Winter Ulcers (*Moritella viscosa*), serological findings from farmed salmonids in Iceland

Aqua Ice 2025 Reykjavik

Work conducted by Linn Emilie Knutsen, Siv Tunheim

In cooperation with Keldur, University of Iceland, BLÁR AKUR and VETAQ.

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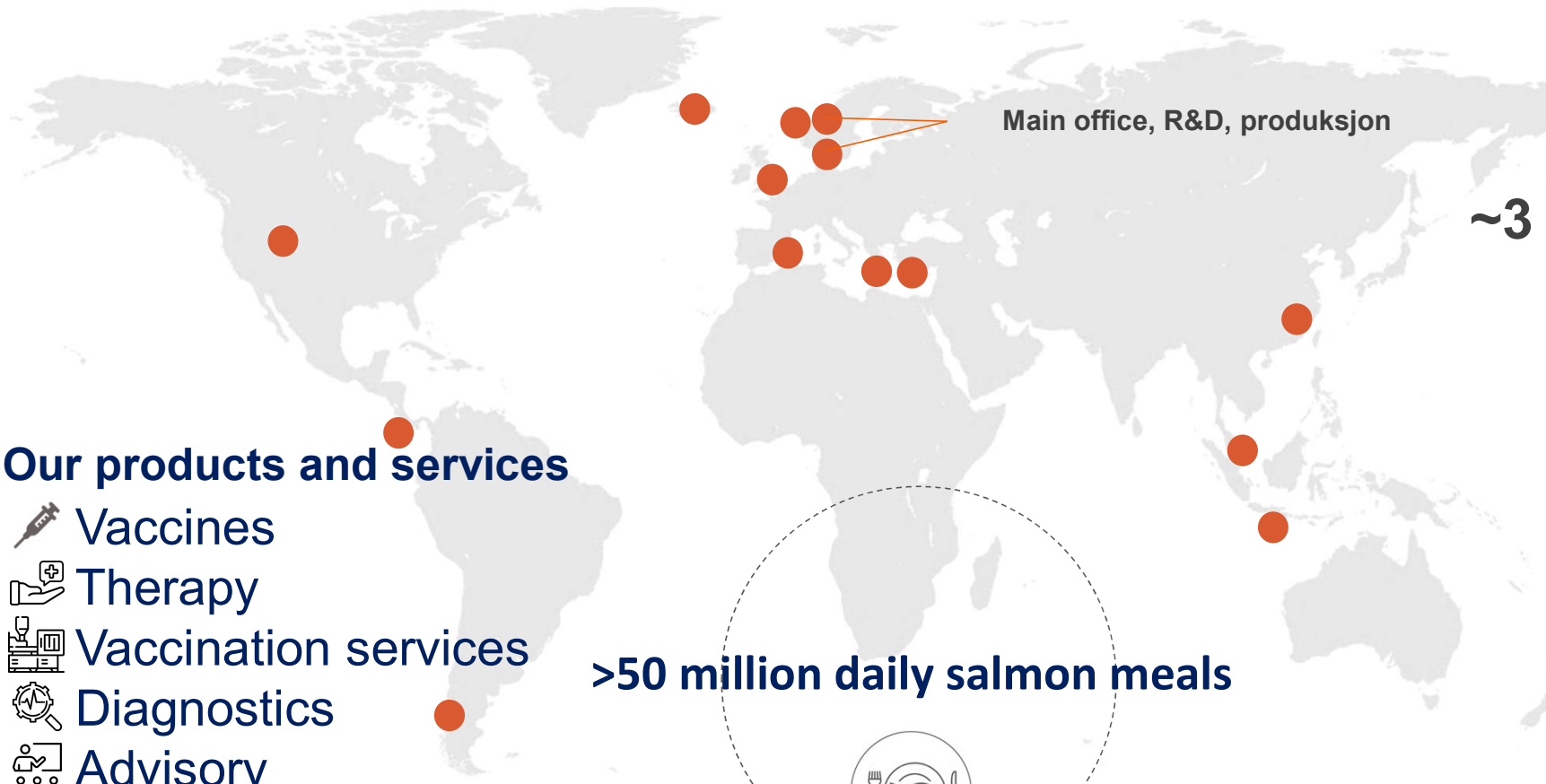
PHARMAQ, secure a safe and sustainable food production



