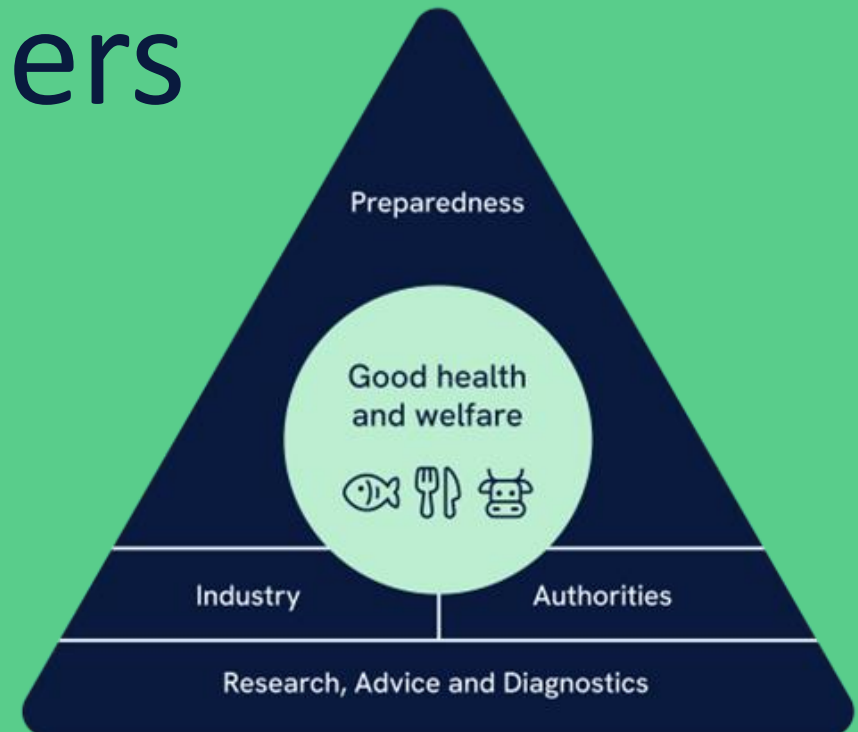


Norwegian action plan against *Campylobacter* in broilers through 24 years

EURL workshop, 01.10.25

Kristin S. Pettersen and Gro S. Johannessen



The Norwegian poultry production

The Norwegian action plan against Campylobacter – aim and history

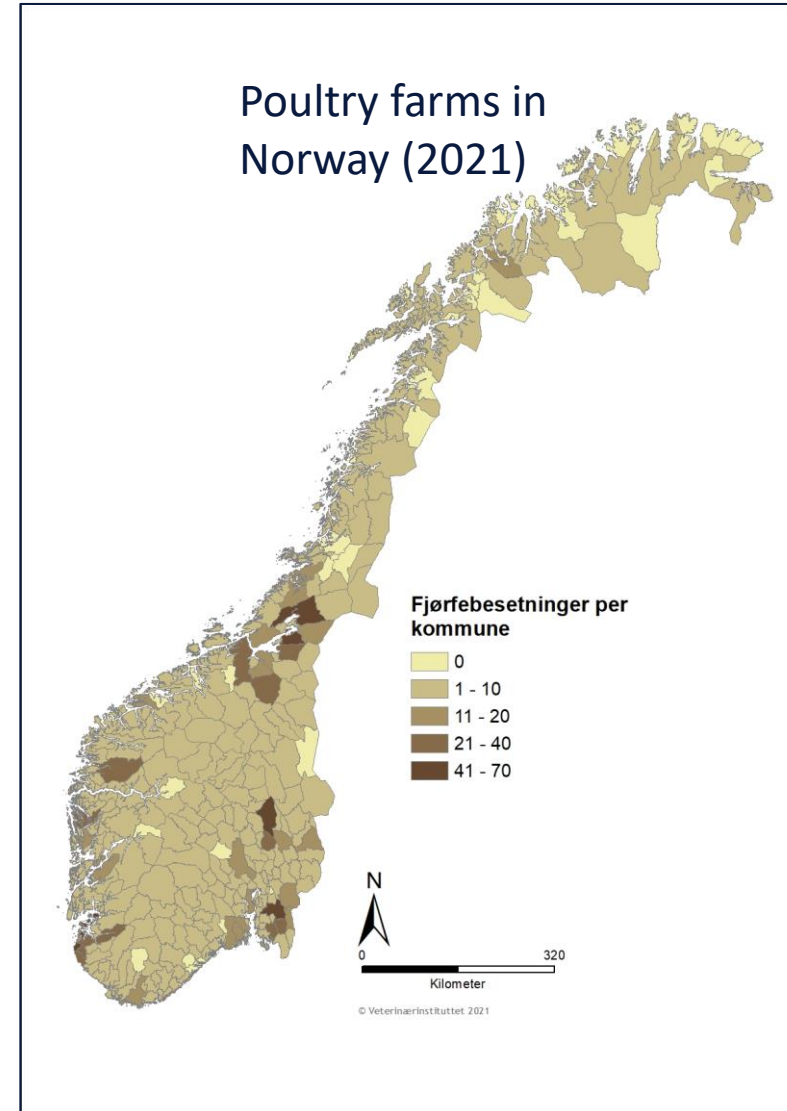
The Norwegian action plan against Campylobacter today – results

