



National Institute for Public Health
and the Environment
Ministry of Health, Welfare and Sport

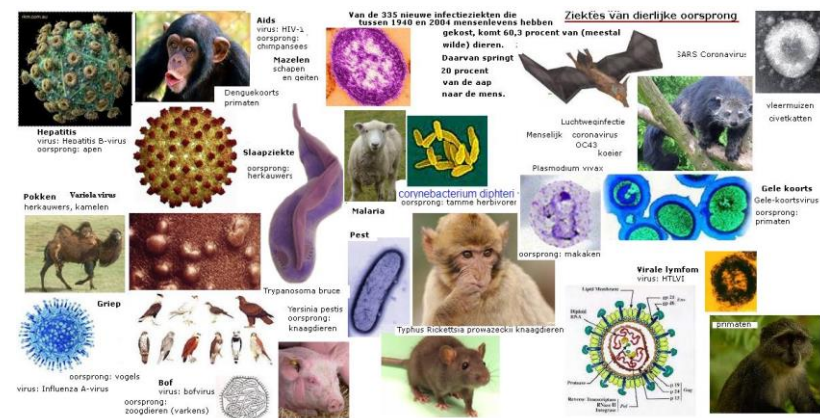
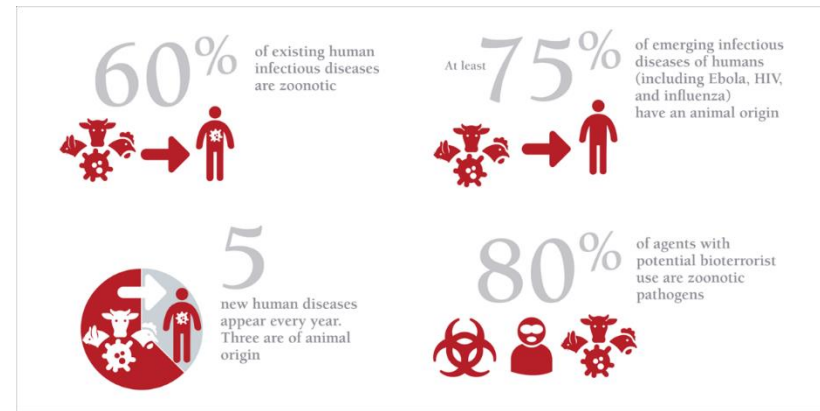
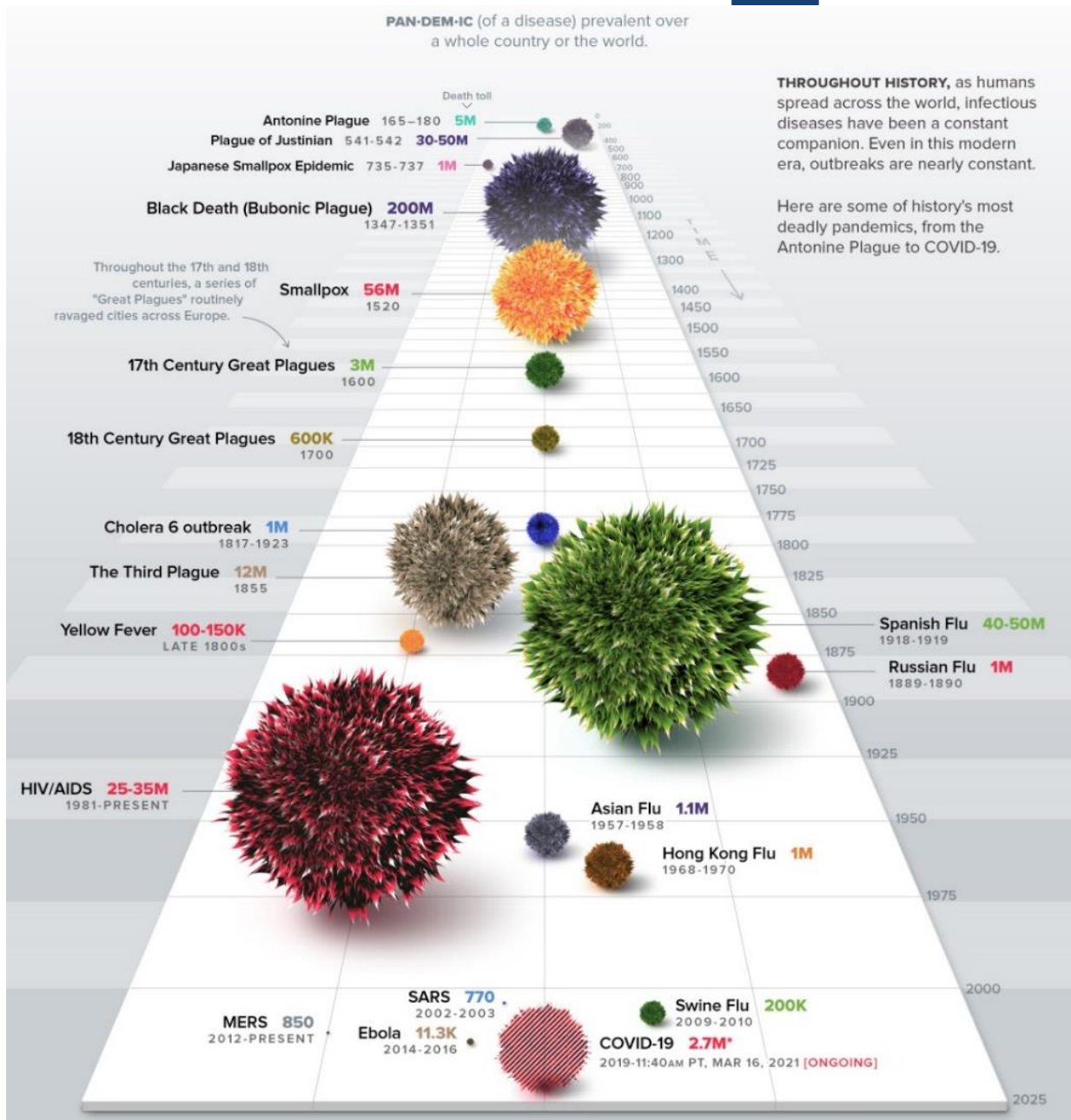
Pandemic prevention Pandemic preparedness what's in the name

