



XX Anniversary  
1998-2018

A NATIONAL PROGRAM

A DRIVER FOR WILDLIFE RESEARCH

AN INTERNATIONAL MISSION

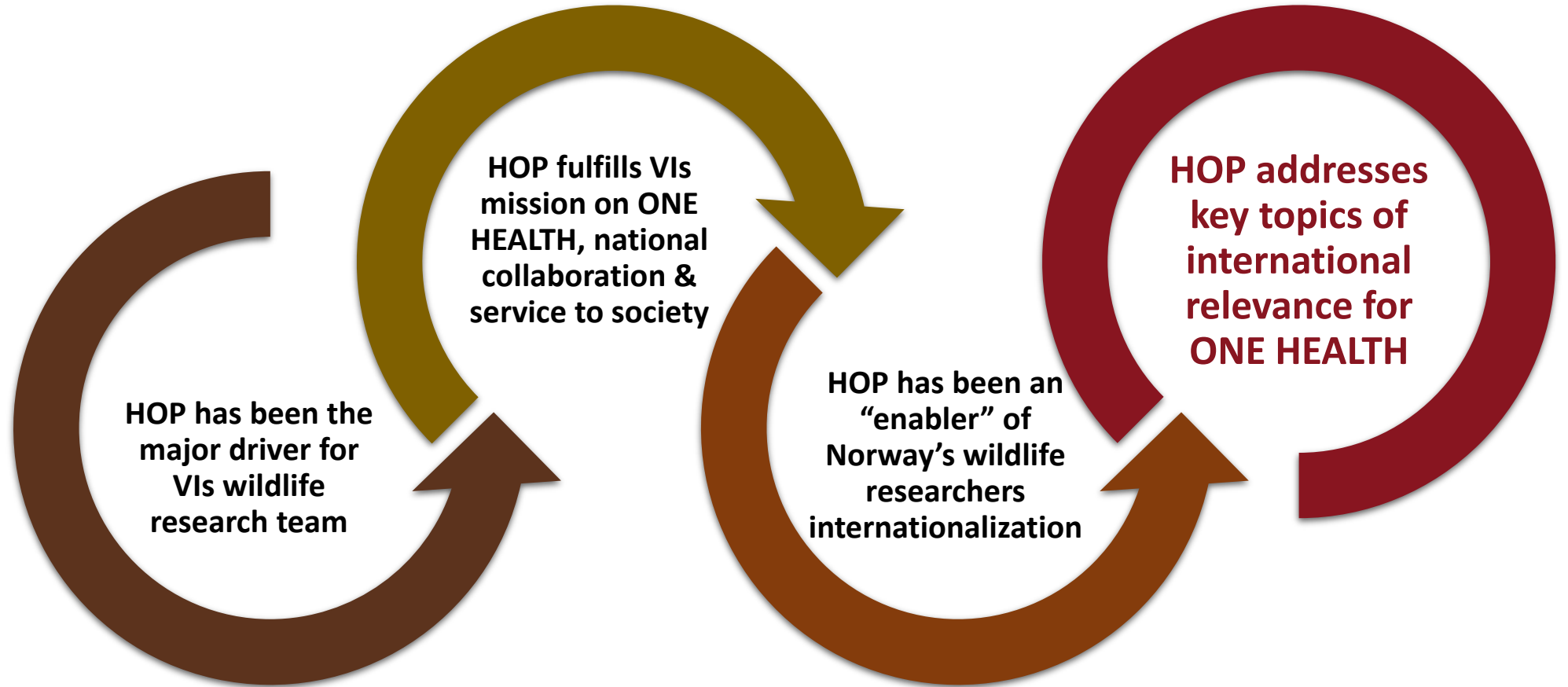


**Veterinærinstituttet**  
Norwegian Veterinary Institute  
Davvi-Norgga šibitdoavttirinstiuthta

**Carlos G. das Neves**  
DVM PhD Dipl.ECZM (Wildlife Pop. Health)  
Associate Professor  
Head of Food Safety & Emerging Health Threats