Research and future perspectives

Questions and comments

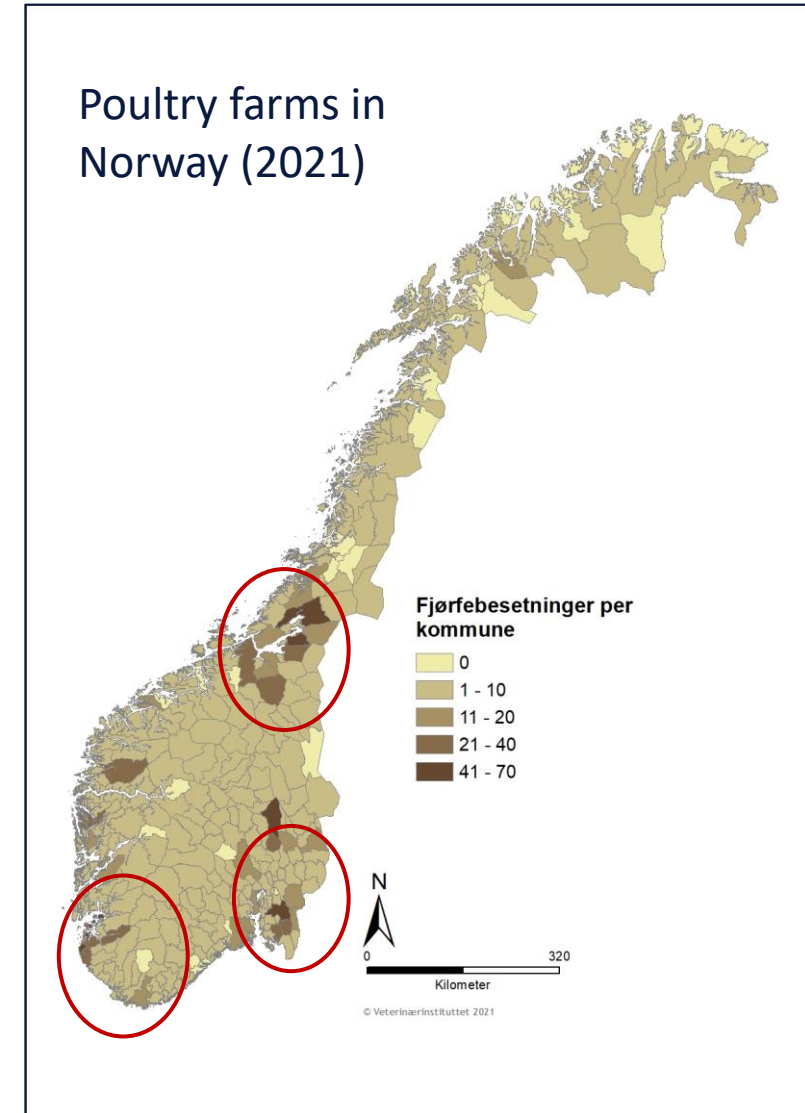
The Norwegian poultry production

- Number of poultry producers (2023):
 - Broilers: Ca 500
 - Egg production: 629
 - Turkey: 45
 - Ducks: 11



