# DEVELOPMENT OF BACTERINS AND VACCINES

## for control of infectious diseases in fish

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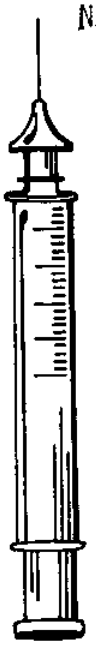

OREGON STATE UNIVERSITY
SEA GRANT COLLEGE PROGRAM
Publication no. ORESU-T-77-012

DECEMBER 1977

PRICE $2.50

immunizing agents may be available in the near future.

BACTERINS AND VACCINES FOR COLD-WATER FISH
by A.J. Novotny and L.W.Harrell

The major obstacle to rearing salmonids in saltwater net pens has been bacterial disease--in particular, vibriosis caused by *V. anguillarum*. When crowded salmon are subjected to the various stresses that accompany their introduction to salt water, they often succumb to vibriosis or other bacterial diseases, which may be carried over from the freshwater phase of their life cycle (Novotny 1975).

Researchers in Japan (Hayashi et al. 1964) reported that bacterins injected into salt water-reared rainbow trout, *Salmo gairdneri*, prevented vibriosis. Later, Fryer et al. (1972) described the oral administration of a formalin-killed sonicate of *V. anguillarum* to protect fish from a natural *Vibrio* challenge.

During the past three years, the National Marine Fisheries Service (NMFS) research group at Manchester, Washington, has relied on intraperitoneal injection of bacterin to control vibriosis successfully in salmonids reared experimentally in salt water. Commercial growers, who vaccinated more than one million coho salmon *(Oncorynchus kisutch)* in Puget Sound during the past several years, have successfully used the technology for mass injection developed by NMFS.

A new serotype of *V. anguillarum* (designated 1669) has recently been described (Harrell et al. 1976). Bivalent bacterins made from this organism (1669) and the original Manchester isolate of *V. anguillarum* (775) have proven effective against both serotypes (unpublished data).

To avoid the two-week, post-immunization delay before introducing fish to salt water, NMFS has been using an effective bacterin-antibacterial preparation given by intraperitoneal injection. The vaccine delivers 675 µg heat-killed 775 *Vibrio* organism, 225 µg of 1669 *Vibrio* with 75 µg nitrofurazone and 95 µg oxytetracycline per 0.15 ml dose. However, the U.S. Food and Drug Administration (FDA) has not approved this preparation. Schaperclaus (1970) reported the successful use of this sound injection procedure to control disease in carp culture. FDA's clearance of this methodology would be highly desirable.

Amend and Fender (1976) have recently described a second delivery system, the hyperosmotic infiltration method, which utilizes changing osmotic gradients between the fish and the bacterin to carry the antigen into the animal. This method was recently tested on pink salmon *(O. gorbuscha)* fry that had an average weight of 1.8 gm. One lot of 727 fish were immunized with a bivalent preparation through the immersion method, and a control group of 574 pink salmon fry were treated with the same medium without killed bacteria. Forty days after introduction to salt water, 490 nonimmunized control salmon had died from vibriosis while only two of the immunized salmon were lost to this disease.

*Vibrio* bacterins to protect fish against vibriosis in salt water have been successful using several routes of administration. Which bacterin delivery system is most effective should become evident in the near future, since several researchers are currently investigating this subject.

BACTERINS AND VACCINES FOR WARMWATER FISH
by J.A. Plumb

Immunization has not been widely applied in warmwater fish culture, though interest in doing so is increasing. Recent experimentation in immunization against warmwater fish disease organisms has provided encouraging data on the applicability of immunoprophylaxis. The immune response of warmwater fish to soluble and insoluble antigens has been recently reviewed (Snieszko 1970; McGlamery et al. 1971; DiConza and Halliday 1971; Schachte and Mora 1973; Anderson 1974; Heartwell 1975 and Corbel 1975). Therefore, this discussion is confined to the experimental and practical applications of bacterins and vaccines to protect warmwater fish from disease.

*Viruses*

Some virus diseases of warmwater fish lend themselves to immunoprophylaxis. Channel catfish virus (CCV) is of greatest concern in the U.S., and CCV's ability to elicit an antibody response in large catfish has been demonstrated (Plumb 1973; Heartwell 1975). However, the disease is a problem mostly in juveniles: during the summer, CCV can infect channel catfish fry and fingerlings up to 3 to 4 months of age and 10 to 12 cm in length. Fijan (personal communication) demonstrated that fingerlings experimentally infected with CCV (by injection), which were held at 15°C for 27 days, were immune to reinfection. For