~400
employees

~3 billion doses
yearly

26
antigens

9 av 10
Salmon are injected with one more vaccines from PHARMAQ

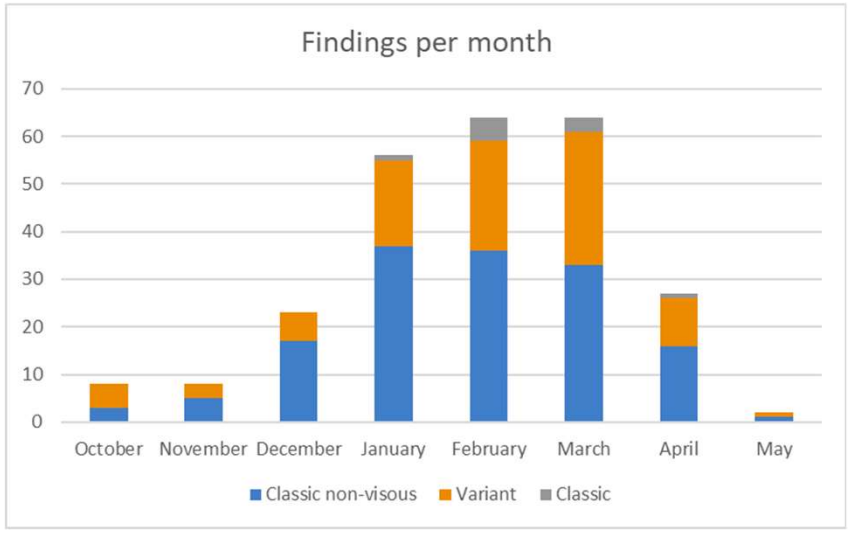
Our products and services

- Vaccines
- Therapy
- Vaccination services
- Diagnostics
- Advisory

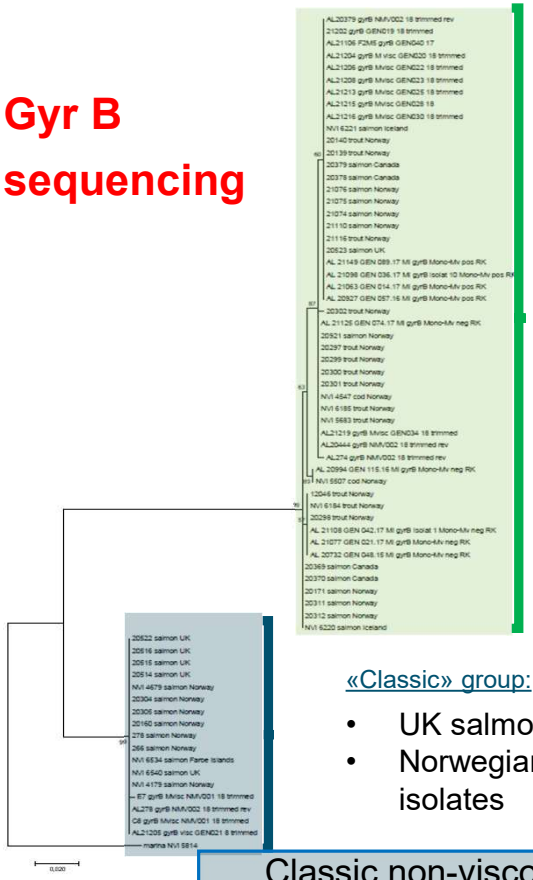
>50 million daily salmon meals

Moritella viscosa- the causative winter ulcer bacteria

- **Classical viscous isolate**
- **Classical non-viscous isolate**
- **Variant isolate**



Gyr B sequencing



«Variant» group:

- Lumpfish and trout isolates
- Canadian salmon isolates
- UK salmon isolates
- Icelandic salmon isolates
- Norwegian salmon isolates

«Classic» group:

