

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-01000      **Date** 10-Mar-2004      **Report** 15-Mar-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 11502      A 3.3 - 16 (5)

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**      Dr. J. Constantine

**Specimen:** Other

**Count** 1

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

S.A. Raverty, D.V.M.,  
Veterinary Pathologist

**History/Symptoms**

Submitted Provincial Surveillance Program samples for bacteriology - identification of isolates and culture and sensitivity.

Sample ID: A 3.3 - 16 (5) sub-culture.

**Bacteriology**

*Aeromonas salmonicida* identified as subspecies *salmonicida*.

\* Results faxed Mar. 15/04.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-01099      **Date** 17-Mar-2004      **Report** 19-Apr-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 11551      A3.4-18(1-8)

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**

**Specimen:** Tissue - Fresh

**Count** 8

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

J.H. Robinson, D.V.M.  
Veterinary Virologist

**History/Symptoms**

Provincial surveillance program.

Virology - PCR for IHN, ISA, IPN, VHS and Piscirickettsia salmonis culture any PCR positive samples.

**Molecular Diagnostics/PCR**

Samples 1-4, 5-8: IHN, VHS, ISA, IPN, Piscirickettsia salmonis negative by PCR.

\* Results faxed Apr. 19/04.

/bb

# ANIMAL HEALTH CENTRE

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

## Case Report

**Submission** 2004-01101      **Date** 17-Mar-2004      **Report** 19-Apr-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 11553      A3.3-15(1-8)

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**

**Specimen:** Tissue - Fresh

**Count** 8

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

J.H. Robinson, D.V.M.  
Veterinary Virologist

**History/Symptoms**

Provincial Surveillance Program samples. Virology - PCR for IHN, ISA, IPN, VHS and Piscirickettsia salmonis.  
Culture any PCR positive samples.

**Molecular Diagnostics/PCR**

Samples 1-4, 5-8: IHN, VHS, ISA, IPN, Piscirickettsia salmonis negative by PCR.

\* Results faxed Apr. 19/04.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-01121      **Date** 18-Mar-2004      **Report** 20-Apr-2004

**Report**      **Copies**

**Submitter:** 9439 Marine Harvest Canada (M)  
**Owner** 11568 #5045, Marine Harvest  
**Farm:**  
**Vet Clinic:**  
**Attending**

**Specimen:** Tissue - Fresh      **Count** 10      **Flock Herd Size:**  
**Species:** Atlantic Salmon      **Age**  
**Breed:**      **Sex:**

**Feed:**      **Feed**

**Vaccination****Treatmen****Diagnosis**

J.H. Robinson, D.V.M.  
Veterinary Virologist

**History/Symptoms**

PO #272882. Log No. 5045. 10 pools tissue for virology. Saltwater entry: 2004. Freshwater.

10 pooled samples for routine virology - tissue culture only. No increase in mortality.

**Virology**

10 samples inoculated onto tissue culture - all negative.

/bb



**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll=Free: 1-800-661-9903

**Case Report**

**Submission** 2004-01122      **Date** 18-Mar-2004      **Report** 20-Apr-2004

**Report**      **Copies**

**Submitter:** 9439 Marine Harvest Canada (M)

**Owner** 11569 #5046, Marine Harvest

**Farm:**

**Vet Clinic:**

**Attending**

**Specimen:** Tissue - Fresh

**Count** 10

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

J.H. Robinson, D.V.M.  
Veterinary Virologist

**History/Symptoms**

PO #272882. Log No. 5046. 10 pooled samples for virology. Tissue culture only. Routine health check.

**Virology**

10 samples inoculated onto tissue culture - all negative.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-01250      **Date** 30-Mar-2004      **Report** 02-Apr-2004

**Report**      **Copies**

**Submitter:** 8447      Stolt Sea Farm Inc.

**Owner** 8447      Stolt Sea Farm Inc.

**Farm:**

**Vet Clinic:**

**Attending**

**Specimen:** Tissue - Fresh

**Count** 2

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

S.A. Raverty, D.V.M.,  
Veterinary Pathologist

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll=Free: 1-800-661-9903

**Case Report**

**Submission** 2004-01492      **Date** 21-Apr-2004      **Report** 25-May-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 11775      A 3.2 - 10 (1-4)

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**      Dr. J. Constantine

**Specimen:** Tissue - Fresh

**Count** 4

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

J.H. Robinson, D.V.M.  
Veterinary Virologist

**History/Symptoms**

Submitted Provincial Surveillance Program samples for virology - PCR for IHN, ISA, IPN, VHS, and Piscirickettsia salmonis. Culture any PCR positive samples.

Sample ID: A 3.2 - 10 (1-4). 4 pools of 5.

**Molecular Diagnostics/PCR**

Samples 1, 2, 3, 4: IHN, VHS, ISA, IPN, Piscirickettsia salmonis negative by PCR.

\* Results faxed May 25/04.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-01494      **Date** 21-Apr-2004      **Report** 25-May-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 11777      A 2.3 - 20 (1-8)

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**      Dr. J. Constantine

**Specimen:** Tissue - Fresh

**Count** 8

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

J.H. Robinson, D.V.M.  
Veterinary Virologist

**History/Symptoms**

Submitted Provincial Surveillance Program samples for virology - PCR for IHN, ISA, IPN, VHS, and Piscirickettsia salmonis. Culture any PCR positive samples.

Sample ID: A 2.3 - 20 (1-8); 8 pools of 5.

**Molecular Diagnostics/PCR**

Samples 1, 2, 3, 4, 5, 6, 7, 8: IHN, VHS, ISA, IPN, Piscirickettsia salmonis negative by PCR.

\* Results faxed May 25/04.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-01495      **Date** 21-Apr-2004      **Report** 25-May-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 11778      A 2.3 - 21 (1-6)

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**      Dr. J. Constantine

**Specimen:** Tissue - Fresh

**Count** 6

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

J.H. Robinson, D.V.M.  
Veterinary Virologist



**History/Symptoms**

Submitted Provincial Surveillance Program samples for virology - PCR for IHN, ISA, IPN, VHS, and Piscirickettsia salmonis. Culture any PCR positive samples.

Sample ID: A 2.3 - 21 (1-6); 6 pools of 5

**Molecular Diagnostics/PCR**

Samples 1, 2, 3, 4, 5, 6: IHN, VHS, ISA, IPN, Piscirickettsia salmonis negative by PCR.

\* Results faxed May 25/04.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-01496      **Date** 21-Apr-2004      **Report** 25-May-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 11779      A 3.2 - 30 (1-8)

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**      Dr. J. Constantine

**Specimen:** Tissue - Fresh

**Count** 8

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

J.H. Robinson, D.V.M.  
Veterinary Virologist

**History/Symptoms**

Submitted Provincial Surveillance Program samples for virology - PCR for IHN, ISA, IPN, VHS, and Piscirickettsia salmonis. Culture any PCR positive samples.

Sample ID: A 3.2 - 30 (1-8); 8 pools of 5.

**Molecular Diagnostics/PCR**

Samples 1, 2, 3, 4, 5, 6, 7, 8: IHN, VHS, ISA, IPN, Piscirickettsia salmonis negative by PCR.

\* Results faxed May 25/04.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-01497      **Date** 21-Apr-2004      **Report** 29-Apr-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 11780      A 2.3 - 19 (1-3)

**Farm:**

**Vet Clinic:**

**Attending**      Dr. J. Constantine

**Specimen:** Tissue - Fresh

**Count** 3

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

J.H. Robinson, D.V.M.  
Veterinary Virologist

**History/Symptoms**

Submitted Provincial Surveillance Program samples for virology - PCR for IHN, ISA, IPN, VHS, and Piscirickettsia salmonis. Culture any PCR positive samples.

Sample ID: A 2.3 - 19 (1-3); 3 pools of 5.

**Virology**

RESULTS

-----

DIAGNOSIS

-----

COMMENTS

-----

Fish Viruses Negative  
Tissue culture = negative

**Molecular Diagnostics/PCR**

Pool #1, 2, 3: IHN, ISA, IPN, VHS, Piscirickettsia salmonis negative by PCR.

\* Results faxed Apr. 29/04.

CORRECTION TO REPORT (Faxed May 4/04):

Samples #1 and #3 - VHS positive by PCR.

/bb/bb



**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-01498      **Date** 21-Apr-2004      **Report** 08-Jun-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 11781      A 3.2 - 29 (1-12)

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**      Dr. J. Constantine

**Specimen:** Tissue - Fresh

**Count** 12

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

J.H. Robinson, D.V.M.  
Veterinary Virologist

**History/Symptoms**

Submitted Provincial Surveillance Program samples for virology - PCR for IHN, ISA, IPN, VHS, and Piscirickettsia salmonis. Culture any PCR positive samples.

Sample ID: A 3.2 - 29 (1-12)

**Molecular Diagnostics/PCR**

Samples 1-4, 5-8, 9-12: IHN, VHS, ISA, IPN, Piscirickettsia salmonis negative by PCR.

\* Results faxed June 8/04.

/bb



**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-01499      **Date** 21-Apr-2004      **Report** 22-Apr-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 11782      A 2.3 - 20 (6)

**Farm:**

**Vet Clinic:**

**Attending**      Dr. J. Constantine

**Specimen:** Other

**Count** 1

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

S.A. Raverty, D.V.M.,  
Veterinary Pathologist

**History/Symptoms**

Submitted Provincial Surveillance Program samples for bacteriology - identification of isolates and culture and sensitivity.

Sample ID: A 2.3 - 20 (6).

**Bacteriology**

*Aeromonas salmonicida* identified as subspecies *salmonicida*.

Sensitive to: Florfenicol, Romet 30, Tri-sulfas, Sulfa-methox-trimeth. and Tetracycline.

\* Results faxed Apr. 22/04.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-01500      **Date** 21-Apr-2004      **Report** 26-Apr-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 11783      A 2.3 - 19 (3)

**Farm:**

**Vet Clinic:**

**Attending**      Dr. J. Constantine

**Specimen:** Other

**Count** 1

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

S.A. Raverty, D.V.M.,  
Veterinary Pathologist

**History/Symptoms**

Submitted Provincial Surveillance Program samples for bacteriology - identification of isolates and culture and sensitivity.

Sample ID: A 2.3 - 19 (3)

**Bacteriology**

The agar plate received by the lab contained 2 different colonies (small and large).  
Bacteria from large colonies identified as *Carnobacterium piscicola*.  
Bacteria from small colonies identified as *Carnobacterium gallinarum*.

See attached sheet for sensitivities.

\* Results faxed Apr. 26/04.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-01700      **Date** 06-May-2004      **Report** 18-May-2004

**Report**      **Copies**

**Submitter:** 11899 Grieg Seafoods B.C. Ltd.

**Owner** 11899 Grieg Seafoods B.C. Ltd.

**Farm:**

**Vet Clinic:**

**Attending** Dr. Milligan

**Specimen:** Tissue - Fresh

**Count** 30

**Flock Herd Size:** 0

**Species:** Atlantic Salmon

**Age**

**Breed:** 2004 SW

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

S.A. Raverty, D.V.M.,  
Veterinary Pathologist

**History/Symptoms**

2004 SW. 550,000. I am moving these fish N to an area with historically high levels of Kudoa and would like a baseline of exposure prior to moving.

Specimens: 30 muscle tissue samples - frozen, keep frozen!! PCR for Kudoa.

**Molecular Diagnostics/PCR**

Pen #8 (1-5), Pen #5 (1-5), Pen #4 (1-5), Pen #6 (1-5), Pen #10 (1-5), Pen #12 (1-5): all samples negative for Kudoa thyrsites by PCR.

\* Results faxed May 18/04.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-01708      **Date** 07-May-2004      **Report** 19-May-2004

**Report**      **Copies**

**Submitter:** 9439 Marine Harvest Canada (M)

**Owner** 9439 Marine Harvest Canada (M)

**Farm:**

**Vet Clinic:**

**Attending**

**Specimen:** Tissue - Fresh

**Count** 6

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

J.H. Robinson, D.V.M.  
Veterinary Virologist

**History/Symptoms**

Submitted fish tissue samples for PCR and tissue culture.

PO# 272899.

Log Number: 5086.

**Virology**

6 samples inoculated onto tissue culture - all negative.

\* Results faxed June 7/04.

**Molecular Diagnostics/PCR**

Samples 1-3, 4-6, 7-9, 10-12, 13-15, 16-18 - IHN, IPN, VHS Virus negative.

\* Results faxed May 19/04.

/bb



**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-01711      **Date** 07-May-2004      **Report** 08-Jun-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 11908      A 3.4 - 38 (1-6)

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**      Dr. J. Constantine

**Specimen:** Tissue - Fresh

**Count** 6

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

J.H. Robinson, D.V.M.  
Veterinary Virologist

**History/Symptoms**

Submitted Provincial Surveillance Program samples for virology - PCR for IHN, ISA, IPN, VHS, and Piscirickettsia salmonis. Culture any PCR positive samples.

Sample ID: A 3.4 - 38 (1-6).

**Molecular Diagnostics/PCR**

Samples 1-3, 4-6: IHN, VHS, ISA, IPN, Piscirickettsia salmonis negative by PCR.

\* Results faxed June 8/04.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-01712      **Date** 07-May-2004      **Report** 08-Jun-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 11909      A 3.3 - 35 (1-8)

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**      Dr. J. Constantine

**Specimen:** Tissue - Fresh

**Count** 8

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

J.H. Robinson, D.V.M.  
Veterinary Virologist

**History/Symptoms**

Submitted Provincial Surveillance Program samples for virology - PCR for IHN, ISA, IPN, VHS, and Piscirickettsia salmonis. Culture any PCR positive samples.

Sample ID: A 3.3 - 35 (1-8).

**Molecular Diagnostics/PCR**

Samples 1-4, 5-8: IHN, VHS, ISA, IPN, Piscirickettsia salmonis negative by PCR.

\* Results faxed June 8/04.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-01713      **Date** 07-May-2004      **Report** 08-Jun-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 11910      A 3.2 - 28 (1-2)

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**      Dr. J. Constantine

**Specimen:** Tissue - Fresh

**Count** 2

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

J.H. Robinson, D.V.M.  
Veterinary Virologist

**History/Symptoms**

Submitted Provincial Surveillance Program samples for virology - PCR for IHN, ISA, IPN, VHS, and Piscirickettsia salmonis. Culture any PCR positive samples.

Sample ID: A 3.2 - 28 (1-2).

**Molecular Diagnostics/PCR**

Samples 1-2: IHN, VHS, ISA, IPN, Piscirickettsia salmonis negative by PCR.

\* Results faxed June 8/04.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-01714      **Date** 07-May-2004      **Report** 08-Jun-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 11911      A 3.3 - 36 (1-4)

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**      Dr. J. Constantine

**Specimen:** Tissue - Fresh

**Count** 4

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

J.H. Robinson, D.V.M.  
Veterinary Virologist

**History/Symptoms**

Submitted Provincial Surveillance Program samples for virology - PCR for IHN, ISA, IPN, VHS, and Piscirickettsia salmonis. Culture any PCR positive samples.

Sample ID: A 3.3 - 36 (1-4).

**Molecular Diagnostics/PCR**

Samples 1-2, 3-4: IHN, VHS, ISA, IPN, Piscirickettsia salmonis negative by PCR.

\* Results faxed June 8/04.

/bb



**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-01715      **Date** 07-May-2004      **Report** 08-Jun-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 11912      A 3.3 - 31 (1-5)

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**      Dr. J. Constantine

**Specimen:** Tissue - Fresh

**Count** 5

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

J.H. Robinson, D.V.M.  
Veterinary Virologist

**History/Symptoms**

Submitted Provincial Surveillance Program samples for virology - PCR for IHN, ISA, IPN, VHS, and Piscirickettsia salmonis. Culture any PCR positive samples.

Sample ID: A 3.3 - 31 (1-5).

**Molecular Diagnostics/PCR**

Samples 1-3, 4-5: IHN, VHS, ISA, IPN, Piscirickettsia salmonis negative by PCR.

\* Results faxed June 8/04.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-01716      **Date** 07-May-2004      **Report** 08-Jun-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 11913      A 3.3 - 34 (1-4)

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**      Dr. J. Constantine

**Specimen:** Tissue - Fresh

**Count** 4

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

J.H. Robinson, D.V.M.  
Veterinary Virologist

**History/Symptoms**

Submitted Provincial Surveillance Program samples for virology - PCR for IHN, ISA, IPN, VHS, and Piscirickettsia salmonis. Culture any PCR positive samples.

Sample ID: A 3.3 - 34 (1-4).

**Molecular Diagnostics/PCR**

Samples 1-2, 3-4: IHN, VHS, ISA, IPN, Piscirickettsia salmonis negative by PCR.

\* Results faxed June 8/04.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-01717      **Date** 07-May-2004      **Report** 08-Jun-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 11914      A 3.3 - 33 (1-7)

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**      Dr. J. Constantine

**Specimen:** Tissue - Fresh

**Count** 7

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

J.H. Robinson, D.V.M.  
Veterinary Virologist

**History/Symptoms**

Submitted Provincial Surveillance Program samples for virology - PCR for IHN, ISA, IPN, VHS, and Piscirickettsia salmonis. Culture any PCR positive samples.

Sample ID: A 3.3 - 33 (1-7).

**Molecular Diagnostics/PCR**

Samples 1-4, 5-7: IHN, VHS, ISA, IPN, Piscirickettsia salmonis negative by PCR.

\* Results faxed June 8/04.

/bb

# ANIMAL HEALTH CENTRE

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

## Case Report

**Submission** 2004-01718      **Date** 07-May-2004      **Report** 10-May-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 11915      A 2.4 - 23 (1)

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**

**Specimen:** Other

**Count** 1

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

S.A. Raverty, D.V.M.,  
Veterinary Pathologist

**History/Symptoms**

Submitted Provincial Surveillance Program samples for bacteriology - identification of isolated and culture and sensitivity.

Sample ID: A 2.4 - 23 (1).

**Bacteriology**

Vibrio sp. identified as Vibrio splendidus.

Sensitive to: Erythromycin, Florfenicol, Romet 30, Tri-sulfas, Sulfa-methox-trimeth. and Tetracycline.

\* Results faxed May 10/04.

/bb



**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-01719      **Date** 07-May-2004      **Report** 13-May-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 11916      A 3.3 - 33 (2) and (6)

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**      Dr. J. Constantine

**Specimen:** Other

**Count** 1

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

S.A. Raverty, D.V.M.,  
Veterinary Pathologist

**History/Symptoms**

Submitted Provincial Surveillance Program samples for bacteriology - identification of isolated and culture and sensitivity.

Sample ID: A 3.3 - 33 (2) and (6).

**Bacteriology**

Isolate #2 identified as *Vibrio wodanis* by DNA sequencing.

Due to very poor growth of this organism, antibiotic sensitivities were unable to be performed.

See attached sheet.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-01720      **Date** 07-May-2004      **Report** 10-May-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 11917      A 3.3 - 36 (2)

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**      Dr. J. Constantine

**Specimen:** Other

**Count** 1

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

S.A. Raverty, D.V.M.,  
Veterinary Pathologist

**History/Symptoms**

Submitted Provincial Surveillance Program samples for bacteriology - identification of isolated and culture and sensitivity.

Sample ID: A 3.3 - 36 (2).

**Bacteriology**

Vibrio sp. identified as Vibrio harveyi.

Sensitive to: Florfenicol, Romet 30, Sulfa-methox-trimeth. and Tetracycline.

\* Results faxed May 10/04.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-01769      **Date** 13-May-2004      **Report** 07-Jun-2004

**Report**      **Copies**

**Submitter:** 9439 Marine Harvest Canada (M)

**Owner** 9439 Marine Harvest Canada (M)

**Farm:**

**Vet Clinic:**

**Attending**

**Specimen:** Tissue - Fresh

**Count** 5

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

J.H. Robinson, D.V.M.  
Veterinary Virologist

**History/Symptoms**

Submitted 5 fresh tissue samples for virology (tissue culture only).

Please quote PO# 272900 for invoicing.

Log ID: 5082.

**Virology**

5 samples inoculated onto tissue culture - all negative.

\* Results faxed June 7/04.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-01850      **Date** 19-May-2004      **Report** 10-Jun-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 11990      A 2. 4 - 23

**Farm:**

**Vet Clinic:**

**Attending**      Dr. J. Constantine

**Specimen:** Tissue - Fresh

**Count** 10

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

J.H. Robinson, D.V.M.  
Veterinary Virologist

**History/Symptoms**

Submitted fresh tissue samples - Provincial Surveillance Program samples for virology - PCR for IHN, ISA, IPN, VHS, and Piscirickettsia salmonis. Culture any PCR positive samples.

Sample ID: A 2.4 - 23 (1-10).

**Molecular Diagnostics/PCR**

Samples 1-5, 6-10: IHN, ISA, IPN, VHS, Piscirickettsia salmonis negative by PCR.

\* Results faxed June 18/04.

/bb



**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-01851      **Date** 19-May-2004      **Report** 18-Jun-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 11991      A 2.4 - 25 (1-6)

**Farm:**

**Vet Clinic:**

**Attending**      Dr. J. Constantine

**Specimen:** Tissue - Fresh

**Count** 6

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

J.H. Robinson, D.V.M.  
Veterinary Virologist

**History/Symptoms**

Submitted fresh tissue samples - Provincial Surveillance Program samples for virology - PCR for IHN, ISA, IPN, VHS, and Piscirickettsia salmonis. Culture any PCR positive samples.

Sample ID: A 2.4 - 25 (1-6).

**Molecular Diagnostics/PCR**

Samples 1-3, 4-6: IHN, ISA, IPN, VHS, Piscirickettsia salmonis negative by PCR.

\* Results faxed June 18/04.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-01853      **Date** 19-May-2004      **Report** 18-Jun-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 11993      A 2.4 - 22

**Farm:**

**Vet Clinic:**

**Attending**      Dr. J. Constantine

**Specimen:** Tissue - Fresh

**Count** 8

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

J.H. Robinson, D.V.M.  
Veterinary Virologist

**History/Symptoms**

Submitted fresh tissue samples - Provincial Surveillance Program samples for virology - PCR for IHN, ISA, IPN, VHS, and Piscirickettsia salmonis. Culture any PCR positive samples.

Sample ID: A 2.4 - 22(1-8).

**Molecular Diagnostics/PCR**

Samples 1-4, 5-8: IHN, ISA, IPN, VHS, Piscirickettsia salmonis negative by PCR.

\* Results faxed June 18/04.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-01854      **Date** 19-May-2004      **Report** 18-Jun-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 11994      A 2.4 - 24

**Farm:**

**Vet Clinic:**

**Attending**      Dr. J. Constantine

**Specimen:** Tissue - Fresh

**Count** 7

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

J.H. Robinson, D.V.M.  
Veterinary Virologist

**History/Symptoms**

Submitted fresh tissue samples - Provincial Surveillance Program samples for virology - PCR for IHN, ISA, IPN, VHS, and Piscirickettsia salmonis. Culture any PCR positive samples.

Sample ID: A 2.4 - 24 (1-7).

**Molecular Diagnostics/PCR**

Samples 1-4, 5-7: IHN, ISA, IPN, VHS, Piscirickettsia salmonis negative by PCR.

\* Results faxed June 18/04.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll=Free: 1-800-661-9903

**Case Report**

**Submission** 2004-01975      **Date** 01-Jun-2004      **Report** 02-Jul-2004

**Report**      **Copies**

**Submitter:** 8447      Stolt Sea Farm Inc.

**Owner** 8447      Stolt Sea Farm Inc.

**Farm:**

**Vet Clinic:**

**Attending**

**Specimen:** Whole Animal

**Count** 4

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

S.A. Raverty, D.V.M.,  
Veterinary Pathologist

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-02095      **Date** 15-Jun-2004      **Report** 18-Jun-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 12146      A.3.1-26 (6)

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**

**Specimen:** Other

**Count** 1

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

S.A. Raverty, D.V.M.,  
Veterinary Pathologist



**History/Symptoms**

Provincial Surveillance Program.

A.3.1-26 (6) subculture. Request bacteriology - identification of isolates and C & S.

**Bacteriology**

This plate was received with no growth.

Incubation at 15 and 22 degrees Celsius failed to produce any growth.

Please re-submit isolate for testing.

Completed by E. Whitton.

\* Results faxed June 18/04.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-02096      **Date** 15-Jun-2004      **Report** 17-Jun-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 12147      A.3.1-27 (1)

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**

**Specimen:** Other

**Count** 1

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

S.A. Raverty, D.V.M.,  
Veterinary Pathologist

**History/Symptoms**

Provincial Surveillance Program.  
A.3.1-27 (1) subculture.

For bacteriology - identification of isolates and C & S.

**Bacteriology**

Bact. plate - *Vibrio ordali* isolated.

Sensitive to: Erythromycin, Florfenicol, Romet 30, Sulfa-methox-trimeth. and Tetracycline.

\* Results faxed June 17/04.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll=Free: 1-800-661-9903

**Case Report**

**Submission** 2004-02113      **Date** 17-Jun-2004      **Report** 21-Jun-2004

**Report**      **Copies**

**Submitter:** 11899 Grieg Seafoods B.C. Ltd.

**Owner** 11899 Grieg Seafoods B.C. Ltd.

**Farm:**

**Vet Clinic:**

**Attending** Dr. B. Milligan

**Specimen:** Tissue - Fresh

**Count** 20

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

J.H. Robinson, D.V.M.  
Veterinary Virologist

**History/Symptoms**

Submitted 20 Atlantic salmon tissue samples for PCR for Kudoa.

Entering fish into a zone with past history of significant Kudoa. Would like an assessment of pre exposures.

**Molecular Diagnostics/PCR**

Pen #9, Pen # (not readable), Pen #18 - Kudoa thyrsites negative by PCR.

\* Results faxed June 21/04.

/bb

# ANIMAL HEALTH CENTRE

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

## Case Report

**Submission** 2004-02141      **Date** 18-Jun-2004      **Report** 29-Jun-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 12172      A.3.1-26 (1-8)

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**

**Specimen:** Tissue - Fresh

**Count** 8

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

J.H. Robinson, D.V.M.  
Veterinary Virologist

**History/Symptoms**

Provincial Surveillance Program. A.3.1-26 (1-8). Virology - PCR for IHN, ISA, IPN, VHS and Piscirickettsia salmonis.

Culture any PCR positive samples.

ID - A.3.1 - 26 (1-8).

**Molecular Diagnostics/PCR**

Samples 1-4, 5-8: IHN, VHS, ISA, IPN, Piscirickettsia salmonis negative by PCR.

\* Results faxed June 29/04.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-02143      **Date** 18-Jun-2004      **Report** 29-Jun-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 12173      A.3.4-37 (1-4)

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**

**Specimen:** Tissue - Fresh

**Count** 4

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

J.H. Robinson, D.V.M.  
Veterinary Virologist



**History/Symptoms**

Provincial Surveillance Program.

A.3.4-37 (1-4). Request Virology - PCR for IHN, ISA, IPN, VHS and *Piscirickettsia salmonis*. Culture any PCR positive samples.

**Molecular Diagnostics/PCR**

Sample 1-2, 3-4: IHN, VHS, ISA, IPN, *Piscirickettsia salmonis* negative by PCR.

\* Results faxed June 29/04.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll=Free: 1-800-661-9903

**Case Report**

**Submission** 2004-02145      **Date** 18-Jun-2004      **Report** 15-Jul-2004

**Report**      **Copies**

**Submitter:** 9439 Marine Harvest Canada (M)

**Owner** 9439 Marine Harvest Canada (M)

**Farm:**

**Vet Clinic:**

**Attending**

**Specimen:** Tissue - Fresh

**Count** 4

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

S.A. Raverty, D.V.M.,  
Veterinary Pathologist

**History/Symptoms**

4 samples labelled 6, 7, 8 and 9. For tissue culture only. Please quote PO #523212 for billing purposes.

Log No. 5110.

**Virology**

4 samples inoculated onto tissue culture - all negative.

\* Results faxed July 15/04.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-02310      **Date** 08-Jul-2004      **Report** 14-Jul-2004

**Report**      **Copies**

**Submitter:** 9439 Marine Harvest Canada (M)  
**Owner** 12255 #5121, Marine Harvest (PO #523218)  
**Farm:**  
**Vet Clinic:**  
**Attending**

**Specimen:** Tissue - Fresh      **Count** 4      **Flock Herd Size:**  
**Species:** Atlantic Salmon      **Age**  
**Breed:** Broodstock      **Sex:**

**Feed:**      **Feed**

**Vaccination****Treatmen****Diagnosis**

- 1 Splenitis
- 2 Metabolic Disease

J.H. Robinson, D.V.M.  
Veterinary Virologist

**History/Symptoms**

Log No. 5121. Attention: J. Robinson. Four samples for virology for tissue culture and PCR for IHNV and VHS. Saltwater entry: 2001.

**Virology**

Fish viruses negative.  
Tissue culture - negative.

\* Results faxed Aug. 10/04.

**Molecular Diagnostics/PCR**

Samples 1-4: IHN Virus negative by PCR.  
Samples 1-4: VHS Virus negative by PCR.

\* Results faxed July 14/04.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-02313      **Date** 08-Jul-2004      **Report** 29-Jul-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 12257      A.2.3-41

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**

**Specimen:** Tissue - Fresh

**Count** 5

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

J.H. Robinson, D.V.M.  
Veterinary Virologist

**History/Symptoms**

Provincial Surveillance Program samples.

ID: A.2.3-41 (1-5). Request virology - PCR for IHN, ISA, IPN, VHS and Piscirickettsia salmonis. Culture any PCR positive samples.

**Virology**

RESULTS

-----

DIAGNOSIS

-----

COMMENTS

-----

Fish Viruses Negative  
Tissue culture = negative

**Molecular Diagnostics/PCR**

Specimens 1-3, 4-6: IHN, IPN, ISA, Piscirickettsia salmonis negative by PCR.  
VHS positive by PCR.

\* Results faxed July 29/04.

/bb





**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-02314      **Date** 08-Jul-2004      **Report** 29-Jul-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 12258      A.2.3-39

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**

**Specimen:** Tissue - Fresh

**Count** 3

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

J.H. Robinson, D.V.M.  
Veterinary Virologist

**History/Symptoms**

Provincial Surveillance Program samples.

ID: A.2.3-39 (1-3). Request virology - PCR for IHN, ISA, IPN, VHS and Piscirickettsia salmonis. Culture any PCR positive samples.

**Molecular Diagnostics/PCR**

Specimens 1-3: IHN, VHS, IPN, ISA, Piscirickettsia salmonis negative by PCR.

\* Results faxed July 29/04.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-02315      **Date** 08-Jul-2004      **Report** 29-Jul-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 12259      A.2.3-40

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**

**Specimen:** Tissue - Fresh

**Count** 1

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

J.H. Robinson, D.V.M.  
Veterinary Virologist

**History/Symptoms**

Provincial Surveillance Program samples.

ID: A.2.3-40 (1). Request virology - PCR for IHN, ISA, IPN, VHS and Piscirickettsia salmonis. Culture any PCR positive samples.

**Molecular Diagnostics/PCR**

Specimen #1: IHN, VHS, IPN, ISA, Piscirickettsia salmonis negative by PCR.

\* Results faxed July 29/04.

/bb

# ANIMAL HEALTH CENTRE

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

## Case Report

**Submission** 2004-02387      **Date** 14-Jul-2004      **Report** 29-Jul-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 12377      A.2.4-43 (1-13)

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**

**Specimen:** Tissue - Fresh

**Count** 13

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

J.H. Robinson, D.V.M.  
Veterinary Virologist

**History/Symptoms**

ID: A.2.4-43 (1-13) Virology - PCR for IHN, ISA, IPN, VHS and Piscirickettsia salmonis. Culture any PCR positive samples.

**Virology**

RESULTS  
-----

DIAGNOSIS  
-----

COMMENTS  
-----

Sample pool 9-13 inoculated onto tissue culture - negative.

**Molecular Diagnostics/PCR**

Specimens 1-4, 5-8, 9-13: IHN, ISA, IPN, Piscirickettsia salmonis negative by PCR.  
VHS Virus positive by PCR.

\* Results faxed July 29/04.

/bb



**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-02388      **Date** 14-Jul-2004      **Report** 19-Jul-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 12285      A.2.4-43 (8)

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**

**Specimen:** Other

**Count** 1

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

S.A. Raverty, D.V.M.,  
Veterinary Pathologist



**History/Symptoms**

Sub culture A.2.4-43 (8). Provincial Surveillance Program. For bacteriology - identification of isolates and C & S.

**Bacteriology**

Vibrio sp. negative for the following serology:

Vibrio ordalii.

Vibrio anguillarum type 1 & 2.

Completed by E.Whitton.

\* Results faxed July 19/04.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-02389      **Date** 14-Jul-2004      **Report** 19-Jul-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 12286      A.2.3-40 (1)

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**

**Specimen:** Other

**Count** 1

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

S.A. Raverty, D.V.M.,  
Veterinary Pathologist

**History/Symptoms**

Sub culture A.2.3-40 (1). For bacteriology - identification of isolates and C & S.

**Bacteriology**

Vibrio sp. negative for the following serology:

V. ordalii

V. anguillarum type 1 & 2

Completed by E. Whitton

\* Results faxed July 19/04.

/bb

# ANIMAL HEALTH CENTRE

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

## Case Report

**Submission** 2004-02390      **Date** 14-Jul-2004      **Report** 29-Jul-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 12287      A.3.3-53 (1-3)

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**

**Specimen:** Tissue - Fresh

**Count** 3

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

J.H. Robinson, D.V.M.  
Veterinary Virologist

**History/Symptoms**

A.3.3-53 (1-3) Provincial Surveillance Program samples.

Request Virology - PCR for IHN, ISA, IPN, VHS and Piscirickettsia salmonis. Culture any PCR positive samples.

**Molecular Diagnostics/PCR**

Specimens 1-3: IHN, VHS, ISA, IPN, Piscirickettsia salmonis negative by PCR.

\* Results faxed July 29/04.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-00250      **Date** 21-Jan-2004      **Report** 27-Jan-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 11157      A 3.2 - 11 (#4 and #5)

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**      Dr. J. Constantine

**Specimen:** Other

**Count** 2

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

S.A. Raverty, D.V.M.,  
Veterinary Pathologist

**History/Symptoms**

Submitted 2 subcultures for bacteriology - identification of isolates and culture and sensitivity.

Sample ID: A 3.2-11 (4 and 5).

**Bacteriology**

Both isolates #4 and #4 identified as Photobacterium phosphoreum.

See attached sheet for sensitivities.

\* Preliminary results faxed Jan. 27th; final results faxed Jan. 30/04.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-02586      **Date** 04-Aug-2004      **Report** 09-Aug-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 12378      A 3.3 - 55 (5 and 2)

**Farm:**

**Vet Clinic:**

**Attending**      Dr. J. Constantine

**Specimen:** Other

**Count** 1

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

S.A. Raverty, D.V.M.,  
Veterinary Pathologist



**History/Symptoms**

Submitted Provincial Surveillance Program samples for bacteriology - identification of isolates and culture and sensitivity.

Sample ID: A 3.3 - 55 (2 and 5).

\* Please do culture and sensitivity for both subcultures.

**Bacteriology**

Both plates - Aeromonas sp. isolated.  
See attached sheet for sensitivities.

\* Results faxed Aug. 9/04.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-02587      **Date** 04-Aug-2004      **Report** 09-Aug-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 12379      A 3.3 - 56 (3)

**Farm:**

**Vet Clinic:**

**Attending**      Dr. J. Constantine

**Specimen:** Other

**Count** 1

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

S.A. Raverty, D.V.M.,  
Veterinary Pathologist

**History/Symptoms**

Submitted Provincial Surveillance Program samples for bacteriology - identification of isolates and culture and sensitivity.

Sample ID: A 3.3 - 56 (3).

**Bacteriology**

Plate - Bacteria identified as *Pseudoalteromonas* sp. by DNA sequencing.

See attached sheet for sensitivities.

\* Results faxed Aug. 12/04.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-02589      **Date** 04-Aug-2004      **Report** 09-Aug-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 12381      A 3.3 - 54 (5)

**Farm:**

**Vet Clinic:**

**Attending**      Dr. J. Constantine

**Specimen:** Other

**Count** 1

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

S.A. Raverty, D.V.M.,  
Veterinary Pathologist

**History/Symptoms**

Submitted Provincial Surveillance Program samples for bacteriology - identification of isolates and culture and sensitivity.

Sample ID: A 3.3 - 54 ( 5).

**Bacteriology**

Plate - Aeromonas sp. isolated.  
See attached sheet for sensitivities.

\* Results faxed Aug. 9/04.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-02592      **Date** 04-Aug-2004      **Report** 14-Aug-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 12406      A 3.3 - 32 (1-8)

**Farm:**

**Vet Clinic:**

**Attending**      Dr. J. Constantine

**Specimen:** Tissue - Fresh

**Count** 1

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

J.H. Robinson, D.V.M.  
Veterinary Virologist

**History/Symptoms**

Submitted Provincial Surveillance Program samples for virology - PCR for IHN, ISA, IPN, VHS, and Piscirickettsia salmonis. Culture any PCR positive samples.