Joke van der Giessen

Centrer for Zoonosen & Omgevingsmicrobiologie

joke.van.der.giessen@rivm.nl

History of pandemics and role of zoonoses



< Source Discover magazine, june 2020



Zoonoses are priority

– Drivers of emergence

Microbiological factors:

Genetic evolution

Human-made factors:

Globalisation

Population growth & urbanisation

Deforestation

Increased animal-human contacts

Socio-economic factors

Climate change

Changing food habits

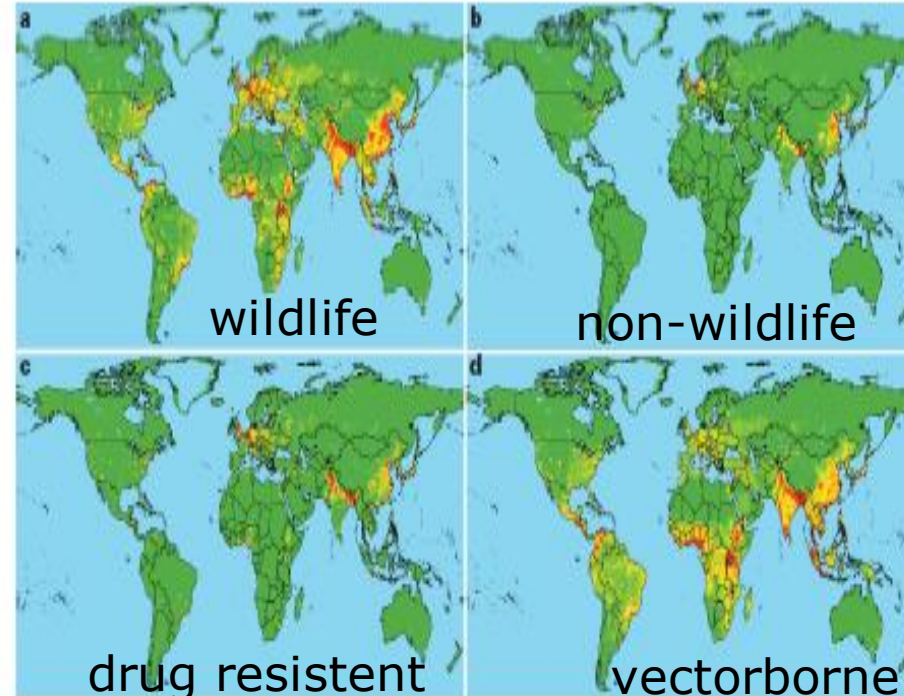


Figure 3 | Global distribution of relative risk of an EID event. Maps are derived for EID events caused by a, zoonotic pathogens from wildlife, b, zoonotic pathogens from non-wildlife, c, drug-resistant pathogens and d, vector-borne pathogens. The relative risk is calculated from regression coefficients and variable values in Table 1 (omitting the variable measuring reporting effort), categorized by standard deviations from the mean and mapped on a linear scale from green (lower values) to red (higher values).

(Jones et al., 2008)



