

Outbreak of *Listeria monocytogenes* caused by consumption of raw fermented trout, Norway, 2018 to 2019

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Introduction

Initial alert

In December 2018, the National Reference Laboratory for Enteropathogenic Bacteria (NRL) at the Norwegian Institute of Public Health (NIPH) reported a whole genome sequencing (WGS) cluster of five cases of *L. monocytogenes* with identical core genome MLST profile. Four cases had sampling dates in November/December 2018, while the first case was sampled in February 2018

Objective

We investigated the outbreak to identify its source in order to implement control measures and prevent further cases

Methods

Case definition

Person with a laboratory confirmed infection with *L. monocytogenes* serogroup IIa, sequence type (ST) 20 and cluster type (CT) 6388 based on WGS

Epidemiological investigation

Cases interviewed with a standardized trawling questionnaire to gather information on demographics, symptoms and exposures

Food investigation

Sampling of leftovers and unopened packages of suspected raw fermented trout ("rakfisk") from outbreak cases

Microbiological investigation

WGS (Illumina MiSeq, 2x300bp) of all clinical and food *L. monocytogenes* isolates received at NRL. Serogroup, ST and CT determined in SeqSphere⁺ V.5.1 (Ridom) using Ruppitsch scheme (1701 loci)

Results

Epidemiology

- 13 confirmed cases
- 10 (77%) men, median age 74 years (range 53-90 years)
- Date of onset or date of sampling ranged from February 2018 to January 2019 (Figure 1)
- Twelve cases from five municipalities in Eastern Norway and one case from Sweden (Figure 2)
- Twelve of 13 cases reported eating rakfisk from Norway prior to illness
- No other common exposures between the cases were identified

Food investigations

- Rakfisk samples from four cases, which originated from the same producer in Norway, were positive for the *L. monocytogenes* outbreak strain

Microbiology

- WGS showed ≤ 1 allelic differences between the human (n=12) and food (n=4) isolates (Figure 3)
- Isolate from the Swedish case clustered with the outbreak strain using the Ion Torrent pipeline of Public Health Agency of Sweden