# Today's "4 dogmas"...





HOP has been the major driver for VIs wildlife research team

# A small “publishing” team...



1998



2005



2006



2013



2017



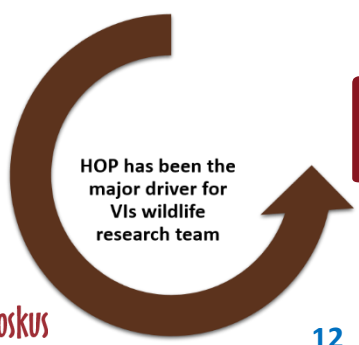
As of today: **3, 75-4 person/years**

As of 01.08.18: **3, 15-3,4 person/years**



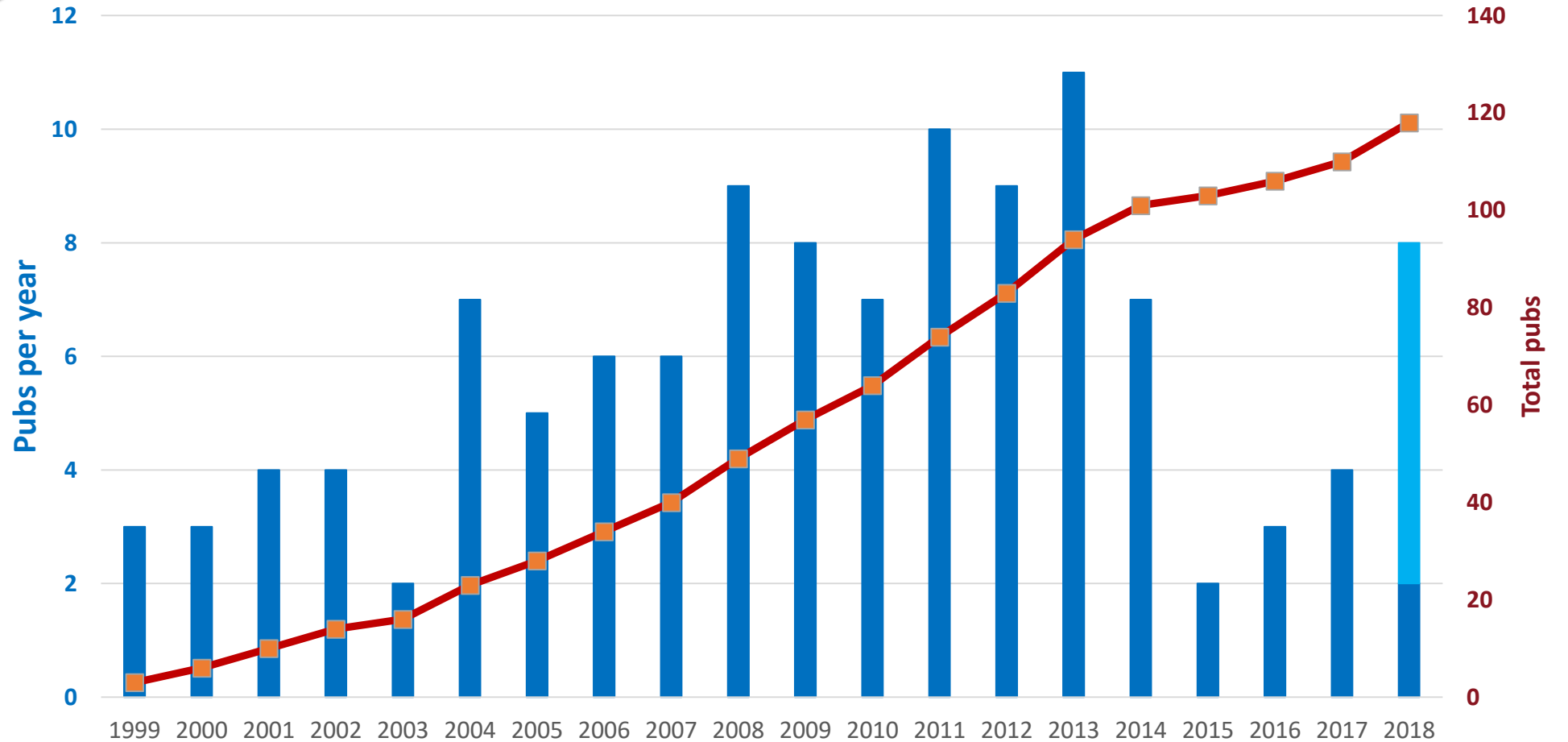
**5,75 person/years**





# Publications...

NVI wildlife team publications 1999-2018



+ reports, + national magazines, +scientific opinions, + + +

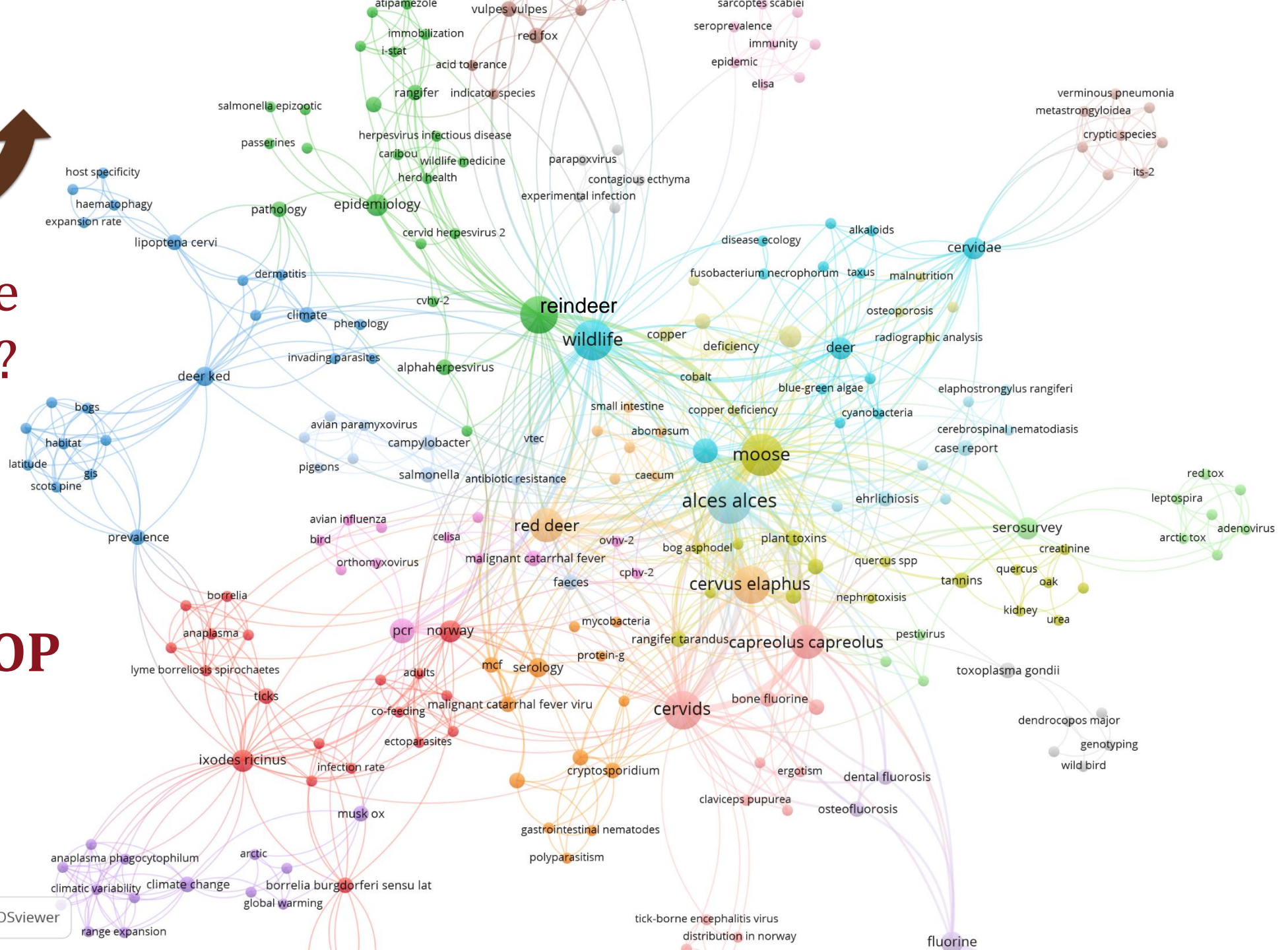






# What have we published on?

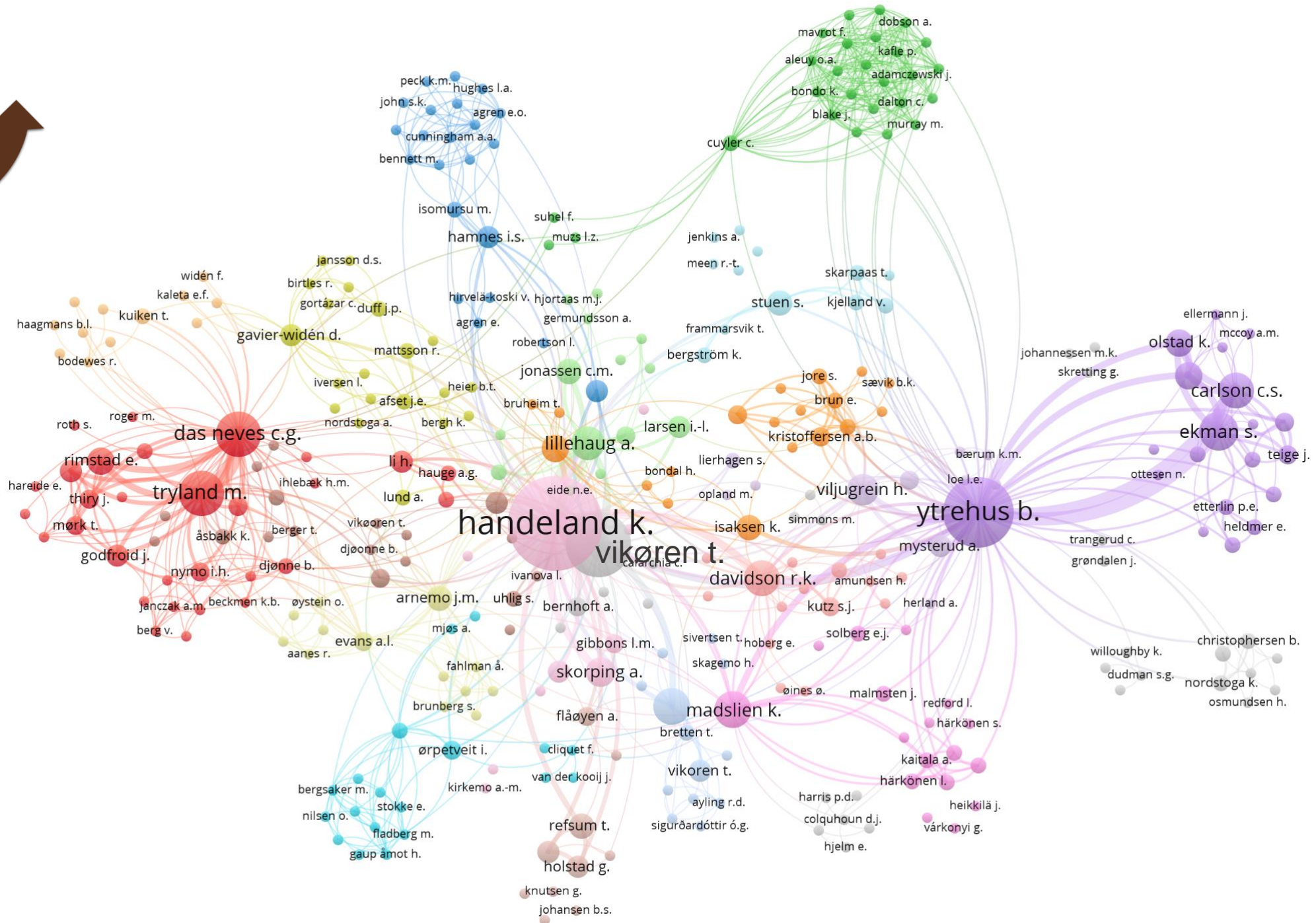
**~65% is HOP related**





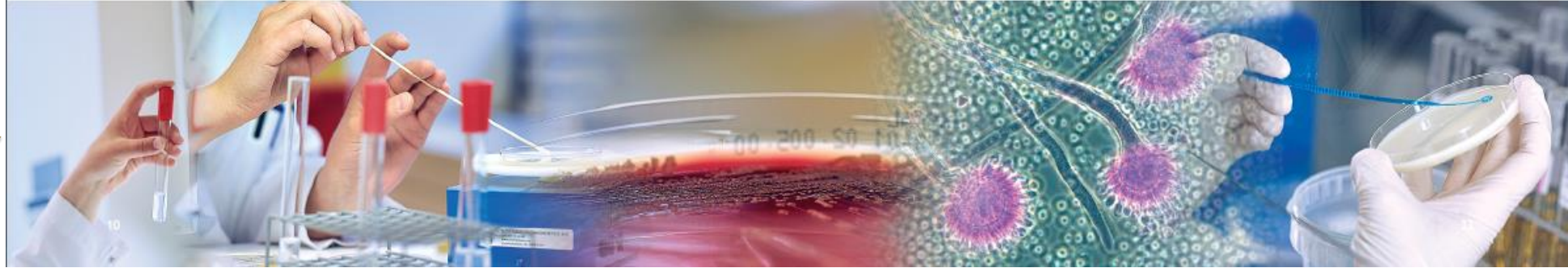


HOP has been the major driver for VIs wildlife research team









# Our mission...

The Norwegian Veterinary Institute is a research institute in the areas of animal health, fish health and food safety, whose primary function is supply of research-based knowledge support to the authorities.

- **Diagnostics/analyses**
- **Counselling about diseases**
- **Risk communication**
- **R&I domestic and abroad**

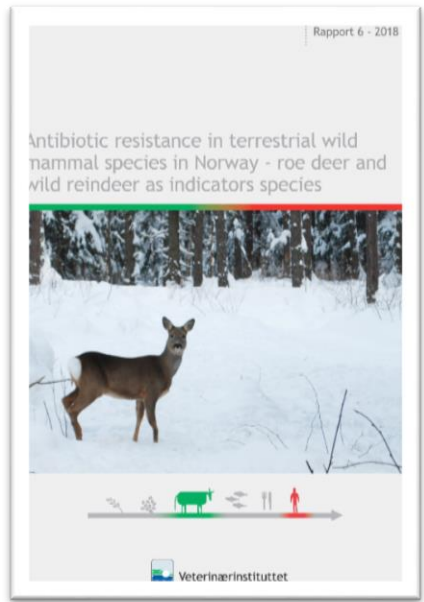


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HOP fulfills Vis mission on ONE HEALTH, national collaboration & service to society



# HEALTHY ANIMALS, HUMANS & ENVIRONMENT

## Wildlife as Source of Zoonotic Infections

Hilde Kruus,<sup>1</sup> Anne-Mette Kjekshus,<sup>2</sup> and Kjell Handeland<sup>3</sup>

Zoonoses with a wildlife reservoir represent a major public health problem, affecting all continents. Hundreds of pathogens and many different transmission routes are involved, and many factors influence the epidemiology of the zoonotic zoonoses. The importance and emergence of wildlife as a reservoir of zoonoses are increasing. Considerable attention and resources are needed to address the public health and food safety aspects and international cooperation. Surveillance, laboratory capability, research, training and education, and coordination are key activities.

### Historical Aspects

Zoonoses have affected human health throughout history and have been a major cause of morbidity and mortality. A historical disease for which the origin and transmission routes are well documented is anthrax. It is a zoonotic disease caused by the bacterium *Bacillus anthracis*, which is found in soil and does not affect the world's major human populations. Anthrax emerged in the 18th