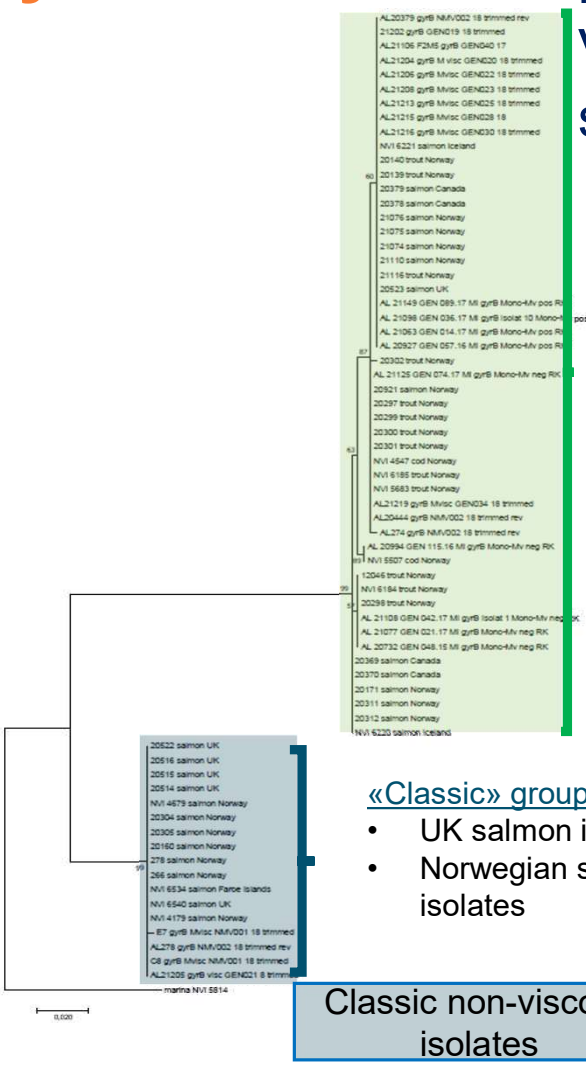
- UK salmon isolates
- Norwegian salmon isolates

Classic non-viscous isolates

Gyr B

Phylogeny *Moritella viscosa*

Variant and classic non-viscous isolates serologically related



«Variant» group:

- Lumpfish and trout isolates
- Canadian salmon isolates
- UK salmon isolates
- Icelandic salmon isolates
- Norwegian salmon isolates

«Classic» group:

- UK salmon isolates
- Norwegian salmon isolates

Classic non-viscous isolates

Serological reaction

A

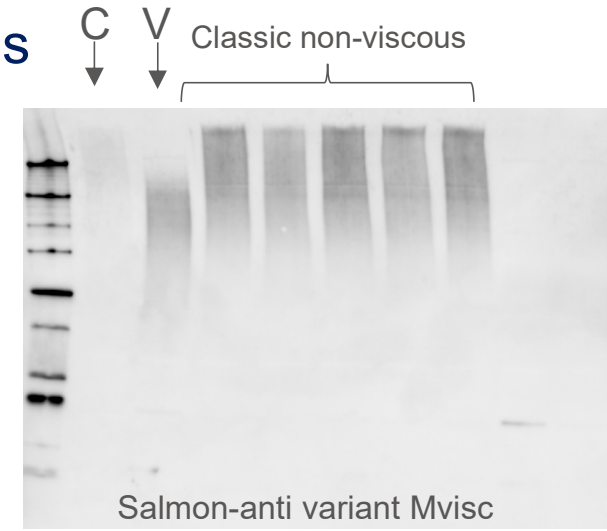
- Norwegian salmon CC1- isolates
- UK salmon isolates
- Canadian variant salm isolates