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Content

Development of the zoonoses disease structure in the Netherlands

Pandemic Prevention and Preparedness plans for Zoonoses

Strengthen Zoonoses from signalling to response

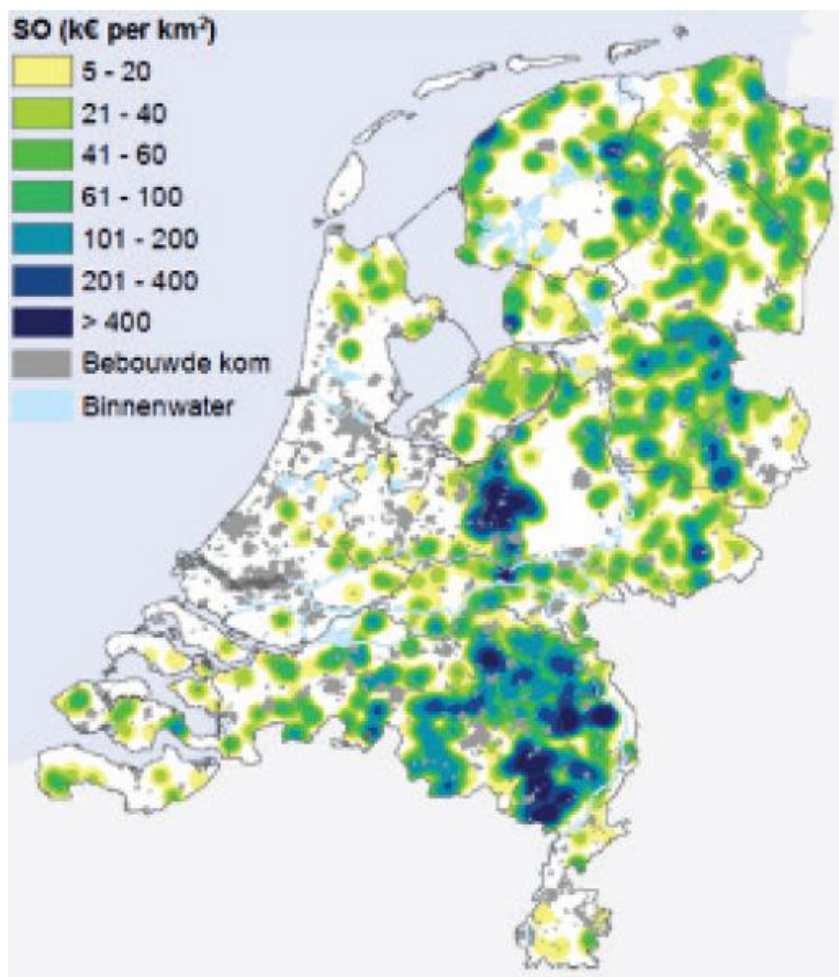
Nine themes and some ongoing results

Example OH surveillance swine influenza

Conclusion



Netherlands: densely populated, intensive livestock and wildlife



- 33.883 km²
- (CBS 2023):
 - 17,8 million habitants
 - 88 million poultry
 - 6,2 million pigs
 - 3,8 million cattle
 - 0,8 million sheep
 - 0,6 million goats
- Wildlife:
 - Migratory and water birds
 - Wild mammals: fox, wolf, raccoon dogs, roe deer, rodents, bats, wild boar





2003: Avian Influenza H7N7 Netherlands

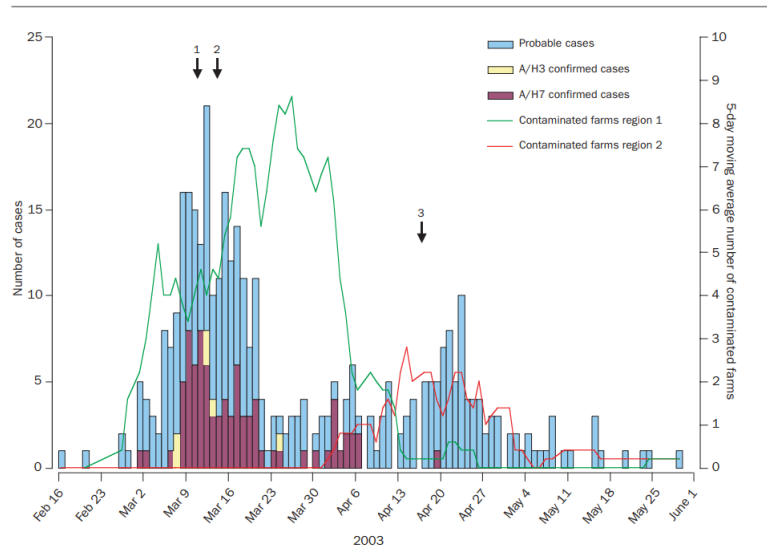


Figure 1: Probable and confirmed cases of human conjunctivitis and influenza-like illness associated with HPAI H3 and H7 infection during the avian influenza epizootic in the Netherlands, 2003. Green and red lines show 5-day moving average of newly diagnosed A/H7 contaminated farms in two regions. Arrows show start of active case finding (1), start of prophylactic treatment with oseltamivir (2) and death of case with HPAI infection (3).

THE LANCET • Vol 363 • February 21, 2004 •
www.thelancet.com



Emerging zoonoses

2004: Advice Health council and WHO Emerging zoonoses



2007-2010: Emerging zoonoses (EmZoo) national programme

1. Surveillance animal and human populations: advice on gaps
2. Prioritise emerging zoonoses: what's next
3. Blueprint for effective One Health collaborative infrastructure: advice