Sample ID: A 3.3 - 32 (1-8).

**Molecular Diagnostics/PCR**

Samples 1-4, 5-8: IHN, VHS, ISA, IPN - Piscirickettsia salmonis Negative by PCR.

\*\* Results faxed on August 14, 2004.

/mb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-02593      **Date** 04-Aug-2004      **Report** 14-Aug-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 12385      A 3.3 - 46 (1-7)

**Farm:**

**Vet Clinic:**

**Attending**      Dr. J. Constantine

**Specimen:** Tissue - Fresh

**Count** 1

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

J.H. Robinson, D.V.M.  
Veterinary Virologist



**History/Symptoms**

Submitted Provincial Surveillance Program samples for virology - PCR for IHN, ISA, IPN, VHS, and Piscirickettsia salmonis. Culture any PCR positive samples.

Sample ID: A 3.3 - 46 (1-7).

**Molecular Diagnostics/PCR**

Samples 1-4, 5-7: IHN, VHS, ISA, IPN: Piscirickettsia salmonis negative by PCR.

\*\* Results faxed on August 14, 2004.

/mb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-02594      **Date** 04-Aug-2004      **Report** 14-Aug-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 12386      A 3.3 - 55 (1-5)

**Farm:**

**Vet Clinic:**

**Attending**      Dr. J. Constantine

**Specimen:** Tissue - Fresh

**Count** 1

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

J.H. Robinson, D.V.M.  
Veterinary Virologist

**History/Symptoms**

Submitted Provincial Surveillance Program samples for virology - PCR for IHN, ISA, IPN, VHS, and Piscirickettsia salmonis. Culture any PCR positive samples.

Sample ID: A 3.3 - 55 (1-5).

**Molecular Diagnostics/PCR**

Samples 1-3, 4-5: IHN, VHS, ISA, IPN, Piscirickettsia salmonis negative by PCR.

\*\* Results faxed on August 14, 2004.

/mb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-02595      **Date** 04-Aug-2004      **Report** 14-Aug-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 12387      A 3.3 - 54 (1-6)

**Farm:**

**Vet Clinic:**

**Attending**      Dr. J. Constantine

**Specimen:** Tissue - Fresh

**Count** 1

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

J.H. Robinson, D.V.M.  
Veterinary Virologist

**History/Symptoms**

Submitted Provincial Surveillance Program samples for virology - PCR for IHN, ISA, IPN, VHS, and *Piscirickettsia salmonis*. Culture any PCR positive samples.

Sample ID: A 3.3 - 54 (1-6).

Addendum: Samples submitted for routine histology processing and analysis on September 3, 2004.

**Gross Pathology**

N/A

**Histopathology**

Slide 1: autolysis, none (other organs) to mild (liver)

- 1) Liver: cholangiofibrosis, multifocal (each 200-300  $\mu\text{m}$  in diameter), with biliary hyperplasia, moderate
- 2) Liver: cholangiohepatitis, multifocal, pleocellular (up to 1 mm in diameter), with biliary hyperplasia, moderate

- 3) Liver: biliary preductular cell hyperplasia, diffuse, mild
- 4) Spleen: ellipsoid hypertrophy, multifocal, mild
- 5) Heart: myocardial karyomegaly, multifocal, moderate
- 6) Head kidney - no significant lesions

Comment: Cholangiohepatitis and cholangiofibrosis is consistent with a bacterial infection ascending from the intestine to the liver. Biliary preductular cell hyperplasia is evidence of exposure to toxins. The toxins could be produced inside the fish (e.g., bacterial toxins) or come from outside the fish (e.g., from the water or the feed). Splenic ellipsoid hypertrophy is consistent with immune stimulation. The cause and significance of myocardial karyomegaly is unknown.

**HISTOPATHOLOGY:**

Slide 2: autolysis, none (spleen and heart), mild (trunk kidney), moderate (liver)

- 1) Liver: pericholangitis, lymphoplasmacytic, multifocal, mild
- 2) Liver: hepatocellular fatty change (lipidosis), diffuse, mild
- 3) Heart: epicarditis, multifocal, pleocellular, mild to moderate
- 4) Heart: myocardial karyomegaly, multifocal, mild
- 5) Trunk kidney: intratubular protein casts, multifocal, mild to moderate, with necrosis of scattered tubular epithelial cells
- 6) Spleen - no significant lesions

Comment: The kidney and liver lesions are probably the most significant. Renal tubular epithelial necrosis results from acute damage to renal epithelial cells; damage is reversible if the basement membrane is spared (as in this case). Causes in fish include exposure to toxicants (e.g., bacterial toxins, or aminoglycoside antibiotics such as gentamycin), but the cause often is undetermined. Casts in renal tubules indicate leaky glomeruli, impaired tubular reabsorption, or both. Hepatocellular fatty change (lipidosis) often occurs when fish are not feeding; it also occurs in cases of inadequate nutrition.

**HISTOPATHOLOGY:**

Slide 3: autolysis, none (other organs) to moderate (liver)

- 1) Liver: peritonitis, granulomatous, lymphoplasmacytic, diffuse, mild, with occasional fine fibrocellular fronds (up to 60  $\mu\text{m}$  thick)
- 2) Liver: hepatocellular fatty change (lipidosis), diffuse, mild
- 3) Spleen: peritonitis, granulomatous, lymphoplasmacytic, diffuse, moderate, with occasional fine fibrocellular fronds (up to 400  $\mu\text{m}$  thick)
- 4) Trunk kidney - no significant lesions

Comment: Splenic and hepatic peritonitis is consistent with a foreign body reaction, probably in response to vaccine adjuvant.

**HISTOPATHOLOGY:**

Slide 4: autolysis, none (other organs) to mild (liver); this slide was also stained with a Gram stain, acid-fast stain, and a silver stain (GMS)

- 1) Liver: hepatitis and peritonitis, granulomatous, multifocal, severe, with multinucleate giant cells and intralesional vacuoles that are about 40  $\mu\text{m}$  in diameter
- 2) Spleen: splenitis, granulomatous, multifocal, mild, with multinucleate giant cells and intralesional vacuoles that are about 40  $\mu\text{m}$  in diameter
- 3) Trunk Kidney: nephritis, interstitial, granulomatous, multifocal, moderate, with multinucleate giant cells and intralesional vacuoles that are about 40  $\mu\text{m}$  in diameter (many vacuoles contain translucent foreign material)



4) Heart: epicarditis, myocarditis, and endocarditis, granulomatous, multifocal, severe, with multinucleate giant cells and intralesional Gram-positive rods consistent with *Renibacterium salmoninarum* (Bacterial Kidney Disease)

5) Heart: mural thrombosis, multifocal, coalescing, acute, severe

6) Liver: hepatocellular fatty change (lipidosis), diffuse, mild

Comment: Disseminated granulomatous inflammation is consistent with a foreign body reaction, and short Gram-positive rods in the heart are consistent with *Renibacterium salmoninarum* (Bacterial Kidney Disease).

The presence of vacuoles and lack of Gram positive rods in organs other than the heart is cause for concern that there might also be a response to vaccine adjuvant. The fish probably died of complications related to thrombi in the heart.

#### HISTOPATHOLOGY:

Slide 5: autolysis, mild (other organs) to moderate (liver)

1) Trunk kidney: renal tubular epithelial necrosis, multifocal, acute, mild

2) Heart: myocardial karyomegaly, multifocal, moderate

3) Liver, head kidney, spleen - no significant lesions (bacteria in heart and spleen are considered post-mortem changes)

Comment: Renal tubular epithelial necrosis results from acute damage to renal epithelial cells; damage is reversible if the basement membrane is spared (as in this case). Causes in fish include exposure to toxicants (e.g., bacterial toxins, or aminoglycoside antibiotics such as gentamycin), but the cause often is undetermined.

#### HISTOPATHOLOGY:

Slide 6: autolysis, none (other organs) to mild (liver)

1) Liver: hepatitis, granulomatous, multifocal, moderate, with multinucleate giant cells and intralesional vacuoles that are about 40 µm in diameter

2) Heart: epicarditis, myocarditis, and endocarditis, granulomatous, multifocal, mild, with multinucleate giant cells

3) Heart: mural thrombosis, multifocal, acute, mild

4) Spleen: splenitis, granulomatous, neutrophilic, multifocal, coalescing, severe, with multinucleate giant cells and intralesional vacuoles that are about 40 µm in diameter

5) Trunk kidney: nephritis, interstitial, granulomatous, multifocal, coalescing, severe, with multinucleate giant cells and intralesional vacuoles that are about 40 µm in diameter

6) Trunk kidney: renal tubular epithelial necrosis, multifocal, acute, mild

Comment: Disseminated granulomatous inflammation is consistent with a foreign body reaction, probably in

#### Molecular Diagnostics/PCR

Samples 1-3, 4-6: IHN, VHS, ISA, IPN, *Piscirickettsia salmonis* negative by PCR.

\*\* Results faxed on August 14, 2004.

#### Final Comments

Histopathology addendum: Sept. 9, 2004.

/sr







**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-02597      **Date** 04-Aug-2004      **Report** 14-Aug-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 12389      A 3.2 - 48 (1-3)

**Farm:**

**Vet Clinic:**

**Attending**      Dr. J. Constantine

**Specimen:** Tissue - Fresh

**Count** 1

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

Gary D. Marty, D.V.M., Ph.D.;  
Diplomate, A.C.V.P  
Fish Pathologist

**History/Symptoms**

Submitted Provincial Surveillance Program samples for virology - PCR for IHN, ISA, IPN, VHS, and Piscirickettsia salmonis. Culture any PCR positive samples.

Sample ID: A 3.2 - 48 (1-3).

Addendum: Aug 20, 2004 - formalized tissue samples received for routine histology and analysis.

**Histopathology**

Slide 1: autolysis, mild (other organs) to moderate (liver)

- 1) Heart: myocardiocyte karyomegaly, with occasional nuclear infolding and pseudoinclusion formation, multifocal, mild
- 2) Liver: pericholangitis, multifocal, lymphoplasmacytic, histiocytic, moderate
- 3) Head kidney, and spleen - no significant lesions

Comment: The cause and significance of myocardiocyte karyomegaly is unknown. Pericholangitis might have resulted from chronic antigenic stimulation of the biliary system, as might occur with a bacterial infection ascending from the intestine; however, the specific cause is unknown.

Slide 2: autolysis, mild

- 1) Liver: pericholangitis, multifocal, lymphoplasmacytic, histiocytic, mild
- 2) Spleen: peritonitis, fibrocellular, subacute, diffuse, moderate
- 3) Head kidney, heart - no significant lesions

Comment: Epicarditis is a fairly common lesion, but the cause is unknown. Splenic peritonitis is consistent with a foreign body reaction, possibly in response to vaccine adjuvant.

Slide 3: autolysis, mild (other organs) to moderate (liver)

- 1) Heart: myocardiocyte karyomegaly, multifocal, mild
- 2) Hepatocellular fatty change (lipidosis), diffuse, mild
- 3) Head kidney, spleen - no significant lesions

Comment: Hepatocellular fatty change (lipidosis) often occurs in cases of inadequate nutrition or when fish are not feeding.

**Molecular Diagnostics/PCR**

Samples 1-3: IHN, VHS, ISA, IPN, Piscirickettsia salmonis Negative by PCR.

**Final Comments**

PCR results faxed to submitter on August 14, 2004.

/sr



**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-02598      **Date** 04-Aug-2004      **Report** 14-Aug-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 12390      A 2.4 - 44 (1-10)

**Farm:**

**Vet Clinic:**

**Attending**      Dr. J. Constantine

**Specimen:** Tissue - Fresh

**Count** 1

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

J.H. Robinson, D.V.M.  
Veterinary Virologist

**History/Symptoms**

Submitted Provincial Surveillance Program samples for virology - PCR for IHN, ISA, IPN, VHS, and *Piscirickettsia salmonis*. Culture any PCR positive samples.

Sample ID: A 2.4 - 44 (1-10).

Addendum: Samples submitted for routine histology processing and analysis on September 3, 2004.

**Histopathology**

Slide 1: autolysis, none (other organs) to mild (liver)

- 1) Liver: cholangiohepatitis, focal, pleocellular (~0.5 mm in diameter), with biliary hyperplasia, moderate
- 2) Heart: epicarditis, multifocal, lymphocytic, mild
- 3) Spleen: no significant lesions
- 4) Trunk kidney: no significant lesions
- 5) Head kidney: no significant lesions

Comment: None of these lesions seem sufficient to have caused the death of this fish. Cholangiohepatitis is consistent with a bacterial infection ascending from the intestine into the liver.

Slide 2: autolysis, none (other organs) to mild (liver)

- 1) Liver: sinusoidal congestion, multifocal, mild
- 2) Heart: myocardial karyomegaly, multifocal, mild
- 3) Spleen: no significant lesions
- 4) Trunk kidney: intratubular protein cast, focal (1 tubule), mild
- 5) Head kidney: no significant lesions

Comment: None of these lesions seem sufficient to have caused the death of this fish.

Slide 3: autolysis, none (other organs) to mild (liver)

- 1) Liver: biliary preductular cell karyomegaly, scattered, mild
- 2) Liver: hepatocellular fatty change (lipidosis), diffuse, mild
- 3) Heart: myocardial karyomegaly, multifocal, moderate
- 4) Spleen: peritonitis, granulomatous, lymphoplasmacytic, multifocal, mild, with occasional fine fibrocellular fronds
- 5) Trunk kidney: no significant lesions
- 6) Head kidney: no significant lesions

Comment: I have not previously seen enlarged nuclei of biliary preductular epithelial cells. Presumably, they enlarge in response to some type of toxicant exposure, but the nature of the toxicant cannot be determined by histopathology. Splenic peritonitis is consistent with a foreign body reaction, probably in response to vaccine adjuvant. Hepatocellular fatty change (lipidosis) often occurs when fish are not feeding; it also occurs in cases of inadequate nutrition.

Slide 4: autolysis, none (other organs) to mild (liver)

- 1) Liver: pericholangitis, lymphoplasmacytic, multifocal, mild
- 2) Heart: myocardial karyomegaly, multifocal, moderate
- 3) Spleen: peritonitis, granulomatous, lymphoplasmacytic, multifocal, mild, with occasional fine fibrocellular fronds
- 4) Trunk kidney: tubular intracytoplasmic protein droplets, multifocal, moderate
- 5) Trunk kidney, renal tubular epithelial necrosis, focal, acute, mild, with regeneration
- 6) Head kidney: no significant lesions
- 7) Liver: hepatocellular fatty change (lipidosis), diffuse, mild

Comment: Renal tubular epithelial protein droplets are normal in some species, or they may be an indication of glomerular disease. Ferguson ("Systemic Pathology of Fish," 1989) reports an association of renal protein droplets and high ammonia levels in salmonids. Renal tubular epithelial necrosis results from acute damage to renal epithelial cells; damage is reversible if the basement membrane is spared (as in this case). Causes in fish include exposure to toxicants (e.g., bacterial toxins, or aminoglycoside antibiotics such as Gentamicin), but the cause often is undetermined.

Slide 5: autolysis, none (other organs) to mild (liver)

- 1) Liver: hepatocellular fatty change (lipidosis), diffuse, mild
- 2) Heart: epicarditis, diffuse, granulomatous, severe, with foci of pleocellular inflammation and fibrinous exudates





- 3) Heart: myocardial karyomegaly, multifocal, moderate
- 4) Spleen: no significant lesions
- 5) Trunk kidney: no significant lesions
- 6) Head kidney: not included in the sections examined

Comment: Severe epicarditis probably contributed to the death of this fish. The reaction is consistent with ongoing immune stimulation; differentials include vaccine reaction and bacterial infection.

Slide 6: autolysis, none (other organs) to mild (liver)

- 1) Liver: hepatocellular fatty change (lipidosis), diffuse, moderate (most prominent in coalescing bands between medium sized vessels)
- 2) Heart: myocardial karyomegaly, multifocal, mild
- 3) Spleen: no significant lesions
- 4) Trunk kidney: no significant lesions
- 5) Head kidney: not included in the sections examined

Comment: Because hepatic lipidosis is associated with lack of nutrients reaching the liver, the pattern of greater fatty change further away from vessels might indicate that this fish had adequate nutrition for only about 60% of its hepatocytes.

Slide 7: autolysis, none (other organs) to mild (liver)

- 1) Liver: no significant lesions
- 2) Heart: myocardial karyomegaly, multifocal, moderate
- 3) Spleen: no significant lesions
- 4) Trunk kidney: tubular intracytoplasmic protein droplets, multifocal, moderate
- 5) Head kidney: not included in the sections examined

Comment: None of these lesions seem sufficient to have caused the death of this fish.

Slide 8: autolysis, none (other organs) to mild (liver)

- 1) Liver: hepatic necrosis, multifocal, acute, moderate
- 2) Heart: myocardial karyomegaly, multifocal, mild
- 3) Spleen: no significant lesions
- 4) Trunk kidney: tubular intracytoplasmic protein droplets, multifocal, mild
- 5) Head kidney: no significant lesions

Comment: The pattern of hepatic necrosis is consistent with damage due to inadequate vascular perfusion of the affected areas; alternatively, affected areas might be infected with a virus. Lack of proliferative lesions in the biliary system is evidence against a toxic cause for the hepatic necrosis.

Slide 9: autolysis, none (other organs) to mild (liver)

- 1) Liver: hepatocellular fatty change (lipidosis), diffuse, mild
- 2) Heart: myocardial karyomegaly, multifocal, mild
- 3) Heart: epicarditis, regionally diffuse, lymphocytic, mild
- 4) Spleen: peritonitis, fibrocellular, regionally diffuse, mild, with occasional fine fibrocellular fronds
- 5) Trunk kidney: tubular dilation, multifocal, mild
- 6) Head kidney: not included in the sections examined

Comment: Splenic peritonitis is consistent with a foreign body reaction, probably in response to vaccine adjuvant. The splenic red pulp is prominent, but I am not sure if prominent red pulp is a lesion.

Slide 10: autolysis, none (other organs) to mild (liver)

- 1) Liver: pericholangitis, lymphoplasmacytic, multifocal, mild
- 2) Heart: no significant lesions
- 3) Spleen: no significant lesions
- 4) Trunk kidney: moderate numbers of eosinophilic granular cells in interstitial tissue



5) Head kidney: abundant eosinophilic granular cells lining (but not distending) sinusoids

Comment: Increased numbers of eosinophilic granular cells have been associated with experimental infection with *Renibacterium salmoninarum*, the cause of bacterial kidney disease (Flaño et al. 1996), but they are not described as a common finding in clinical cases. This case had no evidence of granulomatous inflammation more commonly associated with bacterial kidney disease. Increased numbers of eosinophilic granular cells are sometimes associated with chronic parasitic infections, but again, the inciting cause was not included in the sections examined.

Literature cited:

Flaño, E., López-fierro, P., Razquin, B. E., and A. Villena. 1996. In vitro differentiation of eosinophilic granular cells in *Renibacterium salmoninarum*-infected gill cultures from rainbow trout. *J. Fish & Shellfish Immunology* 3: 173-184.

**Molecular Diagnostics/PCR**

Samples 1-5, 6-10: IHN, VHS, ISA, IPN, *Piscirickettsia salmonis* negative by PCR.

\*\* Results faxed on August 14, 2004.

/mb/bb



**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-02599      **Date** 04-Aug-2004      **Report** 14-Aug-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 12391      A 3.3 - 56 (1-5)

**Farm:**

**Vet Clinic:**

**Attending**      Dr. J. Constantine

**Specimen:** Tissue - Fresh

**Count** 1

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

J.H. Robinson, D.V.M.  
Veterinary Virologist

**History/Symptoms**

Submitted Provincial Surveillance Program samples for virology - PCR for IHN, ISA, IPN, VHS, and *Piscirickettsia salmonis*. Culture any PCR positive samples.

Sample ID: A 3.3 - 56 (1-5).

Addendum: Samples submitted for routine histology processing and analysis on September 3, 2004.

**Histopathology**

ADDENDUM (Sept. 10/04):

Slide 1: autolysis, none (other organs) to moderate (liver)

- 1) Liver: hepatocellular fatty change (lipidosis), diffuse, mild
- 2) Heart: myocardial karyomegaly, multifocal, mild
- 3) Heart: epicarditis, multifocal, lymphocytic, mild
- 4) Spleen: no significant lesions
- 5) Trunk kidney: not included in the sections examined
- 6) Head kidney: nephritis, granulomatous, multifocal, mild

Comment: The cause and significance of myocardial karyomegaly is unknown. Hepatocellular fatty change (lipidosis) often occurs when fish are not feeding; it also occurs in cases of inadequate nutrition.

Slide 2: autolysis, none (other organs) to mild (liver)

- 1) Liver: no significant lesions
- 2) Heart: epicarditis, multifocal, lymphocytic, mild
- 3) Spleen: no significant lesions
- 4) Trunk kidney: no significant lesions
- 5) Head kidney: no significant lesions

Comment: These organs have no lesions that explain the death of this fish.

Slide 3: autolysis, none (other organs) to mild (liver)

- 1) Liver: hepatocellular fatty change (lipidosis), diffuse, mild
- 2) Heart: myocardial karyomegaly, multifocal, moderate
- 3) Spleen: no significant lesions
- 4) Trunk kidney: no significant lesions
- 5) Head kidney: nephritis, granulomatous, multifocal, mild

Comment: The most common organism associated with granulomatous nephritis in salmon is *Renibacterium salmoninarum*, the cause of bacterial kidney disease.

Slide 4: autolysis, none (all organs)

- 1) Liver: hepatocellular fatty change (lipidosis), focal, moderate; diffuse, mild
- 2) Liver: pericholangitis, lymphocytic, multifocal, mild
- 3) Liver: hepatic necrosis, acute, multifocal, mild
- 4) Heart: myocardial karyomegaly, multifocal, mild
- 5) Spleen: no significant lesions
- 6) Trunk kidney: no significant lesions
- 7) Head kidney: no significant lesions

Comment: Hepatic necrosis can be caused by inadequate vascular perfusion or direct cytotoxicity from viral or bacterial infections. Lack of proliferative lesions in the biliary system is evidence against a toxic cause for the hepatic necrosis.

Slide 5: autolysis, none (other organs) to mild (liver)

- 1) Liver: peritonitis, lymphoplasmacytic, regionally diffuse, mild, with occasional fine fibrocellular fronds
- 2) Heart: no significant lesions
- 3) Spleen: peritonitis, granulomatous, lymphoplasmacytic, regionally diffuse, mild, with occasional fine fibrocellular fronds
- 4) Trunk kidney: no significant lesions
- 5) Head kidney: no significant lesions

Comment: Peritonitis is consistent with a foreign body reaction, probably in response to vaccine adjuvant.





**Molecular Diagnostics/PCR**

Samples 1-3, 4-5: IHN, VHS, ISA, IPN, Piscirickettsia salmonis negative by PCR.

\*\* Results faxed on August 14, 2004.

/mb/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-02601      **Date** 04-Aug-2004      **Report** 14-Aug-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 12393      A 3.2 - 49 (1-5)

**Farm:**

**Vet Clinic:**

**Attending**      Dr. J. Constantine

**Specimen:** Tissue - Fresh

**Count** 1

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

J.H. Robinson, D.V.M.  
Veterinary Virologist

**History/Symptoms**

Submitted Provincial Surveillance Program samples for virology - PCR for IHN, ISA, IPN, VHS, and *Piscirickettsia salmonis*. Culture any PCR positive samples.

Sample ID: A 3.2 - 49 (1-5).

Addendum: Samples submitted for routine histology processing and analysis on September 3, 2004.

**Histopathology**

Slide 1: autolysis, none (other organs) to mild (liver)

- 1) Liver: hepatic necrosis, acute, multifocal, moderate
- 2) Heart: no significant lesions
- 3) Spleen: peritonitis, lymphoplasmacytic, regionally diffuse, mild, with occasional fine fibrocellular fronds
- 4) Trunk kidney: glomerular capsule dilation, moderate, and renal tubular dilation, diffuse, mild, with intratubular proteinaceous casts
- 5) Head kidney: no significant lesions

Comment: Hepatic necrosis can be caused by inadequate vascular perfusion or direct cytotoxicity from viral or bacterial infections. Lack of proliferative lesions in the biliary system is evidence against a chronic toxic cause for the hepatic necrosis. Dilation of renal components is evidence of impaired renal function, but the cause is unknown. Splenic peritonitis is consistent with a foreign body reaction, probably in response to vaccine adjuvant.

Slide 2: autolysis, none (other organs) to mild (liver)

- 1) Liver: no significant lesions
  - 2) Heart: epicarditis, regionally diffuse, lymphocytic, mild, with activated fibroblasts
  - 3) Spleen: peritonitis, lymphoplasmacytic, regionally diffuse, mild, with occasional fine fibrocellular fronds
  - 4) Splenitis, granulomatous, multifocal, mild
- Trunk kidney: no significant lesions
- 5) Head kidney: no significant lesions

Comment: Poorly defined foci of granulomatous inflammation in the spleen might be an extension of the foreign body reaction on the peritoneum; alternatively, they might be related to infection with *Renibacterium salmoninarum* (bacterial kidney disease).

Slide 3: autolysis, none (other organs) to mild (liver)

- 1) Liver: biliary preductular cell hyperplasia, diffuse, mild
- 2) Heart: thrombocyte-rich thrombi, multifocal, mild
- 3) Heart: myocardial karyomegaly, multifocal, mild
- 4) Heart: epicarditis, regionally diffuse, lymphocytic, mild
- 5) Spleen: no significant lesions
- 6) Trunk kidney: not included among the sections examined
- 7) Head kidney: not included among the sections examined
- 8) Fatty mesenteries and exocrine pancreas: peritonitis, granulomatous, multifocal, moderate, with one 125- $\mu$ m-diameter well-demarcated vacuole

Comment: Thrombi in the heart might have contributed to the death of this fish. The cause and significance of myocardial karyomegaly is unknown; karyomegaly in other cell types has been associated with exposure to algal toxins (e.g., hepatocytes exposed to microcystin LR). Biliary preductular cell hyperplasia is evidence of exposure to toxins. The toxins could be produced inside the fish (e.g., bacterial toxins) or come from outside the fish (e.g., from the water or the feed). Peritonitis is consistent with a foreign body reaction; differentials include vaccine adjuvant, *Renibacterium salmoninarum*, or other foreign material.

Slide 4: autolysis, none (all organs)

- 1) Liver: hepatitis, lymphohistiocytic, focal (about 100  $\mu$ m in diameter), mild
- 2) Liver: hepatocellular fatty change (lipidosis), diffuse, mild
- 3) Heart: myocardial karyomegaly, multifocal, mild
- 4) Heart: epicarditis, regionally diffuse, lymphocytic, mild, with activated surface fibroblasts
- 5) Spleen: peritonitis, lymphoplasmacytic, regionally diffuse, mild, with occasional fine fibrocellular fronds
- 6) Trunk kidney: no significant lesions
- 7) Head kidney: no significant lesions

Comment: None.



Slide 5: autolysis, none (other organs) to mild (liver)

1) Liver: no significant lesions

2) Heart: no significant lesions

3) Spleen: peritonitis, granulomatous, lymphoplasmacytic, regionally diffuse, moderate, with occasional fine fibrocellular fronds and intralésional vacuoles 30 - 70 µm in diameter

4) Trunk kidney: intratubular fine mineral granules, multifocal, mild

5) Head kidney: moderate numbers of eosinophilic granular cells near sinusoids

Comment: Increased numbers of eosinophilic granular cells have been associated with experimental infection with *Renibacterium salmoninarum*, the cause of bacterial kidney disease (Flaño et al. 1996), but they are not described as a common finding in clinical cases. They might be related to granulomatous inflammation in the peritoneum (likely a reaction to vaccine adjuvant). Increased numbers of eosinophilic granular cells are sometimes associated with chronic parasitic infections, but again, the inciting cause was not included in the sections examined.

Literature cited:

Flaño, E., López-fierro, P., Razquin, B. E., and A. Villena. 1996. In vitro differentiation of eosinophilic granular cells in *Renibacterium salmoninarum*-infected gill cultures from rainbow trout. *J. Fish & Shellfish Immunology* 3: 173-184.

#### **Molecular Diagnostics/PCR**

Samples 1-3,4-5: IHN, VHS, ISA, IPN, *Piscirickettsia salmonis* negative by PCR.

\*\* Results faxed on August 14, 2004.

/mb/bb





# ANIMAL HEALTH CENTRE

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

## Case Report

**Submission** 2004-02682      **Date** 10-Aug-2004      **Report** 13-Aug-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 12428      A 3.3 - 53

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**

**Specimen:** Tissue - Formalized

**Count** 1

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

Gary D. Marty, D.V.M., Ph.D.;  
Diplomate, A.C.V.P  
Fish Pathologist

### **History/Symptoms**

Submitted Provincial Surveillance Program samples for routine histology.

AHC - virology submission 2004/02390.

Sample ID: A 3.3 -53 (1-3)

### **Histopathology**

Slide 1: autolysis, mild.

- 1) Hepatocellular degeneration and single cell necrosis, multifocal, acute, moderate, with individual hepatocytes in vessels.
- 2) Myocardial karyomegaly, multifocal, moderate
- 3) Head kidney, trunk kidney, and spleen - no significant lesions.

The liver has multiple foci of hepatocellular degeneration and necrosis. Affected hepatocytes have pyknotic nuclei and vacuolated cytoplasm, and cell membranes are detached from adjacent cells. Some vessels in the liver and heart contain sloughed hepatocytes. The margin of necrotic areas in the liver occasionally contains mitotic figures (evidence of regeneration). Many nuclei of myocardial cells are enlarged, up to 40x30  $\mu\text{m}$ , and some are folded and contain pseudoinclusions of eosinophilic cytoplasmic material.

Slide 2: autolysis, mild to moderate

- 1) Head kidney, liver, heart, and spleen - no significant lesions

In the liver, about  $\frac{1}{2}$  the hepatocytes have condensed nuclei, and affected cells are evenly distributed throughout the liver. Small numbers of individual hepatocytes are within a large vessel in the liver, but not in the heart. Dr. Raverty also examined the slide, and we decided that these changes are probably post-mortem.

Slide 3: autolysis, mild to moderate

- 1) Exocrine pancreatic necrosis, diffuse, moderate, acute
- 2) Trunk kidney: renal intratubular necrotic cells, focal, acute, mild
- 3) Hepatitis, myocarditis, and interstitial nephritis; granulomatous, multifocal, mild
- 4) Hepatic coagulative necrosis, acute, multifocal, moderate
- 5) Epicarditis, regionally diffuse, granulomatous, lymphocytic, moderate

About  $\frac{1}{2}$  of the exocrine pancreatic cells at the margin of the spleen have nuclei that are pyknotic or karyorrhectic, and a few nuclei have marginated chromatin.



**Final Comments**

The changes in the liver (slide 1) have some features of netpen liver disease associated with exposure to the algal toxin microcystin-LR: individual cell necrosis of hepatocytes with vacuolation and hepatocyte drop-out; however, the hallmark lesion of netpen liver disease - hepatocellular megalocytosis - is not a feature of this liver. Consider other toxins as potential causes of these changes. Necrosis in the pancreas and liver (slide 3) probably resulted from abnormal perfusion, ultimately leading to death of this fish. A differential cause of pancreatic necrosis is Infectious Pancreatic Necrosis (IPN), but IPN is usually associated with necrosis of the interstitial cells of the kidney, and the renal interstitium in this fish is relatively normal. The most common cause of disseminated granulomatous disease in pen-reared salmonids is *Renibacterium salmoninarum*, but the specific cause would need to be confirmed by other methods.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-02683      **Date** 10-Aug-2004      **Report** 23-Aug-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 12429      A 2.4 - 43 (1-13)

**Farm:**

**Vet Clinic:**

**Attending**

**Specimen:** Tissue - Formalized

**Count** 1

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

Gary D. Marty, D.V.M., Ph.D.;  
Diplomate, A.C.V.P  
Fish Pathologist

**History/Symptoms**

Submitted Provincial Surveillance Program samples for routine histology.

AHC - virology submission 2004/02387 and 2004/02388.

Sample ID: A 2.4 -43 (1-13)

**Histopathology**

Slide 1: autolysis, mild.

- 1) Hepatic biliary preductular cell hyperplasia, diffuse, mild
- 2) Hepatic erythropoiesis, focal, mild
- 3) Trunk kidney, heart, and spleen - no significant lesions.

Comment: Biliary preductular cell hyperplasia is evidence of exposure to toxins. The toxins could be produced inside the fish (e.g., bacterial toxins) or come from outside the fish (e.g., from the water or the feed).

Slide 2: autolysis, mild

- 1) Head kidney, trunk kidney, liver, heart, and spleen - no significant lesions

Comment: none

Slide 3: autolysis, mild (other organs) to moderate (liver)

- 1) Hepatic multinucleated giant cells, bifocal, minimal
- 2) Hepatic hematopoiesis, focal, perivascular, mild
- 3) Peritonitis (fatty mesenteries near spleen), granulomatous, lymphoplasmacytic multifocal, mild, with one 80-µm-diameter vacuole
- 4) Head kidney, heart, and spleen - no significant lesions

Comment: Dr. Raverty examined the liver. Multinucleated giant cell macrophages are usually associated with foreign material, including infectious organisms. I found only two such cells in the section. Lesions in the mesenteries are consistent with a foreign body reaction, probably from vaccine adjuvant.

Slide 4: autolysis, (other organs) to moderate (liver)

- 1) Endocarditis and epicarditis, multifocal, lymphoplasmacytic, mild
- 2) Hepatic hematopoiesis, bifocal, mild
- 3) Trunk kidney and spleen - no significant lesions

Comment: none.

Slide 5: autolysis, mild to moderate

- 1) Hepatic neutrophilic granulomas, multifocal, with occasional central vacuoles, mild to moderate
- 2) Spleen: peritonitis, granulomatous, lymphoplasmacytic, regionally diffuse, mild, with occasional fine fibrous fronds
- 3) Head and trunk kidney, heart, and spleen - no significant lesions

Comment: The neutrophilic granulomas contain multiple small foci of intracellular PAS+ material, but no bacteria. Stains for bacteria (Gram's, B&H, and Twort's) were negative. The granulomas did not stain with toluidine blue, and they were not acid-fast. Dr. Raverty examined the HE slide. Vacuoles in the neutrophilic granulomas, and their presence near the surface of the liver, are evidence that they are associated with foreign material (e.g., vaccine adjuvant). Lack of bacteria in the lesion is evidence against the differential cause *Renibacterium salmoninarum*; also, lack of lesions in the kidney makes infection with *R. salmoninarum* less likely. The lesions on the margin of the spleen are consistent with chronic antigenic stimulation. Differentials include vaccine reaction and bacterial infection.

Slide 6: autolysis, mild (kidney) to moderate (liver)

- 1) Renal tubular necrosis, multifocal, with intraluminal protein and necrotic cells
- 2) Renal peritubular fibrosis, multifocal, mild to moderate
- 3) Renal tubular dilation, moderate
- 4) Liver: pericholangitis, lymphocytic, focal, mild
- 3) Head kidney - no significant lesions

Comment: The pattern of changes in the kidney are consistent with intermittent exposure to nephrotoxin(s) over at least a few days; the changes are not specific for endogenous or exogenous toxins.





Slide 7: autolysis, mild

- 1) Heart, ventricle (near atrioventricular valve): thickened endothelium, with scattered eosinophilic granular cells, focal, mild
  - 2) Liver and spleen - no significant lesions
- Comment: none

Slide 8: autolysis, mild to moderate

- 1) Spleen: peritonitis, granulomatous, pleocellular, moderate, regionally diffuse, with multiple fine fibrous fronds, multinucleate giant cells, and small numbers of 40-µm-diameter vacuoles
  - 2) Epicarditis, lymphocytic, diffuse, mild
  - 3) Liver, and trunk kidney - no significant lesions
- Comment: The lesions on the margin of the spleen are consistent with chronic antigenic stimulation. Differentials include vaccine reaction (most likely) and bacterial infection.

Slide 9: autolysis, mild

- 1) Peritonitis, splenic and mesenteric, granulomatous, lymphocytic, mild, regionally diffuse, with occasional fine fibrous fronds
  - 2) Epicarditis, focal, lymphoplasmacytic, minimal
  - 3) Trunk kidney (includes margin of head kidney), and liver - no significant lesions
- Comment: same as slide #8.