century and spread via trade routes throughout Asia, Africa, and Europe. The epidemic, which originated in the first half of the 19th century, spread to most of Europe's population. However, human plague still occurs in Asia, Africa, and the Americas, and the World Health Organization annually reports 100,000 cases in the western Pacific States. Acquisition of plague in humans is linked to consumption of animal products with *Yersinia pestis* carrying flea (3).

Human rabies is described in Mesopotamia in cuneiform tablets as early as 2300 BC. Recognizable descriptions of other zoonotic diseases include cholera, typhoid, diphtheria, and tetanus. Rabies, typhoid, cholera, and tetanus have been described in the literature as well as in figures. Rabies, typhoid, cholera, and tetanus have been described in the literature as well as in figures. Rabies, typhoid, cholera, and tetanus have been described in the literature as well as in figures.

### Transmission Modes

Zoonoses with a wildlife reservoir represent a large spectrum of transmission modes. Several zoonoses can be directly transmitted from wildlife to humans, e.g. *Francisella tularensis*, the causative agent of tularemia, can be transmitted by direct contact with an infected animal.

## SHORT REPORT

### First case of chronic wasting disease in Europe in a Norwegian free-ranging reindeer

Silke L. Bensch,<sup>1</sup> Gerdur J. de Lencastre,<sup>2</sup> Simeone Simionato,<sup>3</sup> Diana Fjellstad,<sup>4</sup> and Eric Viljams<sup>5</sup>

**Abstract**  
Chronic wasting disease (CWD) is a fatal neurodegenerative prion disease that affects several species of cervids. The first case of CWD in Europe was reported in a Norwegian free-ranging reindeer in 2016. The reindeer was found to be infected with the Norwegian free-ranging reindeer prion (NorPrn) and was found to be infected with the Norwegian free-ranging reindeer prion (NorPrn) and was found to be infected with the Norwegian free-ranging reindeer prion (NorPrn).

**Introduction, methods, and results**  
Chronic wasting disease (CWD) is a fatal neurodegenerative prion disease that affects several species of cervids. The first case of CWD in Europe was reported in a Norwegian free-ranging reindeer in 2016. The reindeer was found to be infected with the Norwegian free-ranging reindeer prion (NorPrn) and was found to be infected with the Norwegian free-ranging reindeer prion (NorPrn).