Prioritising 86 zoonotic pathogens



Multicriteria decision analyses: **Higher ranked: more impact**

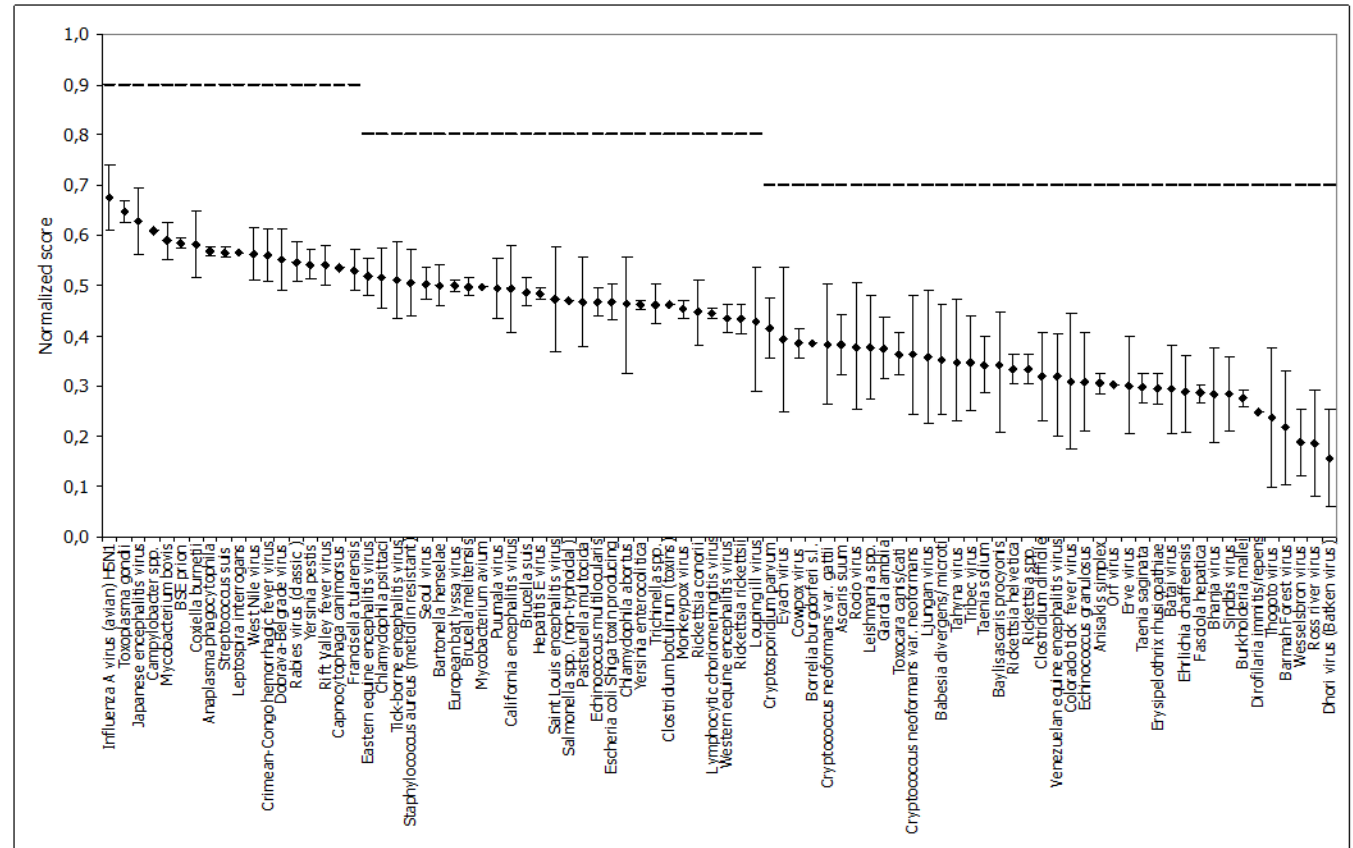
1. Probability of introduction
2. Transmission animal reservoirs
3. Economic damage (animal reservoir)
4. Animal-human transmission
5. Transmission between human
6. Morbidity in humans
7. Mortality in humans