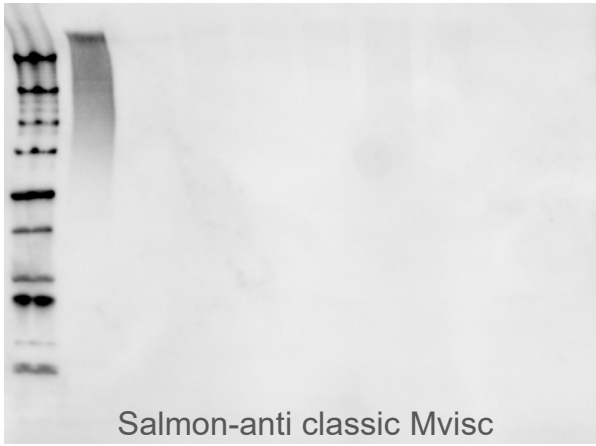
B

- Norwegian variant CC3- isolates
- Icelandic, UK and Norwegian salmon Classical non-viscous isolates

C

- Lumpfish and trout isolates
- Icelandic salmon isolates





Tingbø et al., submitted

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Serological characterization of *M. viscosa* isolates from Iceland

- 10 *M. viscosa* isolates received from Keldur* for serological characterization
- The samples were collected from Arctic char and Atlantic salmon.
- Samples were also sampled from land based and offshore facilities
- The isolates were analyzed with Western blot and id ELISA for comparison with Norwegian vaccine isolates

