

KIDNEY DISEASE OF SALMONID FISHES  
(Bacterial)

By  
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INTRODUCTION

This is a bacterial disease which, since about 1950, has been recognized as an economically important disease of salmon and trout and causes heavy mortalities.

IDENTIFICATION

Produces light, moderate or severe mortalities among fingerling to adult salmonid fishes. Exophthalmus is often present, but macroscopically many dying fish may appear to be normal. Large external welts are often seen on affected brook trout. Tiny unbroken pimples are often associated with small crater-like lesions especially along sides of fishes; this condition is common among infected rainbow trout and chinook salmon. Welts and pimples contain red to cream-colored purulent material composed of blood cells and large numbers of the specific bacteria. Kidney is typically light and grossly swollen. Liver appears pale. Either or both organs may exhibit intact lesions filled with pus. Visceral cavity and other organs are typically hemorrhagic; ascitic fluid is often present.

CAUSE OF THE DISEASE

Tiny (.4 x .8  $\mu$ ) non-motile gram-positive diplobacillus. Probably a Corynebacterium.

SOURCE AND RESERVOIR OF INFECTION

Not positively established. Very likely infected or carrier-type fish. Insect sources have also been postulated.

MODE OF TRANSMISSION

Unknown. Egg transmission has been postulated. West Coast workers have transmitted disease to salmon by feeding. In the East the disease could not be experimentally transmitted by feeding; abrasion or puncture were required.

INCUBATION PERIOD

Slow to develop. Experimentally from one to three or more months have elapsed before mortalities were produced.

PERIOD OF COMMUNICABILITY

Unknown. Likely to be as long as infected fish or possible intermediate hosts are present in the water.

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## SUSCEPTIBILITY AND RESISTANCE

Disease at present unknown among non-salmonids. Propagated Pacific salmon, Atlantic salmon and three main trouts affected; brook trout most severely, rainbow trout least severely of the three.

### RANGE

Unknown.

### OCCURRENCE

Nationwide moderately common, endemic at some stations; infrequent or absent at others. A tendency towards seasonal periodicity has been noted, but the season varies at different stations.

### METHODS OF CONTROL

#### A. Preventive measures.

Until such time as the sources and modes of infection are known strict quarantine or antiseptic disposal of infected lots should be enforced. Facilities and equipment in contact with infected fish should be sterilized before using with healthy fish.

#### B. Treatment.

A satisfactory treatment has not been found. Temporary control among infected trout achieved with 8 to 10 grams of Gantrisin or sulfamerazine per 100 lbs. of fish per day. Therapy to continue until mortalities reach a low level and repeated for one week each month during season. Recurrence almost certain. Under laboratory conditions Erythromycin given orally at the rate of 4.5 grams per 100 pounds per day for 3 weeks gave the best, but not complete, control. Sulfamethazine fed at 2 grams per 100 lbs. fish per day has been successfully used for prophylaxis of salmon. The potential danger of developing sulfa-resistance makes this practice a highly questionable one.

## ANNOTATED BIBLIOGRAPHY

\* Allison, Leonard N.

1958. Multiple sulfa therapy of kidney disease among brook trout. Prog. Fish-Cult., Vol. 20, No. 2, pp. 66-68.

Sulfamerazine, alone or in combination with other sulfonamides, did little to reduce mortality during a month of treatment. Post-treatment mortality among treated lots was significantly lower than non-treated controls. No cures were effected.

Belding, David L. and B. Merrill

1935. A preliminary report upon a hatchery disease of the salmonidae. Trans. Am. Fish. Soc., Vol. 65, pp. 76-84.

Description of symptoms of an apparently infectious disease of trout. In all probability this is the first North American report of what is now known as kidney disease. Epidemiology and etiology are discussed.

\* Davis, H. S.

1953. Culture and Diseases of Game Fishes. Univ. Calif. Press, Berkeley and Los Angeles, 332 pp., illus.

Under descriptions of "popeye" the author gives a short discussion of what is now recognized as kidney disease (last paragraph on p. 287 and 288).

\* Earp, B. J., C. H. Ellis, and E. J. Ordal

1953. Kidney Disease in Young Salmon. State of Washington Dept. of Fisheries Spcl. Rpt., Series, No. 1, 74 pp., illus.

A lengthy report of kidney disease among young salmon in West Coast hatcheries. Symptoms are described. Epidemiological data from seven hatcheries for from 1 to 3 years are presented. Results of hatchery therapy and of therapy of experimentally infected fish are also given. Some work lacked controls, other work inadequately controlled.

