ANTIMYCIN A NEW FISHERY TOOL

ROBERT E. LENNON

Fish Control Laboratory, Bureau of Sport Fisheries and Wildlife, La Crosse

- **A new fish toxicant shows promise in carp control, for it kills carp more readily than most fish and in the concentrations used appears harmless to other animal life.**
- **Because much remains to be learned about optimum dosages, application techniques, and usefulness, the Wisconsin Conservation Commission has entered into a $60,000 contract for research to test Antimycin thoroughly in selected waters during 1966 and 1967.**

Fishery managers have a new tool for combating undesirable fishes in lakes and streams. It is Antimycin, an antibiotic which is produced by microscopic plants very much as penicillin is produced by a mold.

Antimycin was discovered in 1945 by scientists in the Department of Plant Pathology at the University of Wisconsin. It appeared to be deadly to fungi, and therefore was named Antimycin which means *anti-fungus.* Investigators in the University's Department of Biochemistry purified it and defined its chemical properties. On chance that the chemical might be useful for the treatment of certain diseases of crops, it was turned over to the Wisconsin Alumni Research Foundation for further research and development. As work progressed, the antibiotic exhibited increasingly interesting characteristics.

In 1963, Mr. Philip Derse of the Foundation and Dr. Frank Strong of the University reported that Antimycin is very toxic to fish and suggested that it might be useful in fish management because the minute amounts which kill goldfish are harmless to other animals. They also mentioned that it degrades in water within a matter of days. At this point, the new Fish Control Laboratory at La Crosse began extensive experimentation with the compound against fish and other aquatic animals.

More than 30 species of freshwater fish have been exposed to the antibiotic. They included gamefish and those species which are considered to be pests in some waters. Experiments in the laboratory have involved fish of various ages from egg to adult, in hard and soft waters, and at cold to warm temperatures. Later, the chemical was tested in ponds in New Hampshire, New York, Georgia, Wisconsin, Arkansas, Nebraska, and Wyoming against both wild and hatchery fish. It was also tested successfully last summer in two small streams in Vernon county, Wisconsin.

Antimycin is absorbed into the gills of fish, and it kills by interfering with the respiration of body cells. Its action is irreversible, and once a fish has had brief exposure it is doomed. Fortunately carp, pumpkinseeds, and green sunfish are among the more susceptible fish, and they succumb to such extremely small quantities as 1 to 5 parts of antibiotic in a billion parts of water. This potency is better appreciated if we consider that 1 part of substance per billion parts of water is equivalent to 1 ounce of chocolate syrup in 10 million gallons of milk.

Gars, bowfin, goldfish, and bullheads are a little less susceptible to the chemical than carp, and slightly larger amounts are required to kill them. This is an advantage, however, because certain concentrations of Antimycin can be selected to kill some species in a body of water without harming others. For example, we completely eradicated very large populations of carp and green sunfish in a Nebraska pond with an amount of Antimycin which allowed large northern pike and largemouth bass to survive.

A typical trial of Antimycin took place in October 1965 in Veterans Memorial Park pond in West Salem, Wisconsin. In cooperation with the Wisconsin Conservation Department, 10 parts per billion of the antibiotic were applied to the 5-acre pond in an attempt to kill all fish except channel catfish and black bullheads. Within 24 hours we gathered 60 emaciated trout; 5,994 carp of 4 to 27 inches long; many thousands of fathead minnows too numerous to count; and some small northern pike, mudminnows, white sucker, green sunfish, pumpkinseed, bluegills, and white crappies. The followup observations demonstrated that all fish other than the few channel catfish and black bullheads present had perished. A flock of semi-tame mallards on the pond dined heavily on the dead minnows with no ill effects. Continuous monitoring showed that the Antimycin had degraded within 6 days.

The results not only demonstrated the effectiveness of Antimycin against fish, but showed that the pond which is managed for trout on a put-and-take basis had become overrun by carp and fathead minnows. In contrast with the thousands of carp and minnows, there were only 122 gamefish in the pond.

The Wisconsin Alumni Research Foundation recently licensed Ayerst Laboratories, New York, a division of American Home Products Corporation, to produce and market Antimycin. The product, under the trade name FINTROL, has been approved by the Pesticide Regulations Division of the U.S. Department of Agriculture for use in freshwater fishery management.

