

From: Patterson, David
Sent: Wednesday, January 31, 2007 12:20 PM
To: Miller-Saunders, Kristi <MillerK@pac.dfo-mpo.gc.ca>
Subject: FW: cultus lake sockeye salmon histology samples - gill form of a Parvicapsula-like parasite is present

Hi Kristi

Here is the response from Dr. David Speare when he looked at the gill preparations from Cultus fish.

He raises the possibility of another parvicapsula species (pseudobranchicola). If you are planning on running Loma, and Parvi PCR you may want to consider the possibility of another parvi. He has included reference for the pseudobranchicola diagnosis.

Enjoy.

-----Original Message-----

From: Dr. David Speare [mailto:spere@upei.ca]

Sent: December 5, 2006 10:11 AM

To: kieserd@pac.dfo-mpo.gc.ca; BennettW@pac.dfo-mpo.gc.ca; Mbradfor@sfu.ca; BradfordM@pac.dfo-mpo.gc.ca

Subject: cultus lake sockeye salmon histology samples - gill form of a Parvicapsula-like parasite is present

Hi Folks,

Thanks for sending along the slides which arrived yesterday. (William - you did a great job on these slides, and the packaging was terrific ie. they made it here quickly and in one piece!).

The gills certainly do present a diagnostic challenge - and they are possibly the worst looking (ie.pathological) gills which I have ever seen (except for some cases of severe chronic amebic gill disease, or long term reaction to diatoms). Additionally, some of the specific lesions are unique and definitely have not been described before for any type of gill disease. On its own, even without a definitive diagnosis, the pattern of branchial damage would be worthy of a short journal communication. The interstitial branchitis is severe (although not unique); the severe widespread hypertrophy of lamellar epithelial cells, with the development of small proliferative plaques is unique (and it is widespread). The wire-loop changes to the pillar cells are quite interesting and likely represent antigen-antibody deposition effects. The deeper changes within the central venous sinusoid, severe inflammation and degeneration of the cartilage core of the filament are not consistent with any "as yet" described gill problems.

Thus - although at least one slide showed mild to moderate Loma - I am not able to ascribe the changes to Loma. They are not consistent with the spectrum of Loma pathology.

What is present in relatively large numbers in some of the gills, and in moderate to high levels in all of the gill sections, are protozoa which closely resemble the Parvicapsula noted in the kidney. Specifically the Parvicapsula in the gills occurs most commonly in areas of the gill which are the most inflamed and the most hyperplastic. So - it makes a convincing story connecting the pathogen to the host response. I wish I knew more about Parvicapsula, but I have not worked with it all the much before, so my terminology of the life-stages is likely to be a bit "off".

A curiosity is that - unlike in the kidney where the Parvicapsula are clearly distinct

and developmental stages easily defined, in the gill this is less so. There are numerous intracellular stages, many resembling "trophozoites" (using Yasutake's terminology here), but less defined are other stages - and in some cases it appears that the parasite degenerates into an eosinophilic washed out droplet of between 1-2 microns. It is noteworthy to avoid confusing the eosinophilic sacciform (not granular) cell (10 micron inclusion) for the parasite. For some reason in your slides the sacciform cells are staining pale blue and might be (often are) confused for a parasite.

I have a couple of references on my desk dealing with the *Parvicapsula* sp. that has been described affecting the pseudobranch of coho salmon and Atlantic salmon. The article by Yasutake and Elliot - DAO, 2003 has details which are very similar to your case (except of course they found the parasite in the pseudobranch, and apparently not at all in the gill itself!). The article by Nylund et al - DAO 2005 makes a convincing case that the gill is typically involved in *Parvicapsula pseudobranchicola*. The mystery deepens!

So - in summary: Loma is probably a minor factor. A *Parvicapsula* like agent seems to be the major factor. The gill pathology is profound, and highly unusual.

Caveat: I am still musing about the severe lamellar epithelial hypertrophy. In some instances there are *Parvicapsula*-like agents within the hypertrophic cells (although usually the parasite is within macrophages and pillar cells). The hypertrophy really reminds me of the type of megalocytosis that occurs during viral infections - especially similar to alveolar epithelial viral infections of terrestrial animals. So, I think it is well worth not overlooking the possibility of a viral agent that is targeting lamellar epithelial cells specifically (thus being responsible for a subset of the unusual gill lesions). If there is the a virus, it will likely be tough to grown on cell culture because it may need a gill epithelial cell line. The *Parvicapsula*-like agent seems to be more involved with the deeper inflammatory gill lesions.

Next steps: you mentioned the possibility of more collections. It would be interesting to see if the pseudobranch is affected - and this would steer things a bit more towards the *P. pseudobranchicola*. Additionally, we really need to have a look at the gills with transmission EM. This will help further define the parasite, and give us a glimpse into the hypertrophic cells to see if there is any evidence of virus.

Let me know how I can be of further assistance. It certainly is a case which I would be interesting to follow-up with further work and collaboration with you folks.

All the best,

Dave