The Norwegian broiler production

- Broiler production:
 - Average age: 38 days (increasing – Hubbard ca 46 days versus Ross 308 ca 35 days)
 - High biosecurity, free inside the house
 - Death: 2.72 %, 0.06% during transport, Cassation at slaughter: 1.59 %
 - Four abattoirs
 - 117 000 tons slaughtered in 2023
 - 10% increase since 2019
 - Represent 91 % of the poultry meat production
 - Organic broiler production: 0.8 % of total broiler production
 - Imported: 3 500 tons in 2023



The Norwegian action plan against *Campylobacter* – aim

- Started in 2001
- Background
 - Human campylobacteriosis had been increasing
 - Consumption of broiler meat is one of the risk factors for human campylobacteriosis
 - Consumption of broiler meat was increasing
- Aim
 - Reduce the human exposure to thermophilic *Campylobacter* spp. from Norwegian broiler products
- Broilers slaughtered at maximum 50 days of age



The surveillance programme for *Campylobacter* spp. in broiler flocks in Norway 2024

<https://www.vetinst.no/overvaking/campylobacter-fjorfe>

The Norwegian action plan against Campylobacter – history

- Started with:
 - Close collaboration and initiative between food safety authorities, industry, public health institute and Veterinary Institute
 - Sampling on-site at farm and at the abbatoir the whole year
 - Active follow-up of producers having positive flocks
 - Sampling of products (5-10% positive)
- Important adjustments or milestones along the way:
 - Detection method – PCR from 2005, real-time PCR from 2007
 - Time of sampling, 4-8 days before slaughter and only in «season» versus whole year, from 2009
 - Sampling only at farm, not at abbatoir, from 2008
 - Sampling of products stopped after the first years
 - Synergy with NORMVET (antimicrobial resistance)
 - Sampling at the abbatoir if positive
 - Broilers included in the action plan are excluded from the process hygiene criteria regulation

The Norwegian action plan against Campylobacter – sampling

“Seasonal distribution (approx. 80% of positive flocks are slaughtered during the six summer months)”

