Amoebic Gill Disease

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Outline

• Background & brief history
• The parasite
• Clinical signs & diagnosis
• Treatment/s and control
• Prevention & monitoring
Brief history of amoebic gill disease (AGD) in marine salmon

- Australia since 1980s
- WA, USA (1985 – )
- Ireland 1995 (8 sites), sporadic since until 2011 outbreak (12 sites)
- France & Spain (1995)
- Scotland (2006 – 7 [2 sites] & 2011 [26 sites])
- Norway 2006 (4 sites)
- Chile (2007 - )
AGD impact - Australia

• 10% stock loss/week untreated in Australia
• Reduced growth

• Freshwater baths prophylactic (13 x in 15 month cycle)
• 50 – 75 litre FW/smolt
• Adds 10 – 20% production cost
• 80c – AUD$1/kg COP

Source: Dr. R. Taylor, CSIRO

Vet-Aqua International November 2012
AGD impact – Scotland & Ireland

• Mortalities
• Loss in growth
• Increased percentage poor condition
• Increased susceptibility to disease
• Mortalities at lice bath treatment
• Emergency/early harvests
AGD risk factors

- High salinity (> 32ppt)
- High water temperature
- Blooms or swarms?
- Prior gill disease?
- Biofouling?
- Smolt quality/size?
- Farming area/site?
- Other infected sites in area
AGD 2011 Europe – 1st indications

- France – July
- Ireland – August (and re-emerged October)
- Scotland – September

- Why?
2012

• Continued in sites from 2011
• France, Ireland & Scotland
• Orkneys, Shetland (August onwards)
Neoparamoeba perurans

- *Paramoeba pemaquidensis*
- *Neoparamoeba pemaquidensis*
- Then confirmed new species
- *N. perurans*
- parasome
Neoparamoeba perurans & Trichodina sp.
Neoparamoeba sp.
Free living & parasitic
Survives in sediment & net pens
Spread in seawater (>1km)
Survives in seawater at least 14 days
Mean generation time 16 hours

N. perurans now cultured (Crosbie et al. 2012)
Clinical signs & diagnosis
Gill scores (0 – 5)

AGD gross pathology
- May under/over estimate AGD

- Smaller fish worst affected

- Support with fresh smears and histology
# Gross gill score system
(from Taylor *et al.* 2009)

<table>
<thead>
<tr>
<th>Infection level</th>
<th>Gill score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear</td>
<td>0</td>
<td>Healthy red colour</td>
</tr>
<tr>
<td>Very light</td>
<td>1</td>
<td>1 white spot, light scarring or undefined necrotic streaking</td>
</tr>
<tr>
<td>Light</td>
<td>2</td>
<td>2 – 3 spots/small mucus patch</td>
</tr>
<tr>
<td>Moderate</td>
<td>3</td>
<td>Thick mucus patch or spot groupings (up to 20% gill area)</td>
</tr>
<tr>
<td>Advanced</td>
<td>4</td>
<td>Up to 50% of gill area</td>
</tr>
<tr>
<td>Heavy</td>
<td>5</td>
<td>Majority of gill surface</td>
</tr>
</tbody>
</table>
Gill monitoring

• Weekly exam (with lice exam)
• Gill score
• Fresh microscopy (sample lethargic, check nodules, etc.)
• Histopathology (ditto)
• PCR
AGD pathology

Early stage lesions

Healing (adaptive, post treatment)
Site C 07GS0 Mortality Per Pen

% Monthly Mortality

- Severe gill hyperplasia, necrosis
- Bacterial mats, epitheliocystis
- Amoeba

BS5
BS6
BS7
Site B 07GS0 Mortality Per Pen

% Weekly Mortality

- C1
- C2
- C3
- C4
- C5
- C6
- C7
- C8

Amoeba
Diagnosis

• Clinical signs
• Fresh gill smears (technique)
• Stained smears
• Histology
• Molecular (PCR)
AGD histopathology
AGD histopathology sampling

- Sample affected area/s
- Multiple samples
- Serial sections
Treatment & control

- Freshwater baths (2 – 3 hours), <3ppt
  Softer freshwater better
- Hydrogen peroxide (1000 – 1400ppm, 20 – 30 minutes), temperature...
  - Formalin?
  - Chloramine T?
  - In-feeds?
Prevention & monitoring

• Weekly gill checks for signs (beware)
• plus fresh microscopy
• Regular histopath (& PCR)
• Early treatment (be prepared)
• Staff training and awareness
• Net cleanliness & hygiene
• Mort removal
• Fallowing
Training

Gill scoring
Fresh microscopy
Amoeba identification

5 practical workshops for Scotland in 2012
Future

• Single bay management & fallowing
• Improved bath treatments
• Alternative treatments
• Genetics
• Vaccine?
• In-feed treatments?
• Functional feeds?

• Will AGD recur?....
• Major research focus required
Many, many questions

- Pathogen (variant, reservoirs, survival, ability to spread, what to kill it?)
- Therapies (oral amoebicides, baths, peroxide)
- Net-pen management (role of prior gill disease, risk factors, epidemiology)
- Genetics
- Dietary assistance/impact?
Summary

- AGD major challenge for marine salmon farms
- Has caused significant losses in Europe
- Early detection & preparedness crucial

- Be prepared
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