Slide 10: autolysis, mild to moderate

- 1) Head/trunk kidney, heart, and spleen - no significant lesions
- Comment: none

Slide 11: autolysis, mild

- 1) Head/trunk kidney, heart, and spleen - no significant lesions
- Comment: none

Slide 12: autolysis, mild (other organs) to moderate (liver, intestine)

- 1) Hepatic biliary preductular cell hyperplasia, diffuse, mild
  - 2) Myocardial karyomegaly, focal, moderate
  - 3) Epicarditis, lymphocytic, mild, multifocal
  - 4) Intestine: peritonitis, with fibrous fronds, focal, mild
  - 5) Spleen: peritonitis, granulomatous, pleocellular, severe, regionally diffuse, with multiple fine fibrous fronds, multinucleate giant cells, and small numbers of 40- to 100-µm-diameter vacuoles
  - 6) Trunk kidney, and spleen - no significant lesions.
- Comment: Biliary preductular cell hyperplasia is evidence of exposure to toxins. The toxins could be produced inside the fish (e.g., bacterial toxins) or come from outside the fish (e.g., from the water or the feed). The lesions on the surface of the intestine and spleen are consistent with chronic antigenic stimulation; differentials include vaccine reaction and bacterial infection.

Slide 13: autolysis, mild to moderate

- 1) Spleen: peritonitis, granulomatous, pleocellular, mild, regionally diffuse, with multiple fine fibrous fronds, multinucleate giant cells, and small numbers of 40- to 100-µm-diameter vacuoles
  - 2) Hepatocellular fatty change, diffuse, moderate
  - 3) Renal tubular intracytoplasmic protein droplets, multifocal, moderate
  - 4) Epicarditis, lymphocytic, mild, diffuse
- Comment: same as #8, plus: With a PAS stain, only about 1% of the hepatocytes contained PAS+ cytoplasmic material (probably glycogen), the other vacuoles are presumed to be fat (note that alcohol dissolves lipid; because these tissues were put in alcohol for shipping, lipid in the cells was probably



dissolved during shipping; therefore, I did not attempt a fat stain; this problem will be eliminated when tissues are shipped in water or physiologic saline). Hepatocellular lipidosis often occurs in cases of inadequate nutrition or poor feeding. Renal tubular epithelial protein droplets are normal in some species, or they may be an indication of glomerular disease. Ferguson ("Systemic Pathology of Fish," 1989) reports an association of renal protein droplets and high ammonia levels in salmonids.

/sr

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-02684      **Date** 10-Aug-2004      **Report** 23-Aug-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 12430      A 2.3-41 (1-6)

**Farm:**

**Vet Clinic:**

**Attending**

**Specimen:** Tissue - Formalized

**Count** 1

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

Gary D. Marty, D.V.M., Ph.D.;  
Diplomate, A.C.V.P  
Fish Pathologist

**History/Symptoms**

Submitted Provincial Surveillance Program samples for routine histology.

AHC - virology submission 2004/02313.

Sample ID: A 2.3 -41 (1-6)

**Histopathology**

Slide 1: autolysis, mild (other organs) to moderate (liver and spleen)

1) Head kidney, liver, heart, and spleen - no significant lesions.

Comment: none

Slide 2: autolysis, mild (other organs) to moderate (liver)

1) Head kidney, liver, heart, spleen - no significant lesions

Comment: none

Slide 3: autolysis, mild (other organs) to moderate (liver)

1) Spleen: peritonitis, granulomatous, lymphoplasmacytic, regionally diffuse, moderate, with fine fibrous fronds and 30-µm-diameter vacuoles

2) Head kidney, heart, and spleen - no significant lesions

Comment: The lesions on the margin of the spleen are consistent with chronic antigenic stimulation (e.g., vaccine adjuvant).

Slide 4: autolysis, mild

1) Peritonitis (mesenteries near spleen), granulomatous, lymphoplasmacytic, multifocal, mild, with fine fibrous fronds and an 80-µm-diameter vacuole

2) Hepatitis and peritonitis, granulomatous, lymphoplasmacytic, multifocal, mild

3) Renal tubular intracytoplasmic protein droplets, multifocal, mild

4) Head kidney and heart - no significant lesions

Comment: The lesions in the liver and mesenteries around the spleen are consistent with chronic antigenic stimulation (e.g., vaccine adjuvant). Renal tubular epithelial protein droplets are normal in some species, or they may be an indication of glomerular disease. Ferguson ("Systemic Pathology of Fish," 1989) reports in salmonids an association of renal protein droplets and high ammonia levels.

Slide 5: autolysis, mild (other organs) to moderate (liver)

1) Hepatic biliary preductular cell hyperplasia, diffuse, mild

2) Epicarditis, focal, lymphoplasmacytic, mild

3) Peritonitis (mesenteries near spleen), lymphoplasmacytic, regionally diffuse, mild

4) Head kidney and spleen - no significant lesions

Comment: Biliary preductular cell hyperplasia is evidence of exposure to toxins. The toxins could be produced inside the fish (e.g., bacterial toxins) or come from outside the fish (e.g., from the water or the feed).

Slide 6: autolysis, mild (spleen) to moderate (liver and head kidney)

1) Liver, heart, head kidney - no significant lesions

Comment: none

/sr



**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-02685      **Date** 10-Aug-2004      **Report** 23-Aug-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 12431      A 2.3 - 40 (1)

**Farm:**

**Vet Clinic:**

**Attending**

**Specimen:** Tissue - Formalized

**Count** 1

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

Gary D. Marty, D.V.M., Ph.D.;  
Diplomate, A.C.V.P  
Fish Pathologist



**History/Symptoms**

Submitted Provincial Surveillance Program samples for routine histology.

AHC - virology submission 2004/02315 and 2004/02389.

Sample ID: A 2.3 -40 (1)

**Histopathology**

Slide 1: autolysis, mild (other organs) to moderate (liver)

- 1) Renal interstitial edema and hematopoietic hypoplasia, regionally diffuse, mild
- 2) Hepatic mural thrombi, non-occlusive, multifocal, moderate
- 3) Heart, and spleen - no significant lesions.

Comment:

Multiple vascular thrombi in the liver probably contributed to the death of this fish. Hepatic thrombi, along with renal interstitial edema, are consistent with a systemic bacterial infection (specific cause unknown). A systemic viral infection (e.g., IHN) is a less likely differential because the renal interstitium has no evidence of necrosis of hematopoietic cells. Hematopoietic cell hypoplasia might be a real reduction in hematopoietic cells, but it might be only a relative reduction due to expansion of the interstitium by edema; either way, the kidney does not provide evidence that the hematopoietic system was responding to an infection.

/sr



**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-02686      **Date** 10-Aug-2004      **Report** 23-Aug-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 12432      A 2.3 - 39 (1-3)

**Farm:**

**Vet Clinic:**

**Attending**

**Specimen:** Tissue - Formalized

**Count** 1

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

Gary D. Marty, D.V.M., Ph.D.;  
Diplomate, A.C.V.P  
Fish Pathologist

**History/Symptoms**

Submitted Provincial Surveillance Program samples for routine histology.

AHC - virology submission 2004/02314.

Sample ID: A 2.3 -39 (1-3).

**Histopathology**

Slide 1: autolysis, mild

- 1) Hepatic pericholangitis, lymphocytic, focal, mild
- 2) Hepatocellular single cell necrosis (apoptosis), disseminated, acute, moderate
- 3) Spleen and surrounding mesenteries: peritonitis, granulomatous, lymphoplasmacytic, regionally diffuse, mild, with occasional fine fibrous fronds

Trunk kidney, heart, and spleen - no significant lesions.

Comment: Hepatocellular single cell necrosis (apoptosis) can occur in rapidly growing fish that suddenly go off feed about 24 hours before death. Apoptosis is the normal way in which hepatocyte numbers are decreased (i.e., the hepatocytes are not needed when growing fish stop feeding because few to no nutrients are being absorbed into the blood and entering the liver for processing). Peritonitis is consistent with a foreign body reaction, probably in response to vaccine adjuvant.

Slide 2: autolysis, mild

- 1) Hepatic and splenic peritonitis, lymphoplasmacytic, multifocal, mild, with occasional fine fibrocellular fronds
- 2) Epicarditis, regionally diffuse, lymphocytic, minimal
- 3) Head kidney - no significant lesions

Comment: peritonitis is consistent with a foreign body reaction, probably in response to vaccine adjuvant.

Slide 3: autolysis, mild

- 1) Hepatic necrosis, acute, multifocal, moderate
- 2) Splenic peritonitis, lymphoplasmacytic, multifocal, mild, with occasional fine fibrocellular fronds and intralesional globular eosinophilic material
- 3) Intrasplenic multinucleate giant cell macrophage, focal
- 4) Epicarditis, multifocal, lymphocytic, mild
- 5) Head kidney and trunk kidney - no significant lesions

Comment: Hepatic coagulative necrosis, the most significant lesion in this fish, is usually associated with vascular compromise; differentials include bacterial and viral infections, as well as metabolic disturbances. Peritonitis is consistent with a foreign body reaction, probably in response to vaccine adjuvant.

/sr



**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-02689      **Date** 10-Aug-2004      **Report** 17-Aug-2004

**Report**      **Copies**

**Submitter:** 9439 Marine Harvest Canada (M)

**Owner** 12434 Log Number 5130

**Farm:**

**Vet Clinic:**

**Attending**

**Specimen:** Tissue - Fresh

**Count** 10

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

J.H. Robinson, D.V.M.  
Veterinary Virologist

**History/Symptoms**

Submitted 10 samples for IHNV - PCR and tissue culture.

PO # 523230.

**Virology**

Fish viruses negative by culture of 10 tissue samples.

\* Results faxed Sept. 22/04.

**Molecular Diagnostics/PCR**

Samples 1-10: IHN Virus negative by PCR.

\* Results faxed Aug. 17/04.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-02719      **Date** 12-Aug-2004      **Report** 13-Aug-2004

**Report**      **Copies**

**Submitter:** 9283      Pan Fish Canada (Omega Salmon  
Group Ltd.)

**Owner** 9283      Pan Fish Canada (Omega Salmon  
Group Ltd.)

**Farm:**  
**Vet Clinic:**  
**Attending**

**Specimen:** Tissue - Formalized

**Count** 1

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

S.A. Raverty, D.V.M.,  
Veterinary Pathologist



**History/Symptoms**

Submitted the histo samples from some of our Spring entry Atlantics. They have mouth rot, but I think there is something else going on as well. Some of the older fish had quite severe petechial hemorrhages on the swim bladder, pyloric caecae, cecal fat and body wall. Unfortunately none of the fresh ones did so I didn't get a good sample from any severely affected fish. Please send the slides back to Pan Fish when you are done.

Submitted by Jen.

**Histopathology**

1). Peritoneum: Peritonitis, mild to moderate, multifocal, granulomatous, chronic with filariform to papillary mesothelial hyperplasia and vascular congestion

There are no significant lesions within the pyloric caecae, liver, kidney, gills, or heart.

**Final Comments**

Close evaluation of the coelomic cavity did not reveal any indication of acute hemorrhage and based on the small size of the sectioned vasculature, it is difficult to resolve whether the grossly noted petechiae was due to congestion and hyperemia or some other process. The observed discolouration may be associated with increased vascular perfusion associated with the peritonitis. This inflammatory infiltrate is low grade and likely related to long past vaccination, bacterial infection or some other related process. Should fish continue to exhibit gross lesions, follow up submission of fresh tissue for viral culture or possible molecular studies may be considered. Post mortem change in 1 of 2 sections hampered microscopic assessment of the tissues.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-02732      **Date** 13-Aug-2004      **Report** 20-Aug-2004

**Report**      **Copies**

**Submitter:** 11899      Grieg Seafoods B.C. Ltd.

**Owner** 12461      Muchalat South

**Farm:**

**Vet Clinic:**

**Attending**      Dr. Milligan

**Specimen:** Tissue - Fresh

**Count** 9

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

J.H. Robinson, D.V.M.  
Veterinary Virologist

**History/Symptoms**

Please find muscle tissue samples from smolts.

M. South Pen 1 - 3 samples

M. South Pen 7 - 3 samples

M. South Pen 8 - 3 samples

Williamson - 1 sample

Request PCR for Kudoa.

**Molecular Diagnostics/PCR**

Samples #1-1, 1-2, 1-3; #7-1, 7-2, 7-3; #8-1, 8-2, 8-3: Kudoa thyrsites Negative by PCR.

\*\* Results faxed on August 20, 2004.

/mb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-02780      **Date** 19-Aug-2004      **Report** 02-Sep-2004

**Report**      **Copies**

**Submitter:** 10184      Target Marine Hatcheries (Reports)

**Owner** 10184      Target Marine Hatcheries (Reports)

**Farm:**

**Vet Clinic:**

**Attending**      Dr. Sonja Saksida

**Specimen:** Multiple Specimens

**Count** 20

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:** Mixed

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

Gary D. Marty, D.V.M., Ph.D.;  
Diplomate, A.C.V.P  
Fish Pathologist

**History/Symptoms**

PO #52961. Flared gills. Pop eyes. Hemorrhage around eyes. Eye pecks. Spike in mortality over 7 days.  
Treatments: none.  
Specimens: Moribunds and morts: TSA culture plate of gills.  
Request general fish health check for furunculosis, BKD, bacterial gill disease, fungal disease and gill parasites.

**Gross Pathology**

Four bags of dead fish on ice were submitted on ice for necropsy (they were shipped on 8-18-04).

Bags were labeled: "Morts" (~14 fish), "Morts (2)" (~22 fish), "Moribunds" (11 fish), and "Moribunds (2)" (4 fish). Most of the fish in all bags except for the "moribunds" bag had ruptured abdominal cavities, most likely resulting from severe autolysis (decay after death). The fish in the "moribunds" bag were too autolyzed for histopathology, but 5 fish were examined for external parasites on the gill and skin (all were negative), and viscera were removed from each fish and pooled for PCR analysis for IHN, IPN, ISA, and *Piscirickettsia salmonis* (all were negative). Gills of each of the 5 fish were brown and friable (autolyzed). Size of fish examined for external parasites:

Fish #1 - 2.1 g, 6.2 cm (total length)

Fish #2 - 2.0 g, 5.9 cm

Fish #3 - 2.0 g, 6.0 cm

Fish #4 - 2.4 g, 6.4 cm

Fish #5 - 2.5g, 6.3 cm

A TSA bacteriological plate with two streaks from gill (dated 16-08-04) was submitted along with the fish. Bacteria identification of plate contents is pending.

**Bacteriology**

*Pseudomonas* sent for DNA sequencing for species identification  
Bacteria identified as *Pantoea* sp.  
No fungus isolated

*Pseudomonas* identified as *Pseudomonas jessenii* by DNA sequencing.  
These are not known fish pathogens.

\* Results faxed on Sept 13/04.

**Molecular Diagnostics/PCR**

IPN Virus Negative by PCR  
IHN Virus Negative by PCR  
*Piscirickettsia salmonis* Negative by PCR  
ISA Virus Negative by PCR



**Final Comments**

Unfortunately, we were not able to establish a cause of morbidity and mortality in these fish. PCR analysis ruled out IHN, IPN, ISA, and *Piscirickettsia salmonis*. The tissues were too autolyzed for histopathology. If fish continue to show similar clinical signs, please resubmit tissues. Tissue for histopathology can be preserved on site in 10% neutral buffered formalin (immerse 1 part tissue in 10 parts of 10% formalin); after 24 hours, tissues can be transferred to physiological saline (just enough to keep the tissues moist), placed in a leak-proof container, and shipped. Tissues for virus isolation and bacteriology need to be shipped immediately, surrounded by gel ice, after the fish are killed.

/sr

# ANIMAL HEALTH CENTRE

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

## Case Report

**Submission** 2004-02840      **Date** 26-Aug-2004      **Report** 13-Sep-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 12507      A 3.2 - 47 (1-4)

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**      Dr. J. Constantine

**Specimen:** Tissue - Fresh

**Count** 4

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

Gary D. Marty, D.V.M., Ph.D.;  
Diplomate, A.C.V.P  
Fish Pathologist



**History/Symptoms**

Submitted Provincial Surveillance Program samples for virology - PCR for IHN, ISA, IPN, VHS, and *Piscirickettsia salmonis*. Culture any PCR positive samples.

Sample ID: A 3.2 - 47 (1-4).

Addendum: Samples submitted for routine histology processing and analysis on September 3, 2004.

**Histopathology**

Slide 1: autolysis, none (other organs) to mild (liver, head kidney)

- 1) Liver: pericholangitis, lymphocytic, multifocal, mild
- 2) Heart: no significant lesions
- 3) Spleen: splenitis, granulomatous, multifocal, moderate (probable *Renibacterium salmoninarum*)
- 4) Trunk kidney: not included in the sections examined
- 5) Head kidney: no significant lesions

Comment: Probable bacterial kidney disease; differentials: other bacteria.

Slide 2: autolysis, none (all organs)

- 1) Liver: hepatocellular fatty change (lipidosis), multifocal, coalescing, moderate
- 2) Liver: hepatitis, perivascular, granulomatous, focal, mild (probable *Renibacterium salmoninarum*)
- 3) Heart: myocardial karyomegaly, multifocal, mild
- 4) Spleen: no significant lesions
- 5) Trunk kidney: not included in the sections examined
- 6) Head kidney: no significant lesions

Comment: Hepatocellular fatty change (lipidosis) often occurs when fish are not feeding; it also occurs in cases of inadequate nutrition. The cause and significance of myocardial karyomegaly is unknown; karyomegaly in other cell types has been associated with exposure to algal toxins (e.g., hepatocytes exposed to microcystin LR).

Slide 3: autolysis, none (other organs) to mild (liver)

- 1) Liver: hepatic necrosis, chronic, multifocal, moderate, with fibrosis
- 2) Liver: hepatitis, granulomatous, multifocal, mild (probable *Renibacterium salmoninarum*)
- 3) Heart: myocardial karyomegaly, multifocal, mild
- 4) Spleen: no significant lesions
- 5) Trunk kidney: not included in the sections examined
- 6) Head kidney: no significant lesions

Comment: Hepatic necrosis can be caused by inadequate vascular perfusion or direct cytotoxicity from viral or bacterial infections. Small granulomas in the liver are evidence of a chronic bacterial infection like *Renibacterium salmoninarum* (the cause of bacterial kidney disease).

Slide 4: autolysis, none (other organs) to mild (liver)

- 1) Liver: no significant lesions
- 2) Heart: no significant lesions
- 3) Spleen: no significant lesions
- 4) Trunk kidney: not included in the sections examined
- 5) Head kidney: nephritis, granulomatous, multifocal, mild (probable *Renibacterium salmoninarum*)

Comment: Small granulomas in the kidney are evidence of a chronic bacterial infection like *Renibacterium salmoninarum*



**Molecular Diagnostics/PCR**

Samples 1-4: ISA Virus negative by PCR.

Samples 1-4: IPN Virus negative by PCR.

Samples 1-4: IHN, VHS, Piscirickettsia salmonis negative by PCR.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll=Free: 1-800-661-9903

**Case Report**

**Submission** 2004-02912      **Date** 02-Sep-2004      **Report** 20-Sep-2004

**Report**      **Copies**

**Submitter:** 9439 Marine Harvest Canada (M)  
**Owner** 12544 #5145/#5149, Marine Harvest  
**Farm:**  
**Vet Clinic:**  
**Attending**

**Specimen:** Tissue - Fresh      **Count** 4      **Flock Herd Size:**  
**Species:** Atlantic Salmon      **Age**  
**Breed:**      **Sex:**

**Feed:**      **Feed**

**Vaccination****Treatmen****Diagnosis**

Gary D. Marty, D.V.M., Ph.D.;  
Diplomate, A.C.V.P  
Fish Pathologist

**History/Symptoms**

Submitted two samples from each 5145 and 5149 for virology - IHNV - PCR and VITSV - PCR and tissue culture.

Please use PO# 523247.

**Virology**

4 samples inoculated onto tissue culture - all negative.

\* Results faxed on Oct 7/04.

**Molecular Diagnostics/PCR**

ISA Virus negative by PCR.  
Renibacterium salmoninarum negative by PCR.  
IHN Virus negative by PCR.  
VHS Virus negative by PCR.

\* Results faxed Sept. 20/04.

/bb/mm

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-02922      **Date** 03-Sep-2004      **Report** 13-Sep-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 12548      A 3.3-46 (1-7)

**Farm:**

**Vet Clinic:**

**Attending**      Dr. J. Constantine

**Specimen:** Tissue - Formalized

**Count** 7

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

Gary D. Marty, D.V.M., Ph.D.;  
Diplomate, A.C.V.P  
Fish Pathologist

**History/Symptoms**

Submitted Provincial Surveillance Program samples for routine histology and analysis.

Sample ID: A 3.3 - 46 (1-7)



**Histopathology**

Slide 1: autolysis, none (other organs) to mild (liver)

- 1) Liver: hepatocellular fatty change (lipidosis), diffuse, mild
- 2) Heart: myocardial karyomegaly, multifocal, mild
- 3) Spleen: peritonitis, focal, with fibrocellular fronds, mild
- 4) Trunk kidney: intratubular necrotic cells, multifocal, mild
- 5) Head kidney: no significant lesions

Comment: Intratubular necrotic cells in the kidney indicate that a low level of tubular necrosis was occurring at the time of death, but none of the affected tubules were included in the section examined. Renal tubular epithelial necrosis results from acute damage to renal epithelial cells. Causes in fish include exposure to toxicants (e.g., bacterial toxins, or aminoglycoside antibiotics such as Gentamicin). Splenic peritonitis is consistent with a foreign body reaction, probably in response to vaccine adjuvant. Hepatocellular fatty change (lipidosis) often occurs when fish are not feeding; it also occurs in cases of inadequate nutrition. The cause and significance of myocardial karyomegaly is unknown; karyomegaly in other cell types has been associated with exposure to algal toxins (e.g., hepatocytes exposed to microcystin LR).

Slide 2: autolysis, mild (other organs) to moderate (liver)

- 1) Liver: no significant lesions
- 2) Heart: myocarditis, granulomatous, diffuse, severe
- 3) Heart: myocardial karyomegaly, multifocal, mild
- 4) Spleen: no significant lesions
- 5) Trunk kidney: not included in the sections examined
- 6) Head kidney: no significant lesions

Comment: The granulomatous lesions in the heart are indicative of chronic immune stimulation; infection with *Renibacterium salmoninarum* is likely (although no organisms are observed in the section)

Slide 3: autolysis, mild (other organs) to mild (liver)

- 1) Liver: bile ductular hyperplasia, multifocal, moderate
- 2) Heart: no significant lesions
- 3) Spleen: no significant lesions
- 4) Trunk kidney: renal tubular protein casts, multifocal, mild
- 5) Kidney: nephritis, interstitial, granulomatous, focal, mild
- 5) Head kidney: no significant lesions

Comment: Bile ductular hyperplasia is evidence of exposure to toxins. The toxins could be produced inside the fish (e.g., bacterial toxins) or come from outside the fish (e.g., from the water or the feed). Renal tubular protein casts result from glomerular or tubular dysfunction; excess protein leaks through glomeruli, or tubules are unable to reabsorb protein. The most common organism associated with granulomatous nephritis in salmon is *Renibacterium salmoninarum*, the cause of bacterial kidney disease.

Slide 4: autolysis, none (other organs) to mild (liver)

- 1) Liver: pericholangitis, lymphocytic, multifocal, mild
- 2) Heart: myocardial karyomegaly, multifocal, mild
- 3) Heart: epicarditis, regionally diffuse, lymphocytic, mild
- 4) Spleen: no significant lesions
- 5) Trunk kidney (1 piece): renal tubular epithelial necrosis, focal, chronic, moderate, with peritubular fibrosis and multifocal intratubular necrotic cells
- 7) Trunk kidney (other piece): no significant lesions
- 8) Head kidney: no significant lesions

Comment: Renal tubular epithelial necrosis results from acute damage to renal epithelial cells; damage is reversible if the basement membrane is spared (as in this case). Causes in fish include exposure to toxicants (e.g., bacterial toxins, or aminoglycoside antibiotics such as Gentamicin).



Slide 5: autolysis, none (other organs) to mild (liver)

- 1) Liver: hepatitis, perivascular and periductular, lymphohistiocytic, multifocal, mild
- 2) Heart: 1-mm-diameter focus of granulomatous inflammation in the lumen of the ventricle (note: this focus if inflammation may be a post mortem artefact that came from somewhere else in the body)
- 3) Spleen: splenitis, granulomatous, multifocal, mild
- 4) Trunk kidney: nephritis, granulomatous, multifocal, mild
- 5) Head kidney: nephritis, granulomatous, multifocal, mild

Comment: The most common organism associated with multi-organ granulomatous inflammation in salmon is *Renibacterium salmoninarum*, the cause of bacterial kidney disease.

Slide 6: autolysis, mild (other organs) to moderate (liver)

- 1) Liver: hepatitis, granulomatous, focal (200 µm in diameter), mild
- 2) Heart: epicarditis, multifocal, lymphocytic, mild
- 3) Spleen: no significant lesions
- 4) Trunk kidney: renal tubular epithelial necrosis, diffuse, subacute, moderate, with intratubular necrotic cells and peritubular fibrosis
- 5) Head kidney: no significant lesions

Comment: Kidney comment is the same as slide #4. The most common organism associated with granulomatous inflammation in salmon is *Renibacterium salmoninarum*, the cause of bacterial kidney disease.

Slide 7: autolysis, none (other organs) to mild (liver)

- 1) Liver: pericholangitis, lymphocytic, multifocal, mild, with moderate numbers of eosinophilic granular cells
- 2) Heart: myocardial karyomegaly, multifocal, mild
- 3) Spleen: no significant lesions
- 4) Trunk kidney: no significant lesions
- 5) Head kidney: not included in the sections examined

Comment: These organs have no lesions to help explain the death of this fish. Pericholangitis is consistent with chronic immune stimulation, possibly from a bacterial infection ascending from the intestine into the liver via the biliary system.

/bb



**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll=Free: 1-800-661-9903

**Case Report**

**Submission** 2004-02923      **Date** 03-Sep-2004      **Report** 24-Sep-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 13491      A 3.2 - 51

**Farm:**

**Vet Clinic:**

**Attending**      Dr. J. Constantine

**Specimen:** Tissue - Fresh

**Count** 10

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

Gary D. Marty, D.V.M., Ph.D.;  
Diplomate, A.C.V.P  
Fish Pathologist

**History/Symptoms**

Submitted Provincial Surveillance Program samples for virology - PCR for IHN, ISA, IPN, VHS, and *Piscirickettsia salmonis*. Culture any PCR positive samples.

Addendum: Jan. 20/05. Samples submitted for routine histology processing and analysis.

**Histopathology**

ADDENDUM (Feb. 10/05):

Slide 1: autolysis, none (all organs)

1. Liver: no significant lesions
2. Heart: epicarditis, regionally diffuse, lymphocytic, mild
3. Spleen: peritonitis, chronic, focal, with fibrocellular fronds and intralesional focus of mineral (60 µm in diameter), moderate
4. Trunk kidney: not included on the slide
5. Head kidney: interstitial cell hyperplasia, diffuse, moderate

Comment: Epicarditis is evidence of chronic immune stimulation, but the cause is otherwise unknown. Splenic peritonitis is consistent with a foreign body reaction, probably in response to vaccine adjuvant. Interstitial cell hyperplasia in the kidney results from increased demand for erythrocytes or white blood cells somewhere in the body (renal interstitial cells are the blood-forming or hematopoietic cells in the kidney). The liver has several foci of deeply basophilic cells and connective tissue; foci range up to about 250 µm in diameter; I think this pattern of staining is an artefact.

Slide 2: autolysis, none (all organs)

1. Liver: no significant lesions
2. Heart: epicarditis, regionally diffuse, lymphocytic, mild
3. Spleen: peritonitis, chronic, focal, mild
4. Trunk kidney: interstitial cell hyperplasia, diffuse, moderate
5. Head kidney: interstitial cell hyperplasia, diffuse, mild

Comment: none

Slide 3: autolysis, none (all organs)

1. Liver: no significant lesions
2. Heart: myocardial karyomegaly, multifocal, mild
3. Spleen: peritonitis, chronic, focal, moderate
4. Trunk kidney: no significant lesions
5. Head kidney: not included on the slide

Comment: The cause and significance of myocardial karyomegaly is unknown; karyomegaly in other cell types has been associated with exposure to algal toxins (e.g., hepatocytes exposed to microcystin LR in netpen liver disease).

Slide 4: autolysis, mild (other organs) to moderate (liver)

1. Liver: no significant lesions
2. Heart: epicarditis, regionally diffuse, lymphocytic, mild
3. Spleen: peritonitis, chronic, focal, mild
4. Trunk kidney: no significant lesions
5. Head kidney: no significant lesions

Comment: These organs have no lesions to help explain the death of this fish.

Slide 5: autolysis, none (other organs) to mild (liver)

1. Liver: no significant lesions
- 2a. Heart: myocardial karyomegaly, multifocal, mild
- 2b. Heart: epicarditis, regionally diffuse, lymphocytic, mild
3. Spleen: peritonitis, chronic, focal, mild
4. Trunk kidney: nephritis, interstitial, granulomatous, multifocal, mild
5. Head kidney: nephritis, interstitial, granulomatous, multifocal, mild

Comment: The most common organism associated with granulomatous nephritis in salmon is *Renibacterium salmoninarum*, the cause of bacterial kidney disease.





Slide 6: autolysis, moderate (other organs) to mild (heart)

1. Liver: no significant lesions
2. Heart: epicarditis, focal, lymphocytic, mild
3. Spleen: no significant lesions
4. Trunk kidney: no significant lesions
5. Head kidney: not included on the slide

Comment: These organs have no lesions to help explain the death of this fish.

Slide 7: autolysis, mild (other organs) to moderate (liver)

1. Liver: hepatitis, granulomatous, multifocal, severe
- 2a. Heart: epicarditis, granulomatous, diffuse, severe
- 2b. Heart: myocarditis, granulomatous, multifocal, severe
3. Spleen: peritonitis, granulomatous, focal, moderate
- 4a. Trunk kidney: interstitial cell hyperplasia, diffuse, moderate
- 4b. Trunk Kidney: tubular intracytoplasmic protein droplets, multifocal, moderate
5. Head kidney: not included on the slide

Comment: The most common organism associated with disseminated granulomatous inflammation in salmon is *Renibacterium salmoninarum*, the cause of bacterial kidney disease. Renal tubular epithelial protein droplets are normal in some species, or they may be an indication of glomerular disease. Ferguson ("Systemic Pathology of Fish," 1989) reports an association of renal protein droplets and high ammonia levels in salmonids.

Slide 8: autolysis, mild (all organs)

1. Liver: pericholangitis, lymphocytic, multifocal, mild
2. Heart: not included on the slide
3. Spleen: peritonitis, chronic, focal, with fibrocellular fronds, mild
4. Trunk kidney: not included on the slide
5. Head kidney: interstitial cell hyperplasia, diffuse, mild

Comment: Lymphocytic inflammation around bile ductules (liver) is evidence of chronic immune stimulation. This type of inflammation can result from bacteria ascending from the intestine to the liver through the biliary system.

Slide 9: autolysis, mild (other organs) to moderate (liver)

1. Liver: hepatitis, granulomatous, multifocal, with multinucleate giant cells surrounding amorphous grey-brown material, severe
- 2a. Heart: carditis, granulomatous, multifocal to diffuse, moderate
- 2b. Heart: myocardial karyomegaly, multifocal, mild
3. Spleen: splenitis, granulomatous, multifocal, with multinucleate giant cells surrounding amorphous grey-brown material, severe
4. Trunk kidney: nephritis, interstitial, granulomatous, multifocal, with multinucleate giant cells surrounding amorphous grey-brown material, severe
5. Head kidney: nephritis, interstitial, granulomatous, multifocal, with multinucleate giant cells surrounding amorphous grey-brown material, severe

Comment: Granulomatous inflammation in multiple organs of this fish is unusually severe. The amorphous grey-brown material most likely is foreign material, probably of vaccine origin. The larger granulomas in the spleen contain central necrotic regions with moderate numbers of neutrophils. Granulomatous inflammation in the heart does not contain foreign material, but probably has the same underlying cause.

Slide 10: autolysis, none (other organs) to mild (liver)

1. Liver: pigmented macrophage aggregates, multifocal, moderate



- 2. Heart: endocarditis and epicarditis, multifocal, granulomatous, lymphocytic
- 3a. Spleen: splenitis, interstitial, granulomatous, multifocal, mild
- 3b. Spleen: pigmented macrophage aggregates, multifocal, moderate
- 3c. Spleen: peritonitis, chronic, focal, with fibrocellular fronds, mild
- 4a. Trunk kidney: nephritis, interstitial, granulomatous, multifocal, mild
- 4b. Trunk kidney: dilated tubules, diffuse, mild
- 5. Head kidney: no significant lesions

Comment: The pale-yellow pigment in the liver and spleen has small amounts of lipofuscin, but no iron (confirmed with special stains). Accumulation of lipofuscin is a non-specific change that can result from a variety of insults, including rancid feed, low levels of antioxidants in the feed, chronic infections, and exposure to organic contaminants. Conditions that lead to moderate to abundant lipofuscin have been associated with decreased growth and survival in several studies. Granulomatous inflammation in the spleen, kidney, and heart is evidence of chronic immune stimulation; differentials include vaccine adjuvant, *Renibacterium salmoninarum*, or other chronic bacterial infection. Dilated renal tubules are evidence that urine flow is not normal; the cause is unknown.

#### **Molecular Diagnostics/PCR**

Specimens 1-5, 6-10: IHN, VHS, IPN, ISA, *Piscirickettsia salmonis* negative by PCR.

\* Results faxed Sept. 24/04.

/bb



**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-02924      **Date** 03-Sep-2004      **Report** 24-Sep-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 12550      A 3.2 - 50 (1-12)

**Farm:**

**Vet Clinic:**

**Attending**      Dr. J. Constantine

**Specimen:** Tissue - Fresh

**Count** 12

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

Gary D. Marty, D.V.M., Ph.D.;  
Diplomate, A.C.V.P  
Fish Pathologist

**History/Symptoms**

Submitted Provincial Surveillance Program samples for virology - PCR for IHN, ISA, IPN, VHS, and Piscirickettsia salmonis. Culture any PCR positive samples.

Sample ID: A 3.2 - 50 (1-12)

Addendum: Jan. 20/2005 samples submitted for routine histology processing and analysis.

**Histopathology**

ADDENDUM (Feb. 11/05):

Slide 1: autolysis, none (all organs)

- 1a. Liver: peritonitis, chronic, focal, with fibrocellular fronds, mild
- 1b. Liver: pericholangitis, lymphocytic, multifocal, mild
- 1c. Liver: biliary preductular cell hyperplasia, diffuse, mild
- 2a. Heart: myocardial karyomegaly, multifocal, mild
- 2b. Heart: epicarditis, regionally diffuse, lymphocytic, mild
3. Spleen: no significant lesions
4. Trunk kidney: no significant lesions
5. Head kidney: not included on the slide

Comment: Hepatic peritonitis is consistent with a foreign body reaction, probably in response to vaccine adjuvant. Lymphocytic inflammation around bile ductules (liver) is evidence of chronic immune stimulation. This type of inflammation can result from bacteria ascending from the intestine to the liver through the biliary system. Biliary preductular cell hyperplasia is evidence of exposure to toxins. The toxins could be produced inside the fish (e.g., bacterial toxins) or come from outside the fish (e.g., from the water or the feed). The cause and significance of myocardial karyomegaly is unknown; karyomegaly in other cell types has been associated with exposure to algal toxins (e.g., hepatocytes exposed to microcystin LR in netpen liver disease). Epicarditis is evidence of chronic immune stimulation, but the cause is otherwise unknown.

Slide 2: autolysis, none (other organs) to mild (liver)

1. Liver: pericholangitis, lymphocytic, multifocal, mild
  2. Heart: epicarditis, regionally diffuse, lymphocytic, mild
  3. Spleen: peritonitis, chronic, focal, with fibrocellular fronds, mild
  4. Trunk kidney: no significant lesions
  5. Head kidney: no significant lesions
- Comment: none

Slide 3: autolysis, none (all organs)

1. Liver: pigmented macrophage aggregate, focal, mild
2. Heart: myocardial karyomegaly, multifocal, mild
3. Spleen: peritonitis, chronic, regionally diffuse, with fibrocellular fronds, mild
4. Trunk kidney: no significant lesions
5. Head kidney: no significant lesions

Comment: The pale-yellow pigment in the liver and spleen most likely is lipofuscin. Accumulation of lipofuscin is a non-specific change that can result from a variety of insults, including rancid feed, low levels of antioxidants in the feed, chronic infections, and exposure to organic contaminants. Conditions that lead to moderate to abundant lipofuscin have been associated with decreased growth and survival in several studies.