*The Institute for Experimental Pathology at Keldur, University of Iceland

Isolate	Species
Iceland landbased 1	Salmon, Jan. 2025
Iceland landbased 2	Salmon, Dec. 2024
Iceland landbased 3	Salmon, Jul. 2024
Iceland landbased 4	Salmon, May 2023
Iceland landbased 5	Salmon, May 2023
Iceland landbased 6	Char, Nov. 2024
Iceland offshore 9	Salmon, Dec. 2024
Iceland offshore 10	Salmon, Jul. 2024
Iceland offshore 11	Salmon, May 2023
Iceland offshore 12	Salmon, May 2023
Norwegian classical strain	Vaccine strain
Norwegian variant strain	Vaccine strain

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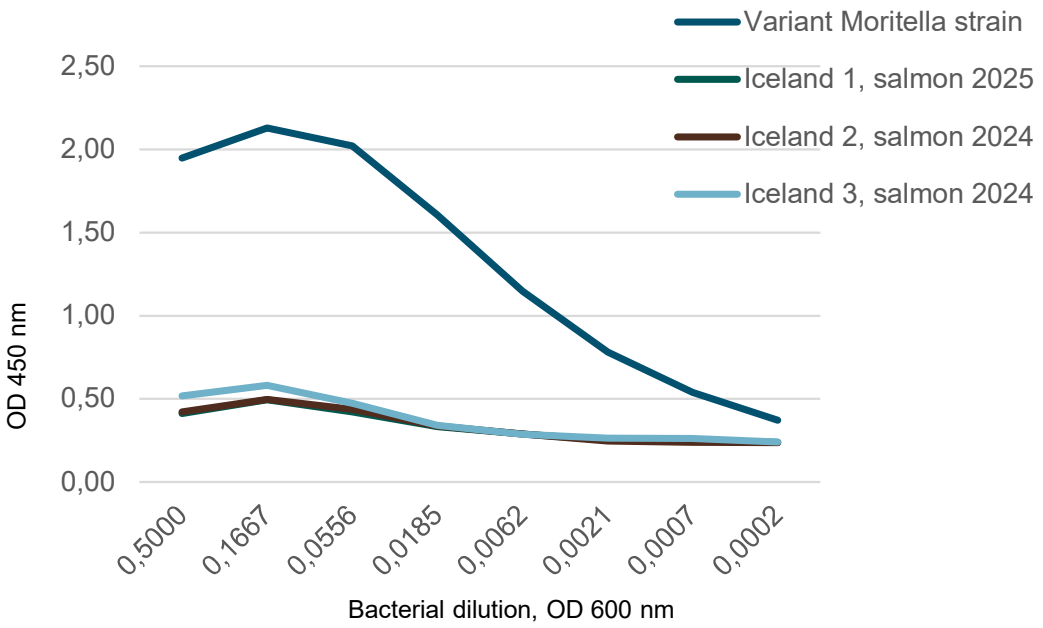
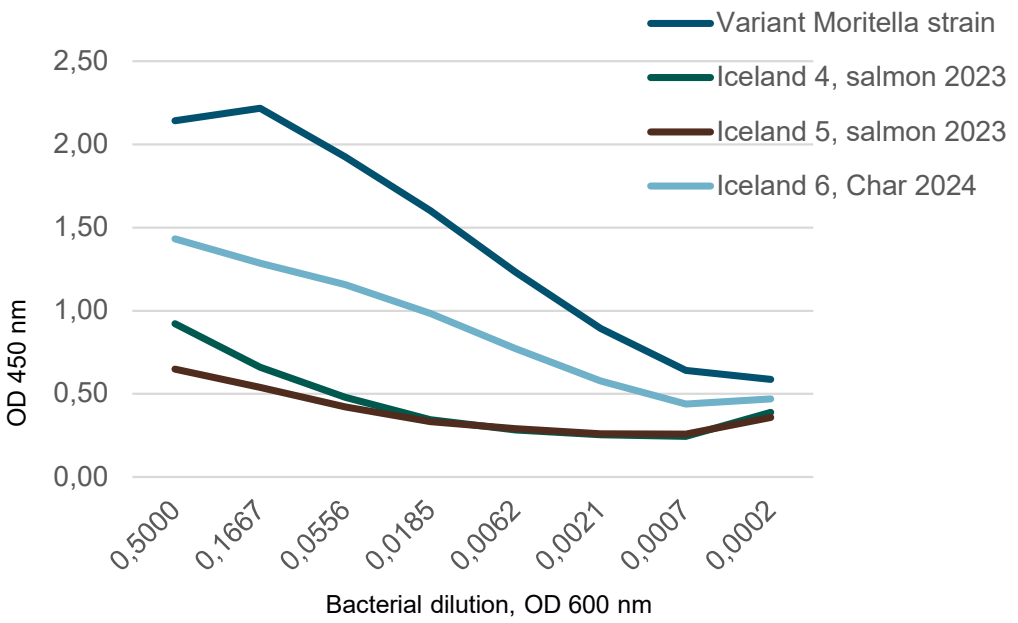
id-ELISA analysis

