, M. E. and K. WOLF. 1974. *Myxosoma cerebralis*: isolation and concentration from fish skeletal elements. II. Sequential enzymatic digestions and purification by differential centrifugation. J. Fish. Res. Board Can. 31(1): 15-20.
5. O'GRODNICK, J. and C. C. GUSTAFSON. 1974. A study of the transmission, life history and control of whirling disease of trout. Progress Report, Pennsylvania Fish Commission, 31 pp.
6. OSSIANDER, F. J. and G. WEDEMEYER. 1973. Computer program for sample sizes required to determine disease incidence in fish populations. J. Fish. Res. Board Can. 30(9): 1383-1384.

Received for publication 8 April 1975