## Diagnostics

## Counselling

## Surveillance

## Research



# National collaboration...



Munnskurv



Čalbmeviški



Fotråte



EIDs



Velferd

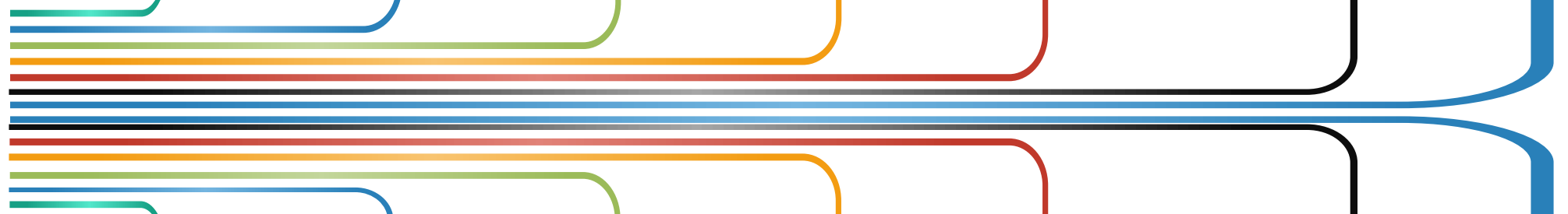


AMR



CWD

**HOP**  
Helseovervåkingsprogrammet  
for hjortevilt og moskus



NIBIO  
NORSK INSTITUTT FOR  
BIOØKONOMI



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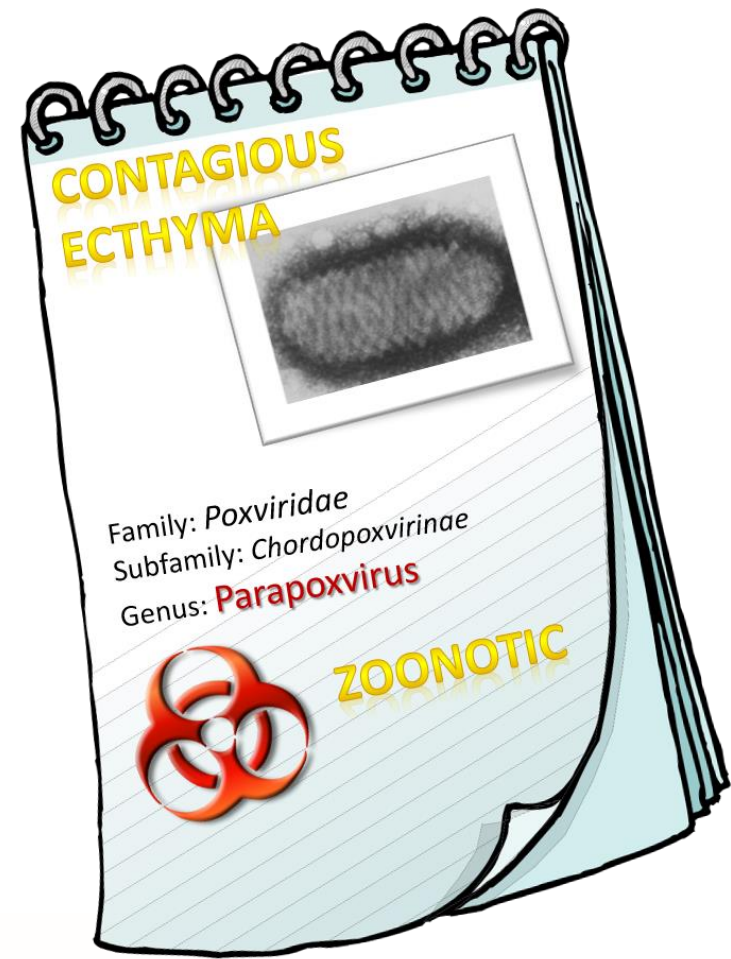






HOP fulfills VIs mission on ONE HEALTH, national collaboration & service to society

# Preparedness... beredskap!





HOP fulfills VIs mission on ONE HEALTH, national collaboration & service to society

# Preparedness... beredskap!

**RABIES VIRUS**



Order: Mononegavirales  
Family: Rhabdoviridæ  
Genus: **Lyssavirus**

**ZOONOTIC**







“New and emerging infections keep coming back and the world needs a collective system, and that requires **international cooperation and collaboration**, in the name of global solidarity”

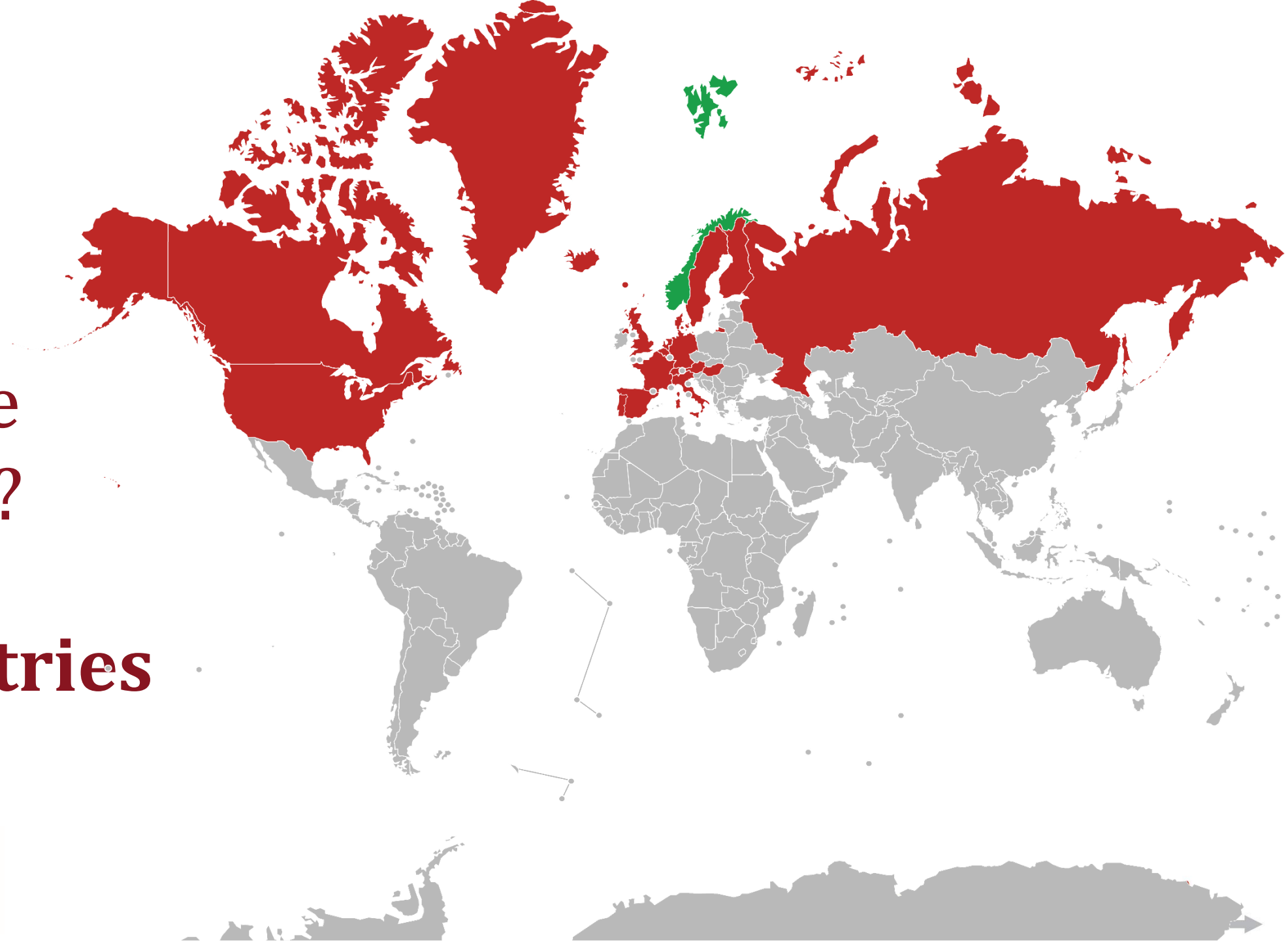
*Margaret Chan – WHO Director General*



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Who do we work with?