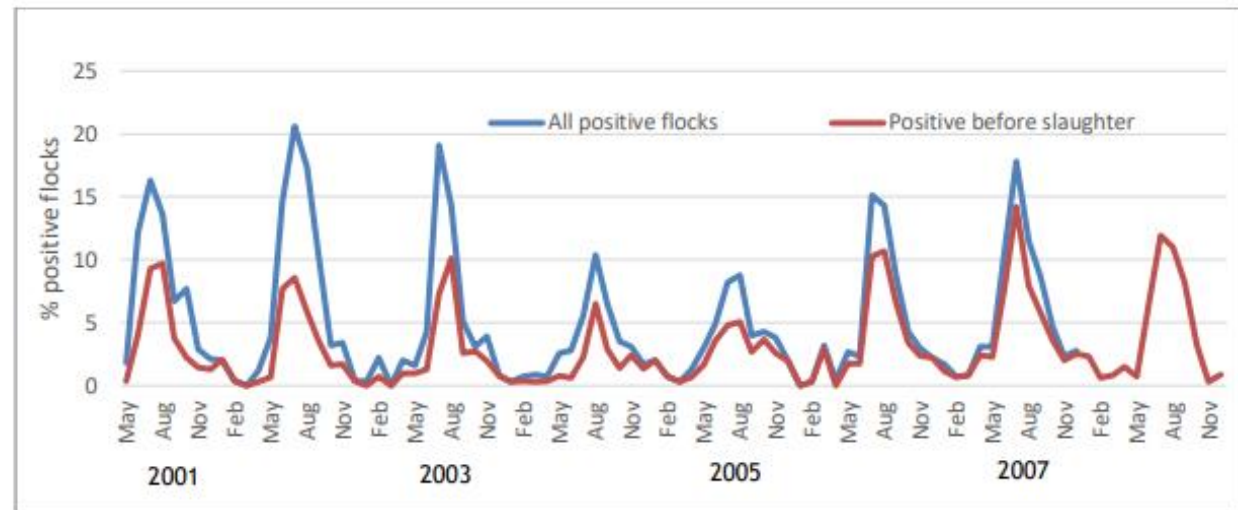
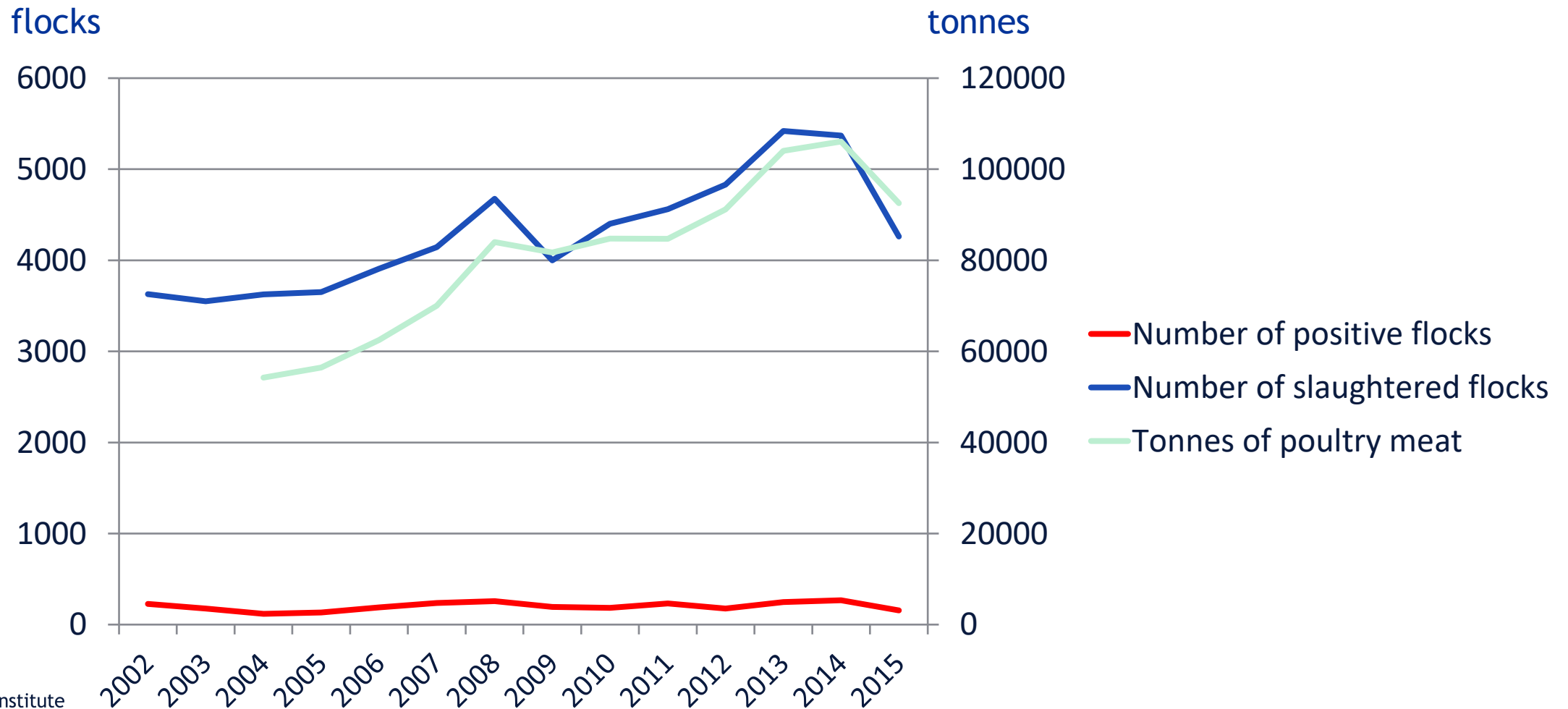


Figure 1. Monthly incidence of Campylobacter spp. in slaughtered Norwegian broiler flocks from May 2001 throughout 2008. The blue line represents flocks positive for Campylobacter spp., these data are based on two test results; before slaughter and at slaughter. The red line represents flocks tested positive for Campylobacter spp. at the sampling at farm before slaughter (from 2005 onwards: sampling approx. four days before slaughter).