Slide 4: autolysis, none (all organs)

- 1a. Liver: biliary preductular cell hyperplasia, diffuse, mild
- 1b. Liver: pigmented macrophage aggregate, focal, mild
- 1c. Liver: pericholangitis, lymphocytic, multifocal, mild
- 2a. Heart: epicarditis and endocarditis, granulomatous, multifocal, mild
- 2b. Heart: myocardial karyomegaly, multifocal, moderate
3. Spleen: no significant lesions
4. Trunk kidney: not included on the slide
5. Head kidney: no significant lesions

Comment: The most common identified cause of granulomatous inflammation in the heart is probably *Renibacterium salmoninarum*; however, other bacteria (e.g., chronic forms of *Yersinia ruckeri*) have also





been associated with granulomatous inflammation.

Slide 5: autolysis, none (all organs)

1. Liver: pericholangitis, lymphocytic, multifocal, mild
- 2a. Heart: myocardial karyomegaly, multifocal, mild
- 2b. Heart: epicarditis, regionally diffuse, lymphohistiocytic, mild
3. Spleen: peritonitis, granulomatous, multifocal, moderate
4. Trunk kidney: eosinophilic granular cells in interstitial tissue, diffuse, mild
5. Head kidney: eosinophilic granular cells in interstitial tissue, diffuse, moderate

Comment: Epicarditis is evidence of chronic immune stimulation, but the cause is otherwise unknown. Increased numbers of eosinophilic granular cells have been associated with experimental infection with *Renibacterium salmoninarum*, the cause of bacterial kidney disease (Flaño et al.1996), but they are not described as a common finding in clinical cases. This case had no evidence of granulomatous inflammation more commonly associated with bacterial kidney disease. Increased numbers of eosinophilic granular cells are sometimes associated with chronic parasitic infections, but again, the inciting cause was not included in the sections examined.

Slide 6: autolysis, mild (all organs)

1. Liver: hepatocellular fatty change (lipidosis), diffuse, severe
- 2a. Heart: myocardial karyomegaly, multifocal, mild
- 2b. Heart: epicarditis, histiocytic, focal mild
3. Spleen: peritonitis, chronic, regionally diffuse, with fibrocellular fronds, moderate
4. Trunk kidney: no significant lesions
5. Head kidney: not included in the section

Comment: Hepatocellular fatty change (lipidosis) often occurs when fish are not feeding; it also occurs in cases of inadequate nutrition. Histiocytic epicarditis is evidence of chronic immune stimulation, but the cause is otherwise unknown. Hepatocyte nuclei stain poorly (very pale) but erythrocytes stain normally, including their nuclei; pale staining of hepatocyte nuclei might be related to severe hepatic fatty change.

Slide 7: autolysis, none (all organs)

- 1a. Liver: biliary preductular cell hyperplasia, diffuse, mild
- 1b. Liver: pericholangitis, lymphocytic, multifocal, mild
- 1c. Liver: peritonitis, chronic, focal, with fibrocellular fronds, mild
2. Heart: epicarditis, histiocytic, focal mild
3. Spleen: peritonitis, chronic, regionally diffuse, with fibrocellular fronds, moderate
4. Trunk kidney: no significant lesions
5. Head kidney: nephritis, interstitial, granulomatous, multifocal, mild

Comment: The most common identified cause of granulomatous inflammation in the kidney is probably *Renibacterium salmoninarum*; however, other bacteria (e.g., chronic forms of *Yersinia ruckeri*) have also been associated with granulomatous inflammation.

Slide 8: autolysis, none (all organs)

1. Liver: hepatocellular fatty change (lipidosis), diffuse, mild
2. Heart: myocardial karyomegaly, multifocal, mild
3. Spleen: peritonitis, chronic, regionally diffuse, with fibrocellular fronds, moderate
4. Trunk kidney: no significant lesions
5. Head kidney: no significant lesions

Comment: none

Slide 9: autolysis, none (other organs) to mild (trunk kidney, liver)

1. Liver: pericholangitis and perivascularitis, lymphoplasmacytic, multifocal, mild



- 2a. Heart: myocardial karyomegaly, multifocal, mild
- 2b. Heart: epicarditis, lymphohistiocytic, focal, mild
- 3. Spleen: peritonitis, chronic, regionally diffuse, with fibrocellular fronds, moderate
- 4. Trunk kidney: no significant lesions
- 5. Head kidney: not included on the slide
- Comment: none

Slide 10: autolysis, none (all organs)

- 1a. Liver: biliary preductular cell hyperplasia, diffuse, mild
- 1b. Liver: peritonitis, chronic, regionally diffuse, with fibrocellular fronds, mild
- 2a. Heart: myocardial karyomegaly, multifocal, mild
- 2b. Heart: epicarditis, lymphohistiocytic, regionally diffuse, mild
- 3. Spleen: peritonitis, chronic, regionally diffuse, with fibrocellular fronds, moderate
- 4. Trunk kidney: no significant lesions
- 5. Head kidney: no significant lesions
- Comment: A 400- $\mu$ m-diameter focus of hemorrhage with several foci of hyaline spheres (each about 15  $\mu$ m in diameter) is probably an artefact.

Slide 11: autolysis, none (other organs) to mild (liver)

- 1a. Liver: biliary preductular cell hyperplasia, diffuse, mild
- 1b. Liver: pericholangitis, lymphoplasmacytic, multifocal, mild
- 2. Heart: myocardial karyomegaly, multifocal, mild
- 3. Spleen: peritonitis, chronic, regionally diffuse, with fibrocellular fronds, moderate
- 4. Trunk kidney: eosinophilic granular cells in interstitial tissue, diffuse, mild
- 5. Head kidney: eosinophilic granular cells in interstitial tissue, diffuse, mild
- Comment: none

Slide 12: autolysis, none (other organs) to mild (liver)

- 1. Liver: hepatocellular fatty change (lipidosis), diffuse, mild
- 2a. Heart: myocardial karyomegaly, multifocal, moderate
- 2b. Heart: epicarditis, lymphohistiocytic, regionally diffuse, mild
- 3. Spleen: no significant lesions
- 4. Trunk kidney: eosinophilic granular cells in interstitial tissue, diffuse, mild
- 5. Head kidney: no significant lesions
- Comment: Two foci, 400- and 250- $\mu$ m in diameter, of hemorrhage with several foci of hyaline spheres (each about 15  $\mu$ m in diameter) is probably an artefact.

Literature cited:

Flaño, E., López-fierro, P., Razquin, B. E., and A. Villena. 1996. In vitro differentiation of eosinophilic granular cells in *Renibacterium salmoninarum*-infected gill cultures from rainbow trout. *J. Fish & Shellfish Immunology* 3: 173-184.



**Molecular Diagnostics/PCR**

Specimens 1-4, 5-8, 9-12: IHN, VHS, IPN, ISA, Piscirickettsia salmonis negative by PCR.

\* Results faxed Sept. 24/04.

/bb

# ANIMAL HEALTH CENTRE

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

## Case Report

**Submission** 2004-03116      **Date** 21-Sep-2004      **Report** 22-Sep-2004

**Report**      **Copies**

**Submitter:** 9283      Pan Fish Canada (Omega Salmon  
Group Ltd.)

**Owner** 9283      Pan Fish Canada (Omega Salmon  
Group Ltd.)

**Farm:**  
**Vet Clinic:**  
**Attending**

**Specimen:** Other  
**Species:** Atlantic Salmon  
**Breed:**

**Count** 1      **Flock Herd Size:**  
**Age**  
**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

Gary D. Marty, D.V.M., Ph.D.;  
Diplomate, A.C.V.P  
Fish Pathologist

**History/Symptoms**

Here are a few more cassettes for you to look at. These are from Atlantic salmon that were entered into seawater in May of this year. We are experiencing problems at some of our farms because caprellids have attached to and grazed on some of the fish leaving behind large lesions. This has obviously lead to osmoregulatory problems. At this specific farm, we are seeing a septicemia caused by *Vibrio* spp. I just want to make sure that this is the only thing going on here as this farm has had an IHN outbreak in the past. Please let me know if you have any questions. This is Pan Fish case number 13091604.

Jen Covello.

**Histopathology**

Three cassettes of fixed tissues were submitted and processed routinely into paraffin for an H&E section:

SP1 - spleen, intestine and surrounding fatty mesenteries, skeletal muscle, liver, and trunk kidney.

SP2 -spleen, intestine and surrounding fatty mesenteries, skin and skeletal muscle, liver, and trunk kidney (includes Corpuscles of Stannius).

SP3 - spleen, intestine and surrounding fatty mesenteries, skeletal muscle, liver, and trunk kidney (includes Corpuscles of Stannius).

Tissue preservation: good (slight autolysis on the tips of intestinal villi is fairly normal).

Measures of physiologic condition:

1. Hepatocellular glycogen depletion, severe (SP1, SP2, SP3)
2. Mesenteric adipose tissue depletion, none (SP1, SP2), mild (SP3)

**Diagnosis**

1. Skin: dermatitis, ulcerative, focal, with intralesional filamentous bacteria and focal granulomatous inflammation, moderate (SP2)
2. Skeletal muscle: necrosis, regionally diffuse, acute, with intralesional filamentous bacteria but minimal inflammation, mild (SP3), moderate (SP2), severe (SP1)
3. Liver: basophilic hepatocellular cytoplasm, diffuse (SP1, SP2, and SP3)
4. Trunk Kidney: interstitial cell hyperplasia, diffuse, mild (SP3), moderate (SP1, SP2)
5. Exocrine pancreas: single cell necrosis, scattered, mild (SP1, SP2, SP3)
6. Spleen and heart: no significant lesions





**Final Comments**

Ulcerative dermatitis and muscle necrosis, with intralesional filamentous bacteria are consistent with the clinical history of ulcers. As a likely pathogenesis, ulcers associated with parasite attachment become infected with filamentous bacteria; invasion of bacteria into deeper tissue results in enlarged ulcers and skeletal muscle necrosis. Because of the lack of necrosis in the liver and kidney, the lesions in these sections are not very characteristic of *Listonella* (*Vibrio*) *anguillarum* infection.

Basophilic cytoplasm in hepatocytes is an indication of active protein synthesis. It is normal in maturing females producing protein for deposition in their eggs. I have not seen hepatocellular basophilia described in juvenile salmon, but I suspect that it could be related to increased protein needed as part of the inflammatory response to the ulcers or in response to protein loss through the ulcers.

Interstitial cell hyperplasia in the trunk kidney is probably related to increased demand for hematopoietic cells (especially monocytes) in response to bacterial infections in multiple ulcers.

Necrosis of exocrine pancreas cells has been associated with bacterial and viral infections. Lack of necrosis in other organs, especially the kidney, makes Infectious Hematopoietic Necrosis virus an unlikely differential. If mortality increases out of proportion to the severity of ulcers, I suggest submitting fresh tissues for IHN PCR (more sensitive test than histopathology for IHN).

The measures of physiologic condition are consistent with healthy growing fish (no more than mild mesenteric fat depletion) that recently decreased their food intake (severe hepatocellular glycogen depletion).

/bb



**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-03225      **Date** 30-Sep-2004      **Report** 19-Oct-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 12681      A 3.1 - 45 (1-2)

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**

**Specimen:** Tissue - Fresh

**Count** 2

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

Gary D. Marty, D.V.M., Ph.D.;  
Diplomate, A.C.V.P  
Fish Pathologist

**History/Symptoms**

Submitted Provincial Surveillance Program samples for virology - PCR for IHN, ISA, IPN, VHS, and Piscirickettsia salmonis. Culture any PCR positive samples.

Sample ID: A 3.1 - 45 (1-2).

Addendum: Oct 7/04 - samples submitted for routine histology.

**Histopathology**

Slide 1: autolysis, none (other organs) to mild (liver)

1) Liver: hepatitis, granulomatous, multifocal, moderate, with occasional multinucleate giant cells

2a) Heart: ventricular endocarditis, granulomatous, diffuse, with occasional multinucleate giant cells, moderate

2b) Heart: epicarditis, multifocal, lymphocytic, mild

3) Spleen: no significant lesions

4a) Kidney: nephritis, interstitial, granulomatous, multifocal, mild

4b) Trunk kidney: interstitial cell hyperplasia, diffuse, moderate

5) Head kidney: nephritis, granulomatous, multifocal, moderate

Comment: The pattern of granulomatous inflammation in the heart is unusual. Macrophages line the endocardial surface throughout most of the ventricle, but they are rarely more than 2 cell layers thick. The endocardial lining of the bulbus arteriosus contains a combination of macrophages and eosinophilic granular cells. The cause of these lesions is unknown, but Renibacterium salmoninarum is a likely differential, particularly given the more classic lesions of bacterial kidney disease in the kidney and liver. Interstitial cell hyperplasia in the kidney results from increased demand for erythrocytes or white blood cells somewhere in the body (renal interstitial cells are the blood-forming or hematopoietic cells in the kidney). Epicarditis is evidence of chronic immune stimulation, but the cause is otherwise unknown.

Slide 2: autolysis, none (other organs) to mild (liver)

1a) Liver: hepatic necrosis, acute, multifocal, mild

1b) Liver: pericholangitis, lymphocytic, multifocal, mild

2) Heart: myocardial karyomegaly, multifocal, mild

3) Spleen: peritonitis, granulomatous, regionally diffuse, moderate, with fine fibrocellular fronds

4) Trunk kidney: no significant lesions

5) Head kidney: no significant lesions

Comment: Hepatic necrosis can be caused by inadequate vascular perfusion or direct cytotoxicity from viral or bacterial infections. Lymphocytic inflammation around bile ductules is evidence of chronic immune stimulation. This type of inflammation can result from bacteria ascending from the intestine to the liver through the biliary system. Splenic peritonitis is consistent with a foreign body reaction, probably in response to vaccine adjuvant. The cause and significance of myocardial karyomegaly is unknown; karyomegaly in other cell types has been associated with exposure to algal toxins (e.g., hepatocytes exposed to microcystin LR).

**Molecular Diagnostics/PCR**

Samples 1-2: IHN, VHS, ISA, IPN, Piscirickettsia salmonis negative by PCR.

/bb





# ANIMAL HEALTH CENTRE

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll=Free: 1-800-661-9903

## Case Report

**Submission** 2004-03226      **Date** 30-Sep-2004      **Report** 13-Oct-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 12682      A 3.1 - 46 (1-5)

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**

**Specimen:** Tissue - Fresh

**Count** 5

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

Gary D. Marty, D.V.M., Ph.D.;  
Diplomate, A.C.V.P  
Fish Pathologist

**History/Symptoms**

Submitted Provincial Surveillance Program samples for virology - PCR for IHN, ISA, IPN, VHS, and *Piscirickettsia salmonis*. Culture any PCR positive samples.

Sample ID: A 3.1 - 46 (1-5).

Addendum: Oct 7/04 - samples submitted for routine histology.



**Histopathology**

Slide 1 (A.3.1 - 46(1)): autolysis, none (other organs) to mild (liver)

- 1) Liver: hepatocellular single cell necrosis, disseminated, mild
- 1b) Liver: pericholangitis, lymphocytic, multifocal, mild
- 2) Heart: no significant lesions
- 3) Spleen and Liver: peritonitis, lymphoplasmacytic, granulomatous, regionally diffuse, mild, with occasional fine fibrocellular fronds
- 4) Trunk kidney: tubular intracytoplasmic protein droplets, multifocal, mild
- 5) Head kidney: no significant lesions
- 6) Fatty mesenteries: peritonitis, multifocal, granulomatous, lymphoplasmacytic, moderate

Comment: Peritonitis is consistent with chronic immune stimulation, probably in response to vaccine adjuvant (i.e., a foreign body reaction). Renal tubular epithelial protein droplets are normal in some species, or they may be an indication of glomerular disease. Ferguson ("Systemic Pathology of Fish," 1989) reports an association of renal protein droplets and high ammonia levels in salmonids. Lymphocytic inflammation around bile ductules is evidence of chronic immune stimulation; this type of inflammation can result from bacteria ascending from the intestine to the liver through the biliary system. Hepatocellular single cell necrosis (apoptosis) can occur in rapidly growing fish that suddenly go off feed about 24 hours before death. Apoptosis is the normal way in which hepatocyte numbers are decreased (i.e., the hepatocytes are not needed when growing fish stop feeding because few to no nutrients are being absorbed into the blood and entering the liver for processing).

Slide 2 (A.3.1 - 46(3)): autolysis, none (other organs) to mild (liver)

- 1) Liver: hepatocellular fatty change (lipidosis), multifocal, mild
- 1b) Liver: pericholangitis, lymphocytic, multifocal, mild
- 1c) Liver: sinusoidal fibrin, multifocal, mild
- 2) Heart: no significant lesions
- 3) Spleen: peritonitis, lymphoplasmacytic, granulomatous, regionally diffuse, moderate, with fine fibrocellular fronds
- 4) Trunk kidney: tubular intracytoplasmic protein droplets, multifocal, mild
- 5) Head kidney: no significant lesions

Comment: Sinusoidal fibrin in the liver may be a form of disseminated intravascular coagulation, and it probably contributed to the death of this fish. Fibrin deposition in the hepatic sinusoids is probably related to a bacterial infection. Hepatocellular fatty change (lipidosis) often occurs when fish are not feeding; it also occurs in cases of inadequate nutrition. Comments on other lesions are the same as for fish #1.

Slide 3 (A.3.1 - 46(2)): autolysis, none (other organs) to mild (liver)

- 1) Liver: no significant lesions
- 2) Heart: epicarditis, regionally diffuse, lymphocytic to granulomatous, moderate
- 3) Spleen: peritonitis, focal, with fine fibrocellular fronds, mild
- 4) Trunk kidney: no significant lesions
- 5) Head kidney: no significant lesions

Comment: Epicarditis is evidence of chronic immune stimulation, but the cause is otherwise unknown. Fibrous fronds on the margin of the spleen are consistent with a mild vaccine reaction.

Slide 4 (A.3.1 - 46(4)): autolysis, mild (other organs), moderate (trunk kidney), to severe (liver)

- 1) Liver: hepatocellular fatty change (lipidosis), multifocal, mild
- 2) Heart: no significant lesions
- 3) Spleen: peritonitis, focal, with fibrocellular fronds, mild
- 4) Trunk kidney: tubular intracytoplasmic protein droplets, multifocal, mild
- 5) Head kidney: no significant lesions

Comments: Comments on these lesions are the same as for fish #1.



Slide 5 (A.3.1 - 46(5)): autolysis, mild (other organs) to mild (liver)

1) Liver: no significant lesions

2) Heart: epicarditis, regionally diffuse, lymphocytic to granulomatous, mild

3) Spleen: peritonitis, lymphoplasmacytic, granulomatous, regionally diffuse, mild, with occasional fibrocellular fronds

4) Trunk kidney: tubular intracytoplasmic protein droplets, multifocal, mild

5) Head kidney: no significant lesions

Comment: Comments on these lesions are the same as for fish #1.

### **Molecular Diagnostics/PCR**

Samples 1-3, 4-5: IHN, VHS, ISA, IPN, *Piscirickettsia salmonis* negative by PCR.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-03227      **Date** 30-Sep-2004      **Report** 15-Oct-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 12683      A 3.4 - 57 (1-4)

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**

**Specimen:** Tissue - Fresh

**Count** 4

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

Gary D. Marty, D.V.M., Ph.D.;  
Diplomate, A.C.V.P  
Fish Pathologist

**History/Symptoms**

Submitted Provincial Surveillance Program samples for virology - PCR for IHN, ISA, IPN, VHS, and Piscirickettsia salmonis. Culture any PCR positive samples.

Sample ID: A 3.4 - 57 (1-4).

Addendum: Oct 7/04 - samples submitted for routine histology.

**Histopathology**

Slide 1 (A 3.4 - 57 (1)): autolysis, none (other organs) to mild (liver and trunk kidney)

- 1) Liver: no significant lesions
- 2) Heart: valvular endocardial eosinophilic granular cells, focal, mild
- 3) Spleen: peritonitis, focal, with fibrocellular fronds, mild
- 4) Trunk kidney: no significant lesions
- 5) Head kidney: no significant lesions

Comment: splenic peritonitis is consistent with a foreign body reaction, probably in response to vaccine adjuvant.

Slide 2 (A 3.4 - 57 (2)): autolysis, mild (other organs) to moderate (liver)

- 1) Liver: no significant lesions
- 2) Heart: no significant lesions
- 3) Spleen (and surrounding fatty mesenteries): peritonitis, granulomatous, lymphoplasmacytic, regionally diffuse, mild, with occasional fine fibrocellular fronds
- 4) Trunk kidney: no significant lesions
- 5) Head kidney: no significant lesions

Comment: same as slide #1.

Slide 3 (A 3.4 - 57 (3)): autolysis, none (other organs) to mild (liver and trunk kidney)

- 1) Liver: no significant lesions
- 2) Heart: myocardial karyomegaly, multifocal, mild
- 3) Spleen (and surrounding fatty mesenteries): peritonitis, granulomatous, lymphoplasmacytic, focal, mild, with occasional fine fibrocellular fronds
- 4) Trunk kidney: no significant lesions
- 5) Head kidney: no significant lesions

Comment: The cause and significance of myocardial karyomegaly is unknown; karyomegaly in other cell types has been associated with exposure to algal toxins (e.g., hepatocytes exposed to microcystin LR).

Slide 4 (A 3.4 - 57 (4)): autolysis, none (other organs) to mild (liver)

- 1) Liver: no significant lesions
- 2a) Heart: myocardial karyomegaly, multifocal, moderate
- 2b) Heart, ventricle: endocardial thrombocytes, focal (area 2 x 4 mm)
- 3) Spleen: peritonitis, granulomatous, lymphoplasmacytic, regionally diffuse, moderate, with occasional fine fibrocellular fronds
- 4) Trunk kidney: no significant lesions
- 5) Head kidney: no significant lesions

Comment: The focus of ventricle lined by thrombocytes is unusual. The thrombocytes simply line the endocardial surface, scattered thinly, no more than 1 cell layer thick (i.e., they do not form thrombi). The significance of these accumulations is unknown, but they might indicate an abnormality in the clotting system.

**Molecular Diagnostics/PCR**

Samples 1-2, 3-4: IHN, VHS, ISA, IPN, *Piscirickettsia salmonis* negative by PCR.

/bb



# ANIMAL HEALTH CENTRE

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

## Case Report

**Submission** 2004-03229      **Date** 30-Sep-2004      **Report** 15-Oct-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 12685      A 3.4 - 58 (1-4)

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**

**Specimen:** Tissue - Fresh

**Count** 4

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

Gary D. Marty, D.V.M., Ph.D.;  
Diplomate, A.C.V.P  
Fish Pathologist



### **History/Symptoms**

Submitted Provincial Surveillance Program samples for virology - PCR for IHN, ISA, IPN, VHS, and Piscirickettsia salmonis. Culture any PCR positive samples.

Sample ID: A 3.4 - 58 (1-4).

Addendum: Oct 7/04 - samples submitted for routine histology.

### **Histopathology**

Slide 1 (A.3.4-58(1)): autolysis, mild (other organs) to moderate (liver)

- 1) Liver: no significant lesions
- 2) Heart: no significant lesions
- 3) Spleen: peritonitis, lymphoplasmacytic, regionally diffuse, mild, with fine fibrocellular fronds
- 4) Trunk kidney: no significant lesions
- 5) Head kidney: no significant lesions

Comment: splenic peritonitis is consistent with a foreign body reaction, probably in response to vaccine adjuvant.

Slide 2 (A.3.4-58(2)): autolysis, none (other organs) to moderate (liver)

- 1) Liver: hepatocellular fatty change (lipidosis), multifocal, mild
- 2) Heart: epicarditis, regionally diffuse, lymphocytic, mild
- 3) Spleen: karyorrhexis, multifocal, mild
- 4) Trunk kidney: no significant lesions
- 5) Head kidney: no significant lesions

Comment: Hepatocellular fatty change (lipidosis) often occurs when fish are not feeding; it also occurs in cases of inadequate nutrition. Epicarditis is evidence of chronic immune stimulation, but the cause is otherwise unknown. The presence of degenerating nuclei (karyorrhexis) is evidence of increased cell turnover.

Slide 3 (A.3.4-58(3)): autolysis, mild (other organs) to moderate (liver)

- 1) Liver: hepatocellular fatty change (lipidosis), multifocal, mild
- 2) Heart: epicarditis, regionally diffuse, lymphocytic, mild
- 3a) Spleen: karyorrhexis, multifocal, mild
- 3b) Spleen: peritonitis, focal, with fibrocellular fronds, mild
- 4) Trunk kidney: no significant lesions
- 5) Head kidney: no significant lesions

Comment: Splenic peritonitis is consistent with a foreign body reaction, probably in response to vaccine adjuvant.

Slide 4 (A.3.4-58(4)): autolysis, none (other organs) to mild (liver)

- 1) Liver: no significant lesions
- 2) Heart: no significant lesions
- 3) Spleen: no significant lesions
- 4) Trunk kidney: no significant lesions
- 5) Head kidney: no significant lesions

Comment: These organs have no lesions to help explain the death of this fish.



**Molecular Diagnostics/PCR**

Samples 1-2, 3-4: IHN, VHS, ISA, IPN, Piscirickettsia salmonis negative by PCR.

/bb

# ANIMAL HEALTH CENTRE

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

## Case Report

**Submission** 2004-03232      **Date** 30-Sep-2004      **Report** 18-Oct-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 12827      A 3.4 - 59 (1-5)

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**

**Specimen:** Tissue - Fresh

**Count** 4

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

Gary D. Marty, D.V.M., Ph.D.;  
Diplomate, A.C.V.P  
Fish Pathologist

**History/Symptoms**

Submitted Provincial Surveillance Program samples for virology - PCR for IHN, ISA, IPN, VHS, and *Piscirickettsia salmonis*. Culture any PCR positive samples.

Sample ID: A 3.4 - 59 (1-5).

Addendum: Oct 7/04 - samples submitted for routine histology.

**Histopathology**

Slide 1 (A.3.4-59(1)): autolysis, none (all organs)

- 1) Liver: no significant lesions
- 2) Heart: epicarditis, regionally diffuse, lymphocytic, mild
- 3) Spleen: peritonitis, lymphoplasmacytic, multifocal, moderate, with multiple fibrocellular fronds
- 4) Trunk kidney (2 pieces): no significant lesions
- 5) Head kidney: not included in the section examined

Comment: Splenic peritonitis is consistent with a foreign body reaction, probably in response to vaccine adjuvant. Epicarditis is evidence of chronic immune stimulation, but the cause is otherwise unknown.

Slide 2 (A.3.4-59(2)): autolysis, none (other organs) to mild (trunk kidney and liver)

- 1) Liver: no significant lesions
- 2) Heart: no significant lesions
- 3) Spleen: peritonitis, lymphoplasmacytic, regionally diffuse, mild, with occasional fine fibrocellular fronds
- 4) Trunk kidney: no significant lesions
- 5) Head kidney: no significant lesions

Comment: same as spleen in slide #1.

Slide 3 (A.3.4-59(3)): autolysis, none (other organs) to mild (liver)

- 1) Liver: hepatocellular necrosis, multifocal, acute, mild to moderate
- 2) Heart: epicarditis, focal, lymphocytic, mild
- 3) Spleen: no significant lesions
- 4) Trunk kidney: no significant lesions
- 5) Head kidney: no significant lesions
- 6) Fatty mesenteries with exocrine pancreas: peritonitis, granulomatous, multifocal, mild

Comment: Hepatic necrosis can be caused by inadequate vascular perfusion or direct cytotoxicity from viral or bacterial infections. Lack of proliferative lesions in the biliary system is evidence against a chronic toxic cause for the hepatic necrosis. Peritonitis is consistent with a foreign body reaction, probably in response to vaccine adjuvant.

Slide 4 (A.3.4-59(4)): autolysis, none (other organs) to mild (liver)

- 1) Liver: hepatocellular atrophy, diffuse, moderate
- 2) Heart: no significant lesions
- 3) Spleen: not included in the section examined
- 4) Trunk kidney: nephritis, interstitial, granulomatous, focal, mild
- 5) Head kidney: no significant lesions

Comment: The most common organism associated with granulomatous nephritis in salmon is *Renibacterium salmoninarum*, the cause of bacterial kidney disease. Hepatocellular atrophy is consistent with the fish not eating for several days before it died.

Slide 5 (A.3.4-59(5)): autolysis, mild (other organs) to moderate (liver)

- 1) Liver: hepatocellular necrosis, multifocal, acute, mild to moderate
- 2) Heart: myocardial karyomegaly, multifocal, mild
- 3) Spleen: no significant lesions
- 4) Trunk kidney: no significant lesions
- 5) Head kidney: no significant lesions
- 6) Fatty mesenteries with exocrine and endocrine pancreas: no significant lesions

Comment: see slide #3. The cause and significance of myocardial karyomegaly is unknown; karyomegaly in other cell types has been associated with exposure to algal toxins (e.g., hepatocytes exposed to microcystin LR).



**Molecular Diagnostics/PCR**

Samples 1-3, 4-5: IHN, VHS, ISA, IPN, Piscirickettsia salmonis negative by PCR.

/bb



**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-03278      **Date** 05-Oct-2004      **Report** 13-Oct-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 12720      A 3.1 - 46 (1)

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**

**Specimen:** Other

**Count** 1

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

Gary D. Marty, D.V.M., Ph.D.;  
Diplomate, A.C.V.P  
Fish Pathologist

**History/Symptoms**

Submitted Provincial Surveillance Program samples for bacteriology - identification of isolates and culture and sensitivity.

Sample ID: A 3.1 - 46 (1).

**Bacteriology**

Isolate identified as *Vibrio* sp. NOT *Vibrio anguillarum* type I and II or *Vibrio ordalii* by serological testing.

Completed by E. Whitton.

*Vibrio* sensitive to: Erythromycin, Florfenicol, Romet 30, Tri-sulfas, Sulfa-methox-trimeth. and Tetracycline.

\* Results faxed Oct. 13/04.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-03279      **Date** 05-Oct-2004      **Report** 13-Oct-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 12721      #189 - Sept 27/04

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**

**Specimen:** Other

**Count** 1

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

Gary D. Marty, D.V.M., Ph.D.;  
Diplomate, A.C.V.P  
Fish Pathologist

**History/Symptoms**

Submitted Provincial Surveillance Program samples for bacteriology - identification of isolates and culture and sensitivity.

Sample ID: #189 - Sept 27/04.

**Bacteriology**

Vibrio anguillarum identified as V. anguillarum type II by serology.  
Completed by E. Whitton.

Vibrio sensitive to: Erythromycin, Florfenicol, Romet 30, Sulfa-methox-trimeth. and Tetracycline.

\* Results faxed Oct. 13/04.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-03480      **Date** 22-Oct-2004      **Report** 18-Nov-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 12832      A 2.3-61 (1-8)

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**

**Specimen:** Tissue - Fresh

**Count** 8

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

Gary D. Marty, D.V.M., Ph.D.;  
Diplomate, A.C.V.P  
Fish Pathologist

**History/Symptoms**

Submitted Provincial Surveillance Program samples for Virology for PCR - IHN, ISA, IPN, VHS and Piscirickettsia salmonis. Culture any PCR positive samples.

Samples labelled: A2.3-61 (1-8).

Addendum - Samples for routine histology received Nov. 9/04.

**Histopathology**

Slide 1: autolysis, none (all organs)

- 1) Liver: no significant lesions
- 2) Heart: no significant lesions
- 3) Spleen: peritonitis, lymphoplasmacytic, granulomatous, regionally diffuse, moderate, with fine fibrocellular fronds
- 4) Trunk kidney: no significant lesions
- 5) Head kidney: no significant lesions

Comment: Splenic peritonitis is consistent with a foreign body reaction, probably in response to vaccine adjuvant.

Slide 2: autolysis, none (other organs) to mild (liver)

- 1) Liver: pericholangitis, lymphocytic, multifocal, mild
- 2) Heart: no significant lesions
- 3) Spleen: peritonitis, lymphoplasmacytic, granulomatous, regionally diffuse, moderate, with fine fibrocellular fronds
- 4) Trunk kidney: tubular intracytoplasmic protein droplets, multifocal, mild
- 5) Head kidney: not included on the slide

Comment: Lymphocytic inflammation around bile ductules (liver) is evidence of chronic immune stimulation. This type of inflammation can result from bacteria ascending from the intestine to the liver through the biliary system. Renal tubular epithelial protein droplets are normal in some species, or they may be an indication of glomerular disease. Ferguson ("Systemic Pathology of Fish," 1989) reports an association of renal protein droplets and high ammonia levels in salmonids.

Slide 3: autolysis, mild (other organs) to moderate (liver)

- 1) Liver: no significant lesions
- 2) Heart: no significant lesions
- 3) Spleen: peritonitis, lymphohistiocytic, multifocal, mild, with fine fibrocellular fronds
- 4) Trunk kidney: no significant lesions
- 5) Head kidney: not included on the slide

Comment: none

Slide 4: autolysis, none (all organs)

- 1) Liver: hepatocellular fatty change (lipidosis), diffuse, moderate
- 2) Heart: no significant lesions
- 3) Spleen: peritonitis, lymphohistiocytic, multifocal, mild, with fine fibrocellular fronds
- 4) Trunk kidney: no significant lesions
- 5) Head kidney: not included on the slide

Comment: Hepatocellular fatty change (lipidosis) often occurs when fish are not feeding; it also occurs in cases of inadequate nutrition.

Slide 5: autolysis, mild (other organs) to moderate (liver)

- 1) Liver: no significant lesions
- 2) Heart: no significant lesions
- 3) Spleen: peritonitis, lymphohistiocytic, multifocal, mild, with fine fibrocellular fronds
- 4) Trunk kidney: no significant lesions
- 5) Head kidney: no significant lesions

Comment: The spleen has foci of karyorrhexis, including small basophilic structures suggestive of rickettsia, but I cannot diagnose *Piscirickettsia salmonis* in this fish based on histology alone.

Slide 6: autolysis, none (other organs) to mild (liver)

- 1a) Liver: hepatic necrosis, acute, multifocal, moderate, with intrahistiocytic bacteria (consistent with





Piscirickettsia salmonis)

- 1b) Liver: vascular wall necrosis, multifocal, moderate (consistent with Piscirickettsia salmonis infection)
- 2) Heart: endocarditis, diffuse, with a thin layer of macrophages, lymphocytes, and plasma cells, moderate
- 3) Spleen: peritonitis, lymphohistiocytic, multifocal, mild, with fine fibrocellular fronds
- 4a) Trunk kidney: nephritis, interstitial, granulomatous, diffuse, with multinucleate giant cells and intrahistiocytic bacteria (consistent with Piscirickettsia salmonis), moderate
- 4b) Trunk Kidney: tubular intracytoplasmic protein droplets, multifocal, moderate
- 5) Head kidney: not included on the slide

Comment: This fish probably died of complications related to Piscirickettsia salmonis infection. The pattern of granulomatous inflammation in the heart sometimes occurs in fish infected with Renibacterium salmoninarum, but other bacteria cannot be ruled out. In this case, it may be related to infection with Piscirickettsia salmonis. Inflammatory cells line the endocardial surface throughout most of the ventricle, but they are rarely more than 2 cell layers thick. Renal tubular epithelial protein droplets are normal in some species, or they may be an indication of glomerular disease. Ferguson ("Systemic Pathology of Fish," 1989) reports an association of renal protein droplets and high ammonia levels in salmonids.

Slide 7: autolysis, mild (other organs) to moderate (liver)

- 1) Liver: hepatocellular fatty change (lipidosis), diffuse, mild
- 2) Heart: no significant lesions
- 3) Spleen: peritonitis, lymphohistiocytic, multifocal, mild, with fine fibrocellular fronds
- 4) Trunk kidney: no significant lesions
- 5) Head kidney: not included on the slide

Comment: The spleen has foci of karyorrhexis, including small basophilic structures suggestive of rickettsia, but I cannot diagnose Piscirickettsia salmonis in this fish based on histology alone.

Slide 8: autolysis, none (other organs) to mild (liver)

- 1) Liver: no significant lesions
- 2) Heart: no significant lesions
- 3) Spleen: peritonitis, lymphohistiocytic, multifocal, mild, with fine fibrocellular fronds
- 4) Trunk kidney: no significant lesions
- 5) Head kidney: not included on the slide

Comment: The tissues have no evidence of Piscirickettsia salmonis infection.

### **Molecular Diagnostics/PCR**

Samples 1-4, 5-8: IHN, VHS IPN, ISA negative by PCR.

Samples 5-8: Piscirickettsia salmonis positive by PCR.

Samples 1-4: Piscirickettsia salmonis negative by PCR.

\* Results faxed Nov. 10/04.

/bb



**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-03481      **Date** 22-Oct-2004      **Report** 19-Nov-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 12833      A2.3-62 (1-11)

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**

**Specimen:** Tissue - Fresh

**Count** 11

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

Gary D. Marty, D.V.M., Ph.D.;  
Diplomate, A.C.V.P  
Fish Pathologist

**History/Symptoms**

Submitted Provincial Surveillance Program samples for Virology for PCR - IHN, ISA, IPN, VHS and Piscirickettsia salmonis. Culture any PCR positive samples.

Samples labelled: A2.3-62 (1-11).

Addendum - Samples for routine histology received Nov. 9/04.

