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IMMUNE RESPONSE OF RAINBOW TROUTS IMMUNIZED WITH  
FORMALIN-KILLED *VIBRIO ANGUILLARUM* :  
ACTIVITY OF PHAGOCYTOSIS OF FISH MACROPHAGES AND  
OPSONIZING EFFECT OF ANTIBODY

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It is known that vaccination of fishes by bacterin is effective for prevention against vibriosis caused by *V. anguillarum*. The purpose of the present study was to examine the host defense mechanism by testing phagocytic activity of rainbow trout macrophages collected from fish immunized with killed *V. anguillarum*. Opsonic activity by specific antibody and complement was also investigated.

The following results were obtained.

1) Forty to 50% of the fish macrophages collected from the anterior kidneys, peripheral blood and peritoneal cavity of rainbow trouts were shown to be phagocytic for latex particles. The phagocytic activity of peritoneal macrophages against *V. anguillarum* was enhanced in the presence of the specific antibody and/or complement from normal rainbow trout. The enhanced opsonizing effect was observed even after treatment of either macrophages or bacteria with the antibody. These results suggested the presence of Fc-like receptors on fish macrophages.

2) In rainbow trouts immunized with formalin-killed bacteria, serum agglutinins were detected 3 weeks after injection. Though the agglutinin titers increased 5 weeks after injection, the bactericidal activity of the serum was not detected in the presence of complement. The phagocytic activity of peritoneal macrophages from immunized fishes showed a significant difference at 5 weeks when compared to the activity of peritoneal macrophages from normal fishes. Seven out of 10 and 8/8 rainbow trouts challenged with living bacteria at 1 and 5 weeks post injection, respectively, were protected, whereas only one fish in the unimmunized control group survived. This result suggested that immunized fishes were able to develop protective immunity against vibrio infection before significant levels of antibody or phagocytic activity became detectable.

The result of the present study suggested that production of serum antibody leads to increase in the phagocytic activity of fish macrophages. In addition to cellular immune responses and non-specific defense mechanisms, activation of macrophages may play a role in protection of fish against bacterial infection.