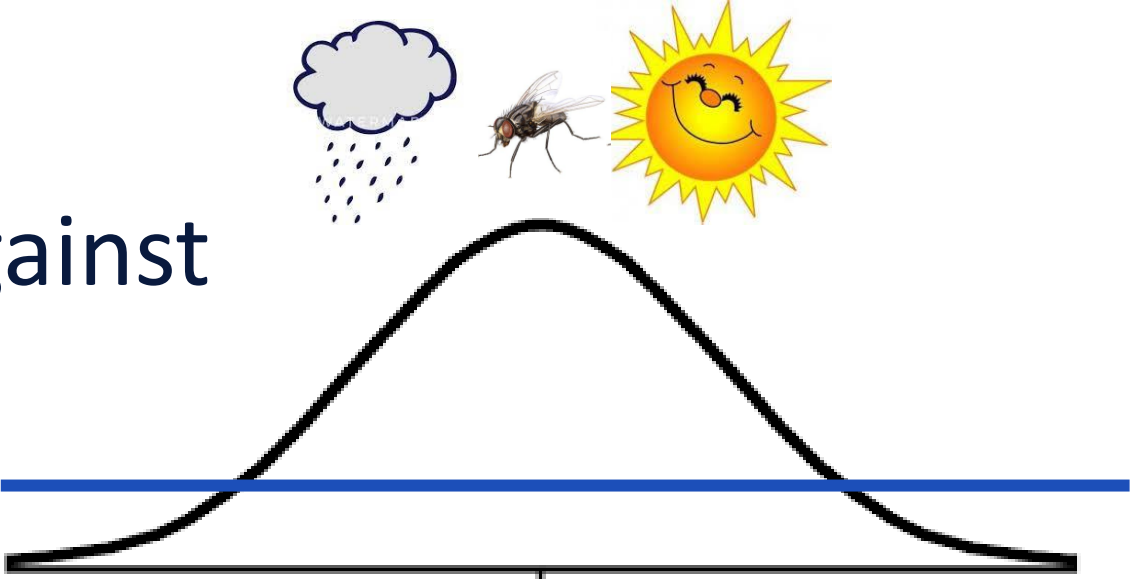
[Campylobacter hos fjørfe - overvåking \(vetinst.no\)](http://vetinst.no)

