Why use outcome based surveillance?

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Main topics of the presentation

- Introduction
- Surveillance
- Example: Documenting freedom from viral haemorrhagic septicaemia (VHS) in Norway
- Conclusion
Introduction
Production

• In 1970: 20,000 salmon smolts
• In 2013: 310 million smolts
• Production in 2013 1,2 million metric tonns
• Value 7,2 billion US $
Surveillance
### Surveillance

**Input based surveillance**

<table>
<thead>
<tr>
<th>Strength</th>
<th>Weakness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Done the same way</td>
<td>Many samples</td>
</tr>
<tr>
<td>Easy to verify</td>
<td>High costs</td>
</tr>
<tr>
<td>Easy to communicate</td>
<td></td>
</tr>
</tbody>
</table>

**Output based surveillance**

<table>
<thead>
<tr>
<th>Strength</th>
<th>Weakness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Differentiation between high and low risk farms</td>
<td>Needs trained and competent field personnel</td>
</tr>
<tr>
<td>Flexible approach</td>
<td>Needs evaluation</td>
</tr>
<tr>
<td>Lower costs</td>
<td></td>
</tr>
</tbody>
</table>
Documenting freedom from VHS in Norway
Viral hemorrhagic septicemia

- OIE listed disease
- Caused by VHSV
- Globally distributed
- Severe disease in rainbow trout
- Norway is approved free from VHS since 1994
Basis for the surveillance program

- Formal framework
- Fish health services
- The Norwegian Food Safety Authority

→ Aquaculture Operation Regulation
→ Private consultant companies or industry owned
→ Dead fish should be removed daily
→ Guidelines
→ Risk-based health
→ Cooperation with the Norwegian Veterinary Institute and fish health biologist
Design of the program - Guidelines

- Rainbow trout is prioritized
- Sampling should cover the whole country
- Sampling risk-based farms with increased mortality
- Sampling includes 10 fishes
- Sampling should only be carried out under 14°C
- Sample should contain kidneys, hearth and optionally brain
- Samples sent in tubes containing RNALater™
- Analyzed for VHSV by real-Time RT-PCR
Results 2013– Farms sampled
## Results 2013

<table>
<thead>
<tr>
<th></th>
<th>Rainbow trout</th>
<th></th>
<th>Atlantic Salmon</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fry/Smolt</td>
<td>On-growing</td>
<td>Brood fish</td>
<td>Total</td>
</tr>
<tr>
<td><strong>No. Sites</strong></td>
<td>8</td>
<td>24</td>
<td>2</td>
<td>34</td>
</tr>
<tr>
<td><strong>No. Samples</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>investigated by</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>real time RT-PCR</td>
<td>140</td>
<td>102</td>
<td>5</td>
<td>247</td>
</tr>
<tr>
<td><strong>No. Investigated</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>by cell culture</td>
<td>4</td>
<td>41</td>
<td>4</td>
<td>49</td>
</tr>
</tbody>
</table>

All samples were negative for VHS
Reduced costs

![Bar chart showing reduced costs over years](image)

- **2013**: 800,000 NOK
- **2014**: 700,000 NOK
- **2015**: 500,000 NOK
Evaluation

Comparing:

• Random sampling through intensive collection of samples across the population – Input based surveillance

• The Norwegian risk-based surveillance program – Output based

Conclusion:

• The Norwegian surveillance program is highly significant when it comes to the documentation of freedom from VHS
Conclusion
Conclusion

• The Norwegian surveillance programme is an example of adaption of an outcome based approach
• High probability of VHS freedom is achieved with:
  – Reduced costs
  – Allocating surveillance resources towards high risk farms and individual fish
• Challenges:
  – Requires a model for evaluation
  – Practical implementation
Thank you for your attention