**Histopathology**

Slide 1: autolysis, none (other organs) to mild (liver)

- 1) Liver: no significant lesions
- 2) Heart: no significant lesions
- 3) Spleen: peritonitis, regionally diffuse, with fibrocellular fronds, moderate
- 4) Trunk kidney: tubular intracytoplasmic protein droplets, multifocal, mild
- 5) Head kidney: no significant lesions

Comment: Splenic peritonitis is consistent with a foreign body reaction, probably in response to vaccine adjuvant. Renal tubular epithelial protein droplets are normal in some species, or they may be an indication of glomerular disease. Ferguson ("Systemic Pathology of Fish," 1989) reports an association of renal protein droplets and high ammonia levels in salmonids. The tissues had no lesions consistent with *Piscirickettsia salmonis*.

Slide 2: autolysis, mild (all organs)

- 1a). Liver: vasculitis, multifocal, mild, with karyorrhexis and intracellular 1.5-µm-diameter basophilic structures consistent with *Piscirickettsia salmonis*
- 1b). Liver: hepatocellular fatty change (lipidosis), diffuse, mild
- 1c). Liver: pericholangitis, lymphocytic, multifocal, mild
- 2) Heart: epicarditis, multifocal, lymphocytic, mild
- 3) Spleen: parenchymal karyorrhexis, multifocal, with intracellular 1.5-µm-diameter basophilic structures consistent with *Piscirickettsia salmonis*, mild
- 4a) Trunk kidney: interstitial cell hyperplasia and karyorrhexis, multifocal, with intracellular 1.5-µm-diameter basophilic structures consistent with *Piscirickettsia salmonis*, mild
- 4b) Trunk kidney: tubular intracytoplasmic protein droplets, multifocal, moderate
- 5) Head kidney: sinus histiocytosis with karyorrhexis, diffuse, mild, with rare intracellular 1.5-µm-diameter basophilic structures consistent with *Piscirickettsia salmonis*

Comment: Several organs have mild lesions consistent with the PCR finding of *Piscirickettsia salmonis*. Hepatocellular fatty change (lipidosis) often occurs when fish are not feeding; it also occurs in cases of inadequate nutrition. Lymphocytic inflammation around bile ductules (liver) is evidence of chronic immune stimulation. This type of inflammation can result from bacteria ascending from the intestine to the liver through the biliary system. Epicarditis is evidence of chronic immune stimulation, but the cause is otherwise unknown.

Slide 3: autolysis, none (other organs) to mild (liver)

- 1) Liver: no significant lesions
- 2) Heart: endocarditis, lymphohistiocytic, multifocal, mild, with karyorrhexis
- 3) Spleen: peritonitis, lymphoplasmacytic, granulomatous, regionally diffuse, moderate, with fine fibrocellular fronds
- 4) Trunk kidney: tubular intracytoplasmic protein droplets, multifocal, mild
- 5) Head kidney: no significant lesions

Comment: *Piscirickettsia salmonis* are difficult to differentiate from karyorrhectic debris, but some of the small basophilic structures in the heart may be *Piscirickettsia salmonis* organisms. Epicarditis is evidence of chronic immune stimulation, but the cause is otherwise unknown.

Slide 4: autolysis, none (other organs) to mild (liver)

- 1) Liver: hepatitis, necrotizing, multifocal, coalescing, neutrophilic, subacute, with acute vasculitis and abundant intracellular *Piscirickettsia salmonis*
- 2a) Heart: epicarditis, multifocal, lymphocytic, mild
- 2b) Heart: endocardial histiocytosis, mild, diffuse
- 3) Spleen: splenitis, multifocal, coalescing, granulomatous, moderate, with small numbers of intracellular *Piscirickettsia salmonis* and foci of necrosis infiltrated by neutrophils
- 4a) Trunk kidney: nephritis, interstitial, multifocal, coalescing, granulomatous, neutrophilic, moderate, with



small numbers of intracellular *Piscirickettsia salmonis*

4b) Trunk kidney: tubular intracytoplasmic protein droplets, multifocal, mild

5) Head kidney: nephritis, diffuse, histiocytic, moderate, with eosinophilic granular cells and small numbers of intracellular *Piscirickettsia salmonis*

Comment: This fish died of complications related to infection with *Piscirickettsia salmonis*. Macrophages line the endocardial surface throughout most of the ventricle, but they are rarely more than 2 cell layers thick; this pattern is fairly common in Atlantic salmon with bacterial infections.

Slide 5: autolysis, none (other organs) to mild (liver)

1a) Liver: hepatic necrosis and vasculitis, acute, fibrinous, moderate, with intracellular *Piscirickettsia salmonis*

1b) Liver: pericholangitis, lymphocytic, multifocal, mild

2) Heart: endocardial histiocytosis, mild, diffuse

3) Spleen: splenic necrosis, diffuse moderate, with moderate numbers of intracellular *Piscirickettsia salmonis*

4a) Trunk kidney: nephritis, interstitial, diffuse, granulomatous, neutrophilic, moderate, with intracellular *Piscirickettsia salmonis*

4b) Trunk kidney: tubular intracytoplasmic protein droplets, multifocal, mild

5) Head kidney: not included on the slide

Comment: This fish died of complications related to infection with *Piscirickettsia salmonis*. Lymphocytic inflammation around bile ductules (liver) is evidence of chronic immune stimulation. This type of inflammation can result from bacteria ascending from the intestine to the liver through the biliary system.

Slide 6: autolysis, mild (other organs) to moderate (liver and trunk kidney)

1) Liver: hepatic necrosis and fibroplasia, subacute, severe, with abundant intracellular *Piscirickettsia salmonis*

2) Heart: epicarditis, regionally diffuse, lymphohistiocytic, mild, with small numbers of intracellular *Piscirickettsia salmonis*

3) Spleen: parenchymal histiocytosis, diffuse, mild, with moderate numbers of intracellular *Piscirickettsia salmonis*

4a) Trunk kidney: nephritis, interstitial, diffuse, histiocytic, mild, with small numbers of intracellular *Piscirickettsia salmonis*

4b) Trunk kidney: tubular intracytoplasmic protein droplets, multifocal, mild

5) Head kidney: sinus histiocytosis, mild, diffuse, with small numbers of intracellular *Piscirickettsia salmonis*

Comment: This fish died of complications related to infection with *Piscirickettsia salmonis*.

Slide 7: autolysis, none (other organs) to mild (liver)

1) Liver: basophilic hepatocellular cytoplasm, diffuse

2) Heart: no significant lesions

3a) Spleen: peritonitis, granulomatous, focal, mild, with occasional fine fibrocellular fronds

3b) Spleen: prominent red pulp, diffuse, with moderate numbers of eosinophilic granular cells

4) Trunk kidney: tubular intracytoplasmic protein droplets, multifocal, mild

5) Head kidney: sinus histiocytosis, mild, diffuse, with small numbers of eosinophilic granular cells

Comment: Basophilic cytoplasm in hepatocytes is an indication of active protein synthesis. It is normal in mature females producing protein for deposition in their eggs. I have not seen hepatocellular basophilia described in juvenile salmon (although I see it occasionally), but I suspect that it could be related to increased protein needed as part of an inflammatory response. Splenic peritonitis is consistent with a foreign body reaction, probably in response to vaccine adjuvant. The cause of prominent splenic red pulp and moderate numbers of eosinophilic granular cells is unknown, but chronic bacterial infection is the primary differential (no organisms are obvious in the H&E section). Some of the organs have karyorrhexis, including small basophilic structures suggestive of rickettsia, but I cannot diagnose *Piscirickettsia salmonis* in





this fish based on histology alone.

Slide 8: autolysis, mild (other organs) to moderate (liver)

- 1) Liver: vasculitis, multifocal, acute, with acute hepatic necrosis and moderate numbers of intracellular *Piscirickettsia salmonis*
- 2) Heart: epicarditis, regionally diffuse, lymphohistiocytic, mild
- 3) Spleen: parenchymal histiocytosis, diffuse, mild, with small numbers of intracellular *Piscirickettsia salmonis*
- 4a) Trunk kidney: nephritis, interstitial, diffuse, histiocytic, mild, with small numbers of intracellular *Piscirickettsia salmonis*
- 4b) Trunk kidney: tubular intracytoplasmic protein droplets, multifocal, mild
- 5) Head kidney: sinus histiocytosis, moderate, diffuse, with moderate numbers of intracellular *Piscirickettsia salmonis*

Comment: This fish died of complications related to infection with *Piscirickettsia salmonis*.

Slide 9: autolysis, none (other organs) to mild (liver)

- 1) Liver: hepatitis, necrotizing, multifocal, coalescing, neutrophilic, subacute, with acute vasculitis and moderate numbers of intracellular *Piscirickettsia salmonis*
- 2) Heart: endocardial histiocytosis, mild, diffuse
- 3) Spleen: parenchymal histiocytosis, diffuse, mild, with small numbers of intracellular *Piscirickettsia salmonis*
- 4a) Trunk kidney: nephritis, interstitial, diffuse, histiocytic, mild, with small numbers of intracellular *Piscirickettsia salmonis*
- 4b) Trunk kidney: tubular intracytoplasmic protein droplets, multifocal, mild
- 5) Head kidney: sinus histiocytosis, moderate, diffuse, with small numbers of intracellular *Piscirickettsia salmonis*

Comment: This fish died of complications related to infection with *Piscirickettsia salmonis*.

Slide 10: autolysis, none (other organs) to mild (liver)

- 1) Liver: hepatitis, necrotizing, multifocal, coalescing, neutrophilic, subacute, with acute vasculitis and moderate numbers of intracellular *Piscirickettsia salmonis*
- 2a) Heart: epicarditis, regionally diffuse, lymphohistiocytic, mild
- 2b) Heart: endocardial histiocytosis, mild, diffuse
- 3) Spleen: parenchymal histiocytosis, diffuse, mild, with small numbers of intracellular *Piscirickettsia salmonis*
- 4a) Trunk kidney: nephritis, interstitial, diffuse, histiocytic, mild, with small numbers of intracellular *Piscirickettsia salmonis*
- 4b) Trunk kidney: tubular intracytoplasmic protein droplets, multifocal, mild
- 5) Head kidney: sinus histiocytosis, moderate, diffuse, with small numbers of intracellular *Piscirickettsia salmonis*

Comment: This fish died of complications related to infection with *Piscirickettsia salmonis*.

Slide 11: autolysis, none (other organs) to moderate (liver)

- 1) Liver: no significant lesions
- 2) Heart: myocardial karyomegaly, multifocal, moderate (some nuclei as large as 20x60 µm)
- 3) Spleen: no significant lesions
- 4a) Trunk kidney: nephritis, interstitial, diffuse, histiocytic, mild, with small numbers of intracellular *Piscirickettsia salmonis*
- 4b) Trunk kidney: tubular intracytoplasmic protein droplets, multifocal, moderate



**Molecular Diagnostics/PCR**

Samples 1-4, 5-8, 9-11: IHN, VHS, IPN, ISA negative by PCR.

Samples 1-4, 5-8, 9-11: *Piscirickettsia salmonis* positive by PCR.

\* Results faxed Nov. 10/04.

/bb

# ANIMAL HEALTH CENTRE

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

## Case Report

**Submission** 2004-03482      **Date** 22-Oct-2004      **Report** 22-Nov-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 12834      A2.4-65 (1-2)

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**

**Specimen:** Tissue - Fresh

**Count** 2

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

Gary D. Marty, D.V.M., Ph.D.;  
Diplomate, A.C.V.P  
Fish Pathologist

**History/Symptoms**

Submitted Provincial Surveillance Program samples for Virology for PCR - IHN, ISA, IPN, VHS and Piscirickettsia salmonis. Culture any PCR positive samples.

Samples labelled: A2.4-65 (1-2).

Addendum - Samples for routine histology received Nov. 9/04.

**Histopathology**

Slide 1: autolysis, none (all organs)

1. Liver: hepatocellular fatty change (lipidosis), diffuse, moderate
- 2a. Heart: mural thrombus, focal (100 x 50 µm), mild
- 2b. Heart: myocardial karyomegaly, multifocal, mild
3. Spleen: no significant lesions
4. Trunk kidney: no significant lesions
5. Head kidney: no significant lesions

Comment: Hepatocellular fatty change (lipidosis) often occurs when fish are not feeding; it also occurs in cases of inadequate nutrition. The cause and significance of myocardial karyomegaly is unknown; karyomegaly in other cell types has been associated with exposure to algal toxins (e.g., hepatocytes exposed to microcystin LR in netpen liver disease).

Slide 2: autolysis, none (other organs) to mild (liver)

1. Liver: hepatocellular fatty change (lipidosis), diffuse, mild
2. Heart: no significant lesions
3. Spleen: parenchymal yellow-green pigment, disseminated, intracellular, mild
- 4a. Trunk kidney: yellow-brown lipofuscin casts in renal tubules, multifocal, mild, with epithelial attenuation
- 4b. Trunk kidney: macrophages distended by yellow-gold pigment, intravascular and interstitial, multifocal, mild
5. Head kidney: not included on the slide

Comment: The yellow-green pigment in the spleen and kidney is lipofuscin (Schmorl's stain positive; Pearl's iron stain negative). Accumulation of lipofuscin is a nonspecific change that can result from a variety of insults, including rancid feed, low levels of antioxidants in the feed, chronic infections, and exposure to organic contaminants. In pen-reared salmon, hepatic lipofuscin accumulation is a common feature of netpen liver disease (microcystin-LR). Conditions that lead to moderate to abundant lipofuscin have been associated with decreased growth and survival in several studies.

**Molecular Diagnostics/PCR**

Samples 1-2: IHN, VHS, IPN, ISA, Piscirickettsia salmonis negative by PCR.

\* Results faxed Nov. 10/04.

/bb



**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-03510      **Date** 26-Oct-2004      **Report** 28-Oct-2004

**Report**      **Copies**

**Submitter:** 12847      Heritage Salmon  
**Owner** 12849      Raza Island (Case #04-38, PO #14359)  
**Farm:**  
**Vet Clinic:**  
**Attending**      Dr. Peter McKenzie

**Specimen:** Whole Animal      **Count** 1      **Flock Herd Size:**  
**Species:** Atlantic Salmon      **Age**  
**Breed:**      **Sex:**

**Feed:**      **Feed**

**Vaccination****Treatmen****Diagnosis**

Gary D. Marty, D.V.M., Ph.D.;  
 Diplomate, A.C.V.P  
 Fish Pathologist

### **History/Symptoms**

Submission consisting of 4 whole fish. Case #04-38. PO #14359. Large die-off 'pin heads' after approx. 2 months entry to SW. These fish are a follow up case and have been in formalin some time. I have recently switched them over to ethanol.

Please prepare for diagnostic histology exam for Dr. Gary Marty. Please fax or email report to Dr. Peter McKenzie.

### **Histopathology**

Tissue preservation is fair for most organs; gill and intestine have moderate to severe autolysis.

Slide 1: transverse section through head, includes, gill, brain, eye, and thymus; no significant lesions.

Slide 2: stomach, intestine, liver, heart, gill and testis.

Slide 3: stomach, intestine, liver, heart, head kidney, and gill.

Slides 4 and 5: transverse sections through head, includes, gill, brain, eye, and pseudobranch; no significant lesions.

Slide 6: stomach, intestine, liver, heart, and ovary.

Slide 7: 2 eyes, spleen, intestine, and surrounding mesenteries;

Slides 8, 9, and 10: transverse section through body includes skin, skeletal muscle, and trunk kidney.

### **Diagnosis**

- 1) Liver: hepatocellular megalocytosis and single cell necrosis, severe (slide 6), consistent with netpen liver disease (microcystin-LR)
- 2) Liver: hepatocellular lipofuscinosis, diffuse, moderate (slide 2), consistent with netpen liver disease (microcystin-LR)
- 3) Spleen, stomach, intestine, and fatty mesenteries: peritonitis, granulomatous, multifocal, with intralesional vacuoles up to 200  $\mu$ m in diameter, moderate to severe (slides 2 and 7)
- 4) Spinal cord: intraneuronal vacuoles, clear, well-demarcated, about 30  $\mu$ m in diameter, multifocal, mild (slides 8, 9, and 10)





**Final Comments**

The microscopic changes in the livers of these fish are consistent with netpen liver disease caused by exposure to the algal toxin microcystin-LR. Hepatocellular karyomegaly/megalocytosis results from sublethal injury to hepatocytes, and affected cells may be able to survive for several months. Hepatic megalocytosis can result from exposure to several types of toxicants, including aflatoxins, pyrrolizidine alkaloids, complex chemical mixtures from marine sediment extracts, and the algal toxin microcystin-LR.

Accumulation of lipofuscin in the liver is a non-specific change that can result from a variety of insults, including rancid feed, low levels of antioxidants in the feed, chronic infections, and exposure to organic contaminants. Lipofuscin accumulation is a common feature of netpen liver disease. Conditions that lead to moderate to abundant hepatic lipofuscin have been associated with decreased growth and survival in several studies. Commonly cultured fish species (e.g., rainbow trout and Atlantic salmon) that are healthy and fed nutritionally complete diets do not accumulate lipofuscin.

Splenic peritonitis is consistent with a foreign body reaction, probably in response to vaccine adjuvant.

The significance of the intraneuronal vacuoles in the spinal cord is unknown; the change might be an artefact. [I don't think fish are susceptible to spongiform encephalopathies.]

/bb



**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-03511      **Date** 26-Oct-2004      **Report** 01-Nov-2004

**Report**      **Copies**

**Submitter:** 12847      Heritage Salmon  
**Owner** 12848      Hotham (Case #04-37, PO 14360)  
**Farm:**  
**Vet Clinic:**  
**Attending**      Dr. Peter McKenzie

**Specimen:** Tissue - Formalized      **Count** 8      **Flock Herd Size:**  
**Species:** Atlantic Salmon      **Age**  
**Breed:**      **Sex:**

**Feed:**      **Feed**

**Vaccination****Treatmen****Diagnosis**

Gary D. Marty, D.V.M., Ph.D.;  
Diplomate, A.C.V.P  
Fish Pathologist

**History/Symptoms**

Submission consists of 4 histo cassettes containing kidney tissue and 4 whole fish. Fixed in formalin 48 hrs. Switched to ethanol.

Small chronic increase in mortalities. Recent salt water entries. Hemorrhage around fins. Ocular hemorrhage. 'Pop eye'.

Please prepare for histo. Exam by Dr. Gary Marty. Please use case #04-37. Report to Dr. Peter McKenzie.

P.O. No. 14360.

Additional History: Dr. McKenzie reported that fish sampled for bacteriology on the same day as these fish were positive for *Yersinia ruckeri* Type 01 from brain and kidney.

**Histopathology**

Tissue preservation is good for most organs; some sections of intestine have mild to moderate autolysis.

Slides 1-4: trunk kidney; in slides 3 and 4, tubular regeneration is common, but there is no evidence of tubular degeneration.

Slide 5: gill (4 pieces)

Slides 6 and 7: eye (8 pieces)

Slide 8: heart (4 pieces)

Slide 9: liver (4 pieces)

Slide 10: spleen (4 pieces)

Slides 11 and 12 (each contains 2 pieces): transverse section through head, includes, gill, brain, eye, and thymus.

Slide 13: intestines (2 pieces)

Slide 14: stomach (1 piece), intestine (3 pieces), and testis (4 pieces).

Slide 15: stomach (1 piece), intestine (3 pieces), and ovary (1 piece)

Slides 16-19: transverse section through body includes skin, skeletal muscle, and trunk kidney.

Measure of physiologic condition:

Hepatocellular glycogen depletion, severe (slide 9, all 4 sections)



**Diagnosis**

1. Trunk Kidney: tubular intracytoplasmic protein droplets, multifocal, mild (slides 1 and 4)
2. Eye: perforated corneal ulcer, acute, with histiocytic endophthalmitis, iridic herniation through the perforated cornea, and intracellular bacterial rods, severe (slide 6, 2 of 4 eye sections)
3. Eye: endophthalmitis, diffuse, acute neutrophilic, histiocytic with detached retina, partially herniated lens, and intralesional bacteria, severe (slide 7, 1 of 4 eye sections)
4. Eye: panophthalmitis and detached retina, neutrophilic, histiocytic, acute, severe, with perichoroidal hemorrhage (slide 7, 2 of 4 eye sections)
5. Eye: endophthalmitis, diffuse, acute neutrophilic, histiocytic with hemorrhage and intralesional bacteria, moderate (slide 7, 1 of 4 eye sections)
6. Heart: endocarditis, diffuse, with a thin layer of macrophages and eosinophilic granular cells, none (slide 8, 1 section), mild (slide 8, 2 sections), moderate (slide 8, 1 section)
7. Liver: basophilic hepatocellular cytoplasm, diffuse, moderate (slide 9, all 4 sections)
8. Spleen and surrounding mesenteries: peritonitis, granulomatous, regionally diffuse, mild, with occasional intralesional vacuoles up to 200 µm in diameter (slide 10, all 4 sections)
9. Spleen: splenitis, granulomatous, multifocal, mild (slide 10, 1 section)
10. Head, veins basolateral to the brain: phlebitis, bilaterally symmetric, with abundant transmural eosinophilic granular cells, moderate (slides 11 and 12, both sections on each slide)
11. Head: intracerebral hemorrhage, multifocal, with erythrocytes, neutrophils, and macrophages in the fourth ventricle (slide 12)
12. Intestine, stomach, and surrounding mesenteries: peritonitis, granulomatous, regionally diffuse, moderate, (slide 13, 14, and 15; all sections except for two testes in slide 14)
13. Trunk kidney: interstitial cell hyperplasia, diffuse, mild (slide 16, 3 sections), moderate (slide 16, 1 section)





**Final Comments**

The findings in these fish point to 4 significant processes: 1) chronic peritonitis, probably in response to vaccine adjuvant; 2) traumatic lesions in the eye with secondary infection; 3) disseminated granulomatous inflammation, possibly reacting to a chronic bacterial infection like *Renibacterium salmoninarum* (less commonly, *Yersinia ruckeri*); and 4), the gross description of "hemorrhage around fins" is consistent with the culture of *Yersinia ruckeri*.

The lesions in the eye are consistent with trauma followed by bacterial infection, and *Yersinia ruckeri* is among the common bacteria associated with these types of lesions. Intracerebral hemorrhage and inflammatory cells in one fish may be a result of extension from the eye.

Granulomatous inflammation in the spleen of these fish is consistent with a chronic bacterial infection like *Yersinia ruckeri* or *Renibacterium salmoninarum*. *Yersinia ruckeri* causes necrotic foci in the liver, kidney, and spleen [no necrotic foci in this case]. Acute cases are associated with hemorrhage and heavily infiltrated with leucocytes, whereas chronic cases are granulomatous (source Fish Pathology, 3rd Edition. 2001. R.J. Roberts). To rule out an underlying infection with *Renibacterium salmoninarum*, consider submission of fresh samples of kidney for *Renibacterium salmoninarum* PCR analysis.

The pattern of endocardial granulomatous inflammation in the heart sometimes occurs in fish infected with *Renibacterium salmoninarum*, but other bacteria cannot be ruled out. [I have not seen it associated with *Yersinia ruckeri* infection.] Here, macrophages and eosinophilic granular cells line the endocardial surface throughout most of the ventricle and bulbus arteriosus, but they are rarely more than 2 cell layers thick.

Basophilic cytoplasm in hepatocytes is an indication of active protein synthesis. It is normal in mature females producing protein for deposition in their eggs. I have not seen hepatocellular basophilia described in juvenile salmon, but I suspect that it could be related to increased protein needed as part an inflammatory response (in this case, in the heart and eyes). Interstitial cell hyperplasia in the kidney results from increased demand for erythrocytes or white blood cells somewhere in the body (also consistent with eye and heart lesions).

Granulomatous peritonitis is consistent with a foreign body reaction, probably in response to vaccine adjuvant. Granulomatous splenitis in one fish is probably a result of infection with Bacterial kidney disease.

I have not previously seen bilateral intracranial phlebitis with abundant eosinophilic granular cells. Increased numbers of eosinophilic granular cells have been associated with experimental infection with *Renibacterium salmoninarum*, the cause of bacterial kidney disease (Flaño et al. 1996), but they are not described as a common finding in clinical cases. This case had only minimal evidence of granulomatous inflammation more commonly associated with bacterial kidney disease. Increased numbers of eosinophilic granular cells are sometimes associated with chronic parasitic infections, but again, the inciting cause was not included in the sections examined.

Renal tubular epithelial protein droplets are normal in some species, or they may be an indication of glomerular disease. Ferguson ("Systemic Pathology of Fish," 1989) reports an association of renal protein droplets and high ammonia levels in salmonids.

**Literature cited:**

Flaño, E., López-fierro, P., Razquin, B. E., and A. Villena. 1996. In vitro differentiation of eosinophilic granular cells in *Renibacterium salmoninarum*-infected gill cultures from rainbow trout. J. Fish & Shellfish Immunology 3: 173-184.

/bb





**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-03543      **Date** 29-Oct-2004      **Report** 01-Nov-2004

**Report**      **Copies**

**Submitter:** 9420      Sea to Sky Veterinary Service  
**Owner** 12866      Sea to Sky Vet. Services, SS-114  
**Farm:**  
**Vet Clinic:** 12866      Sea to Sky Vet. Services, SS-114  
**Attending**      Dr. Sonja Saksida

**Specimen:** Tissue - Formalized      **Count** 1      **Flock Herd Size:**  
**Species:** Atlantic Salmon      **Age**  
**Breed:**      **Sex:**

**Feed:**      **Feed**

**Vaccination****Treatmen****Diagnosis**

Gary D. Marty, D.V.M., Ph.D.;  
Diplomate, A.C.V.P  
Fish Pathologist

**History/Symptoms**

Case ID: SS-114.

Request histology. High priority. Species: Atlantic; Age: 04; Avg. weight: 1kg +; Site type: net pens.

History: Low DO, elevated mortality in one pen. Mortalities have hemorrhage on liver, swimbladder, slightly swollen kidney. Off feed.

Please fax or email report to: Dr. Sonja Saksida. Please invoice Sea to Sky Veterinary Service.

**Histopathology**

Processing/quality notes: Tissue preservation is fair to poor for most organs; gill and intestine have severe autolysis.

Slide 1 (S9-11-1): brain (3 pieces), liver (2 pieces), trunk kidney (2 pieces), plus intestine and surrounding fatty mesenteries (2 pieces)

Slide 2 (S9-11-3): brain, liver, trunk kidney, spleen, gill, plus intestine and surrounding fatty mesenteries

Slide 3 (S9-11-4): brain, liver, trunk kidney, spleen, heart, gill, plus intestine and surrounding fatty mesenteries

**Diagnosis**

1. Liver: vasculitis and mural thrombus (up to 1 x 0.2 mm) surrounded by foci of congestion and hemorrhage (up to 1-mm-diameter, slide 2; up to 3-mm-diameter, slide 3), multifocal, acute, with intracellular 2-µm-diameter basophilic structures consistent with *Piscirickettsia salmonis*, moderate (slides 2 and 3)
2. Liver: hepatitis, histiocytic, diffuse, with intracellular 2-µm-diameter basophilic structures consistent with *Piscirickettsia salmonis*, mild (slide 1)
2. Spleen: splenitis, histiocytic, diffuse, with intracellular 2-µm-diameter basophilic structures consistent with *Piscirickettsia salmonis*, moderate (slides 2 and 3)
3. Trunk kidney: interstitial cell hyperplasia, diffuse, moderate (slides 1, 2, and 3)
4. Trunk Kidney: nephritis, interstitial, histiocytic, diffuse, with intracellular 2-µm-diameter basophilic structures consistent with *Piscirickettsia salmonis*, mild (slide 3), moderate (slide 1)
5. Trunk Kidney: tubular intracytoplasmic protein droplets, multifocal, mild (slide 1)
6. Trunk Kidney: glomerulonephritis, diffuse, with multifocal synechiae and hypertrophy of the parietal layer of the glomerular capsule, moderate (slide 2)
7. Heart and gill: no significant lesions (all slides)



**Final Comments**

The pattern of hepatic thrombosis, vasculitis, and congestion, with intracellular basophilic organisms, is consistent with *Piscirickettsia salmonis* infection. Similar intracellular organisms in the spleen and kidney are also consistent with *Piscirickettsia salmonis*. Note, however, that these organs also have abundant karyorrhexis, which can mimic rickettsial organisms. I recommend PCR to confirm *Piscirickettsia salmonis*, and bacterial culture to rule out other bacterial infections.

Interstitial cell hyperplasia in the kidney results from increased demand for erythrocytes or white blood cells somewhere in the body (renal interstitial cells are the blood-forming or hematopoietic cells in the kidney).

Renal tubular epithelial protein droplets are normal in some species, or they may be an indication of glomerular disease. Ferguson ("Systemic Pathology of Fish," 1989) reports an association of renal protein droplets and high ammonia levels in salmonids.

/bb





**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-03594      **Date** 03-Nov-2004      **Report** 05-Nov-2004

**Report**      **Copies**

**Submitter:** 11899 Grieg Seafoods B.C. Ltd.

**Owner** 11899 Grieg Seafoods B.C. Ltd.

**Farm:**

**Vet Clinic:**

**Attending**

**Specimen:** Other

**Count** 2

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:** Salmo salar

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

Gary D. Marty, D.V.M., Ph.D.;  
Diplomate, A.C.V.P  
Fish Pathologist

### **History/Symptoms**

Submitted histo. samples (cassettes) from 2 fresh fish; skin, kidney, spleen and liver.

Very low prevalence of this particular lesion (see below) in one particular population purchased from another company; prevalence does not appear to be changing - appears to be a concern primarily of quality (affected fish are down-graded).

PM lesions - generalized superficial 5 - 15 mm ulcers penetrating in some instances to muscle layers with corresponding scale loss; generally round - can be up to 50/fish.

### **Histopathology**

Both cassettes are labelled "W.P. OCT 28"

Slide 1: skin (epidermis, dermis, hypodermis, and underlying skeletal muscle), liver, spleen, and trunk kidney

Slide 2: skin (epidermis, dermis, hypodermis, and underlying skeletal muscle), liver, and trunk kidney (with Corpuscle of Stannius)

Tissue preservation: most organs, fair (i.e., mild to moderate post mortem autolysis)

Measures of physiologic condition:

1. Hepatocellular glycogen depletion, severe (slides 1 and 2)

### **Diagnosis**

1. Skin: dermatitis, ulcerative, focal, moderate (slides 1 and 2)
2. Spleen: granuloma, focal, 600 µm in diameter (slide 1)
3. Liver: yellow-brown pigmented macrophage aggregates and sinusoidal macrophages, disseminated, mild (slide 1)



**Final Comments**

Ulcerative dermatitis is almost always associated with bacterial infection, although bacteria might not be the initiating cause of the ulcers. Consider bacterial culture of these lesions (if not already done). Deeper sections of the block #1 were stained for bacteria (Twort's Gram stain; acid-fast stain); unfortunately, the single granuloma was not present in the special stains, so further characterization of the lesion could not be done. Also, do these fish have a history of infestation with sea lice?

The yellow-brown pigment in the liver (slide 1) is probably mostly lipofuscin. Accumulation of lipofuscin in the liver is a nonspecific change that can result from a variety of insults, including rancid feed, low levels of antioxidants in the feed, chronic infections, and exposure to organic contaminants. Conditions that lead to moderate to abundant hepatic lipofuscin have been associated with decreased growth and survival in several studies.

Notes on tissue preservation and handling:

1. The epidermis commonly separates from the dermis as a post mortem change, and in these slides it is difficult to separate antemortem from post mortem separation. Cells in the dermis that resemble infiltrative inflammatory cells are actually autolyzed hepatocytes that sloughed from the liver.
2. The cassettes contained too much tissue volume to be processed well. Tissue samples should fit loosely into cassettes. If the tissues must be compacted to fit into a cassette, it is better to split the tissues into two cassettes. Also, it is better to keep tissue with bone (e.g., gill, skin with scales) in separate cassettes from soft tissues.

/bb



**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll=Free: 1-800-661-9903

**Case Report**

**Submission** 2004-03662      **Date** 09-Nov-2004      **Report** 15-Nov-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 12929      A 3.2-67

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**

**Specimen:** Other

**Count** 1

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:** Atlantic

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

Gary D. Marty, D.V.M., Ph.D.;  
Diplomate, A.C.V.P  
Fish Pathologist

**History/Symptoms**

Provincial Surveillance Program Samples. Submitted culture for bacteriology - identification of isolates and C & S.

ID - A 3.2-67.

**Bacteriology**

Please note: Isolates from all quadrants of the agar plate were cross-contaminated, most prominent organisms were subcultured for identification and sensitivities.  
Bacteria identified as *Psychrobacter immobilis*.

Completed by E. Whitton.

\* Results faxed Nov. 15/04.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll=Free: 1-800-661-9903

**Case Report**

**Submission** 2004-03663      **Date** 09-Nov-2004      **Report** 15-Nov-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 12930      A 3.2-70

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**

**Specimen:** Other

**Count** 1

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:** Atlantic

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

Gary D. Marty, D.V.M., Ph.D.;  
Diplomate, A.C.V.P  
Fish Pathologist



**History/Symptoms**

Provincial Surveillance Program samples. Submitted culture for bacteriology - identification of isolates and C & S.

ID - A 3.2-70.

**Bacteriology**

Tetracycline designates Oxytetracycline.

Bacteria identified as Psychrobacter immobilis.

Vibrio sp. Negative for Serology: V.ordallii, V. anguillarum type 1 & 2.

Please note: The culture plate contained was cross contaminated, most prominent organisms were subcultured and identified.

Completed by E.Whitton

\* Results faxed Nov. 15/04.

/bb

# ANIMAL HEALTH CENTRE

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

## Case Report

**Submission** 2004-03667      **Date** 09-Nov-2004      **Report** 23-Nov-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 12934      A 3.2-67 (#1-4)

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**

**Specimen:** Tissue-Fresh f Forma

**Count** 5

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:** Atlantic

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

Gary D. Marty, D.V.M., Ph.D.;  
Diplomate, A.C.V.P  
Fish Pathologist

**History/Symptoms**

Provincial Surveillance Program samples. Request Virology - PCR for IHN, ISA, IPN, VHS and Piscirickettsia salmonis. Culture any PCR positive samples. Samples also submitted for routine histology.

ID - A 3.2-67 (#1-4).

**Histopathology**

Slide 1: autolysis, none (other organs) to mild (liver)

- 1a. Liver: pericholangitis, lymphocytic, multifocal, mild
- 1b. Liver: hepatocellular fatty change (lipidosis), diffuse, mild
2. Heart: endocarditis, focal, with a thin layer of lymphocytes and plasma cells, mild
- 3a. Spleen and adjacent fatty mesenteries: peritonitis, granulomatous, regionally diffuse, moderate, with occasional fine fibrocellular fronds
- 3b. Spleen: parenchymal yellow-green pigment (iron and lipofuscin), disseminated, intracellular (including multinucleate giant cells), moderate
4. Trunk kidney: tubular intracytoplasmic protein droplets, multifocal, moderate
5. Head kidney: no significant lesions

Comment: The yellow-green pigment in the spleen is both hemosiderin and lipofuscin. Accumulation of lipofuscin is a nonspecific change that can result from a variety of insults, including rancid feed, low levels of antioxidants in the feed, chronic infections, and exposure to organic contaminants. Conditions that lead to moderate to abundant lipofuscin have been associated with decreased growth and survival in several studies. Accumulation of hemosiderin is evidence of increased turnover of red blood cells.

Lymphocytic inflammation around bile ductules (liver) is evidence of chronic immune stimulation. This type of inflammation can result from bacteria ascending from the intestine to the liver through the biliary system. Lymphoplasmacytic inflammation in the heart is also evidence of chronic immune stimulation (cause unknown). Hepatocellular fatty change (lipidosis) often occurs when fish are not feeding; it also occurs in cases of inadequate nutrition.

Splenic peritonitis is consistent with a foreign body reaction, probably in response to vaccine adjuvant.

Renal tubular epithelial protein droplets are normal in some species, or they may be an indication of glomerular disease. Ferguson ("Systemic Pathology of Fish," 1989) reports an association of renal protein droplets and high ammonia levels in salmonids.

Slide 2: autolysis, none (other organs) to mild (liver and trunk kidney)

1. Liver: hepatocellular fatty change (lipidosis), diffuse, minimal
2. Heart: no significant lesions
3. Spleen and adjacent fatty mesenteries: peritonitis, granulomatous, regionally diffuse, moderate, with occasional fine fibrocellular fronds
4. Trunk kidney: tubular intracytoplasmic protein droplets, multifocal, mild
5. Head kidney: no significant lesions

Comment: Renal tubular epithelial protein droplets are normal in some species, or they may be an indication of glomerular disease. Ferguson ("Systemic Pathology of Fish," 1989) reports an association of renal protein droplets and high ammonia levels in salmonids.