An immunological characterization method used to study/quantify binding between antigen (*M. viscosa*) and antibodies

→ Serological comparison of six isolates of *M.viscosa* and antibodies in plasma from salmon vaccinated with **a variant moritella isolates from Norway**





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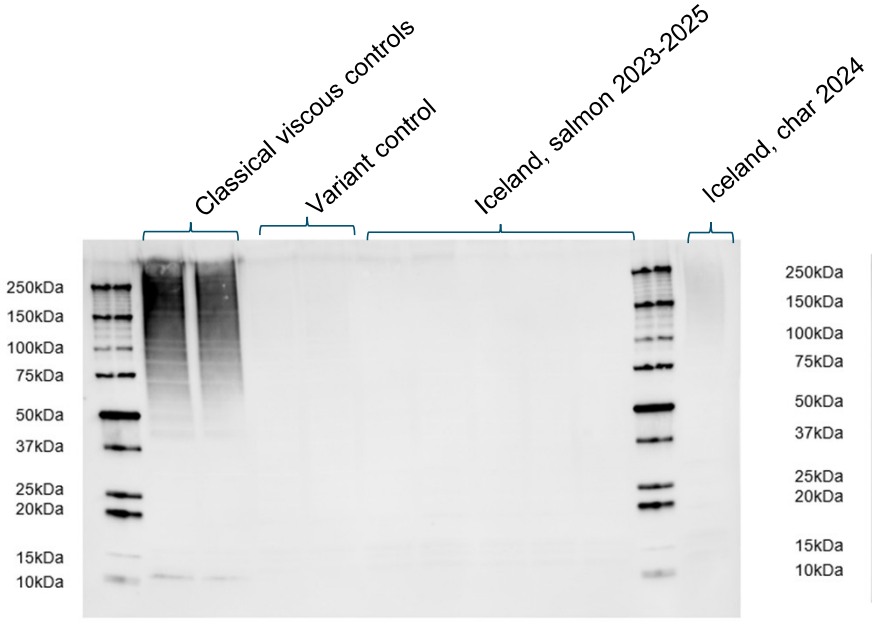
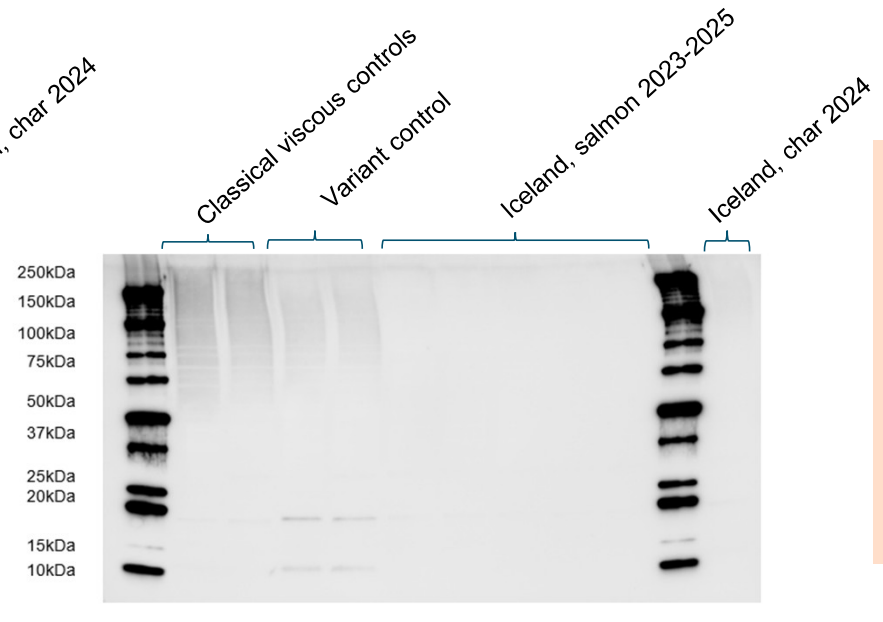
Western Blot analysis

An immunological characterization method used to separate and detect proteins and carbohydrate structures in *M. viscosa* isolates, that are recognized by an antibody

→ Blots stained with antibodies in plasma from salmon immunized with the **classical** and **variant moritella isolates**



Antibody: Atlantic salmon anti classical isolate



Antibody: Atlantic salmon anti variant isolate

Antibodies produced in salmon against **variante** or **classic** *M. viscosa* isolates did not detect antigen structures of the Icelandic *M.viscosa* isolates from landbased salmon

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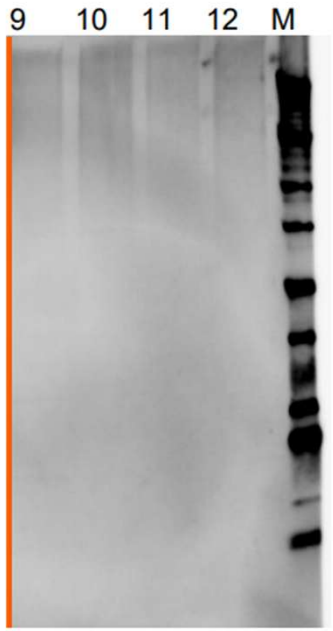
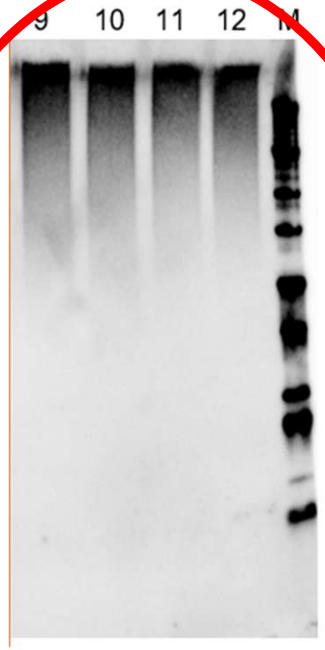
Moritella isolates from farmed Atlantic salmon

Offshore seawater sites in Iceland-showes crossprotection against the variant isolate