The Norwegian action plan against Campylobacter – results versus production

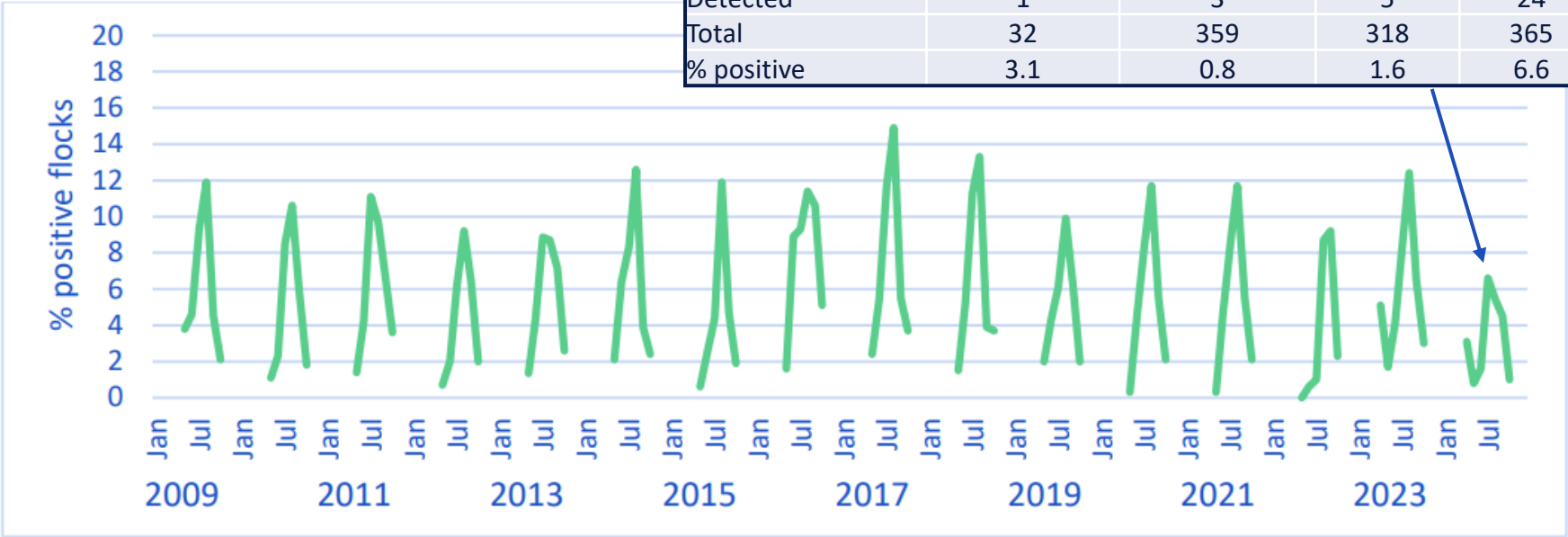


The Norwegian action plan against Campylobacter

– risk-based sampling



	April	May	June	July	August	September	October	Total
Not detected	31	356	313	341	333	316	311	2001
Detected	1	3	5	24	19	15	3	70
Total	32	359	318	365	352	331	314	2071
% positive	3.1	0.8	1.6	6.6	5.4	4.5	1.0	3.4



Campylobacter hos fjørfe -
overvåking - Veterinærinstituttet
(vetinst.no)

The Norwegian action plan against Campylobacter today



Day 2:
Results
ready



Veterinærinstituttet
Norwegian Veterinary Institute

Mattilsynet

ANIMALIA



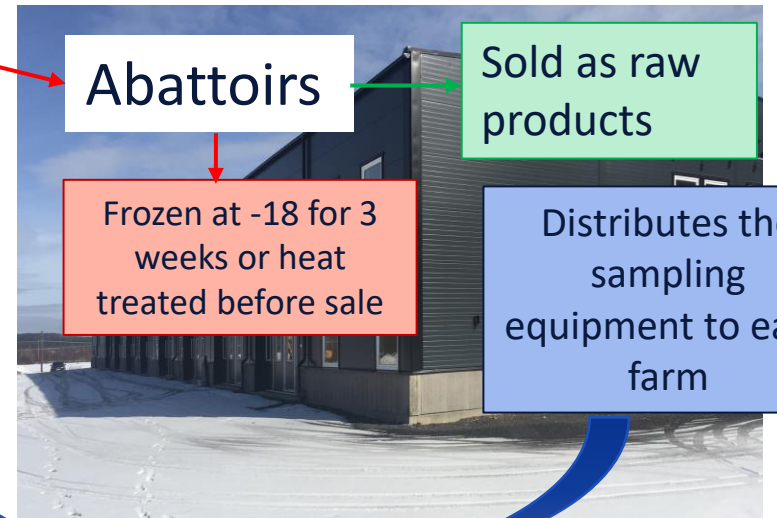
NVI sends out sampling
equipment before season



Day 2



Day 1



Abattoirs

Sold as raw
products

Frozen at -18 for 3
weeks or heat
treated before sale

Distributes the
sampling
equipment to each
farm

Slaktedag:	Mandag	Tirsdag	Onsdag	Torsdag	Fredag
Prøven tas og sendes:	Tirsdag	Onsdag	Torsdag	Fredag	Mandag

Sampling and analysis



Photo: From sampling form, Norwegian Veterinary Institute



- Real-time PCR*
- 10 caecal droppings -one swab each = one sample
- Analysed in two parallells - A flock is considered positive if both parallells are positive
- No isolate available, no verification of alive bacteria is possible
- Un-known status: sampled at time of slaughter - cultivation

Sample quality is registered and actively used for advice and follow-up of the farmer



Photo: Cathrine Fjellvang, Norwegian Veterinary Institute

Do we detect all positive flocks?