Slide 3: autolysis, none (other organs) to mild (liver)

- 1a. Liver: hepatitis, focal (~300 x 700 µm), granulomatous, with multinucleate giant cells, moderate
- 1b. Liver: hepatocellular fatty change (lipidosis), diffuse, mild
- 2a. Heart: endocarditis, multifocal, with a thin layer of lymphocytes and plasma cells, mild
- 2b. Heart: epicarditis, regionally diffuse, lymphocytic, mild
3. Spleen: no significant lesions
4. Trunk kidney: tubular intracytoplasmic protein droplets, multifocal, mild
5. Head kidney: no significant lesions

Comment: Granulomatous hepatitis is probably the result of a chronic bacterial infection, and *Renibacterium salmoninarum* is the most common species associated with these lesions in pen-reared salmon. Epicarditis is evidence of chronic immune stimulation, but the cause is otherwise unknown.



Slide 4: autolysis, none (other organs) to mild (liver)

1. Liver: hepatocellular fatty change (lipidosis), diffuse, mild
2. Heart: endocarditis, multifocal, with a thin layer of lymphocytes and plasma cells, mild
3. Spleen: splenitis, multifocal, granulomatous, mild, with intracellular yellow-gold pigment
4. Trunk kidney: no significant lesions
5. Head kidney: no significant lesions

Comment: The pigment in the spleen has the same staining characteristics (and, presumably, pathogenesis) as the fish in slide #1.

**Molecular Diagnostics/PCR**

Samples 1-2, 3-4: IHN, VHS, ISA, IPN, *Piscirickettsia salmonis* negative by PCR.

\* Results faxed Dec. 1/04.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-03668      **Date** 09-Nov-2004      **Report** 22-Nov-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 12936      A 3.5-80 (#1-5)

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**

**Specimen:** Tissue-Fresh f Forma

**Count** 6

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:** Atlantic

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

Gary D. Marty, D.V.M., Ph.D.;  
Diplomate, A.C.V.P  
Fish Pathologist

**History/Symptoms**

Provincial Surveillance Program samples. Request Virology - PCR for IHN, ISA, IPN, VHS and Piscirickettsia salmonis. Culture any PCR positive samples. Samples also submitted for routine histology.

ID - A 3.5-80 (#1-5).



**Histopathology**

Slide 1: autolysis, mild (other organs) to moderate (liver)

1. Liver: no significant lesions
2. Heart: endocarditis, multifocal, with a thin layer of lymphocytes and plasma cells, mild
3. Spleen: peritonitis, lymphohistiocytic, multifocal, mild, with occasional fine fibrocellular fronds
4. Trunk kidney: tubular intracytoplasmic protein droplets, multifocal, mild
5. Head kidney: no significant lesions

Comment: Lymphoplasmacytic inflammation in the heart is evidence of chronic immune stimulation, but the cause is otherwise unknown. Splenic peritonitis is consistent with a foreign body reaction, probably in response to vaccine adjuvant. Renal tubular epithelial protein droplets are normal in some species, or they may be an indication of glomerular disease. Ferguson ("Systemic Pathology of Fish," 1989) reports an association of renal protein droplets and high ammonia levels in salmonids.

Slide 2: autolysis, none (other organs) to mild (liver)

1. Liver: hepatocellular fatty change (lipidosis), diffuse, mild
- 2a. Heart: endocarditis, multifocal, with a thin layer of lymphocytes and plasma cells, mild
- 2b. Heart: myocardial karyomegaly, multifocal, mild
3. Spleen: peritonitis, lymphohistiocytic, multifocal, mild, with occasional fine fibrocellular fronds
4. Trunk kidney: tubular intracytoplasmic protein droplets, multifocal, mild
5. Head kidney: no significant lesions

Comment: Hepatocellular fatty change (lipidosis) often occurs when fish are not feeding; it also occurs in cases of inadequate nutrition. The cause and significance of myocardial karyomegaly is unknown; karyomegaly in other cell types has been associated with exposure to algal toxins (e.g., hepatocytes exposed to microcystin LR in netpen liver disease).

Slide 3: autolysis, none (other organs) to mild (liver)

- 1a. Liver: biliary preductular cell hyperplasia, diffuse, mild
- 1b. Liver: basophilic hepatocellular cytoplasm, diffuse
2. Heart: no significant lesions
- 3a. Spleen: parenchymal yellow-green pigment, disseminated, intracellular, mild
- 3b. Spleen and adjacent fatty mesenteries: peritonitis, granulomatous, regionally diffuse, moderate, with occasional fine fibrocellular fronds
4. Trunk kidney: no significant lesions
5. Head kidney: no significant lesions

Comment: Biliary preductular cell hyperplasia is evidence of exposure to toxins. The toxins could be produced inside the fish (e.g., bacterial toxins) or come from outside the fish (e.g., from the water or the feed). Basophilic cytoplasm in hepatocytes is an indication of active protein synthesis. It is normal in mature females producing protein for deposition in their eggs. I have not seen hepatocellular basophilia described in juvenile salmon, but I suspect that it could be related to increased protein needed as part an inflammatory response.

The yellow-green pigment in the spleen most likely is lipofuscin. Accumulation of lipofuscin is a nonspecific change that can result from a variety of insults, including rancid feed, low levels of antioxidants in the feed, chronic infections, and exposure to organic contaminants. Conditions that lead to moderate to abundant lipofuscin have been associated with decreased growth and survival in several studies. In this fish, splenic lipofuscin accumulation and hepatic preductular cell hyperplasia might have the same underlying cause.

Slide 4: autolysis, none (other organs) to mild (liver)

1. Liver: hepatocellular fatty change (lipidosis), diffuse, moderate
2. Heart: myocardial karyomegaly, multifocal, mild
- 3a. Spleen: parenchymal yellow-green pigment, disseminated, intracellular, mild
- 3b. Spleen and adjacent fatty mesenteries: peritonitis, granulomatous, diffuse, moderate, with occasional



fine fibrocellular fronds

4. Trunk kidney: tubular intracytoplasmic protein droplets, multifocal, mild

5. Head kidney: not included on the slide

Comment: see comments on similar lesions above.

Slide 5: autolysis, mild (other organs) to moderate (liver)

1a. Liver: biliary preductular cell hyperplasia, diffuse, mild

1b. Liver: hepatocellular single cell necrosis (apoptosis), disseminated, acute, mild

2. Heart: no significant lesions

3. Spleen: lymphoid karyorrhexis, disseminated, mild

4. Trunk kidney: no significant lesions

5. Head kidney: no significant lesions

Comment: Hepatocellular single cell necrosis (apoptosis) can occur in rapidly growing fish that suddenly go off feed about 24 hours before death. Apoptosis is the normal way in which hepatocyte numbers are decreased (i.e., the hepatocytes are not needed when growing fish stop feeding because few to no nutrients are being absorbed into the blood and entering the liver for processing). Single cell necrosis can also result from exposure to toxins.

The presence of degenerating nuclei (karyorrhexis) in the spleen is evidence of increased cell turnover.

#### **Molecular Diagnostics/PCR**

Samples 1-3, 4-5: IHN, VHS, ISA, IPN, *Piscirickettsia salmonis* negative by PCR.

\* Results faxed Dec. 1/04.

/bb



# ANIMAL HEALTH CENTRE

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

## Case Report

**Submission** 2004-03670      **Date** 09-Nov-2004      **Report** 22-Nov-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 12937      A 3.2-70 (#1-4)

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**

**Specimen:** Tissue-Fresh f Forma

**Count** 5

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:** Atlantic

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

Gary D. Marty, D.V.M., Ph.D.;  
Diplomate, A.C.V.P  
Fish Pathologist

**History/Symptoms**

Provincial Surveillance Program samples. Request Virology - PCR for IHN, ISA, IPN, VHS and Piscirickettsia salmonis. Culture any PCR positive samples. Samples also submitted for routine histology.

ID - A 3.2-70 (#1-4).

**Histopathology**

Slide 1: autolysis, none (other organs) to mild (liver)

1a. Liver: yellow-green pigmented macrophages, disseminated, mild, consistent with intracellular lipofuscin

1b. Liver: hepatocellular fatty change (lipidosis), diffuse, mild

2. Heart: no significant lesions

3. Spleen: no significant lesions

4. Trunk kidney: no significant lesions

5. Head kidney: no significant lesions

Comment: Accumulation of lipofuscin in the liver is a nonspecific change that can result from a variety of insults, including rancid feed, low levels of antioxidants in the feed, chronic infections, and exposure to organic contaminants. Conditions that lead to moderate to abundant hepatic lipofuscin have been associated with decreased growth and survival in several studies. Hepatocellular fatty change (lipidosis) often occurs when fish are not feeding; it also occurs in cases of inadequate nutrition.

Slide 2: autolysis, none (other organs) to mild (liver)

1. Liver: vasculitis, multifocal, lymphocytic, neutrophilic, subacute, moderate

2. Heart: no significant lesions

3. Spleen: not included on the slide

4. Trunk kidney: no significant lesions

5. Head kidney: no significant lesions

Comment: Vasculitis in the liver is probably the result of a bacterial infection.

Slide 3: autolysis, none (all organs)

1a. Liver: pericholangial and perivascular immature mononuclear cells, multifocal, mild

1b. Liver: hepatocellular fatty change (lipidosis), diffuse, moderate

2a. Heart: endocarditis, multifocal, with a thin layer of macrophages, lymphocytes, and plasma cells, mild

2b. Heart: myocardial karyomegaly, multifocal, mild

3. Spleen and surrounding fatty mesenteries: peritonitis, granulomatous, multifocal, mild, with fine fibrocellular fronds

4. Trunk kidney: no significant lesions

5. Head kidney: hematopoietic cell hyperplasia, diffuse, moderate

Comment: Cells with large nuclei surrounding bile ductules and vessels in the liver have more features of a proliferative disorder than an inflammatory response. The unusual cells have pale basophilic cytoplasm and large nuclei that are round to C-shaped, with finely stippled chromatin. The cells resemble immature hematopoietic cells in the head kidney. The C-shaped nuclei are similar to the nuclei that occur in "cutaneous histiocytoma" of dogs. In dogs, cutaneous histiocytomas proliferate to about 1.5 cm in diameter, and mitotic figures can be abundant in the rapid growth phase; later, they are infiltrated by lymphocytes and spontaneously regress. However, the lesions in this fish had no mitotic figures, and foci of unusual cells were never more than 100 µm thick.

Lymphoplasmacytic inflammation with macrophages in the heart is evidence of chronic immune stimulation, but the cause is otherwise unknown. The cause and significance of myocardial karyomegaly is unknown; karyomegaly in other cell types has been associated with exposure to algal toxins (e.g., hepatocytes exposed to microcystin LR in netpen liver disease).

Splenic peritonitis is consistent with a foreign body reaction, probably in response to vaccine adjuvant.

Slide 4: autolysis, none (other organs) to mild (liver)

1. Liver: hepatitis, perivascular, neutrophilic, histiocytic, focal, mild

2a. Heart: endocarditis, multifocal, with a thin layer of lymphocytes and plasma cells, mild

2b. Heart: epicarditis, regionally diffuse, lymphocytic, moderate, with fibroplasia

3. Spleen: no significant lesions





4. Trunk kidney: no significant lesions

5. Head kidney: no significant lesions

Comment: Focal perivascular hepatitis is consistent with a bacterial infection, possibly arriving via the vasculature from another site. Epicarditis is evidence of chronic immune stimulation, but the cause is otherwise unknown.

**Molecular Diagnostics/PCR**

Samples 1-2, 3-4: IHN, VHS, ISA, IPN, *Piscirickettsia salmonis* negative by PCR.

\* Results faxed Dec. 1/04.

/bb

# ANIMAL HEALTH CENTRE

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

## Case Report

**Submission** 2004-03671      **Date** 09-Nov-2004      **Report** 26-Nov-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 12938      A 3.4-78 (#1-3)

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**

**Specimen:** Tissue-Fresh f Forma

**Count** 4

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:** Atlantic

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

Gary D. Marty, D.V.M., Ph.D.;  
Diplomate, A.C.V.P  
Fish Pathologist

**History/Symptoms**

Provincial Surveillance Program samples. Request Virology - PCR for IHN, ISA, IPN, VHS and Piscirickettsia salmonis. Culture any PCR positive samples. Samples also submitted for routine histology.

ID - A 3.4-78 (#1-3).

**Histopathology**

Slide 1: autolysis, none (other organs) to mild (liver and trunk kidney)

1a. Liver: hepatocellular fatty change (lipidosis), diffuse, mild

1b. Liver: yellow-green pigment in sinusoidal macrophages, disseminated, mild, with intracellular hemosiderin and lipofuscin (confirmed with special stains)

2. Heart: myocardial karyomegaly, multifocal, mild

3. Spleen: no significant lesions

4. Trunk kidney: no significant lesions

5. Head kidney: no significant lesions

Comment: Yellow-green pigment in sinusoidal macrophages in the liver is a result of accumulation of lipofuscin and/or hemosiderin. Accumulation of lipofuscin is a nonspecific change that can result from a variety of insults, including rancid feed, low levels of antioxidants in the feed, chronic infections, and exposure to organic contaminants. Conditions that lead to moderate to abundant hepatic lipofuscin have been associated with decreased growth and survival in several studies. Hemosiderin accumulation in the liver is evidence of increased turnover of red blood cells

Hepatocellular fatty change (lipidosis) often occurs when fish are not feeding; it also occurs in cases of inadequate nutrition.

The cause and significance of myocardial karyomegaly is unknown; karyomegaly in other cell types has been associated with exposure to algal toxins (e.g., hepatocytes exposed to microcystin LR in netpen liver disease).

Slide 2: autolysis, none (all organs)

1a. Liver: biliary preductular cell hyperplasia, diffuse, mild

1b. Liver: hepatocellular fatty change (lipidosis), diffuse, mild

2. Heart: myocardial karyomegaly, multifocal, mild

3. Spleen: prominent ellipsoids (small arterioles, large capillaries) densely lined by inflammatory cells (lymphocytes and monocytes)

4. Trunk kidney: no significant lesions

5. Head kidney: nephritis, granulomatous, lymphoplasmacytic, focal, moderate

Comment: Biliary preductular cell hyperplasia is evidence of exposure to toxins. The toxins could be produced inside the fish (e.g., bacterial toxins) or come from outside the fish (e.g., from the water or the feed).

Granulomatous inflammation in the head kidney is consistent with a chronic bacterial infection, and *Renibacterium salmoninarum* is the most common organism associated with these lesions.

Prominent ellipsoids in the spleen are evidence of chronic immune stimulation, probably from a bacterial infection, the specific cause is unknown.

Slide 3: autolysis, none (other organs) to mild (liver)

1a. Liver: hepatic necrosis, acute, multifocal, mild

1b. Liver: biliary preductular cell hyperplasia, diffuse, mild

1c. Liver: pericholangitis, lymphocytic, multifocal, mild

2a. Heart: myocardial karyomegaly, multifocal, mild

2b. Heart: endocarditis, focal (200 x 50 µm), with a thin layer of macrophages, lymphocytes, and plasma cells, mild

2c. Heart: epicarditis, focal (400 µm in diameter), granulomatous, mild

3. Spleen: no significant lesions

4. Trunk kidney (and swollen skeletal muscle fibres): no significant lesions

5. Head kidney: no significant lesions



Comment: Hepatic necrosis can be caused by inadequate vascular perfusion or direct cytotoxicity from viral or bacterial infections. Lymphocytic inflammation around bile ductules (liver) is evidence of chronic immune stimulation. This type of inflammation can result from bacteria ascending from the intestine to the liver through the biliary system.

Lymphoplasmacytic inflammation in the heart is evidence of chronic immune stimulation, but the cause is otherwise unknown. Granulomatous epicarditis is evidence of chronic immune stimulation; the most common

**Molecular Diagnostics/PCR**

Samples 1-3: IHN, VHS, ISA, IPN, *Piscirickettsia salmonis* negative by PCR.

\* Results faxed Dec. 1/04.

/bb

# ANIMAL HEALTH CENTRE

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

## Case Report

**Submission** 2004-03672      **Date** 09-Nov-2004      **Report** 26-Nov-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 12939      A 3.2-71 (#1-5)

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**

**Specimen:** Tissue-Fresh f Forma

**Count** 6

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:** Atlantic

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

Gary D. Marty, D.V.M., Ph.D.;  
Diplomate, A.C.V.P  
Fish Pathologist

**History/Symptoms**

Provincial Surveillance Program samples. Request Virology - PCR for IHN, ISA, IPN, VHS and Piscirickettsia salmonis. Culture any PCR positive samples. Samples also submitted for routine histology.

ID - A 3.2-71 (#1-5).



**Histopathology**

Slide 1: autolysis, none (other organs) to mild (liver and trunk kidney)

1. Liver: no significant lesions
2. Heart: no significant lesions
3. Spleen: splenitis, lymphoplasmacytic, perivascular, moderate (bands of inflammatory cells are up to 400 µm thick)
4. Trunk kidney: no significant lesions
5. Head kidney: not included on the slide

Comment: This is the largest accumulation of lymphocytes and plasma cells I have seen in spleens of Atlantic salmon. They are arranged in regular cord similar to the pattern of hematopoietic cells in a normal head kidney. In fact, less than 10% of the cells in the splenic cords are large, immature hematopoietic cells. Therefore, a component of this reaction is hematopoietic, but the majority represents chronic inflammation. Bacterial infection is the most likely cause.

Slide 2: autolysis, none (other organs) to mild (liver)

1. Liver: hepatocellular fatty change (lipidosis), diffuse, mild
2. Heart: myocardial karyomegaly, multifocal, mild
3. Spleen and surrounding fatty mesenteries: peritonitis, lymphohistiocytic, multifocal, mild, with fine fibrocellular fronds
4. Trunk kidney: no significant lesions
5. Head kidney: no significant lesions

Comment: Splenic peritonitis is consistent with a foreign body reaction, probably in response to vaccine adjuvant. The cause and significance of myocardial karyomegaly is unknown; karyomegaly in other cell types has been associated with exposure to algal toxins (e.g., hepatocytes exposed to microcystin LR in netpen liver disease). Hepatocellular fatty change (lipidosis) often occurs when fish are not feeding; it also occurs in cases of inadequate nutrition.

Slide 3: autolysis, none (all organs)

1. Liver: biliary preductular cell hyperplasia, diffuse, mild
2. Heart: no significant lesions
3. Spleen and surrounding fatty mesenteries: peritonitis, lymphohistiocytic, multifocal, mild, with fine fibrocellular fronds
4. Trunk kidney: no significant lesions
5. Head kidney: not included on the slide

Comment: Biliary preductular cell hyperplasia is evidence of exposure to toxins. The toxins could be produced inside the fish (e.g., bacterial toxins) or come from outside the fish (e.g., from the water or the feed).

Slide 4: autolysis, mild (other organs) to moderate (liver)

1. Liver: pericholangitis, lymphocytic, multifocal, moderate
2. Heart: no significant lesions
3. Spleen: no significant lesions
4. Trunk kidney: no significant lesions
5. Head kidney: no significant lesions

Comment: Lymphocytic inflammation around bile ductules (liver) is evidence of chronic immune stimulation. This type of inflammation can result from bacteria ascending from the intestine to the liver through the biliary system.

Slide 5: autolysis, none (other organs) to mild (liver)

- 1a. Liver: yellow-brown pigmented macrophage aggregates and sinusoidal macrophages, disseminated, mild, with intracellular hemosiderin and/or lipofuscin
- 1b. Liver: pericholangitis, lymphocytic, multifocal, mild



- 1c. Liver: biliary preductular cell hyperplasia, diffuse, mild
2. Heart: not included on the slide
3. Spleen: peritonitis, lymphoplasmacytic, granulomatous, regionally diffuse, moderate, with fibrocellular fronds
4. Trunk kidney: no significant lesions
5. Head kidney: no significant lesions

Comment: Accumulation of lipofuscin in the liver is a nonspecific change that can result from a variety of insults, including rancid feed, low levels of antioxidants in the feed, chronic infections, and exposure to organic contaminants. Conditions that lead to moderate to abundant hepatic lipofuscin have been associated with decreased growth and survival in several studies. Hemosiderin accumulation in the liver is evidence of

### **Molecular Diagnostics/PCR**

Samples 1-3, 4-5: IHN, VHS, ISA, IPN, Piscirickettsia salmonis negative by PCR.

/bb

# ANIMAL HEALTH CENTRE

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

## Case Report

**Submission** 2004-03673      **Date** 09-Nov-2004      **Report** 26-Nov-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 12940      A 3.4-79 (#1-3)

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**

**Specimen:** Tissue-Fresh f Forma

**Count** 4

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:** Atlantic

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

Gary D. Marty, D.V.M., Ph.D.;  
Diplomate, A.C.V.P  
Fish Pathologist

**History/Symptoms**

Provincial Surveillance Program samples. Request Virology - PCR for IHN, ISA, IPN, VHS and Piscirickettsia salmonis. Culture any PCR positive samples. Samples also submitted for routine histology.

ID - A 3.4-79 (#1-3).

**Histopathology**

Slide 1: autolysis, none (all organs)

1a. Liver: biliary preductular cell hyperplasia, diffuse, moderate

1b. Liver: peritonitis, lymphohistiocytic, focal, moderate, with dilated vessels (lymphatics?), occasional fine fibrocellular fronds, and adjacent hepatic sinusoidal fibrosis

2. Heart: no significant lesions

3. Spleen: peritonitis, regionally diffuse, with fibrocellular fronds, mild

4. Trunk kidney: no significant lesions

5. Head kidney: no significant lesions

Comment: Biliary preductular cell hyperplasia is evidence of exposure to toxins. The toxins could be produced inside the fish (e.g., bacterial toxins) or come from outside the fish (e.g., from the water or the feed). Hepatic peritonitis is consistent with a foreign body reaction, probably in response to vaccine adjuvant. The sinusoidal fibrosis is unusual, but probably a result of blocked and inflamed lymphatic vessels.

Splenic peritonitis is consistent with a foreign body reaction, probably in response to vaccine adjuvant.

Slide 2: autolysis, none (all organs)

1. Liver: hepatitis, granulomatous, lymphoplasmacytic, focal mild

2. Heart: no significant lesions

3. Spleen: no significant lesions

4. Trunk kidney: occlusive thrombus, cellular and fibrinous, in a vessel 200x100 µm

5. Head kidney: no significant lesions

Comment: The thrombus in the trunk kidney is evidence of endothelial damage, most likely as a result of a bacterial infection. Granulomatous inflammation in the liver is consistent with a chronic bacterial infection, and Renibacterium salmoninarum is the most common organism associated with these lesions.

Slide 3: autolysis, none (other organs) to mild (liver)

1a. Liver: biliary preductular cell hyperplasia, diffuse, mild

1b. Liver: hepatocellular fatty change (lipidosis), diffuse, mild

2. Heart: myocardial karyomegaly, multifocal, moderate

3. Spleen: no significant lesions

4. Trunk kidney: no significant lesions

5. Head kidney: no significant lesions

Comment: Hepatocellular fatty change (lipidosis) often occurs when fish are not feeding; it also occurs in cases of inadequate nutrition. The cause and significance of myocardial karyomegaly is unknown; karyomegaly in other cell types has been associated with exposure to algal toxins (e.g., hepatocytes exposed to microcystin LR in netpen liver disease).



**Molecular Diagnostics/PCR**

Samples 1-3: IHN, VHS, ISA, IPN, *Piscirickettsia salmonis* negative by PCR.

/bb

# ANIMAL HEALTH CENTRE

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

## Case Report

**Submission** 2004-03674      **Date** 09-Nov-2004      **Report** 29-Nov-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 12941      A 3.2-68 (#1-4)

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**

**Specimen:** Tissue-Fresh f Forma

**Count** 4

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:** Atlantic

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

Gary D. Marty, D.V.M., Ph.D.;  
Diplomate, A.C.V.P  
Fish Pathologist



**History/Symptoms**

Provincial Surveillance Program samples. Request Virology - PCR for IHN, ISA, IPN, VHS and Piscirickettsia salmonis. Culture any PCR positive samples. Samples also submitted for routine histology.

ID - A 3.2-68 (#1-4).

**Histopathology**

Slide 1: autolysis, none (other organs) to mild (trunk kidney, liver)

1. Liver: hepatocellular fatty change (lipidosis), diffuse, mild
2. Heart: myocardial karyomegaly, multifocal, mild
3. Spleen: no significant lesions
4. Trunk kidney: no significant lesions
5. Head kidney: no significant lesions

Comment: Hepatocellular fatty change (lipidosis) often occurs when fish are not feeding; it also occurs in cases of inadequate nutrition. The cause and significance of myocardial karyomegaly is unknown; karyomegaly in other cell types has been associated with exposure to algal toxins (e.g., hepatocytes exposed to microcystin LR in netpen liver disease).

Slide 2: autolysis, mild (other organs) to moderate (liver)

1. Liver: severe post-fixation desiccation artefact; no significant lesions
2. Heart: myocardial karyomegaly, multifocal, mild
3. Spleen: splenic congestion, diffuse, moderate
4. Trunk kidney: renal edema, diffuse, moderate
5. Head kidney: no significant lesions

Comment: Most spleens of dead salmon are contracted and have comparatively few erythrocytes; by comparison, this spleen contains abundant erythrocytes. The only significance may be that the fish was not under stress when it died. [Fish often contract their spleen when under stress.]

I have not previously seen edema in the trunk kidney of pen-reared Atlantic salmon. The hematopoietic cells and head kidney in this case are relatively normal, so the increased space between renal tubules in the trunk kidney is not a result of hematopoietic necrosis (as might be expected with IHN infection). Possible differentials include a bacterial infection or an inherent metabolic dysfunction.

Slide 3: autolysis, none (other organs) to mild (liver)

1. Liver: hepatocellular fatty change (lipidosis), diffuse, mild
2. Heart: no significant lesions
3. Spleen: no significant lesions
4. Trunk kidney: sinusoidal eosinophilic granular cells, diffuse, mild
5. Head kidney: sinusoidal eosinophilic granular cells, diffuse, abundant

Comment: Increased numbers of eosinophilic granular cells have been associated with experimental infection with *Renibacterium salmoninarum*, the cause of bacterial kidney disease (Flaño et al. 1996), but they are not described as a common finding in clinical cases. This case had no evidence of granulomatous inflammation more commonly associated with bacterial kidney disease. Increased numbers of eosinophilic granular cells are sometimes associated with chronic parasitic infections, but again, the inciting cause was not included in the sections examined.

Literature cited:

Flaño, E., López-fierro, P., Razquin, B. E., and A. Villena. 1996. In vitro differentiation of eosinophilic granular cells in *Renibacterium salmoninarum*-infected gill cultures from rainbow trout. *J. Fish & Shellfish Immunology* 3: 173-184.

Slide 4: autolysis, none (other organs) to mild (liver)

1. Liver: hepatocellular fatty change (lipidosis), diffuse, mild
2. Heart: no significant lesions
- 3a. Spleen: peritonitis, lymphoplasmacytic, granulomatous, regionally diffuse, moderate, with fine fibrocellular fronds
- 3b. Spleen: splenic congestion, moderate, with abundant acid hematin crystals in the middle of the section
4. Trunk kidney: no significant lesions



5. Head kidney: sinusoidal eosinophilic granular cells, diffuse, mild

Comment: Splenic peritonitis is consistent with a foreign body reaction, probably in response to vaccine adjuvant. Acid hematin forms brown-black microcrystalline granules that are birefringent under polarized light; the crystals are about the size of bacterial rods. Acid hematin results from tissues fixed in formalin having a low pH. In my experience (and here), acid hematin crystals most commonly form in tissues that are difficult for formalin to penetrate (e.g., a blood-filled spleen); it may be that lactic acid built up in the tissues overwhelms the buffers in the little formalin that is able to penetrate the deeper parts of the organ.

#### **Molecular Diagnostics/PCR**

Samples 1-2, 3-4: IHN, VHS, ISA, IPN, *Piscirickettsia salmonis* negative by PCR.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll=Free: 1-800-661-9903

**Case Report**

**Submission** 2004-03765      **Date** 18-Nov-2004      **Report** 11-Feb-2005

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 12997      A 2.3 - 60

**Farm:**

**Vet Clinic:**

**Attending**

**Specimen:** Tissue - Fresh

**Count** 3

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

Gary D. Marty, D.V.M., Ph.D.;  
Diplomate, A.C.V.P  
Fish Pathologist

**History/Symptoms**

Submitted Provincial Surveillance Program samples for virology - PCR for IHN, ISA, IPN, VHS, and *Piscirickettsia salmonis*. Culture an PCR positive samples.

Sample ID: A 2.3 - 60 (1-3).

Addendum: Jan. 20/05. Samples submitted for routine histology processing and analysis.

**Histopathology**

Slide 1: autolysis, none (other organs) to mild (liver)

- 1a. Liver: hepatitis, granulomatous, pleocellular, multifocal, moderate
- 1b. Liver: vasculitis, lymphoplasmacytic, focal, mild
- 1c. Liver: biliary preductular cell hyperplasia, diffuse, mild
2. Heart: no significant lesions
3. Spleen: peritonitis, chronic, focal, with fibrocellular fronds, mild
- 4a. Trunk kidney, renal intratubular necrotic cells (probably epithelial cells), focal, acute, mild
4. Trunk kidney: renal tubular mineralization, focal, mild
5. Head kidney: not included on the slide

Comment: Granulomatous inflammation in the liver is consistent with a chronic bacterial infection, and *Renibacterium salmoninarum* is the most common organism associated with these lesions. Hepatic lymphoplasmacytic vasculitis is consistent with chronic immune stimulation and might also be related to infection with *Renibacterium salmoninarum*. Biliary preductular cell hyperplasia is evidence of exposure to toxins. The toxins could be produced inside the fish (e.g., bacterial toxins) or come from outside the fish (e.g., from the water or the feed).

Splenic peritonitis is consistent with a foreign body reaction, probably in response to vaccine adjuvant. Renal mineralization is common in cultured fish species; when severe, the condition is termed nephrocalcinosis. The lesion is not considered fatal, although feed conversion may be adversely affected. The cause is unknown, but renal mineralization has been experimentally reproduced through high carbon dioxide levels, magnesium deficiency, selenium toxicity, and a diet low in minerals (source, "Systemic Pathology of Fish", 1989, by H. Ferguson). Clinically, renal mineralization is most commonly associated with high carbon dioxide levels.

Renal tubular epithelial necrosis results from acute damage to renal epithelial cells; damage is reversible if the basement membrane is spared (as in this case). Causes in fish include exposure to toxicants (e.g., bacterial toxins, or aminoglycoside antibiotics).

Slide 2: autolysis, none (all organs)

- 1a. Liver: peritonitis, chronic, multifocal, with fibrocellular fronds, mild
- 1b. Liver: pericholangitis, lymphocytic, multifocal, mild
- 1c. Liver: hepatic necrosis, acute, focal, mild
- 1d. Liver: sinusoidal congestion around medium-sized blood vessels (peliosis), multifocal, moderate
- 2a. Heart: epicarditis, regionally diffuse, lymphocytic, mild
- 2b. Heart: myocardial karyomegaly, multifocal, mild
3. Spleen: no significant lesions
4. Trunk kidney: no significant lesions
5. Head kidney: no significant lesions

Comment: Lymphocytic inflammation around bile ductules (liver) is evidence of chronic immune stimulation. This type of inflammation can result from bacteria ascending from the intestine to the liver through the biliary system. Focal hepatic necrosis is usually a result of vascular compromise; potential causes include a bacterial or viral infection, but PCR ruled out *Piscirickettsia* and major viral infections. Hepatic peliosis is evidence of sinusoidal damage; peliosis and hepatic necrosis are two of the classic lesions associated with ISAV infections. Peliosis has been described in wild fish (dab) surveyed in the north Pacific (source: <http://www.cefas.co.uk/publications/aquatic/aemr41.pdf>), but the cause was not determined. I have seen it in farmed rainbow trout fed rancid feed with high mycotoxin concentrations (unpublished data).

Epicarditis is evidence of chronic immune stimulation, but the cause is otherwise unknown. The cause and significance of myocardial karyomegaly is unknown; karyomegaly in other cell types has been associated with exposure to algal toxins (e.g., hepatocytes exposed to microcystin LR in netpen liver disease).





Slide 3: autolysis, none (other organs) to mild (liver)

1. Liver: pericholangitis, lymphocytic, multifocal, mild
2. Heart: epicarditis, regionally diffuse, lymphohistiocytic, mild
- 3a. Spleen: parenchymal golden pigment, multifocal, intracellular, moderate
- 3b. Spleen: peritonitis, chronic, regionally diffuse, with fibrocellular fronds, mild
4. Trunk kidney: intratubular necrotic epithelial cells, focal, acute, mild
5. Head kidney: not included on the slide

Comment: The golden pigment in the spleen most likely is lipofuscin. Accumulation of lipofuscin is a non-specific change that can result from a variety of insults, including rancid feed, low levels of antioxidants in the feed, chronic infections, and exposure to organic contaminants. In pen-reared salmon, hepatic lipofuscin accumulation is a common feature of netpen liver disease (microcystin-LR). Conditions that lead to moderate to abundant lipofuscin have been associated with decreased growth and survival in several

### **Molecular Diagnostics/PCR**

Samples 1-3: IHN, VHS, ISA, IPN, *Piscirickettsia salmonis* negative by PCR.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll=Free: 1-800-661-9903

**Case Report**

**Submission** 2004-03767      **Date** 18-Nov-2004      **Report** 14-Feb-2005

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 12999      A 3.4 - 77

**Farm:**

**Vet Clinic:**

**Attending**

**Specimen:** Tissue - Fresh

**Count** 1

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

Gary D. Marty, D.V.M., Ph.D.;  
Diplomate, A.C.V.P  
Fish Pathologist

**History/Symptoms**

Submitted Provincial Surveillance Program samples for virology - PCR for IHN, ISA, IPN, VHS, and Piscirickettsia salmonis. Culture an PCR positive samples.

Sample ID: A 3.4 - 77 (1).

Addendum: Jan. 20/05. Samples submitted for routine histology processing and analysis.

**Gross Pathology**

Quality control/quality assurance: the sections contain moderate precipitates of acid hematin; this is probably a result of transferring tissues to ethanol followed by return to formalin as part of processing the tissue into paraffin.

**Histopathology**

Slide 1: autolysis, mild (other organs) to severe (liver)

1. Liver: pericholangitis, lymphocytic, focal, mild

2. Heart: no significant lesions

3. Spleen: no significant lesions

4. Trunk kidney: no significant lesions

5. Head kidney: not included on the slide

Comment: Lymphocytic inflammation around bile ductules (liver) is evidence of chronic immune stimulation. This type of inflammation can result from bacteria ascending from the intestine to the liver through the biliary system.

**Molecular Diagnostics/PCR**

Samples 1: IHN, VHS, ISA, IPN, Piscirickettsia salmonis negative by PCR.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-03839      **Date** 24-Nov-2004      **Report** 01-Dec-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 13036      A 2.4 - 64 (1)

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**

**Specimen:** Other

**Count** 2

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

Gary D. Marty, D.V.M., Ph.D.;  
Diplomate, A.C.V.P  
Fish Pathologist

**History/Symptoms**

Submitted Provincial Surveillance Program samples for bacteriology (2 plates) - for identification of isolates and culture and sensitivity.

Sample ID: A 2.4 - 64 (1).

**Bacteriology**

Isolate #1 - *Aeromonas salmonicida*.

Isolate #2 - *Photobacterium angustum*.

\* Results faxed Dec. 1/04.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll=Free: 1-800-661-9903

**Case Report**

**Submission** 2004-03858      **Date** 25-Nov-2004      **Report** 22-Dec-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 13048      A 2.4-64 (1-2)

**Farm:**

**Vet Clinic:**

**Attending**

**Specimen:** Tissue - Fresh

**Count** 2

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

Gary D. Marty, D.V.M., Ph.D.;  
Diplomate, A.C.V.P  
Fish Pathologist

**History/Symptoms**

Submitted Provincial Surveillance Program samples for virology - PCR for IHN, ISA, IPN, VHS, and Piscirickettsia salmonis. Culture any PCR positive samples.

Please refer to case 2005-00189 for histo. results.

Sample ID: A2.4-64 (1-2).

**Molecular Diagnostics/PCR**

Samples 1-2: IHN, VHS, ISA, Piscirickettsia salmonis negative by PCR.

\* Results faxed Dec. 22/04.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll=Free: 1-800-661-9903

**Case Report**

**Submission** 2004-00039      **Date** 07-Jan-2004      **Report** 09-Feb-2004

**Report**      **Copies**

**Submitter:** 9439 Marine Harvest Canada (M)

**Owner** 9439 Marine Harvest Canada (M)

**Farm:**

**Vet Clinic:**

**Attending**

**Specimen:** Tissue - Fresh

**Count** 10

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:** Atlantic Salmon

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

J.H. Robinson, D.V.M.  
Veterinary Virologist



**History/Symptoms**

Submitted 10 fresh fish tissues for virology - tissue culture only.

