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Exposure of Fingerling Spring Chinook Salmon to Mixtures of Furanace-10, Quinaldine, and MS-222

To facilitate handling during hatchery or research operations, fishery workers often crowd large numbers of fish into small troughs containing an anesthetic bath of MS-222, quinaldine, or both (Schoettger and Steuke 1970). Under these highly crowded and stressful conditions, the presence of contagious fish diseases could cause an abnormally high mortality due to increased fish-to-fish transmission of the disease organisms. Under these conditions, the addition of an antimicrobial agent to the anesthetic bath may help increase survival.

Furanace-10 (P-7138[1]), a broad-spectrum chemotherapeutic agent, appears to be a possible candidate for such an application. At low concentrations, the drug has shown bactericidal action on a wide range of gram-positive and gram-negative bacterial fish pathogens. Furanace-10 is also active against the ubiquitous fungus, *Saprolegnia parasitica*, and exerts powerful control over many parasitic flagellates. In addition, research by Takase et al. (1968) indicated that fish rapidly absorb the drug to therapeutic levels—an absolute requirement for use in an anesthetic bath.

As a precautionary measure, new chemical mixtures are usually tested for possible synergistic effects on a few fish before they are used on large numbers of fish. This study was therefore conducted to determine whether Furanace-10, when added to anesthetic baths (solutions of fresh water and an anesthetic), might cause significant immediate mortalities to fingerling spring chinook salmon (*Oncorhynchus tshawytscha*).

Three tests were conducted on fingerling spring chinook salmon weighing an average of 15.2 g. In all tests Furanace-10 (10% active ingredient) was added at a concentration of 10 mg/L. The anesthetics used were quinaldine (5 mg/L) in test 1; MS-222 (30 mg/L) in test 2; and a mixture of quinaldine (5 mg/L) and MS-222

[1] Reference to trade names does not imply endorsement by the National Marine Fisheries Service, NOAA.

(30 mg/L) in test 3. Control fish were exposed to the solutions of the anesthetics only, at the same concentrations as their respective test groups.

In each test and control group, 20 fingerlings were exposed to the solutions in 37.5-L (10-gal) aquaria for 1 h in water at a temperature of 13°C and pH of 7.9. After exposure each group was isolated in larger aquaria with fresh running water for 72 h, while behavior and mortalities were monitored.

During the first hour after exposure, the fish were closely observed for signs of abnormal behavior. All fish showed typical instability during recovery from the anesthetics but resumed normal orientations and activities after 15 min.

Mortality was negligible—one experimental fish each in tests 1 and 3, and one control fish in test 1. The mortalities were probably a direct result of handling.

None of the three mixtures tested conspicuously altered behavior or caused significant immediate mortality. It therefore appears that solutions of the three chemicals could be used safely as baths or dips for experimental purposes.

Of the three chemicals used in this study, only MS-222 is registered by the Food and Drug Administration for use on food fishes; Furanace-10 is registered for use on non-food fishes.

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Colchicine-induced Polyploidy in Brook Trout

The Rhode Island Division of Fisheries stocks 2-year-old fish for the state's recreational angler program. Thus, sexually mature trout are in the hatchery during the fall preceding spring stocking. When trout become sexually mature their death rate increases, susceptibility to infection increases, and growth rate decreases. These problems could be greatly reduced by inducing sterility in such stocks of fish.

Polyploidy would seem to be a possible method of inducing sterility. Purdom (1972) was successful in inducing polyploidy in plaice (*Pleuronectes platessa*) by cold-shocking eggs after fertilization. However, Lincoln et al. (1974) were unsuccessful in inducing triploids by cold-shocking in the Atlantic salmon (*Salmo salar*). Refstie et al. (1977) induced mosaic polyploids by treating eggs at various stages of early development with the drug cytochalasin B. Maximum polyploid cells were obtained for both Atlantic salmon and rainbow trout (*Salmo gairdneri*) with a concentration of 10 μg/mL. The optimum number of degree hours (h°) after fertilization that treatment should start varied. (A degree hour is defined as the time in hours multiplied by the water temperature in Celsius degrees.) For Atlantic salmon, the best results were obtained when treatment started between 45 and 70 h° after fertilization, whereas 35 to 50 h° was best for rainbow trout. However, increased embryo mortality was observed in both species.

The alkaloid colchicine has been used extensively to induce polyploidy in plants but has been generally unsuccessful in animals. We undertook the present study to try to find a method of using this low-cost drug to induce polyploidy in brook trout (*Salvelinus fontinalis*).

We conducted two trials with 0.01% colchicine solutions on fertilized eggs of the brook trout just before the first cleavage. The time of first cleavage in this strain of brook trout was estimated to be 105 h° after fertilization.

In trial 1, eggs were stripped, fertilized, and placed in two hatching trays. Eggs were allotted at the rate of 340 g/tray (22 eggs/g) and the temperature of the water flowing over the eggs was 12°C. At 84 h° after fertilization both trays were removed from the incubator and immersed in the colchicine solution. After 36 h° of treatment, eggs were removed from the colchicine and returned to the incubator.

In trial 2, each of five trays containing 340 g of eggs was similarly treated 90 h° after fertilization for 30 h° in 10°C water. Control eggs were maintained under a normal hatching regime in both trials.

When the eggs were placed in the trays, all dead eggs and blanks were removed. Following the initial removal, dead embryos were removed periodically and numbers recorded. In trial 1, chromosome preparations were obtained from gill epithelium of hatched fry ac-