Atlantic salmon anti classical strain



Atlantic salmon anti variant strain

Sample ID	Lane
MW std	M
2023-1	9
2023-2	10
2023-3	11
2023-4	12

Antibodies from salmon against variante isolate, detect the antigen structures of offshore Icelandic non-viscous *M.viscosa* isolates

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Summary moritella

- The results indicate that the moritella isolates from the land-based Atlantic salmon in Iceland are serotypically different from the traditional classical and variant antigen in the vaccines
- The Moritella isolate from the seawater reared salmon (offshore) in Iceland is classified as **classical non-viscous** and is responding serologically to the variant antigen in the vaccine

- Pharmaq is continuing the serological moritella work throughout 2026
- Pharmaq is interested in receiving and analyzing more Icelandic isolates with the industry to get a better understanding of the diversity of *M. viscosa* in Iceland.

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Diagnostics in Iceland

Pharmaq Analytiq partners with Sýni

Sýni -Established 1993, present in Reykjavik and Akureyri

- Microbiological services and chemical analysis
  - PCR, microbiology, health and food safety
  - ISO 17025 Accredited private laboratory in Iceland by SWEDAC
  - Designated/approved by MAST
- Consulting unit
- Training in food safety and quality
- Auditing

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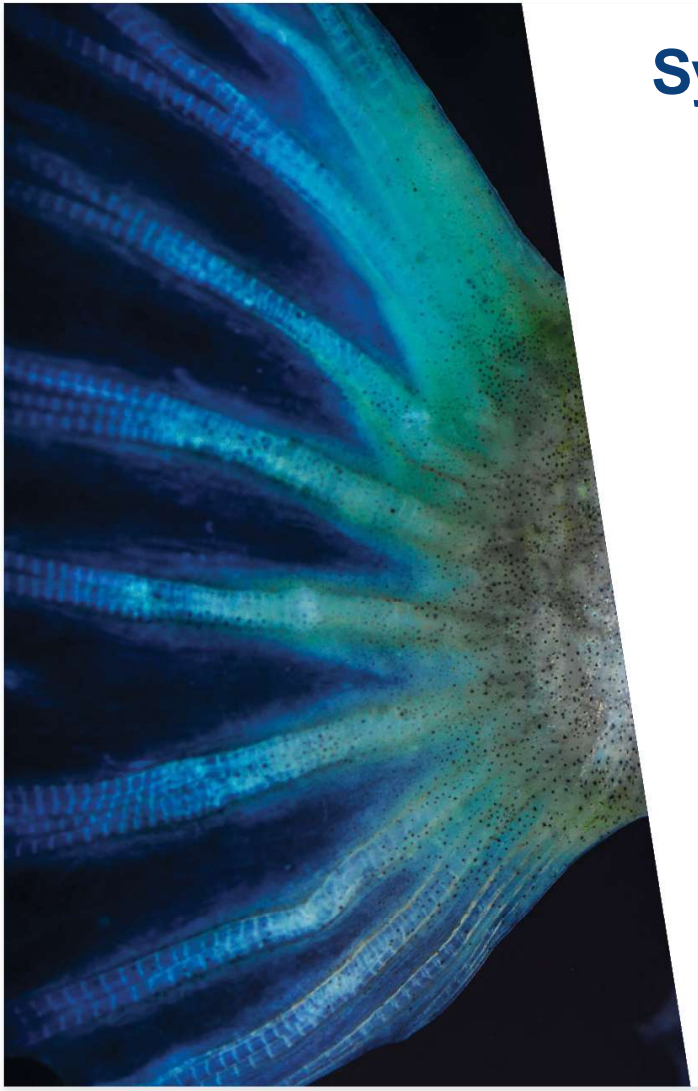

Syni –Diagnostic services for aquaculture in Iceland

- **RT-PCR (Syni)**
  - In-house extraction of DNA/RNA
  - Urgent response – can obtain results same day / next day
  - Standard response 3-5 days
- **Smoltvision (Syni)** –smoltification tool
- **Histology** (Analytiq, Norway)
  - Traditional histology, Immunohistochemistry
- **Microbiology (Syni)** Culture and characterization of samples
  - Agar plates/Microbevision
- **NGS**
  - Microbial community
  - Whole genome sequencing

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