Log Number: 5005.

**Virology**

10 samples inoculated onto tissue culture - all negative.

\*Virology results faxed on February 9, 2004.

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-03948      **Date** 03-Dec-2004      **Report** 18-Feb-2005

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 13103      A 3.3 - 73 (1-3)

**Farm:**

**Vet Clinic:**

**Attending**

**Specimen:** Tissue - Fresh

**Count** 1

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

Gary D. Marty, D.V.M., Ph.D.;  
Diplomate, A.C.V.P  
Fish Pathologist

**History/Symptoms**

Submitted Provincial Surveillance Program samples for virology - PCR for IHN, ISA, VHS, and Piscirickettsia salmonis. Culture any PCR positive samples.

Sample ID: A 3.3 - 73 (1-3).

Addendum: Jan. 20/2005 Samples submitted for routine histology processing and analysis.

**Gross Pathology**

Quality control/quality assurance: the sections of spleen contain moderate precipitates of acid hematin; this might be a result of transferring tissues to ethanol followed by return to formalin as part of processing the tissue into paraffin.

**Histopathology**

Slide 1: autolysis, none (other organs) to mild (liver)

- 1a. Liver: hepatocellular fatty change (lipidosis), multifocal, mild
- 1b. Liver: basophilic hepatocellular cytoplasm, diffuse, mild
2. Heart: myocardial karyomegaly, multifocal, mild
3. Spleen: peritonitis, chronic, focal, with fibrocellular fronds, mild
4. Trunk kidney: nephritis, interstitial, granulomatous, focal (200 µm in diameter), mild
5. Head kidney: no significant lesions

Comment: The most common organism associated with granulomatous nephritis in salmon is *Renibacterium salmoninarum*, the cause of bacterial kidney disease. Hepatocellular fatty change (lipidosis) often occurs when fish are not feeding; it also occurs in cases of inadequate nutrition. Basophilic cytoplasm in hepatocytes is an indication of active protein synthesis. It is normal in mature females producing protein for deposition in their eggs. In juvenile salmon it might be related to increased protein needed as part an inflammatory response. The cause and significance of myocardial karyomegaly is unknown; karyomegaly in other cell types has been associated with exposure to algal toxins (e.g., hepatocytes exposed to microcystin LR in netpen liver disease). Splenic peritonitis is consistent with a reaction to foreign material; it is common in fish that have been vaccinated.

Slide 2: autolysis, none (all organs)

- 1a. Liver: hepatocellular fatty change (lipidosis), multifocal, mild
- 1b. Liver: basophilic hepatocellular cytoplasm, diffuse, moderate
2. Heart: no significant lesions
3. Spleen: no significant lesions
4. Trunk kidney: no significant lesions
5. Head kidney: no significant lesions

Comment: none

Slide 3: autolysis, mild (all organs)

1. Liver: parenchymal golden pigment, disseminated, intracellular (including multinucleate giant cells), moderate
- 1b. Liver: basophilic hepatocellular cytoplasm, diffuse, moderate
2. Heart: no significant lesions
3. Spleen: no significant lesions
4. Trunk kidney: no significant lesions
5. Head kidney: no significant lesions

Comment: The golden pigment in the liver most likely is lipofuscin. Accumulation of lipofuscin is a nonspecific change that can result from a variety of insults, including rancid feed, low levels of antioxidants in the feed, chronic infections, and exposure to organic contaminants. Conditions that lead to moderate to abundant lipofuscin have been associated with decreased growth and survival in several studies.

**Molecular Diagnostics/PCR**

Samples 1-3: IHN, VHS, ISA, IPN, *Piscirickettsia salmonis* negative by PCR.

\* Results faxed Dec. 22/04.

/bb



**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-03949      **Date** 03-Dec-2004      **Report** 23-Feb-2005

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 13104      A 3.3 - 75 (1-6)

**Farm:**

**Vet Clinic:**

**Attending**

**Specimen:** Tissue - Fresh

**Count** 1

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

Gary D. Marty, D.V.M., Ph.D.;  
Diplomate, A.C.V.P  
Fish Pathologist

**History/Symptoms**

Submitted Provincial Surveillance Program samples for virology - PCR for IHN, ISA, VHS, and Piscirickettsia salmonis. Culture any PCR positive samples.

Sample ID: A3.3 - 75 (1-6).

Addendum: Jan. 20/2005. Samples submitted for routine histology processing and analysis.

**Gross Pathology**

Quality control/quality assurance: the sections contain moderate precipitates of acid hematin; this might be a result of transferring tissues to ethanol followed by return to formalin as part of processing the tissue into paraffin. Alternatively, tissues might not have been fixed in neutral buffered formalin.

**Histopathology**

Slide 1: autolysis, mild (other organs) to moderate (liver)

1. Liver: peritonitis, chronic, multifocal, with fibrocellular fronds, mild
2. Heart: no significant lesions
3. Spleen: peritonitis, chronic, multifocal, with fibrocellular fronds, mild
4. Trunk kidney: no significant lesions
5. Head kidney: no significant lesions

Comment: Changes in these tissues were not sufficient to explain the death of this fish. Hepatic/splenic peritonitis is consistent with a reaction to foreign material; it is common in fish that have been vaccinated.

Slide 2: autolysis, mild (other organs) to moderate (liver)

- 1a. Liver: hepatocellular fatty change (lipidosis), diffuse, mild
- 1b. Liver: basophilic hepatocellular cytoplasm, diffuse, mild
2. Heart: epicarditis and endocarditis, multifocal, lymphoplasmacytic, mild
3. Spleen: peritonitis, chronic, multifocal, with fibrocellular fronds, mild
4. Trunk kidney: no significant lesions
5. Head kidney: no significant lesions

Comment: Hepatocellular fatty change (lipidosis) often occurs when fish are not feeding; it also occurs in cases of inadequate nutrition. Basophilic cytoplasm in hepatocytes is an indication of active protein synthesis. It is normal in mature females producing protein for deposition in their eggs. In juvenile salmon it might be related to increased protein needed as part an inflammatory response. Endocarditis and epicarditis are evidence of chronic immune stimulation, but the cause is otherwise unknown.

Slide 3: autolysis, none (other organs) to mild (liver)

- 1a. Liver: hepatic necrosis, acute, multifocal, coalescing, with intralesional karyorrhexis and small numbers intrahistiocytic basophilic structures that might be *Piscirickettsia salmonis*, severe
- 1b. Liver: hepatocellular fatty change (lipidosis), diffuse, moderate
- 1c. Liver: basophilic hepatocellular cytoplasm, diffuse, mild
2. Heart: epicarditis, focal, with abundant intralesional karyorrhexis and small numbers intrahistiocytic basophilic structures that might be *Piscirickettsia salmonis*, mild
3. Spleen: no significant lesions
4. Trunk kidney: no significant lesions
5. Head kidney: not included in the section

Comment: Hepatic necrosis can be caused by inadequate vascular perfusion or direct cytotoxicity from viral or bacterial infections. Although the heart and liver have basophilic structures that resemble *Piscirickettsia salmonis*, the PCR results provide evidence against common fish pathogens as the cause for the hepatic necrosis. Lack of proliferative lesions in the biliary system is evidence against a chronic toxic cause for the hepatic necrosis.

Slide 4: autolysis, none (other organs) to mild (liver)

1. Liver: basophilic hepatocellular cytoplasm, diffuse, mild
2. Heart: epicarditis, multifocal, lymphoplasmacytic, mild
3. Spleen: no significant lesions
4. Trunk kidney: no significant lesions
5. Head kidney: not included in the section

Comment: none

Slide 5: autolysis, mild (other organs) to moderate (liver)

1. Liver: no significant lesions
2. Heart: no significant lesions
3. Spleen: peritonitis, chronic, multifocal, with fibrocellular fronds, moderate
4. Trunk kidney: no significant lesions





5. Head kidney: not included in the section

Comment: none

Slide 6: autolysis, none (other organs) to mild (liver)

1a. Liver: hepatocellular fatty change (lipidosis), diffuse, mild

1b. Liver: basophilic hepatocellular cytoplasm, diffuse, moderate

2. Heart: epicarditis, multifocal, lymphoplasmacytic, with eosinophilic granular cells, mild

3. Spleen: peritonitis, chronic, multifocal, with fibrocellular fronds, moderate

4. Trunk kidney: renal tubular epithelial necrosis, focal, acute, mild

5. Head kidney: no significant lesions

Comment: Renal tubular epithelial necrosis results from acute damage to renal epithelial cells; damage is reversible if the basement membrane is spared (as in this case). Causes in fish include exposure to toxicants (e.g., bacterial toxins, or aminoglycoside antibiotics such as Gentamicin).

### **Molecular Diagnostics/PCR**

Samples 1-3, 4-6: IHN, VHS, ISA, IPN, *Piscirickettsia salmonis* negative by PCR.

\* Results faxed Dec. 22/04.

ADDENDUM (sent - Mar. 3/05):

PCR analysis of a paraffin section from block #3 was negative for *Piscirickettsia salmonis*. Because the *Piscirickettsia salmonis* PCR uses a large primer, formalin fixation probably decreases PCR sensitivity (the change in sensitivity has not been quantified). Therefore, this case should still be considered *Piscirickettsia salmonis* suspect, but the number of organisms is probably not sufficient to have caused the death of this fish. [The positive control paraffin section was positive for *Piscirickettsia salmonis*, but organisms in the positive control case were abundant.]

/bb



**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll=Free: 1-800-661-9903

**Case Report**

**Submission** 2004-03950      **Date** 03-Dec-2004      **Report** 14-Dec-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 13105      A 3.3 - 75 (1,2,3)

**Farm:**

**Vet Clinic:**

**Attending**

**Specimen:** Other

**Count** 1

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

Gary D. Marty, D.V.M., Ph.D.;  
Diplomate, A.C.V.P  
Fish Pathologist

**History/Symptoms**

Submitted subcultures for bacteriology - identification of isolates and culture and sensitivity.

Virology being submitted in same shipment; please reference case number 2004/03949.

Sample ID: A 3.3 - 75 (1, 2, 3).

**Bacteriology**

Bact. Plate: Due to poor biochemical reactivity isolates were identified by DNA sequencing. Isolates identified as *Photobacter phosphoreum*.

Bacteria sensitive to: erythromycin, florfenicol, ROMET 30, sulfa-methox-trimeth, tetracycline.

**Virology**

Results to follow when completed.

/mb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll=Free: 1-800-661-9903

**Case Report**

**Submission** 2004-04009      **Date** 08-Dec-2004      **Report** 13-Dec-2004

**Report**      **Copies**

**Submitter:** 12847      Heritage Salmon  
**Owner** 13134      Wehlis Bay, PO# 14388  
**Farm:**  
**Vet Clinic:**  
**Attending**

**Specimen:** Tissue - Formalized      **Count** 4      **Flock Herd Size:**  
**Species:** Atlantic Salmon      **Age**  
**Breed:**      **Sex:**

**Feed:**      **Feed**

**Vaccination****Treatmen****Diagnosis**

Gary D. Marty, D.V.M., Ph.D.;  
Diplomate, A.C.V.P  
Fish Pathologist

### **History/Symptoms**

Submitted 4 tissue cassettes - 2 internal tissues and 2 skin for histology.

Harvest size fish. Small amount of hemorrhage on anterior flesh wall (pectoral area). Red rash uniform along flanks. Lots of skin erosion. Site has some BKD and comes from populations with VHS.

Sample ID: 04-45.

### **Histopathology**

Four cassettes of tissues were submitted:

Slide 1 (WB-1) - gill, intestine, liver, spleen, head kidney, heart, and skeletal muscle

Slide 2 (WB-1-S) - gill, intestine, liver, spleen, head/trunk kidney junction, heart, and skeletal muscle; intestinal ceca, exocrine pancreas, and surrounding mesenteric adipose tissue

Slide 3 (WB-S) - skeletal muscle and skin (epidermis not included on the slide)

Slide 4 (WB 4) - skeletal muscle and skin (epidermis not included on the slide; slide includes only a 1.5-mm-long piece of epidermis)

Tissue preservation is good for all organs except the intestine, which has mild autolysis. The margins of some of the organs have evidence of dehydration after fixation (e.g., nuclei stain dull blue; erythrocyte cytoplasm stains yellow instead of red).

Measures of physiologic condition

Hepatocellular glycogen depletion, severe (slides 1, 2)

Mesenteric adipose tissue depletion, none (slide 2)

This pattern is consistent with healthy growing fish (abundant mesenteric adipose tissue) that recently stopped eating (hepatocellular glycogen depletion).

### **Diagnosis**

1. Liver: biliary preductular cell hyperplasia, diffuse, mild (slides 1, 2)
2. Liver: hepatocellular fatty change (lipidosis), diffuse, mild (slide 1)
3. Head kidney: eosinophilic granular cells in interstitial tissue diffuse, moderate (slide 1)
4. Heart: myocardial karyomegaly, multifocal, mild (slide 1)
5. Skeletal muscle: myonecrosis, multifocal, peracute, mild (slide 3)
6. Skin: dermatitis, ulcerative, diffuse, severe, with scattered superficial filamentous bacteria (slides 3, 4)





**Final Comments**

Skin ulcers are probably the most significant lesion in these fish, but other lesions might contribute to decreased fitness and increased susceptibility to ulcers. Small ulcers are common in fish, and filamentous bacteria commonly invade skin ulcers. Once filamentous bacteria become established, the ulcers often get larger (as in this case). Enlargement of ulcers is enhanced when fish are under some type of stress (e.g., crowding, suboptimal water quality, other infection). Bacteria in this case invade to depth of about 200 µm.

Biliary preductular cell hyperplasia is evidence of exposure to toxins. The toxins could be produced inside the fish (e.g., bacterial toxins) or come from outside the fish (e.g., from the water or the feed). Hepatocellular fatty change (lipidosis) often occurs when fish are not feeding; it also occurs in cases of inadequate nutrition.

Increased numbers of eosinophilic granular cells have been associated with experimental infection with *Renibacterium salmoninarum*, the cause of bacterial kidney disease (Flaño et al. 1996), but they are not described as a common finding in clinical cases. This case had no evidence of granulomatous inflammation more commonly associated with bacterial kidney disease. Increased numbers of eosinophilic granular cells are sometimes associated with chronic parasitic infections, but again, the inciting cause was not included in the sections examined.

The cause and significance of myocardial karyomegaly is unknown; karyomegaly in other cell types has been associated with exposure to algal toxins (e.g., hepatocytes exposed to microcystin LR in netpen liver disease).

Myonecrosis in this fish is limited to scattered individual white-muscle fibers; affected fibers have flocculent cytoplasm and loss of cross striations. This pattern is consistent with capture myopathy.

Literature cited:

Flaño, E., López-fierro, P., Razquin, B. E., and A. Villena. 1996. In vitro differentiation of eosinophilic granular cells in *Renibacterium salmoninarum*-infected gill cultures from rainbow trout. *J. Fish & Shellfish Immunology* 3: 173-184.



**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll=Free: 1-800-661-9903

**Case Report**

**Submission** 2004-04010      **Date** 08-Dec-2004      **Report** 15-Dec-2004

**Report**      **Copies**

**Submitter:** 12847      Heritage Salmon  
**Owner** 13135      Maude, PO# 14388  
**Farm:**  
**Vet Clinic:**  
**Attending**

**Specimen:** Tissue - Formalized      **Count** 2      **Flock Herd Size:**  
**Species:** Atlantic Salmon      **Age**  
**Breed:**      **Sex:**

**Feed:**      **Feed**

**Vaccination****Treatmen****Diagnosis**

Gary D. Marty, D.V.M., Ph.D.;  
Diplomate, A.C.V.P  
Fish Pathologist

**History/Symptoms**

Submitted 2 tissue cassettes (M-H, M-H3) for histology.

Sample ID: 04-44. Results to Dr. Peter McKenzie.

Smolt site. Internal hemorrhage on swim bladder and pylorus. History of ERM.

**Gross Pathology**

N/A

**Histopathology**

Two cassettes of tissues were submitted:

Slide 1 (M-H1) - gill, intestine, liver, spleen, head kidney, heart, and skeletal muscle

Slide 2 (M-H3) - gill, intestine, liver, spleen, head kidney, heart, and skeletal muscle; intestinal ceca, exocrine pancreas, and surrounding mesenteric adipose tissue

Tissue preservation is fair to poor for all organs; the intestine and gill have the most severe autolysis. The margins of some of the organs have evidence of dehydration after fixation (e.g., nuclei stain dull blue; erythrocyte cytoplasm stains yellow instead of red).

Measures of physiologic condition

Hepatocellular glycogen depletion, severe (slides 1, 2)

Mesenteric adipose tissue depletion, mild (slides 1, 2)

This pattern is consistent with fairly healthy growing fish (abundant mesenteric adipose tissue) that recently stopped eating (hepatocellular glycogen depletion).

**Diagnosis**

1. Exocrine pancreas and surrounding fatty mesenteries: peritonitis, lymphoplasmacytic, granulomatous, regionally diffuse, moderate, with abundant fibrocellular fronds (slide 2)
2. Heart: endocarditis, diffuse, with endothelial cell hypertrophy and a thin layer of macrophages, mild (slide 1) or mural thrombi, mild (slide 2)
3. Head kidney: atrophy of hematopoietic cords, multifocal, moderate (slides 1, 2)

**Final Comments**

Granulomatous peritonitis and atrophy of hematopoietic cells in the head kidney are consistent with a chronic bacterial infection like *Yersinia ruckeri*, the cause of enteric redmouth disease (ERM). Definitive diagnosis requires culture or PCR. Granulomatous lesions have been associated with ERM [Sources: Kent, M.L., and T.T. Poppe. 1998. Diseases of seawater netpen-reared salmonid fishes. Quadra Printers, Ltd. Nanaimo, B.C., Canada. AND, Fish Pathology, 3rd Edition. 2001. R.J. Roberts]

The pattern of inflammation in the heart is consistent with a systemic immune stimulation, probably a bacterial infection. Inflammatory cells lining the endocardial surface throughout most of the ventricle are rarely more than 2 cell layers thick.

/sr

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll=Free: 1-800-661-9903

**Case Report**

**Submission** 2004-04011      **Date** 08-Dec-2004      **Report** 15-Dec-2004

**Report**      **Copies**

**Submitter:** 12847      Heritage Salmon  
**Owner** 13136      Cliff Bay, PO# 14388  
**Farm:**  
**Vet Clinic:**  
**Attending**

**Specimen:** Tissue - Formalized      **Count** 3      **Flock Herd Size:**  
**Species:** Atlantic Salmon      **Age**  
**Breed:**      **Sex:**

**Feed:**      **Feed**

**Vaccination****Treatmen****Diagnosis**

Gary D. Marty, D.V.M., Ph.D.;  
Diplomate, A.C.V.P  
Fish Pathologist

### **History/Symptoms**

Submitted 3 tissue cassettes (CB-1-3, CB-2-2, CB-2-1) for histology.

Sample ID: 04-46.

Internal hemorrhage on swim bladder and pylorus. Smolt entries. History of ERM.

### **Histopathology**

Three cassettes of tissues were submitted:

Slide 1 (CB-1-3) - gill, intestine, liver, spleen, trunk/head kidney junction, heart, and skeletal muscle; intestinal ceca, exocrine pancreas, and surrounding mesenteric adipose tissue

Slide 2 (CB-2-1) - gill, intestine, liver, spleen, trunk/head kidney junction, heart, and skeletal muscle; intestinal ceca, exocrine pancreas, and surrounding mesenteric adipose tissue

Slide 3 (CB-2-2) - gill, intestine, liver, spleen, trunk kidney, head kidney, heart, and skin/skeletal muscle; intestinal ceca, exocrine pancreas, and surrounding mesenteric adipose tissue

In slides 1 and 3, tissue preservation is fair to poor for all organs; the intestine and gill have the most severe autolysis. In slide 2, tissue preservation is good for most organs (the intestine and gill have mild autolysis). The margins of some of the organs have evidence of dehydration after fixation (e.g., nuclei stain dull blue; erythrocyte cytoplasm stains yellow instead of red).

Measures of physiologic condition:

Hepatocellular glycogen depletion, severe (slides 1, 2, 3)

Mesenteric adipose tissue depletion, none (slides 1, 2, 3)

This pattern is consistent with healthy growing fish (abundant mesenteric adipose tissue) that recently stopped eating (hepatocellular glycogen depletion).

### **Diagnosis**

1. Exocrine pancreas and surrounding fatty mesenteries: peritonitis, lymphoplasmacytic, granulomatous, regionally diffuse, with abundant fibrocellular fronds, mild (slides 1, 2), moderate (slide 3)
2. Heart: endocarditis, diffuse, with endothelial cell hypertrophy and a thin layer of macrophages, mild (slides 1, 2, 3)
3. Trunk/Head kidney: atrophy of hematopoietic cords, multifocal, mild (slides 1, 2, 3)





**Final Comments**

Granulomatous peritonitis and atrophy of hematopoietic cells in the head kidney are consistent with a chronic bacterial infection like *Yersinia ruckeri*, the cause of enteric redmouth disease (ERM). Atrophy is probably secondary to necrosis of hematopoietic tissue. Definitive diagnosis requires bacterial culture or PCR. Granulomatous lesions have been associated with ERM [Sources: Kent, M.L., and T.T. Poppe. 1998. Diseases of seawater netpen-reared salmonid fishes. Quadra Printers, Ltd. Nanaimo, B.C., Canada. AND, Fish Pathology, 3rd Edition. 2001. R.J. Roberts]

The pattern of inflammation in the heart is consistent with a systemic immune stimulation, probably a bacterial infection. Inflammatory cells lining the endocardial surface throughout most of the ventricle are rarely more than 2 cell layers thick.

/sr

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll=Free: 1-800-661-9903

**Case Report**

**Submission** 2004-04053      **Date** 13-Dec-2004      **Report** 15-Dec-2004

**Report**      **Copies**

**Submitter:** 9420      Sea to Sky Veterinary Service  
**Owner** 13161      SS-115  
**Farm:**  
**Vet Clinic:** 9420      Sea to Sky Veterinary Service  
**Attending**      Dr. S. Saksida

**Specimen:** Tissue - Formalized      **Count** 1      **Flock Herd Size:**  
**Species:** Atlantic Salmon      **Age**  
**Breed:**      **Sex:**

**Feed:**      **Feed**

**Vaccination****Treatmen****Diagnosis**

Gary D. Marty, D.V.M., Ph.D.;  
Diplomate, A.C.V.P  
Fish Pathologist

### **History/Symptoms**

Submitted formalized tissue for histology. BKD diagnosed on site previously.

### **Histopathology**

Two cassettes of tissues were submitted:

Slide 1 (Van 8) - brain, gill, liver, spleen, and trunk kidney; skin with underlying skeletal muscle and cartilage (eye?); intestinal ceca, exocrine pancreas, and surrounding mesenteric adipose tissue

Slide 2 (Van 8) - brain, gill, liver, spleen, and trunk kidney; eye (skin with skeletal muscle, choroid rete, and cartilage); intestinal ceca, exocrine pancreas, and surrounding mesenteric adipose tissue

Tissue preservation is good for all organs. The margins of some of the organs have evidence of dehydration after fixation (e.g., nuclei stain dull blue; erythrocyte cytoplasm stains yellow instead of red).

Measures of physiologic condition

Hepatocellular glycogen depletion, severe (slides 1, 2)

Mesenteric adipose tissue depletion, moderate (slide 1), severe (slide 2)

This pattern in the measures of physiologic condition is consistent with fish that have not been eating well for a long time.

### **Diagnosis**

- 1a. Spleen: splenitis, focal (700 µm in diameter), granulomatous, mild (slide 1)
- 1b. Spleen, peritonitis, lymphohistiocytic, focal, mild, with occasional fine fibrocellular fronds (slide 2)
2. Liver: hepatitis, granulomatous, multifocal, coalescing, moderate (slide 1)
3. Liver: hepatocellular fatty change (lipidosis), diffuse, moderate (slide 1)
4. Liver: basophilic hepatocellular cytoplasm, diffuse, mild (slides 1, 2)
5. Trunk kidney: nephritis, interstitial, granulomatous, multifocal, coalescing, moderate (slide 1)
6. Trunk Kidney: tubular intracytoplasmic protein droplets, multifocal, mild (slide 1)
7. Intestinal ceca: peritonitis and enteritis, granulomatous, multifocal, coalescing, moderate (slide 1)
8. Skin with underlying skeletal muscle and cartilage (eye?): dermatitis, panniculitis, myositis, chondritis, granulomatous, multifocal, coalescing, severe (slide 1)
9. Eye: panophthalmitis, granulomatous, multifocal, coalescing, severe (slide 2)
10. Gill: branchitis, granulomatous, multifocal, mild (slide 1)



**Final Comments**

Granulomatous inflammation in the spleen, liver, skin, eye, gill, and trunk kidney of the fish in slide #1 is consistent with a chronic bacterial infection, and *Renibacterium salmoninarum* is the most common organism associated with these lesions. Consider PCR on fresh tissues for confirmation. Splenic peritonitis (slide 2) is consistent with a foreign body reaction, probably in response to vaccine adjuvant. The lack of disseminated lesions in the fish in slide #2 makes *Renibacterium salmoninarum* a less likely differential for the panophthalmitis in that fish.

Hepatocellular fatty change (lipidosis) often occurs when fish are not feeding; it also occurs in cases of inadequate nutrition. Basophilic cytoplasm in hepatocytes is an indication of active protein synthesis. It is normal in mature females producing protein for deposition in their eggs. In juvenile salmon it might be related to increased protein needed as part an inflammatory response.

/sr

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-04054      **Date** 13-Dec-2004      **Report** 25-Feb-2005

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 13162      A 3.3 - 72 (1-10)

**Farm:**

**Vet Clinic:**

**Attending**

**Specimen:** Tissue - Fresh

**Count** 1

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

Gary D. Marty, D.V.M., Ph.D.;  
Diplomate, A.C.V.P  
Fish Pathologist

**History/Symptoms**

Submitted Provincial Surveillance Program samples for virology - PCR for IHN, ISA, IPN, VHS, and Piscirickettsia salmonis. Culture any PCR positive samples.

Sample ID: A 3.3 - 72 (1-10).

Addendum: Jan. 20/05. Samples submitted for routine histology processing and analysis.

**Histopathology**

Quality control/quality assurance: the sections contain moderate precipitates of acid hematin; this might be a result of transferring tissues to ethanol followed by return to formalin as part of processing the tissue into paraffin. Alternatively, tissues might not have been fixed in neutral buffered formalin.

Slide 1: autolysis, none (other organs) to mild (liver)

- 1a. Liver: hepatocellular fatty change (lipidosis), diffuse, moderate
- 1b. Liver: basophilic hepatocellular cytoplasm, diffuse, mild
2. Heart: endocarditis, multifocal, lymphoplasmacytic, mild
3. Spleen: parenchymal golden pigment, disseminated, intracellular, mild
4. Trunk kidney: no significant lesions
5. Head kidney: no significant lesions

Comment: Hepatocellular fatty change (lipidosis) often occurs when fish are not feeding; it also occurs in cases of inadequate nutrition. Basophilic cytoplasm in hepatocytes is an indication of active protein synthesis. It is normal in mature females producing protein for deposition in their eggs. In juvenile salmon it might be related to increased protein needed as part an inflammatory response. Lymphoplasmacytic inflammation in the heart is evidence of chronic immune stimulation (e.g., low grade bacterial infection), but the cause is otherwise unknown. The golden pigment in the spleen most likely is lipofuscin. Accumulation of lipofuscin is a non-specific change that can result from a variety of insults, including rancid feed, low levels of antioxidants in the feed, chronic infections, and exposure to organic contaminants. Conditions that lead to moderate to abundant lipofuscin have been associated with decreased growth and survival in several studies.

Slide 2: autolysis, mild (other organs) to moderate (liver)

- 1a. Liver: hepatocellular fatty change (lipidosis), diffuse, mild
- 1b. Liver: basophilic hepatocellular cytoplasm, diffuse, mild
2. Heart: no significant lesions
3. Spleen: peritonitis, lymphohistiocytic, focal, moderate, with fine fibrocellular fronds
4. Trunk kidney: interstitial cell hyperplasia, diffuse, mild
5. Head kidney: no significant lesions

Comment: Splenic peritonitis is consistent with a reaction to foreign material; it is common in fish that have been vaccinated. Interstitial cell hyperplasia in the kidney results from increased demand for erythrocytes or white blood cells somewhere in the body (renal interstitial cells are the blood-forming or hematopoietic cells in the kidney).

Slide 3: autolysis, none (other organs) to mild (liver)

1. Liver: hepatocellular fatty change (lipidosis), diffuse, moderate
2. Heart: no significant lesions
3. Spleen: peritonitis, chronic, focal, with fine fibrocellular fronds, mild
4. Trunk kidney: interstitial cell hyperplasia, diffuse, mild
5. Head kidney: no significant lesions

Comment: none

Slide 4: autolysis, none (other organs) to mild (liver)

- 1a. Liver: hepatocellular fatty change (lipidosis), diffuse, severe
- 1b. Liver: basophilic hepatocellular cytoplasm, diffuse, mild
2. Heart: myocardial karyomegaly, multifocal, mild
3. Spleen: peritonitis, lymphohistiocytic, focal, moderate, with fine fibrocellular fronds
4. Trunk kidney: no significant lesions
5. Head kidney: no significant lesions

Comment: The cause and significance of myocardial karyomegaly is unknown; karyomegaly in other cell types has been associated with exposure to algal toxins (e.g., hepatocytes exposed to microcystin LR in





netpen liver disease).

Slide 5: autolysis, mild (other organs) to moderate (liver)

1a. Liver: hepatocellular fatty change (lipidosis), diffuse, moderate

1b. Liver: basophilic hepatocellular cytoplasm, diffuse, mild

2. Heart: no significant lesions

3. Spleen: no significant lesions

4. Trunk kidney: no significant lesions

5. Head kidney: no significant lesions

Comment: A small focus of bacterial rods in the heart is consistent with post mortem growth.

Slide 6: autolysis, none (other organs) to mild (liver)

1. Liver: basophilic hepatocellular cytoplasm, diffuse, mild

2. Heart: endocarditis, multifocal, with a thin layer of lymphocytes and plasma cells, moderate

2. Heart: epicarditis, multifocal, lymphoplasmacytic, mild

3. Spleen: peritonitis, chronic, focal, with fine fibrocellular fronds, mild

4. Trunk kidney: no significant lesions

5. Head kidney: not included on the slide

Comment: Lymphoplasmacytic inflammation in the heart is evidence of chronic immune stimulation (e.g., low grade bacterial infection), but the cause is otherwise unknown. In wild salmon, this type of reaction is associated with intravascular presporogonic stages of a myxosporean, but this heart has no myxosporeans. Epicarditis is evidence of chronic immune stimulation, but the cause is otherwise unknown.

Slide 7: autolysis, none (other organs) to mild (liver)

1a. Liver: hepatocellular fatty change (lipidosis), diffuse, severe

1b. Liver: basophilic hepatocellular cytoplasm, diffuse, mild

1c. Liver: biliary preductular cell hyperplasia, diffuse, mild

1d. liver: peritonitis, lymphohistiocytic, focal, moderate

2. Heart: epicarditis, multifocal, lymphoplasmacytic, mild

3a. Spleen: peritonitis, lymphohistiocytic, focal, moderate, with fine fibrocellular fronds

3b. Spleen: parenchymal golden pigment, multifocal, intracellular, mild

4. Trunk kidney: nephritis, interstitial, granulomatous, focal, mild

5. Head kidney: nephritis, interstitial, granulomatous, multifocal, mild

Comment: Biliary preductular cell hyperplasia is evidence of exposure to toxins. The toxins could be produced inside the fish (e.g., bacterial toxins) or come from outside the fish (e.g., from the water or the feed). The pathogenesis of hepatic peritonitis is probably the same as described for the spleen above. The most common organism associated with granulomatous nephritis in salmon is *Renibacterium salmoninarum*, the cause of bacterial kidney disease; however, in a mild case like this one, other bacteria cannot be ruled out.

Slide 8: autolysis, none (other organs) to mild (liver)

1. Liver: hepatocellular fatty change (lipidosis), diffuse, severe

2. Heart: endocarditis and epicarditis, lymphohistiocytic, multifocal, mild

3. Spleen: peritonitis, chronic, regionally diffuse, with fine fibrocellular fronds, mild

4. Trunk kidney: no significant lesions

5. Head kidney: not included on the slide

Comment: none

Slide 9: autolysis, none (other organs) to mild (liver)

1. Liver: hepatocellular fatty change (lipidosis), diffuse, moderate



- 1b. Liver: basophilic hepatocellular cytoplasm, diffuse, mild
- 2. Heart: no significant lesions
- 3a. Spleen: parenchymal golden pigment, multifocal, intracellular, mild
- 3b. Spleen: peritonitis, chronic, multifocal, with fine fibrocellular fronds, mild
- 4. Trunk kidney: no significant lesions
- 5. Head kidney: no significant lesions
- Comment: none

Slide 10: autolysis, none (other organs) to mild (liver)

- 1. Liver: basophilic hepatocellular cytoplasm, diffuse, moderate
- 2. Heart: epicarditis, lymphohistiocytic, multifocal, mild
- 3. Spleen: peritonitis, chronic, multifocal, with fine fibrocellular fronds, mild
- 4. Trunk kidney: no significant lesions

### **Molecular Diagnostics/PCR**

Samples 1-5, 6-10: IHN, VHS, ISA, IPN, *Piscirickettsia salmonis* negative by PCR.

\* Results faxed Dec. 22/04.

/bb



**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll=Free: 1-800-661-9903

**Case Report**

**Submission** 2004-04055      **Date** 13-Dec-2004      **Report** 25-Feb-2005

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 13163      A 3.3 - 74 (1-9)

**Farm:**

**Vet Clinic:**

**Attending**

**Specimen:** Tissue - Fresh

**Count** 1

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

Gary D. Marty, D.V.M., Ph.D.;  
Diplomate, A.C.V.P  
Fish Pathologist

**History/Symptoms**

Submitted Provincial Surveillance Program samples for virology - PCR for IHN, ISA, IPN, VHS, and *Piscirickettsia salmonis*. Culture any PCR positive samples.

Sample ID: A 3.3 - 74 (1-9).

Addendum: Jan. 20/05. Samples submitted for routine histology processing and analysis.

**Histopathology**

Quality control/quality assurance: the sections contain moderate precipitates of acid hematin; this might be a result of transferring tissues to ethanol followed by return to formalin as part of processing the tissue into paraffin. Alternatively, tissues might not have been fixed in neutral buffered formalin.

Slide 1: autolysis, none (all organs)

- 1a. Liver: hepatocellular fatty change (lipidosis), diffuse, moderate
- 1b. Liver: basophilic hepatocellular cytoplasm, diffuse, moderate
2. Heart: myocardial karyomegaly, multifocal, mild
3. Spleen: peritonitis, chronic, regionally diffuse, with fine fibrocellular fronds, mild
4. Trunk kidney: interstitial cell hyperplasia, diffuse, mild
5. Head kidney: interstitial cell hyperplasia, diffuse, mild

Comment: Hepatocellular fatty change (lipidosis) often occurs when fish are not feeding; it also occurs in cases of inadequate nutrition. Basophilic cytoplasm in hepatocytes is an indication of active protein synthesis. It is normal in mature females producing protein for deposition in their eggs. In juvenile salmon it might be related to increased protein needed as part an inflammatory response. The cause and significance of myocardial karyomegaly is unknown; karyomegaly in other cell types has been associated with exposure to algal toxins (e.g., hepatocytes exposed to microcystin LR in netpen liver disease). Splenic peritonitis is consistent with a reaction to foreign material; it is common in fish that have been vaccinated. Interstitial cell hyperplasia in the kidney results from increased demand for erythrocytes or white blood cells somewhere in the body (renal interstitial cells are the blood-forming or hematopoietic cells in the kidney).

Slide 2: autolysis, none (other organs) to mild (liver)

1. Liver: hepatocellular fatty change (lipidosis), diffuse, severe
2. Heart: no significant lesions
3. Spleen: no significant lesions
4. Trunk kidney: no significant lesions
5. Head kidney: no significant lesions

Comment: none

Slide 3: autolysis, mild (other organs) to moderate (liver)

1. Liver: basophilic hepatocellular cytoplasm, diffuse, mild
2. Heart: no significant lesions
- 3a. Spleen: parenchymal golden pigment, disseminated, intracellular, mild
- 3b. Spleen: peritonitis, chronic, focal, with fine fibrocellular fronds, mild
4. Trunk kidney: interstitial cell hyperplasia, diffuse, mild
5. Head kidney: interstitial cell hyperplasia, diffuse, mild

Comment: The golden pigment in the spleen most likely is lipofuscin. Accumulation of lipofuscin is a non-specific change that can result from a variety of insults, including rancid feed, low levels of antioxidants in the feed, chronic infections, and exposure to organic contaminants. Conditions that lead to moderate to abundant lipofuscin have been associated with decreased growth and survival in several studies.