**19 countries**



 **norden**  
NordForsk

**RANGIFER HEALTH:** Scientific and educational cooperation in reindeer health

[www.rangifer-health.com](http://www.rangifer-health.com)







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## LETTERS

DOI: 10.7589/2017-03-053

Journal of Wildlife Diseases, 54(2), 2018, pp. 000–000  
© Wildlife Disease Association 2018

### Gammaherpesvirus (Type 1 Ruminant Rhadinovirus) in Muskox (*Ovibos moschatus*) in Greenland

Kjell Handeland,<sup>1,4</sup> Lajos Zoltan Muzs,<sup>2</sup> Christine Cuyler,<sup>3</sup> Marianne Heum,<sup>1</sup> Faisal Suhel,<sup>1</sup> and Carlos G. das Neves<sup>1</sup> <sup>1</sup>Norwegian Veterinary Institute, PO Box 750 Sentrum, N-0106 Oslo, Norway; <sup>2</sup>Lajos Zoltan Muzs, Veterinary & Food Authority of Greenland, Box 169, 3920 Qaqortoq, Greenland; <sup>3</sup>Greenland Institute of Natural Resources, PO Box 570, 3900 Nuuk, Greenland; <sup>4</sup>Corresponding author (e-mail: kjell.handeland@vetinst.no)

**ABSTRACT:** The world's native distribution of muskox (*Ovibos moschatus*) is restricted to Canada and Greenland, and a muskox-specific gammaherpesvirus has been described from Canadian populations. We analyzed spleen samples from the Kangerlussuaq muskox population in Greenland and identified muskox gammaherpes by PCR and sequencing.

Malignant catarrhal fever (MCF) is a generally fatal viral disease primarily affecting ruminants of the Bovidae and Cervidae (Li et al. 2014). It is caused by closely related gammaherpesviruses known as MCF viruses (MCFVs), now placed in the genus *Macacivirus*. The viruses exist within the bovid subfamilies Caprinae (sheep, goat) and Alcelaphinae (wildebeest) as latent infections in reservoir hosts (Russel et al. 2009). Both the *Ovine herpesvirus 2* (OvHV2) of sheep and *Caprine herpesvirus 2* from goats have been recognized as a cause of MCF in free-ranging cervids in Norway (Vikøren et al. 2006). Several viruses closely related to known MCFVs have now been reported. Due to limited information, these viruses have mostly been named as ruminant rhadinovirus, depicting an older nomenclature of ruminant rhadinovirus type 1 (Type 1 RuRv–MCF like) and type 2 (Type 2 RuRv–lymphotropic like; Li et al. 2005) based on antigenic epitopes shared by MCFVs and absent in lymphotropic viruses.

In 2003, a gammaherpesvirus specific to muskox (*Ovibos moschatus*) was described from Canada and classified as MCFV–muskox (Type 1 ruminant rhadinovirus of muskox; Li et al. 2003). The same virus has been identified in the muskox population in Norway (Vikøren et al. 2013). To date, there have been no investigations of this virus in muskox in

Greenland. The objective of our study was to examine whether this virus is present in the muskox population at Kangerlussuaq in southwestern Greenland (Kangerlussuaq Airport, 67°01'N, 50°41'W).

The muskox belongs to the bovid subfamily Caprinae. Its native distribution is restricted to Canada and northeastern Greenland. The Kangerlussuaq population originates from 27 animals translocated from northeastern Greenland in the 1960s. Today, the Kangerlussuaq muskoxen are a well-established population that provides the basis for commercial harvesting (Cuyler et al. 2009; Gunn et al. 2013). Spleen samples from 27 muskoxen aged 1 yr or older were collected at the Kangerlussuaq slaughterhouse in February 2014. One half of each spleen was cut off and placed in a plastic bag. In the laboratory, the capsule was cut open, and a tissue sample was removed from the depth of the spleen. Approximately 35 mg of tissue was homogenized in 750 µL of lysis buffer (NucliSENS<sup>®</sup>, BioMérieux, Durham, North Carolina, USA). We extracted DNA from the homogenate (total volume 750 µL) by using the automatic extraction system NucliSensH<sup>®</sup> easyMag<sup>™</sup> (BioMérieux) according to the manufacturer's protocol. The DNA was diluted in 40 µL and stored at –80 C. Detection of herpesvirus DNA was performed by amplifying a 215–315-base pair (bp) fragment of the DNA polymerase gene by using a nested PCR with degenerate primers as described previously (VanDevanter et al. 1996), having however replaced the original Taq polymerase by Platinum<sup>®</sup> Tfi DNA polymerase (ThermoFisher Scientific–Life Technologies, Carlsbad, California, USA) and increased the primers final concentrations from 0.2 µM to 0.3 µM.





OIE Global Conference on Wildlife  
Animal Health and Biodiversity -  
Preparing for the Future  
Paris (France), 23-25 February 2011

ABSTRACT BOOK



The 62nd International Conference of  
the Wildlife Disease Association

July 27- August 2, 2013  
Knoxville, Tennessee



67th Annual International Conference  
**WILDLIFE DISEASE ASSOCIATION**  
August 5-10, 2018 | St. Augustine, FL | USA

Connecting Wildlife Health, Conservation and Management in a Changing World



To be or not to be.... BE!



64TH ANNUAL INTERNATIONAL CONFERENCE of the  
**Wildlife Disease Association**

Novotel Twin Waters Resort,  
Twin Waters, Sunshine Coast,  
Queensland, Australia

July 26th - 30th, 2015

HOSTED BY THE WILDLIFE DISEASE ASSOCIATION AUSTRALASIAN SECTION



**WDA**  
**KALAAAN-KAB • WDALA**  
San Cristóbal de Las Casas 2017

63rd Annual  
Wildlife Disease Association Conference  
**One Health:**  
Transitioning from Theory to Practice



July 27 - August 1, 2014  
Albuquerque, New Mexico

59th Annual International  
Conference of the Wildlife  
Disease Association



Wildlife Health in a Shrinking World:  
ECOLOGY, MANAGEMENT AND CONSERVATION

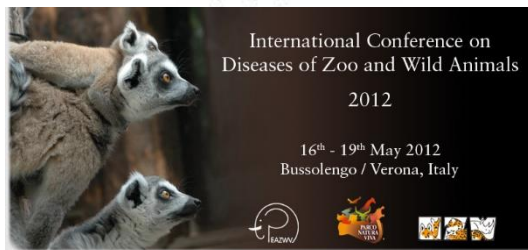


WILDLIFE DISEASE ASSOCIATION  
INTERNATIONAL CONFERENCE  
June 26 - July 1, 2005  
Cairns, Queensland, Australia

8th CONFERENCE of the  
**ewda**  
EUROPEAN WILDLIFE DISEASE ASSOCIATION  
ROVINJ - CROATIA  
2-5 October, 2008



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International Conference on  
Diseases of Zoo and Wild Animals  
2012

16th - 19th May 2012  
Bussolengo / Verona, Italy







**1st International One Health Congress**  
 Human Health, Animal Health, the Environment and Global Survival  
 Melbourne Convention Centre  
 Victoria, Australia  
 14–16 February 2011



**3<sup>RD</sup> INTERNATIONAL ONE HEALTH CONGRESS**



A World United Against Infectious Diseases:  
**CROSS-SECTORAL SOLUTIONS**  
 Jan 28<sup>th</sup> - Feb 2<sup>nd</sup>, 2013 | Bangkok, Thailand

PRINCE MAHIDOL AWARD CONFERENCE 2013  
 1<sup>st</sup> GLOBAL CONFERENCE ON REGIONAL SURVEILLANCE NETWORKS  
 2<sup>nd</sup> INTERNATIONAL ONE HEALTH CONGRESS  
 CENTENNIAL COMMEMORATION of the Rockefeller Foundation

humans | animals | the environment



**One Health EcoHealth 2016**  
 3-7 December 2016 • Melbourne, Australia

The 4th International One Health Congress & 6th Biennial Congress of the International Association for Ecology and Health



**Saskatoon CANADA 22-25 June 2018**

THE 5<sup>TH</sup> INTERNATIONAL **one health CONGRESS**



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# VI's international «wildteam»



Nordisk  
Ministerråd



Vitenskapskomiteen for mat og miljø  
Norwegian Scientific Committee for Food and Environment



harmonised Approaches in monitoring wildlife  
Population Health, And Ecology and Abundance



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OIE  
WORLD ORGANISATION  
FOR ANIMAL HEALTH







«A threat **anywhere..**  
Is a threat **everywhere!**»

