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Sent: Monday, March 14, 2011 4:35 PM
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Subject: Cohn Commission Information for Laura Richards

Please review for content as soon as possible. These are meant to be brief "general" statements for Dr. Richards.

She will be receiving additional evidence tomorrow that will likely contain other fish health related material that we will need to help her with.

Thank you, Stewart

ISAV (Salmon Anaemia Virus) causes the disease ISA (Infectious Salmon Anaemia)

One of the most important viral diseases of farmed Atlantic salmon (Europe, New Brunswick and Chile). Signs of ISA disease and the presence of ISAV have never been found in British Columbian or adjacent waters. One outbreak of disease that was attributed to ISAV was reported in farmed coho salmon in Chile.

The fact sheet that was circulated was produced by the Center for Food Security and Public Health Iowa State University. Although it bears to OIE logo this is not an official OIE document as suggest by Dr. Morton in recent correspondence. This fact sheet is largely based on the official OIE chapter on ISA which is part of the Manual of Diagnostic Tests for Aquatic Animals 2009. One key difference is that the OIE makes no reference to "GOLD STANDARDS". This is further elaborated on below.

Have movement of Atlantic salmon eggs introduced ISAV into BC waters?

Points:

The table of egg numbers imported into BC is the number of eggs that the industry requested the Introductions and Transfers Committee to bring into BC. I am not familiar with the exact number of eggs imported but that number will be less than the number supplied in the table.

Note: With respect to risk of transfer of ISAV with eggs the OIE in Section 2.3.1 of the Manual of Diagnostic Tests for Aquatic Animals 2009 notes: "There is no strong evidence for vertical transmission through infected gonadal products." That said DFO has maintained a strict policy with respect to introductions of Atlantic salmon eggs.

In recent years all egg imports into BC have come from a certified disease free facility in Iceland. The local fish health officer (DFO, Mark Higgins) confirms the disease status of the facility. Iceland has never had a report of ISAV and the fish from which these eggs are obtained are maintained under strict quarantine. They are screen for disease and surface disinfected before shipping. On arrival in BC the eggs are surface disinfected again. Eggs are hatched and the progeny reared for 120 days in quarantine.

All testing during the quarantine periods is carried out by a third party laboratory that conducts these tests for the importer (industry). The results of all testing are given to the local fish health officer (DFO, Mark Higgins) and these data are used to determine whether the fish can be released from

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quarantine. Fish are tested for ISAV using cell culture as outlined in the OIE diagnostic manual.

Routine testing of Atlantic salmon farms has been conducted by BCMALF using RT-PCR at their Abbotsford Laboratory. I am not sure of the numbers of salmon screen over the years but these data are available in their annual fish health reports. **ISAV has never been detected in any of these screenings.**

In 2004/05 a study in Broughton Archipelago examined 283 chinook, 182 chum, 122 coho, 143 pink and a 100 sockeye for the presence of ISAV. **ISAV was not detected in any of these fish.**

To the best of my knowledge laboratory work using live ISAV has never been conducted in British Columbia.

Infection studies of steelhead trout, chum, chinook and coho salmon were conducted in Washington state some years ago (Jim Winton's laboratory). These species were injected with a strain of ISAV that was virulent to Atlantic salmon. None of these fish developed ISA disease, however virus could be isolated from them for a short period of time KYLE PLEASE CHECK//////////

There is no "Gold Standard" for ISAV detection: (this statement is not made in the official OIE document)

This term is poorly defined and frequently mistakenly defined as a test that is 100% sensitive and accurate, something that is impossible to achieve. This is a quote out of the new OIE Validation chapter: "The term 'gold standard' is commonly used to describe any standard of comparison, but it should be limited to methods or combination of methods that unequivocally classify animals as infected/exposed or uninfected." Organizations such as the OIE are going away from using this term/definition as you can imagine few such tests exist.

One working definition is that it is the best test at this time (reference test) based on available science against which other tests can be compared. **There are numerous different types of tests in the OIE manual for the detection of ISAV and these can all be considered as reference tests. The OIE recommended test methods based on availability, utility and diagnostic sensitivity and specificity for use in targeted surveillance and diagnosis of ISA include: 1) isolation in cell culture with virus identification and 2) RT-PCR or Real Time RT-PCR. Both of these have and continue to be used in the screening of Atlantic salmon and wild salmon in BC.**

Molecular diagnostic tests (RT-PCR, Real Time RT-PCR) will identify stains of ISAV that are virulent and non-virulent to Atlantic salmon. As I understand these have been the primary screening tools used by the province.

Please note that international and domestic movements of aquatic animals and their reproductive products now fall under the Health of Animals Act which is the responsibility of the CFIA. Any questions related to how egg transfers will occur in the future should be directed to them.

Retrovirus and Marine Anemia

Marine Anemia: also known as plasmacytoid leukemia, was first described disease of farmed Pacific salmon in British Columbia in the early 1990's. Most of what is known about the disease has been generated through laboratory studies or field investigations of severely affected farms involving Dr. M. Kent. The causative agent of this disease is controversial. In the early 1990's lines of evidence point

to a retrovirus as the cause, however this virus has never been isolated or otherwise characterized from infected fish. In later years M. Kent reviewed cases that suggested a role for the protozoan *Nucleospora salmonis* in this disease. The agent remains unidentified and the disease poorly classified.

In the Science paper Dr. Miller suggested the genomic signature was indicative of a retroviral infection. The link between the genomic signature, a retrovirus, Marine Anemia and fish farms stems from presentations made at meetings in Nanaimo, that have been picked up by Dr. Morton and others.

In a meeting last week Dr. Miller informed us that she had obtained parvovirus sequences from livers of fish showing this genomic signature. The type of virus hasn't been previously reported from fish, but is known from other lower vertebrates. In attendance was Dr. Brian Riddell as well as representatives from the BCSGA and Marine Harvest. You may be asked about this new development by their lawyers as there is no implication of salmon farms.

She mentioned that she has developed molecular tests for the virus that they were going to use to examine the correlation between the genomic signature and presence/absence of this virus. She also mentioned doing some histology of the livers to look for signs of disease. At this time there is no link between this virus, the genomic signature and disease in sockeye salmon.

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