Slide 4: autolysis, mild (other organs) to moderate (liver)

1. Liver: hepatocellular fatty change (lipidosis), diffuse, severe
2. Heart: no significant lesions
- 3a. Spleen: parenchymal golden pigment, disseminated, intracellular, mild
- 3b. Spleen: peritonitis, chronic, focal, with fine fibrocellular fronds, mild
4. Trunk kidney: no significant lesions
5. Head kidney: no significant lesions

Comment: none

Slide 5: autolysis, mild (other organs) to severe (liver)





- 1a. Liver: hepatic necrosis, acute, multifocal, coalescing, moderate
- 1b. Liver: hepatocellular fatty change (lipidosis), diffuse, moderate
2. Heart: endocarditis and epicarditis, lymphohistiocytic, multifocal, moderate
3. Spleen: peritonitis, chronic, regionally diffuse, with fine fibrocellular fronds, mild
4. Trunk kidney: no significant lesions
5. Head kidney: no significant lesions

Comment: Hepatic necrosis can be caused by inadequate vascular perfusion or direct cytotoxicity from viral or bacterial infections. Lack of proliferative lesions in the biliary system is evidence against a chronic toxic cause for the hepatic necrosis. Lymphohistiocytic inflammation in the heart is evidence of chronic immune stimulation (e.g., low grade bacterial infection), but the cause is otherwise unknown. Karyorrhexis in this case makes it different from most cases of carditis that I see.

Slide 6: autolysis, mild (other organs) to moderate (liver)

1. Liver: hepatocellular fatty change (lipidosis), diffuse, mild
2. Heart: no significant lesions
3. Spleen: peritonitis, chronic, regionally diffuse, with fine fibrocellular fronds, moderate
4. Trunk kidney: no significant lesions
5. Head kidney: no significant lesions

Comment: none

Slide 7: autolysis, mild (other organs) to moderate (liver)

1. Liver: hepatocellular fatty change (lipidosis), diffuse, moderate
2. Heart: myocardial karyomegaly, multifocal, mild
3. Spleen: peritonitis, chronic, regionally diffuse, with fine fibrocellular fronds, mild
4. Trunk kidney: no significant lesions
5. Head kidney: no significant lesions

Comment: none

Slide 8: autolysis, none (other organs) to mild (liver)

- 1a. Liver: hepatitis, granulomatous, focal, severe
- 1b. Liver: hepatic necrosis, acute, multifocal, coalescing, moderate
- 1c. Liver: basophilic hepatocellular cytoplasm, diffuse, mild
- 2a. Heart: epicarditis, lymphohistiocytic, multifocal, coalescing, moderate
- 2b. Heart: endocarditis, lymphohistiocytic, multifocal, coalescing, mild
- 3a. Spleen: splenitis, granulomatous, focal, mild
- 3b. Spleen: peritonitis, chronic, regionally diffuse, with fine fibrocellular fronds, moderate
- 4a. Trunk kidney: nephritis, tubulointerstitial, granulomatous, focal, severe
- 4b. Trunk kidney: interstitial golden pigment, multifocal, intracellular, moderate
- 5a. Head kidney: nephritis, interstitial, granulomatous, focal, moderate
- 5b. Head kidney: interstitial cell hyperplasia, diffuse, mild

Comment: The most common organism associated with disseminated granulomatous disease in salmon is *Renibacterium salmoninarum*, the cause of bacterial kidney disease. Hepatic necrosis in this fish is probably secondary to *Renibacterium salmoninarum* infection. The golden pigment in the kidney is probably lipofuscin, with the same pathogenesis and significance as lipofuscin in the spleen of other fish.

Slide 9: autolysis, none (other organs) to mild (liver)

- 1a. Liver: hepatocellular fatty change (lipidosis), diffuse, moderate
- 1b. Liver: basophilic hepatocellular cytoplasm, diffuse, moderate
2. Heart: epicarditis, lymphohistiocytic, multifocal, mild
3. Spleen: peritonitis, chronic, regionally diffuse, with fine fibrocellular fronds, moderate
4. Trunk kidney: no significant lesions



**Submission** 2004-04055

## **Case Report**

5. Head kidney: no significant lesions  
Comment: none

### **Molecular Diagnostics/PCR**

Samples 1-5, 6-9: IHN, VHS, ISA, IPN, *Piscirickettsia salmonis* negative by PCR.

\* Results faxed Dec. 22/04.

ADDITIONAL RESULTS (faxed Mar. 8/05):

*Nucleospora salmonis* negative by PCR.

/bb



**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll=Free: 1-800-661-9903

**Case Report**

**Submission** 2004-04056      **Date** 13-Dec-2004      **Report** 28-Feb-2005

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 13164      A 3.3 - 76 (1-3)

**Farm:**

**Vet Clinic:**

**Attending**

**Specimen:** Tissue - Fresh

**Count** 1

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

Gary D. Marty, D.V.M., Ph.D.;  
Diplomate, A.C.V.P  
Fish Pathologist

**History/Symptoms**

Submitted Provincial Surveillance Program samples for virology - PCR for IHN, ISA, IPN, VHS, and *Piscirickettsia salmonis*. Culture any PCR positive samples.

Sample ID: A 3.3 - 76 (1-3).

Addendum: Jan. 20/05. Samples submitted for routine histology processing and analysis.

**Histopathology**

Quality control/quality assurance: the sections contain moderate precipitates of acid hematin; this might be a result of transferring tissues to ethanol followed by return to formalin as part of processing the tissue into paraffin. Alternatively, tissues might not have been fixed in neutral buffered formalin.

Slide 1: autolysis, mild (other organs) to moderate (liver)

1. Liver: basophilic hepatocellular cytoplasm, diffuse, moderate
2. Heart: myocardial karyomegaly, multifocal, mild
3. Spleen: peritonitis, chronic, regionally diffuse, with fine fibrocellular fronds, mild
4. Trunk kidney: no significant lesions
5. Head kidney: no significant lesions

Comment: Basophilic cytoplasm in hepatocytes is an indication of active protein synthesis. It is normal in mature females producing protein for deposition in their eggs. The cause and significance of myocardial karyomegaly is unknown; karyomegaly in other cell types has been associated with exposure to algal toxins (e.g., hepatocytes exposed to microcystin LR in netpen liver disease). Splenic peritonitis is consistent with a reaction to foreign material; it is common in fish that have been vaccinated.

Slide 2: autolysis, mild (other organs) to moderate (liver)

- 1a. Liver: hepatocellular fatty change (lipidosis), diffuse, mild
- 1b. Liver: hepatocellular hydropic degeneration, multifocal, coalescing, acute, with scattered foci of fibrin, moderate
2. Heart: no significant lesions
3. Spleen: no significant lesions
4. Trunk kidney: no significant lesions
5. Head kidney: not included on the slide

Comment: Hepatocellular fatty change (lipidosis) often occurs when fish are not feeding; it also occurs in cases of inadequate nutrition. Hydropic degeneration among large numbers of hepatocytes provides evidence that the liver was being exposed to toxins. Potential sources of the inciting toxins include the water and a bacterial infection. In this case affected hepatocytes had the range of changes associated with hydropic degeneration, from slightly expanded granular cytoplasm to large cytoplasmic vacuoles. After hydropic degeneration can no longer be reversed, the changes are called single cell necrosis. Intravascular foci of fibrin probably impaired hepatic blood flow.

Slide 3: autolysis, none (other organs) to mild (liver)

- 1a. Liver: hepatocellular single cell necrosis (apoptosis), disseminated, acute, mild
- 1b. Liver: basophilic hepatocellular cytoplasm, diffuse, mild
2. Heart: endocarditis, multifocal, lymphohistiocytic, with intracellular basophilic structures in one cell that resemble *Piscirickettsia salmonis*, mild
- 3a. Spleen: parenchymal golden pigment, disseminated, intracellular, moderate
- 3b. Spleen: peritonitis, chronic, focal, with fibrocellular fronds, mild
4. Trunk kidney: no significant lesions
5. Head kidney: no significant lesions

Comment: Hepatocellular single cell necrosis (apoptosis) can occur in rapidly growing fish that suddenly go off feed about 24 hours before death. Apoptosis is the normal way in which hepatocyte numbers are decreased (i.e., the hepatocytes are not needed when growing fish stop feeding because few to no nutrients are being absorbed into the blood and entering the liver for processing). The golden pigment in the spleen most likely is lipofuscin. Accumulation of lipofuscin is a non-specific change that can result from a variety of insults, including rancid feed, low levels of antioxidants in the feed, chronic infections, and exposure to organic contaminants. Conditions that lead to moderate to abundant lipofuscin have been associated with decreased growth and survival in several studies. Splenic peritonitis is consistent with a reaction to foreign material; it is common in fish that have been vaccinated.





The heart has a single cell that contains several basophilic structures that are each about 1 µm in diameter (location, 35 x 110 on the Nikon Eclipse 50i in room 106, Animal Health Centre). The size and intracellular location of these structures is consistent with *Piscirickettsia salmonis*. The PCR results are not consistent with *Piscirickettsia salmonis*; however, the pooled tissues used for the PCR analysis might not have included any *Piscirickettsia*. Alternatively, the structures in this cell might be karyorrhectic nuclei (the morphologic features of *Piscirickettsia* and karyorrhectic nuclei are very similar).

**Molecular Diagnostics/PCR**

Samples 1-3: IHN, VHS, ISA, IPN, *Piscirickettsia salmonis* negative by PCR.

\* Results faxed Dec. 22/04.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll=Free: 1-800-661-9903

**Case Report**

**Submission** 2004-04057      **Date** 13-Dec-2004      **Report** 28-Feb-2005

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 13165      A 3.2 - 69 (1-6)

**Farm:**

**Vet Clinic:**

**Attending**

**Specimen:** Tissue - Fresh  
**Species:** Atlantic Salmon  
**Breed:**

**Count** 1

**Flock Herd Size:**  
**Age**  
**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

Gary D. Marty, D.V.M., Ph.D.;  
Diplomate, A.C.V.P  
Fish Pathologist

**History/Symptoms**

Submitted Provincial Surveillance Program samples for virology - PCR for IHN, ISA, IPN, VHS, and *Piscirickettsia salmonis*. Culture any PCR positive samples.

Sample ID: A 3.2 - 69 (1-6).

Addendum: Jan. 20/05. Samples submitted for routine histology processing and analysis.

**Histopathology**

Quality control/quality assurance: the sections contain occasional precipitates of acid hematin; this might be a result of transferring tissues to ethanol followed by return to formalin as part of processing the tissue into paraffin. Alternatively, tissues might not have been fixed in neutral buffered formalin.

Slide 1: autolysis, none (other organs) to mild (liver)

1. Liver: basophilic hepatocellular cytoplasm, diffuse, moderate
2. Heart: no significant lesions
3. Spleen: peritonitis, chronic, focal, with fibrocellular fronds, moderate
4. Trunk kidney: no significant lesions
5. Head kidney: not included on the slide

Comment: Basophilic cytoplasm in hepatocytes is an indication of active protein synthesis. It is normal in mature females producing protein for deposition in their eggs. In juvenile salmon it might be related to increased protein needed as part of an inflammatory response. Splenic peritonitis is consistent with a reaction to foreign material; it is common in fish that have been vaccinated.

Slide 2: autolysis, none (other organs) to mild (liver)

1. Liver: basophilic hepatocellular cytoplasm, diffuse, mild
2. Heart: no significant lesions
3. Spleen: peritonitis, chronic, focal, with fibrocellular fronds, moderate
4. Trunk kidney: no significant lesions
5. Head kidney: no significant lesions

Comment: none

Slide 3: autolysis, none (other organs) to mild (liver)

1. Liver: hepatitis, granulomatous, multifocal, severe
1. Liver: basophilic hepatocellular cytoplasm, diffuse, moderate
2. Heart: epicarditis, histiocytic, regionally diffuse, mild
3. Spleen: splenitis, granulomatous, focal, mild
4. Trunk kidney: nephritis, interstitial, granulomatous, multifocal, coalescing, severe
5. Head kidney: not included on the slide

Comment: The most common organism associated with disseminated granulomas in salmon is *Renibacterium salmoninarum*, the cause of bacterial kidney disease. Histiocytic epicarditis may be secondary to disseminated granulomatous disease.

Slide 4: autolysis, mild (other organs) to moderate (liver)

- 1a. Liver: serosal necrotic tissue, 4 mm wide and 1.5 mm thick, focal, severe
- 1b. Liver: biliary preductular cell hyperplasia, diffuse, mild
2. Heart: no significant lesions
3. Spleen: not included on the slide
- 4a. Trunk kidney: renal tubular mineralization, multifocal, mild
- 4b. Trunk Kidney: tubular intracytoplasmic protein droplets, focal, mild

Comment: The necrotic mass on the surface of the liver is composed of vacuolated eosinophilic material admixed with degenerating adipocytes. Biliary preductular cell hyperplasia is evidence of exposure to toxins. The toxins could be produced inside the fish (e.g., bacterial toxins) or come from outside the fish (e.g., from the water or the feed). The source of the necrotic material on the surface of the liver is unknown; it might be mostly foreign material (e.g., of vaccine origin).

Renal mineralization is common in cultured fish species; when severe, the condition is termed nephrocalcinosis. The lesion is not considered fatal, although feed conversion may be adversely affected. The cause is unknown, but renal mineralization has been experimentally reproduced through high carbon dioxide levels, magnesium deficiency, selenium toxicity, and a diet low in minerals (source, "Systemic



Pathology of Fish", 1989, by H. Ferguson). Clinically, renal mineralization is most commonly associated with high carbon dioxide levels. Renal tubular epithelial protein droplets are normal in some species, or they may be an indication of glomerular disease. Ferguson ("Systemic Pathology of Fish," 1989) reports an association of renal protein droplets and high ammonia levels in salmonids.

5. Head kidney: no significant lesions

Slide 5: autolysis, none (other organs) to mild (liver)

1. Liver: hepatocellular hydropic degeneration, dissemination, acute, mild

1. Liver: basophilic hepatocellular cytoplasm, diffuse, mild

1b. Liver: biliary preductular cell hyperplasia, diffuse, mild

2. Heart, bulbus arteriosus: histiocytes and neutrophils lining vascular spaces, diffuse, mild

3. Spleen: peritonitis, chronic, regionally diffuse, with fibrocellular fronds, moderate

4. Trunk kidney: no significant lesions

5. Head kidney: no significant lesions

Comment: Hydropic degeneration among small numbers of hepatocytes provides evidence that the liver was being exposed to toxins. Potential sources of the inciting toxins include the water and a bacterial infection. In this case affected hepatocytes had the range of changes associated with hydropic degeneration, from slightly expanded granular cytoplasm to large cytoplasmic vacuoles. After hydropic degeneration can no longer be reversed, the changes are called single cell necrosis. Histiocytes and neutrophils lining vascular spaces in the heart may be in response to circulating antigen (e.g., low grade bacterial infection), but the cause is otherwise unknown.

Slide 6: autolysis, none (all organs)

1. Liver: basophilic hepatocellular cytoplasm, diffuse, mild

2. Heart: no significant lesions

3. Spleen: peritonitis, chronic, focal, with fibrocellular fronds, mild

4. Trunk kidney: small numbers of eosinophilic granular cells in interstitial tissue, diffuse

5. Head kidney: moderate numbers of eosinophilic granular cells in interstitial tissue, diffuse

Comment: Increased numbers of eosinophilic granular cells in the kidney is a fairly common finding in Atlantic salmon. Eosinophilic granular cells have been associated with experimental infection of rainbow trout with *Listonella anguillarum* (Lamas et al. 1991), but I have not seen this pattern of inflammation described in Atlantic salmon exposed to *Listonella anguillarum*. Increased numbers of eosinophilic granular cells are sometimes associated with chronic parasitic infections, but the inciting cause was not included in the sections examined.

Lamas, J., Bruno, D.W., Santos, Y., Anadon, R., and A.E. Ellis. 1991. Eosinophilic granular cell response to intraperitoneal injection with *Vibrio anguillarum* and its extracellular products in rainbow trout, *Oncorhynchus mykiss*. *Fish Shellfish Immunol.* 1(3):187-194.

### **Molecular Diagnostics/PCR**

Samples 1-3, 4-6: IHN, VHS, ISA, IPN, *Piscirickettsia salmonis* negative by PCR.

\* Results faxed Dec. 22/04.

/bb







**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-04147      **Date** 21-Dec-2004      **Report** 23-Dec-2004

**Report**      **Copies**

**Submitter:** 12847      Heritage Salmon  
**Owner** 13204      Heritage Salmon #04-48 (PO 14396)  
**Farm:**  
**Vet Clinic:**  
**Attending**      Dr. Peter McKenzie

**Specimen:** Other      **Count** 1      **Flock Herd Size:**  
**Species:** Atlantic Salmon      **Age**  
**Breed:**      **Sex:**

**Feed:**      **Feed**

**Vaccination****Treatmen****Diagnosis**

Gary D. Marty, D.V.M., Ph.D.;  
Diplomate, A.C.V.P  
Fish Pathologist

### **History/Symptoms**

Submitter: Tim Talbot. Recent SW entries. Recent increase in mortalities. Internal hemorrhage in flesh, pylorus, liver. External hemorrhage around basal fins and vent. Adjacent to populations with ERM. Three tissue cassettes fixed in formalin - shipped in ethanol (labelled MI or Maude #4).

Tests/analysis requested: Please prepare for histo exam by Dr. Gary Marty. Please report to Dr. Peter McKenzie.

### **Histopathology**

Three cassettes of tissues were submitted:

Slide 1 (Maude Isl. DEN #4) - gill, liver, spleen, exocrine pancreas, and mesenteric adipose tissue

Slide 2 (M.I. Dec 15 #4) - gill, liver, spleen, trunk kidney, stomach, intestinal ceca, exocrine pancreas, and mesenteric adipose tissue

Slide 3 (M.I. Dec 15 #4) - gill, liver, spleen, head kidney, skin and skeletal muscle

Tissue preservation is fair for all organs (i.e., autolysis mild in slide 2; moderate in slides 1 and 3).

Measures of physiologic condition

Hepatocellular glycogen depletion, severe (slides 1, 2, 3)

Mesenteric adipose tissue depletion, none (slides 1, 2, 3)

The pattern in the measures of physiologic condition is consistent with fish that were healthy and growing (abundant mesenteric fat), but stopped eating normally within the past few days (severe glycogen depletion).

### **Diagnosis**

1. Spleen, stomach, intestinal ceca, and surrounding fatty mesenteries: peritonitis, granulomatous, diffuse, with fibrin and fibrocellular fronds, mild (slide 3), moderate (slide 2), severe (slide 1)
2. Liver: basophilic hepatocellular cytoplasm, diffuse, mild (slide 3), moderate (slides 1, 2)
3. Trunk kidney: glomerulonephritis, generalized, proliferative, with multiple synechiae, moderate (slide 2)
4. Head kidney: hematopoietic atrophy, diffuse, moderate (slide 3)



**Final Comments**

These fish have lesions in several organs consistent with a bacterial infection, duration of more than a few days but less than a few weeks. Consider bacterial culture and screening for IHN (if not already done).

Basophilic cytoplasm in hepatocytes is an indication of active protein synthesis. It is normal in mature females producing protein for deposition in their eggs. In juvenile salmon it might be related to increased protein needed as part an inflammatory response.

Splenic peritonitis is consistent with a foreign body reaction; differentials include a chronic bacterial infection, response to vaccine adjuvant, or a combination of the two. Inflammation of mesenteric fat is associated with congested vessels that probably account for the reddening of the viscera, described grossly. In slide 2, the splenic parenchyma contains multiple small foci of fibrin (consistent with a bacterial infection).

Glomerulonephritis is a fairly nonspecific reaction to a variety of systemic diseases. Synechiae - adhesions between the visceral and parietal layers of the glomerular capsule - are evidence of glomerular enlargement and damage to the glomerular capsule.

In the head kidney, normal clusters of deeply basophilic hematopoietic cells are replaced by pale-staining cells with large nuclei. These cells probably provide the network of support for hematopoietic cells, but some of these cells might be macrophages. Lack of hematopoietic cells is probably a result of sudden increased demand for inflammatory cells, with little chance to respond through production of new cells.

/sr



**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-00479      **Date** 05-Feb-2004      **Report** 10-Feb-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 11242      A 2.4-8 (#1-7)

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**      Dr. J. Constantine

**Specimen:** Tissue - Fresh

**Count** 7

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

J.H. Robinson, D.V.M.  
Veterinary Virologist

**History/Symptoms**

Submitted 2 fresh tissues.

A 2.4-8 (#1-7).

Provincial Surveillance Program samples.

Request Virology - PCR for IHN, ISA, IPN, VHS and Piscirickettsia salmonis. Culture any PCR positive samples.

**Molecular Diagnostics/PCR**

Samples 1-4, 5-7: IHN, IPN, VHS, ISA, Piscirickettsia salmonis negative by PCR.

\* Results faxed Feb. 10/04.

/bb

**Toxicology**

RESULTS

-----

DIAGNOSIS

-----

COMMENTS

-----





**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-00623      **Date** 16-Feb-2004      **Report** 24-Feb-2004

**Report**      **Copies**

**Submitter:** 8447      Stolt Sea Farm Inc.  
**Owner** 11294      Port Elizabeth  
**Farm:**  
**Vet Clinic:**  
**Attending**

**Specimen:** Whole Animal      **Count** 1      **Flock Herd Size:**  
**Species:** Atlantic Salmon      **Age** 25 week(s)  
**Breed:**      **Sex:**

**Feed:**      **Feed**

**Vaccination****Treatmen****Diagnosis**

S.A. Raverty, D.V.M.,  
Veterinary Pathologist

**History/Symptoms**

Submitted Atlantic Salmon for full necropsy and heavy metal analysis on 3 sets of tissues in bags as well as the tissue from the 2 whole fish.

Appear to be an acute event. Possibly O2 or plankton event. Just finished treatment with slice. Did not appear to overdose fish though. We have sent tissue off for testing residue.

P.O #48806.

**Bacteriology**

No bacteria isolated from liver, kidney and spleen of Group 2.

3+ Bacteria identified as Burkholderia sp. from large intestine in Group 1.

Bacteria identified as Psychrobacter immobilis from kidney in Group 1.

No Salmonella sp. isolated.

Vibrio sp. identified as Vibrio metschnikovii.

\* Results faxed Feb. 20th and 24/04.

**Virology**

2 samples inoculated onto tissue culture - both viruses negative.

\* Results faxed Mar. 18/04.

**Toxicology**

See attached sheets.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

**Ministry of  
Agriculture, Food and Fisheries**  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll=Free: 1-800-661-9903**Case Report****Submission** 2004-00066      **Date** 09-Jan-2004      **Report** 26-Jan-2004**Report**      **Copies****Submitter:** 11036 Mainstream Canada (M)**Owner** 11079 Westside**Farm:****Vet Clinic:****Attending****Specimen:** Tissue - Fresh**Count** 1**Flock Herd Size:****Species:** Atlantic Salmon**Age****Breed:****Sex:****Feed:****Feed****Vaccination****Treatmen****Diagnosis**J.H. Robinson, D.V.M.  
Veterinary Virologist

**History/Symptoms**

Submitted pooled kidneys and spleens of three fish for virology - cell culture and PCR for IHN.

Please send report to Howie Manchester 250-723-4644 (phone).

Mainstream Canada PO # 4775.

**Virology**

Fish viruses negative by culture.

\*Virology results faxed on Feb. 9, 2004.

**Molecular Diagnostics/PCR**

IHN Virus negative by PCR.

VHS Virus negative by PCR.

\* Results faxed Jan. 26/04.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-00721      **Date** 20-Feb-2004      **Report** 01-Mar-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 11332      A.2.4-6 (1-3)

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**      Dr. Joanne Constantine

**Specimen:** Tissue - Fresh

**Count** 3

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

J.H. Robinson, D.V.M.  
Veterinary Virologist

**History/Symptoms**

Submitted fresh tissue for Virology - PCR for IHN, ISA, IPN, VHS and Piscirickettsia salmonis. Culture any PCR positive samples.

Provincial Surveillance Program samples.

I.D. A.2.4-6 (1-3).

**Molecular Diagnostics/PCR**

Samples 1-3: IHN, VHS, ISA, IPN Virus negative by PCR.  
Piscirickettsia salmonis negative by PCR.

\* Results faxed Mar. 1/04.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-00722      **Date** 20-Feb-2004      **Report** 01-Mar-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 11333      A.2.4-5 (1-8)

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**      Dr. Joanne Constantine

**Specimen:** Tissue - Fresh

**Count** 8

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

J.H. Robinson, D.V.M.  
Veterinary Virologist



**History/Symptoms**

Submitted fresh tissue for Virology - PCR for IHN, ISA, IPN, VHS and Piscirickettsia salmonis. Culture any PCR positive samples.

Provincial Surveillance Program samples.

I.D. A.2.4-5 (1-8).

**Molecular Diagnostics/PCR**

Samples 1-4, 5-8: IHN, VHS, ISA, IPN Virus negative by PCR.  
Piscirickettsia salmonis negative by PCR.

\* Results faxed Mar. 1/04.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-00723      **Date** 20-Feb-2004      **Report** 01-Mar-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 11334      A.2.4-7 (1-10)

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**      Dr. Joanne Constantine

**Specimen:** Tissue - Fresh

**Count** 10

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

J.H. Robinson, D.V.M.  
Veterinary Virologist

**History/Symptoms**

Submitted fresh tissue for Virology - PCR for IHN, ISA, IPN, VHS and Piscirickettsia salmonis. Culture any PCR positive samples.

Provincial Surveillance Program samples.

I.D. A.2.4-7 (1-10).

**Molecular Diagnostics/PCR**

Samples 1-5, 6-10: IHN, VHS, ISA, IPN Virus negative by PCR.  
Piscirickettsia salmonis negative by PCR.

\* Results faxed Mar. 1/04.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-00725      **Date** 20-Feb-2004      **Report** 20-Feb-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 11335      A.2.4-8 (1-10)

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**      Dr. Joanne Constantine

**Specimen:** Tissue - Fresh

**Count** 10

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

J.H. Robinson, D.V.M.  
Veterinary Virologist

**History/Symptoms**

Submitted fresh tissue for Virology - PCR for IHN, ISA, IPN, VHS and Piscirickettsia salmonis. Culture any PCR positive samples.

Provincial Surveillance Program samples.

I.D. A.2.4-8 (1-10).

**Final Comments**

Research project. Case closed.

/bb

# ANIMAL HEALTH CENTRE

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

## Case Report

**Submission** 2004-00726      **Date** 20-Feb-2004      **Report** 01-Mar-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 11336      A.3.2-9 (1-3)

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**      Dr. Joanne Constantine

**Specimen:** Tissue - Fresh

**Count** 3

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

J.H. Robinson, D.V.M.  
Veterinary Virologist

**History/Symptoms**

Submitted fresh tissue for Virology - PCR for IHN, ISA, IPN, VHS and Piscirickettsia salmonis. Culture any PCR positive samples.

Provincial Surveillance Program samples.

I.D. A.3.2-9 (1-3).

**Molecular Diagnostics/PCR**

Samples 1-3: IHN, VHS, ISA, IPN Virus negative by PCR.  
Piscirickettsia salmonis negative by PCR.

\* Results faxed Mar. 1/04.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-00835      **Date** 27-Feb-2004      **Report** 29-Mar-2004

**Report**      **Copies**

**Submitter:** 11036 Mainstream Canada (M)

**Owner** 11036 Mainstream Canada (M)

**Farm:**

**Vet Clinic:**

**Attending**

**Specimen:** Tissue - Fresh

**Count** 4

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

J.H. Robinson, D.V.M.  
Veterinary Virologist



**History/Symptoms**

PO #750110. Biotech Services, Boot Lagoon Hatchery, Site 306, C-13, RR#3, Central Lake Road, Port Alberni BC V9Y 7L7.

Four pooled samples:

- A) Miller/P1/1
- B) Miller/P5, P8, P7, P2/1
- C) Miller/P1, P4
- D) Miller/P6/1

Please screen for Virus via cell culture. Atlantic salmon. Average weight approx. 3kg. Mortalities appear to have external myxobacterial infection ('net rash'), most off feed, slight peritoneal hemorrhaging (bruising?).

\*Please call 250-723-4644 if you have any questions: Caroline Cherry or Howie Manchester fax 250-723-4614.

**Virology**

4 samples inoculated onto tissue culture - all negative.

\* Results faxed Mar. 29/04.

/bb



**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-00877      **Date** 02-Mar-2004      **Report** 10-Mar-2004

**Report**      **Copies**

**Submitter:** 9439 Marine Harvest Canada (M)

**Owner** 11428 #5041, Marine Harvest

**Farm:**

**Vet Clinic:**

**Attending**

**Specimen:** Tissue - Fresh

**Count** 10

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

J.H. Robinson, D.V.M.  
Veterinary Virologist

**History/Symptoms**

Submitted 10 baggies (3 fish/bag) for virology, tissue culture, and PCR - IHNV. Please quote the PO #272880 for invoicing purposes.

**Virology**

10 samples inoculated onto tissue culture - all negative.

\* Results faxed Mar. 29/04.

**Molecular Diagnostics/PCR**

Samples 1-10: IHN Virus negative by PCR.

\* Results faxed Mar. 10/04.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-00928      **Date** 04-Mar-2004      **Report** 12-Mar-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 11456      A.2, 3-4 (1-3)

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**      Dr. J. Constantine

**Specimen:** Tissue - Fresh

**Count** 3

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

J.H. Robinson, D.V.M.  
Veterinary Virologist

**History/Symptoms**

Submitted Provincial Surveillance Program samples for virology - PCR for IHN, ISA, IPN, VHS, and Piscirickettsia salmonis. Culture any PCR positive samples.

Sample ID: A.2,3-4 (1-3).

**Molecular Diagnostics/PCR**

Samples 1-3: VHS, IHN, IPN, ISA, Piscirickettsia salmonis negative by PCR.

\* Results faxed Mar. 12/04.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-00929      **Date** 04-Mar-2004      **Report** 12-Mar-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 11457      A.2.3 - 2 (1-4)

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**      Dr. J. Constantine

**Specimen:** Tissue - Fresh

**Count** 4

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

J.H. Robinson, D.V.M.  
Veterinary Virologist

**History/Symptoms**

Submitted Provincial Surveillance Program samples for virology - PCR for IHN, ISA, IPN, VHS, and Piscirickettsia salmonis. Culture any PCR positive samples.

Sample ID: A.2.3-2 (1-4).

**Molecular Diagnostics/PCR**

Samples 1-2, 3-4: VHS, IHN, IPN, ISA, Piscirickettsia salmonis negative by PCR.

\* Results faxed Mar. 12/04.

/bb



**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-00930      **Date** 04-Mar-2004      **Report** 12-Mar-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 11458      A 2.3 - 3 (1-10)

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**      Dr. J. Constantine

**Specimen:** Tissue - Fresh

**Count** 10

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

J.H. Robinson, D.V.M.  
Veterinary Virologist

**History/Symptoms**

Submitted Provincial Surveillance Program samples for virology - PCR for IHN, ISA, IPN, VHS, and Piscirickettsia salmonis. Culture any PCR positive samples.

Sample ID: A 2.3-3 (1-10).

**Virology**

RESULTS

-----

DIAGNOSIS

-----

COMMENTS

-----

2 pooled samples inoculated onto tissue culture - both negative.

**Molecular Diagnostics/PCR**

Samples 1-5, 6-10: VHS Virus positive by PCR.  
IHN, IPN, ISA, Piscirickettsia salmonis negative by PCR.

\* Results faxed Mar. 12/04.

/bb



**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-00980      **Date** 09-Mar-2004      **Report** 16-Mar-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 11487      A3.3-13(1-6)

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**      Dr. J. Constantine

**Specimen:** Tissue - Fresh

**Count** 6

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

J.H. Robinson, D.V.M.  
Veterinary Virologist

**History/Symptoms**

Submitted Provincial Surveillance Program samples for virology - PCR for IHN, ISA, IPN, VHS, and Piscirickettsia salmonis. Culture any PCR positive samples.

Sample ID: A3.3 - 13 (1-6)

**Molecular Diagnostics/PCR**

Samples 1-3, 4-6: VHS, IHN, IPN, ISA, Piscirickettsia salmonis negative by PCR.

\* Results faxed Mar. 16/04.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-00981      **Date** 09-Mar-2004      **Report** 16-Mar-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 11488      A 3.3 - 12 (1-7)

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**      Dr. J. Constantine

**Specimen:** Tissue - Fresh

**Count** 7

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

J.H. Robinson, D.V.M.  
Veterinary Virologist

**History/Symptoms**

Submitted Provincial Surveillance Program samples for virology - PCR for IHN, ISA, IPN, VHS, and Piscirickettsia salmonis. Culture any PCR positive samples.

Sample ID: A3.3 - 12 (1-7)

**Molecular Diagnostics/PCR**

Samples 1-3, 4-7: IHN, VHS, IPN, ISA, Piscirickettsia salmonis negative by PCR.

\* Results faxed Mar. 16/04.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-00982      **Date** 09-Mar-2004      **Report** 16-Mar-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 11489      A3.3-16(1-5)

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**      Dr. J. Constantine

**Specimen:** Tissue - Fresh

**Count** 5

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

J.H. Robinson, D.V.M.  
Veterinary Virologist



**History/Symptoms**

Submitted Provincial Surveillance Program samples for virology - PCR for IHN, ISA, IPN, VHS, and Piscirickettsia salmonis. Culture any PCR positive samples.

Sample ID: A3.3 - 16 (1-5)

**Molecular Diagnostics/PCR**

Samples 1-3, 4-5: IHN, VHS, IPN, ISA, Piscirickettsia salmonis negative by PCR.

\* Results faxed Mar. 16/04.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-00983      **Date** 09-Mar-2004      **Report** 16-Mar-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 11490      A 3.3 - 14 (1-10)

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**      Dr. J. Constantine

**Specimen:** Tissue - Fresh

**Count** 10

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

J.H. Robinson, D.V.M.  
Veterinary Virologist

**History/Symptoms**

Submitted Provincial Surveillance Program samples for virology - PCR for IHN, ISA, IPN, VHS, and Piscirickettsia salmonis. Culture any PCR positive samples.

Sample ID: A3.3 - 14 (1-10)

**Molecular Diagnostics/PCR**

Samples 1-5, 6-10: IHN, VHS, IPN, ISA, Piscirickettsia salmonis negative by PCR.

\* Results faxed Mar. 16/04.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-00984      **Date** 09-Mar-2004      **Report** 16-Mar-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 11491      A 3.3 - 17 (1-8)

**Farm:**

**Vet Clinic:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Attending**      Dr. J. Constantine

**Specimen:** Tissue - Fresh

**Count** 8

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

J.H. Robinson, D.V.M.  
Veterinary Virologist

**History/Symptoms**

Submitted Provincial Surveillance Program samples for virology - PCR for IHN, ISA, IPN, VHS, and Piscirickettsia salmonis. Culture any PCR positive samples.

Sample ID: A3.3 - 17 (1-8)

**Molecular Diagnostics/PCR**

Samples 1-4, 5-8: IHN, VHS, IPN, ISA, Piscirickettsia salmonis negative by PCR.

\* Results faxed Mar. 16/04.

/bb

**ANIMAL HEALTH CENTRE**

AAVLD - Accredited Laboratory

Ministry of  
Agriculture, Food and Fisheries  
1767 Angus Campbell Road

Abbotsford BC V3G 2M3 Telephone: (604) 556-

Facsimile: (604) 556-3010  
Toll-Free: 1-800-661-9903

**Case Report**

**Submission** 2004-00999      **Date** 10-Mar-2004      **Report** 17-Mar-2004

**Report**      **Copies**

**Submitter:** 3409      Ministry of Agriculture & Lands (Dr.  
J.Constantine)

**Owner** 11501      A 3.3 - 12 (4)

**Farm:**

**Vet Clinic:**

**Attending**      Dr. J. Constantine

**Specimen:** Other

**Count** 1

**Flock Herd Size:**

**Species:** Atlantic Salmon

**Age**

**Breed:**

**Sex:**

**Feed:**

**Feed**

**Vaccination**

**Treatmen**

**Diagnosis**

S.A. Raverty, D.V.M.,  
Veterinary Pathologist

**History/Symptoms**

Submitted Provincial Surveillance Program samples for bacteriology - identification of isolates and culture and sensitivity.

Sample ID: A 3.3 - 12 (4) sub-culture.

**Bacteriology**

Due to the extremely poor growth of this isolate, biochemical testing and sensitivities were unable to be performed.

This isolate was identified as a *Vibrio logei* by DNA sequencing.

\* Preliminary results faxed Mar. 17th; final results faxed Mar. 24/04.

/bb