*Barack Obama*

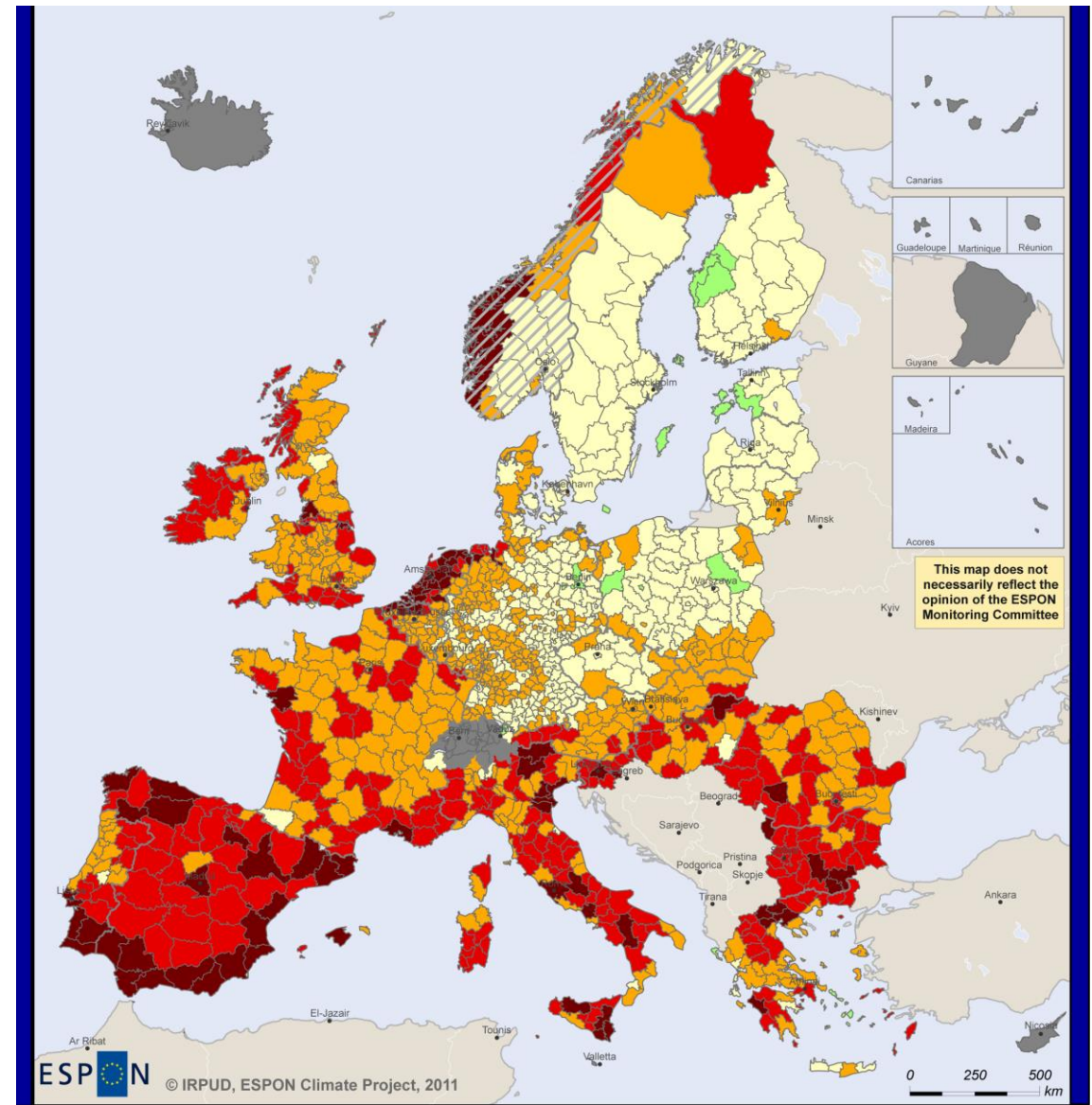


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# Climate change is also a Norwegian problem