Reprinted from the *WISCONSIN CONSERVATION BULLETIN,* March—April 1966

FINTROL consists of Antimycin coated on plain sand. The novel formulation is dry and resembles ordinary sand in feel and appearance. Moreover, it imparts no odor or color to treated water. It is easily applied by hand or by means of a seed spreader, and the Antimycin is released gradually into the water as the sand sinks to the bottom.

There is some likelihood that fish managers may be able to obtain Antimycin in formulations which will release the antibiotic precisely at only certain depths. Thus a manager could treat the upper, intermediate, or bottom layers of water without effects in other layers.

Antimycin has other unique and important advantages as a fishery tool. It readily kills fertilized eggs of carp, goldfish, and suckers. It could be used therefore both effectively and economically against congregations of spawning fish with confidence that the fish and any eggs already deposited would be killed.

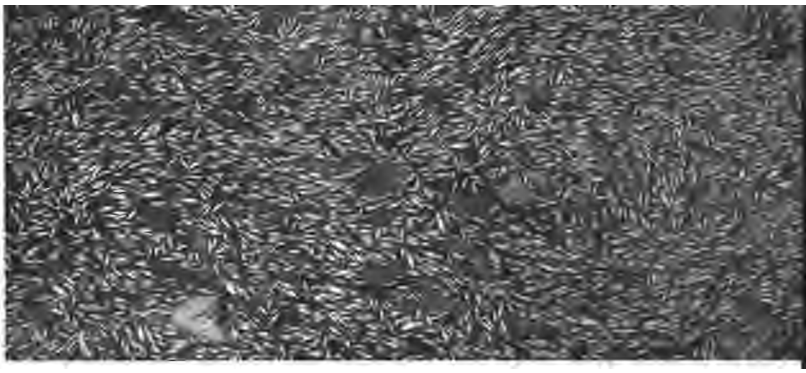
Antimycin has none of the repelling effects on fish which have been a disadvantage in other toxicants. Carp, for example, do not attempt to escape from treated water or to seek bottom springs.

Certainly, the rapid degradation of Antimycin in water is an outstanding advantage. It degrades in lakes and streams in 1 to 14 days, but usually takes place between 4 and 7 days. In general, its disappearance is more rapid in hard, alkaline water than in soft, acid water. Wherever desirable, degradation of the antibiotic in water can be accelerated easily and safely by adding potassium permanganate.

The fact that Antimycin has very little effect on fish-food animals is also important. Since the chemical disintegrates quickly and leaves the food supply intact, reclaimed waters can be stocked soon with fish. The usual time lag between a reclamation and the beginning of good fishing therefore can be reduced.

What about the effects of Antimycin on other living things? This question had to be answered before we could proceed with the chemical as a management tool. Aquatic plants and insects, tadpoles, frogs, salamanders, turtles, and water snakes were exposed without harm to quantities of the chemical which kill fish. Moreover, the Wisconsin Alumni Research Foundation and Ayerst Laboratories found that fish-killing concentrations of Antimycin are harmless to mallards, ringneck pheasants, pigeons, chickens, quail, mice, rats, rabbits, guinea pigs, dogs, and lambs. The tests also demonstrated that there is a great margin of safety between fish-killing concentrations and concentrations which might endanger other animals. This margin, of course, is increased by the rapid disappearance of the chemical in water. Thus, minute quantities of Antimycin are considered to be selectively toxic to fish.

A question concerning the edibility of Antimycin-killed fish is raised often. It is possible that the fish may be used safely as food by humans and animals, but it is not an accepted fact at the moment. Work is underway at Ayerst Laboratories and the University of Wisconsin to establish the degree of safety. The final decision on edibility, however, rests with the U.S. Food and Drug Administration.



Minnows turned bottoms up in a West Salem test of Antimycin.

Where and when will Antimycin be used? Recently, the Conservation Department issued a contract to the Wisconsin Alumni Research Foundation for thorough testing of the chemical during 1966 and 1967 as a control for carp in Wisconsin waters. Selected lakes and streams which contain problem quantities of carp are to be treated in various ways to determine maximum effectiveness and economy. Some trials may be under ice. Others may be made on congregations of spawning carp. Streams are to get a lot of attention because this is the first chemical which appears to be well suited and safe for such use.

Antimycin is one of the more promising fishery tools, and its potentials for control of gars, bowfin, carp, goldfish, minnows, suckers, bullheads, green sunfish, and the like have only been touched. The near future will reveal how large a role that it will play in the improvement of sport fishing in Wisconsin and elsewhere.

In Nebraska, 10- to 30-pound carp were killed within 24 hours by 10 parts per BILLION of Antimycin.