The occurrence of *Campylobacter* spp. in Norwegian broiler flocks older than 50 days of age at slaughter - a pilot study



No, but most of them



Average: 43.3 % of the samples *C. jejuni* positive – and increasing with age



Pilot: Screening of campylobacter in backyard poultry flocks

Photo: Kristin S. Pettersen

https://media.snl.no/media/141396/standard_shutterstock_104474144.jpg

Acknowledgements



NVI team



500 broiler farms



Research and future perspectives

- On-going research projects:
 - CampySafe
 - Two WGS pilot projects: sequenced about 100 isolates from cattle and ca 200 from broilers (NORMVET) – AMR and epidemiology

Previous projects:

- «Reinere kyllingslakt» - publications in the reference list
 - AirSample - publications in the reference list (Gro S. Johannessen presented this previously)
- **Biobanking of samples**



Campysafe – critical evaluation of the action plan

(Animalia, NMBU, NVI, Private industry)

Key question: What is acceptable food safety level? = today's action plan

Research questions:

When do the flock get infected? Alternative rapid detection methods available and suitable?

Slaughter

The preventive effect of new processing techniques at the abattoir? What are the quantitative level – if low – three weeks of freezing necessary?

Flock arrives at the farm



Surveillance sample taken 4-6 days before slaughter



References

Reinere kyllingslakt:

Hauge SJ, Johannessen GS, Haverkamp THA, Bjørkøy S, Llarena AK, Spilsberg B, Leithaug M, Økland M, Holthe J, Røtterud OJ, Alvseike O, Nagel-Alne GE. (2023) Assessment of poultry process hygiene and bacterial dynamics along two broiler slaughter lines in Norway. Food Control 146 (2023) 109526. <https://doi.org/10.1016/j.foodcont.2022.109526>

Llarena AK, Skjeve E, Bjørkøy S, Forseth M, Winge J, Hauge SJ, Johannessen GS, Spilsberg B, Nagel-Alne GE. (2022) Rapid detection of *Campylobacter* spp. in chickens before slaughter. Food Microbiol. 2022, 103:103949. doi: 10.1016/j.fm.2021.103949. Epub 2021 Nov 19.

AlrSample:

Haverkamp, T.H.A., Spilsberg, B., Johannessen, G.S. *et al.* Detection and characterization of *Campylobacter* in air samples from poultry houses using shotgun metagenomics – a pilot study. *BMC Microbiol* **24**, 399 (2024). <https://doi.org/10.1186/s12866-024-03563-3>

Hoorfar J, Kolářková I, Johannessen GS, Garofolo G, Marotta F, Wiczorek K, Osek J, Torp M, Spilsberg B, Sekse C, Thornval NR, Karpíšková R. (2020) [A multi-center proposal for a fast screening tool in biosecured chicken flocks for the foodborne pathogen *Campylobacter*](#). Appl Environ Microbiol. 2020 Oct 1;86(20):e01051-20. doi: 10.1128/AEM.01051-20.

Johannessen GS, Garofolo G, Di Serafino G, Kolářková I, Karpíšková R, Wiczorek K, Osek J, Christensen J, Torp M, Hoorfar J. (2020) [Campylobacter in chicken - Critical parameters for international, multicentre evaluation of air sampling and detection methods](#). Food Microbiol. 2020 Sep;90:103455. doi: 10.1016/j.fm.2020.103455. Epub 2020 Feb 8.

Scientifically ambitious,
forward-looking and collaborative
– for One Health



Norwegian
Veterinary Institute