Aggregate potential impact of climate change





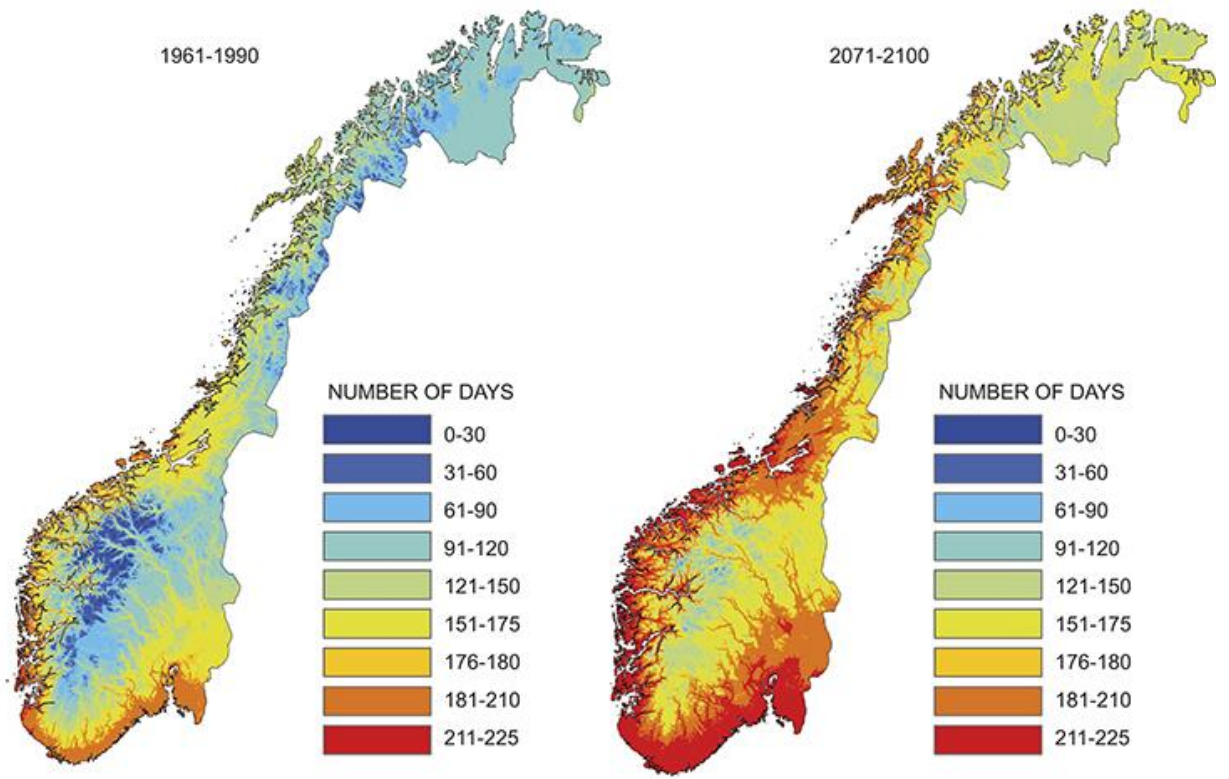


Figure 3.5 Tick distribution is related to the length of the growing season

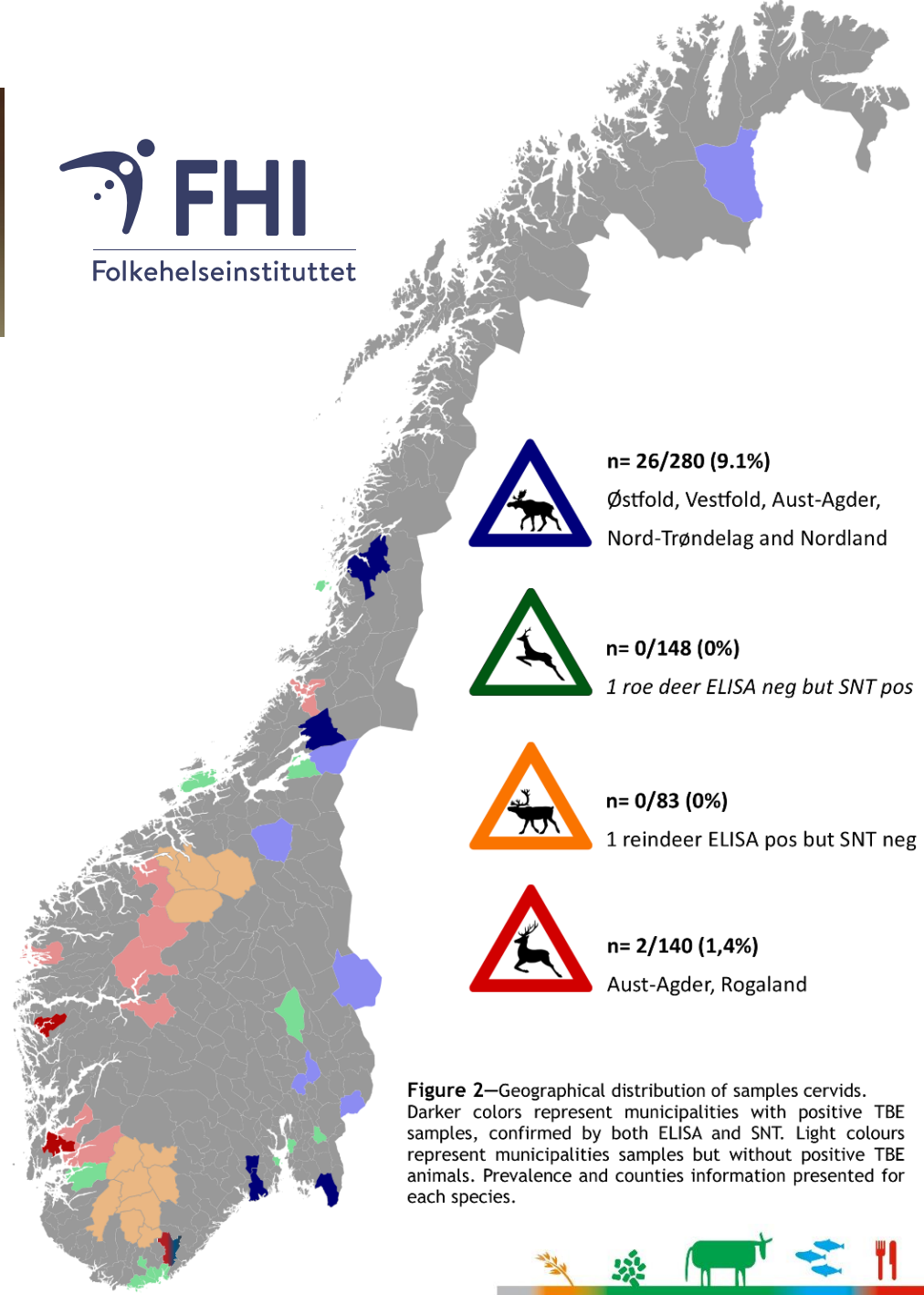
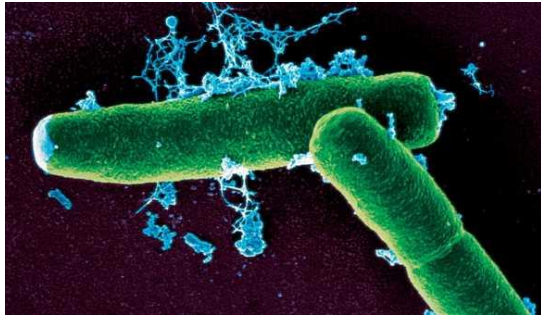


Figure 2—Geographical distribution of samples cervids. Darker colors represent municipalities with positive TBE samples, confirmed by both ELISA and SNT. Light colours represent municipalities samples but without positive TBE animals. Prevalence and counties information presented for each species.





# Anthrax



AFP/Russian Emergency Ministry





# Antimicrobial Resistance in SVALBARD



© alfrfrey



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# Antibiotic resistance in Svalbard reindeer

(*Rangifer tarandus platyrhynchus*)

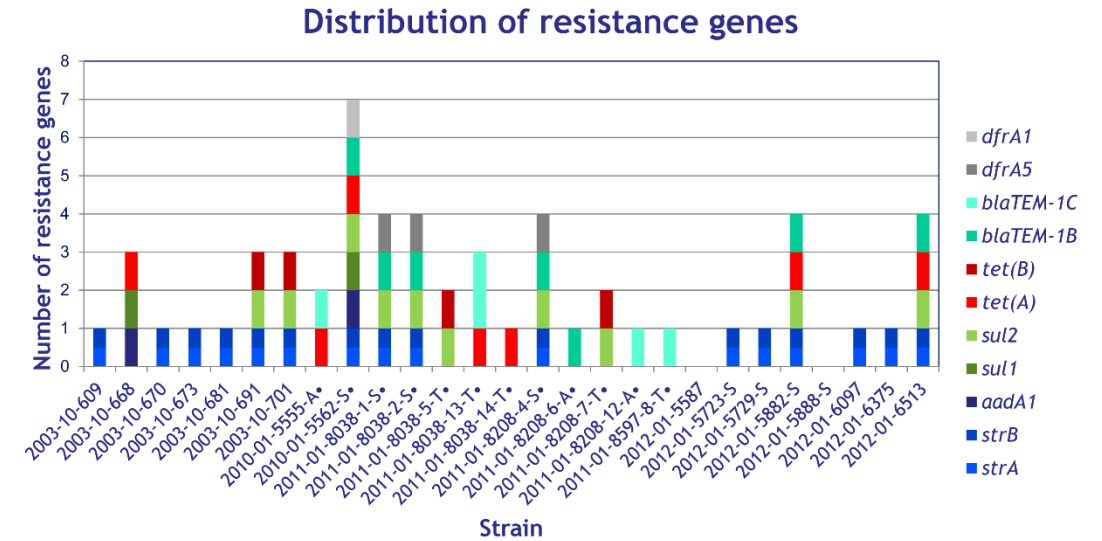


Figure 1. Isolates included in the study and their genotypic resistance profile. Strains marked with “\*” are isolated from Svalbard reindeer.

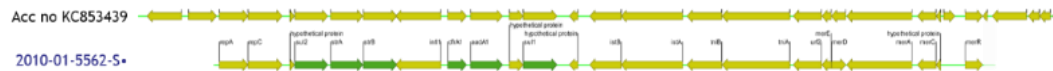


Figure 3. Structure of conjugative resistance plasmid originating from *E. coli* (2010-01-5562-5) from Svalbard reindeer and map of a 19 kb region (below) containing resistance genes with 99% identity to part of plasmid pACN001-F (KC853439) isolated from poultry in China

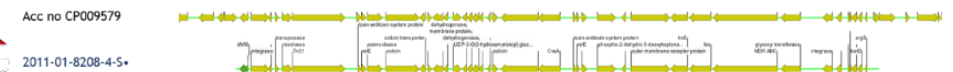
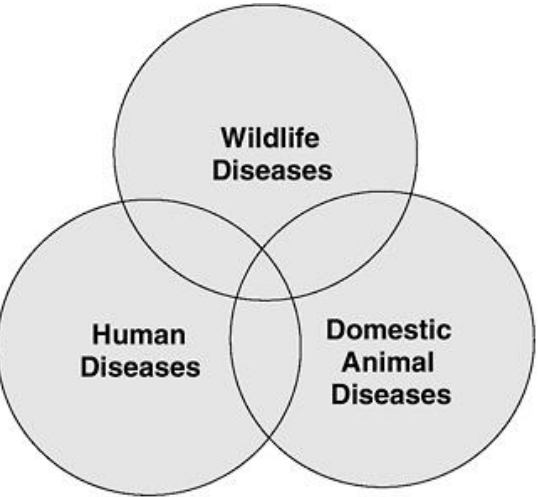





Figure 4. Structure of conjugative resistance plasmid originating from *E. coli* (2011-01-8208-4-5) from Svalbard reindeer and map of 36 kb region (below) with 99% identity to part of plasmid FAP1 plasmid 1 (CP009579) isolated from pig faeces in the Netherlands.