Griffin, Philip J.

1954. The nature of bacteria pathogenic to fish. (Symposium. Research on Fish Diseases: A review of progress during the past 10 years). Trans. Am. Fish. Soc., Vol. 83, pp. 241-253.

Brief mention is made of the etiological agent of kidney disease. Several biological properties are described.

Herald, Earl S., R. P. Dempster and H. McCully

1954. The effect of Aureofac-enriched diet (Aureomycin and B<sub>12</sub>) upon young king salmon. Calif. Fish and Game, Vol. 40, No. 4, pp. 415-421.

A very brief account of (presumptively identified) kidney disease infected king salmon under aquarium conditions. 55.9 p.p.m. aureomycin once a day for 201 days resulted in increased mortality over untreated lot. Experiment not replicated.

Ordal, E. J. and B. J. Earp

1956. Cultivation and transmission of etiological agent of kidney disease in salmonid fishes. Proc. Soc. Exp. Biol. and Med., Vol. 92, pp. 85-88, illus.

This paper gives the composition of the first semi-synthetic medium upon which the causative organism of kidney disease could be consistently grown. Results of transmission experiments demonstrate the fulfillment of the generally accepted Koch's postulates for establishing an organism as the cause of a disease.

\* Rucker, R. R., A. F. Bernier, W. J. Whipple and R. E. Burrows

1951. Sulfadiazine for kidney disease. Prog. Fish-Cult., Vol. 13, No. 3, pp. 135-137.

Kidney disease occurrence among fingerling salmon. Infected fish given 2 extended courses of sulfadiazine showed less mortality than untreated fish.

\* Rucker, Robert R., B. J. Earp, and E. J. Ordal

1954. Infectious diseases of Pacific salmon. (Symposium. Research on Fish Diseases: A review of progress during the past 10 years). Trans. Am. Fish. Soc., Vol. 83, pp. 279-312.

Summary type discussion of knowledge of kidney disease especially as it occurs among various species of Pacific salmon is included in a larger work on the diseases of these fishes.

\* Snieszko, S. F.

1954. Therapy of bacterial fish diseases. (Symposium. Research on Fish Diseases: A review of progress during the past 10 years), Trans. Am. Fish. Soc., Vol. 83, pp. 313-330.

A brief resume of the status of knowledge on therapy of kidney disease is included in this comprehensive paper.

\* Snieszko, S. F. and P. J. Griffin

1955. Kidney disease in brook trout and its treatment. Prog. Fish-Cult., Vol. 17, No. 1, pp. 3-13, illus.

Detailed description of kidney disease symptoms (there is reason to believe that the granuloma also described is a confounding condition independent of kidney disease). Results of therapy (two sulfonamides on naturally infected trout) (five sulfonamides and three antibiotics on experimentally infected trout) are given. Recommendations for therapy are best available.

Watson, S. W.

1954. Virus diseases of fish. (Symposium. Research on Fish Diseases: A review of progress during the past 10 years). Trans. Am. Fish. Soc., Vol. 83, pp. 331-341.

A brief note on European (virus caused?) kidney disease and its possible relation to North American kidney disease is included in a larger work.

Wolf, Ken, and C. E. Dunbar

1957. Strain differences in a fish-pathogenic Corynebacterium. Bacteriological Proceedings A57.

Transmission of kidney disease to trout was attempted with two strains of bacteria; five different methods. Results are presented.

1958. In vitro and in vivo sensitivity testing of a fish-pathogenic Corynebacterium. Bacteriological Proceedings A42.

Sixteen strains of the bacterium were tested in vitro for their sensitivity to 34 chemotherapeutic agents. The results aided in selecting 11 agents for in vivo trials. Generalized results are presented.

Wood, James W., and J. Wallis

1955. Kidney disease in adult chinook salmon and its transmission by feeding to young chinook salmon. Research Briefs, Fish Comm. of Oregon, Vol. 6, No. 2, pp. 32-40.

First report of kidney disease among adult spring chinook salmon. Young salmon infected (100%) by feeding infected adult carcasses. Dosage of 2 gms/100 lbs. fish sulfamethazine effectively blocked infection of fish receiving infected carcasses. Experiment was not replicated and period of observation not stated.

\* Papers indicated by an asterisk are of special importance to fish culturists.