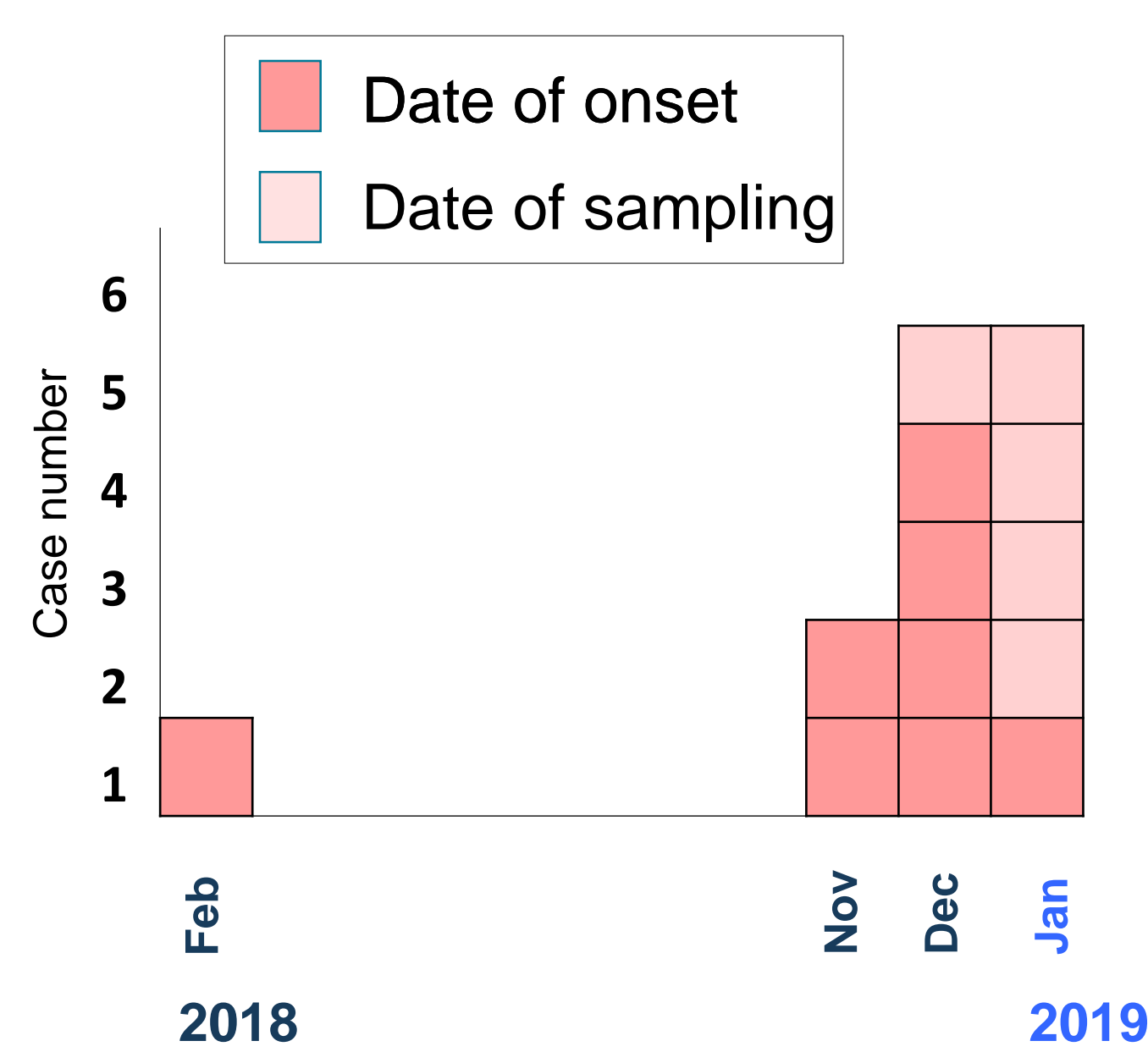


Figure 1. Epicurve by date of onset or date of sampling of cases with the *L. monocytogenes* outbreak strain.

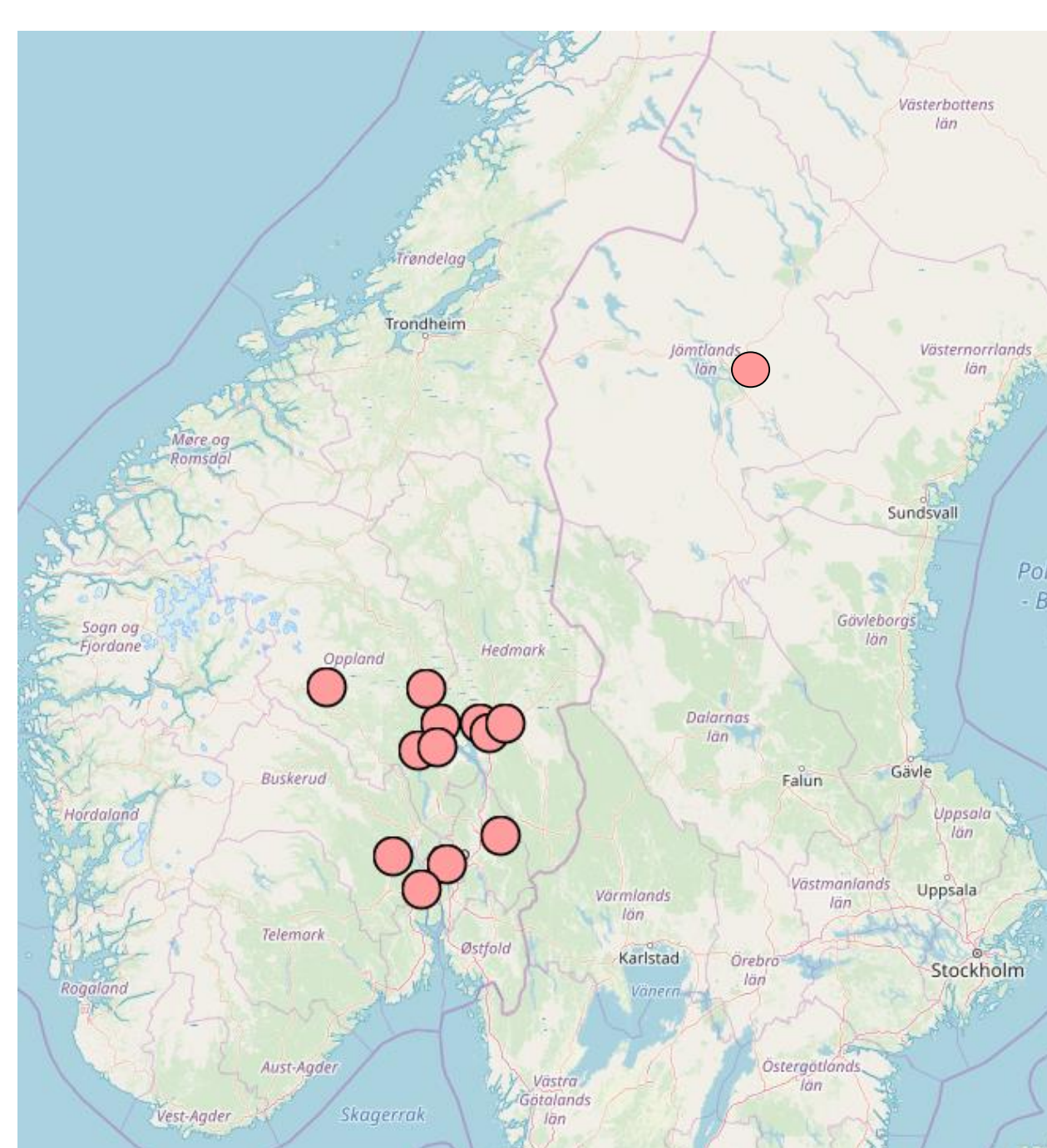


Figure 2. Geographical distribution of cases with the *L. monocytogenes* outbreak strain.