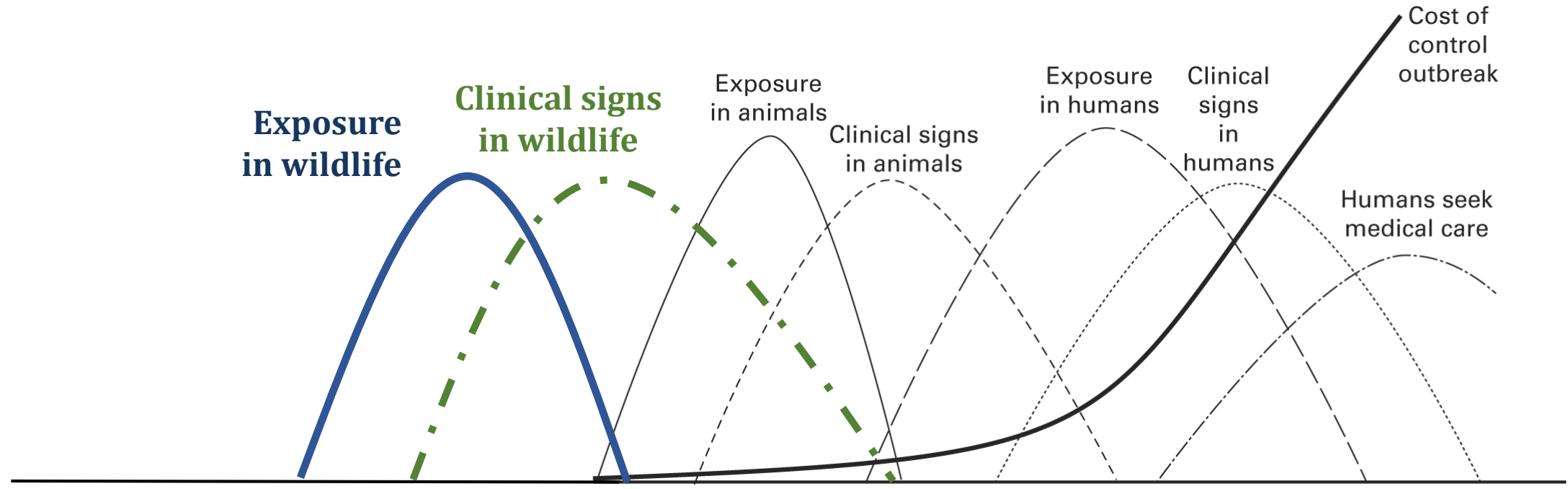
# 20 years of diagnostic & research



- Digital necrobacillosis in wild reindeer (*F.necrophorum*)
- Rabies in wild reindeer in Svalbard 
- Oestrinae (*Cephenemyia trompe*) severe infestation in wild reindeer
- Contagius ecthyma (Parapoxvirus) in muskox 
- *Mycoplasma ovipneumoniae* pneumonia in muskox
- European yew (*Taxus baccata*) poisoning in moose
- Deer ked (*Lipoptnea cervi*) alopecia in moose
- *Borrelia burgdorferi* infection in moose and roe deer 
- *Bartonella* in moose and red deer 
- MCF (gammaherpesvirus) in red deer, reindeer and muskox
- Chronic Wasting Disease 



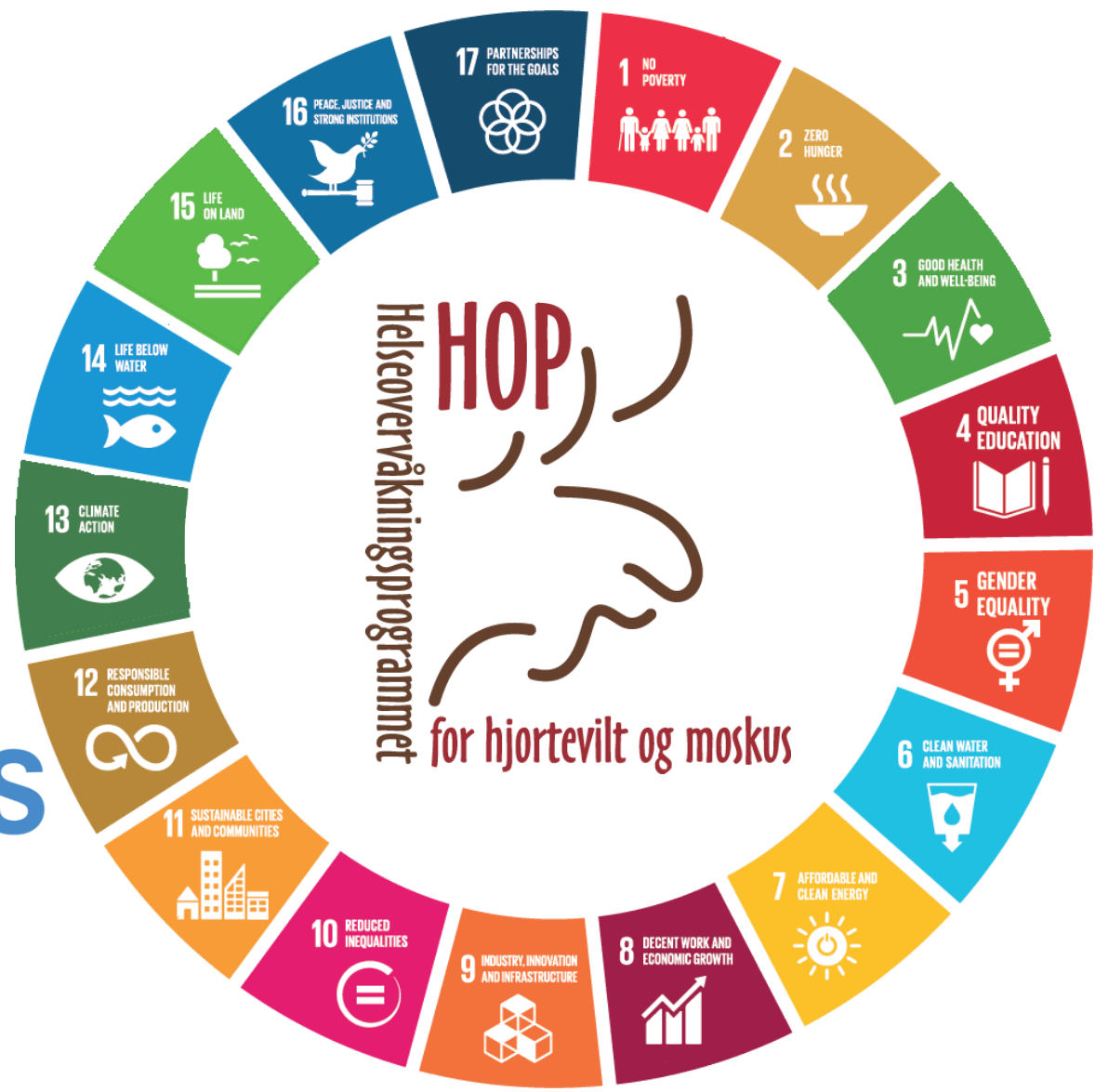
# A strong strategy for a health future for wildlife, animals, humans & environment



Source: Adapted from IOM (2009).







Helseovervåkningsprogrammet  
**HOP**  
for vilt

**Tusen takk!**  
**Giitu!**