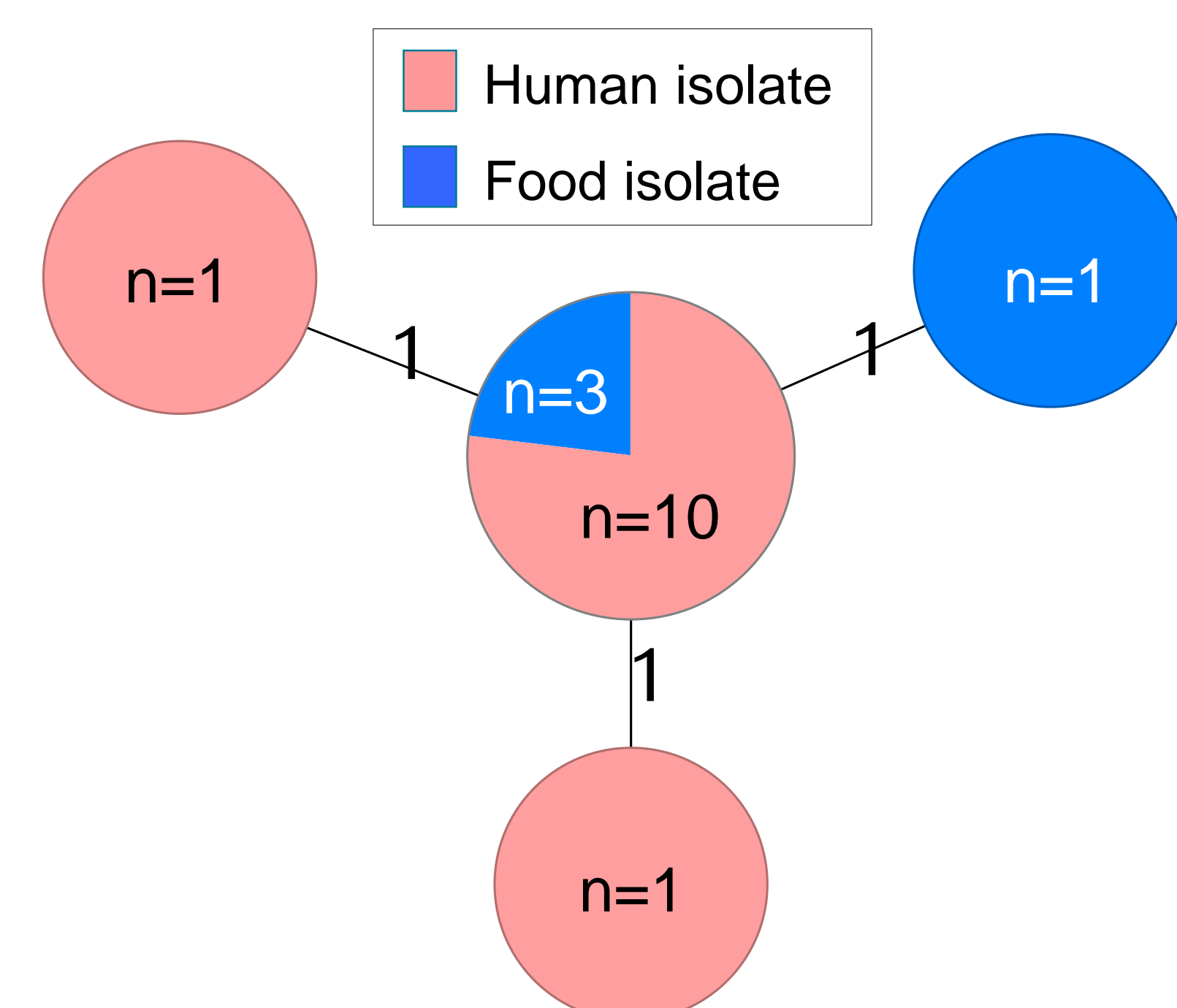


Figure 3. Minimum spanning tree of *L. monocytogenes* from human (n=12, in peach) and food (n=4, in blue) samples by core genome MLST (1701 alleles). Number on branches denote allelic differences between isolates.

Conclusions

- Epidemiological investigations and WGS analyses identified the likely source of the outbreak and linked the cases to rakfisk from a specific producer in Norway
- Case distribution by sampling date suggests that *L. monocytogenes* was introduced into the production line prior to February 2018, followed by continued environmental and food contamination
- The implicated producer voluntarily recalled the rakfisk in January 2019, although environmental investigations are ongoing
- We recommend that people in risk groups for listeriosis avoid eating rakfisk

We gratefully acknowledge the interviewed cases, the local food safety authorities, the Norwegian Veterinary Institute, the municipality doctors and the Public Health Agency of Sweden for their cooperation in this investigation.

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