Via livestock 44%

Via vectors: 46%

Via wildlife: 85%

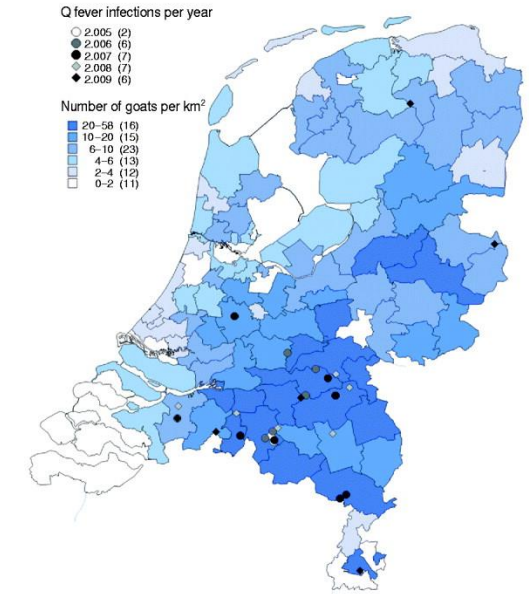
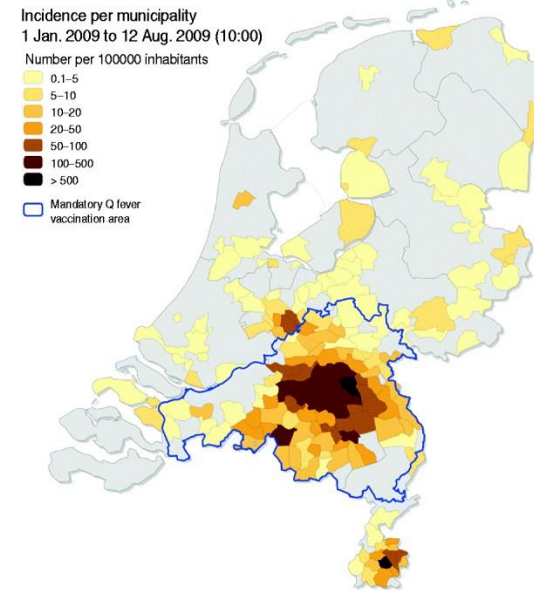
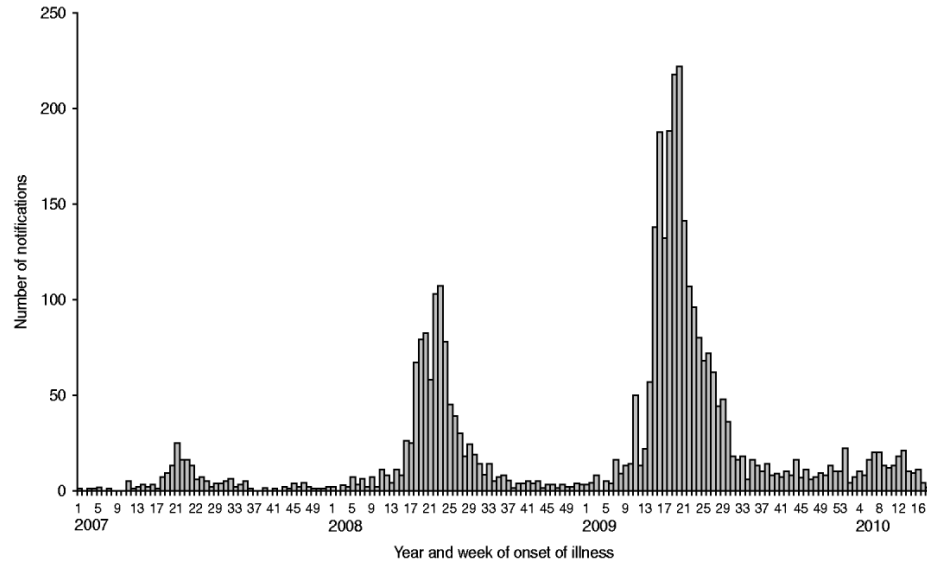
Via companion animals: 29%



(EmZoo lijst Havelaar et al., Plos One, 2011)



2007-2009: Q-fever outbreak Netherlands



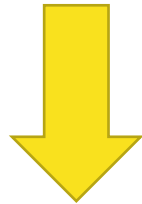
ROEST HIJ, TILBURG JJHC, VAN DER HOEK W, et al. The Q fever epidemic in The Netherlands: history, onset, response and reflection. *Epidemiology and Infection*. 2011;139(1):1-12. doi:10.1017/S0950268810002268

OH conference Wageningen 24 April 2024



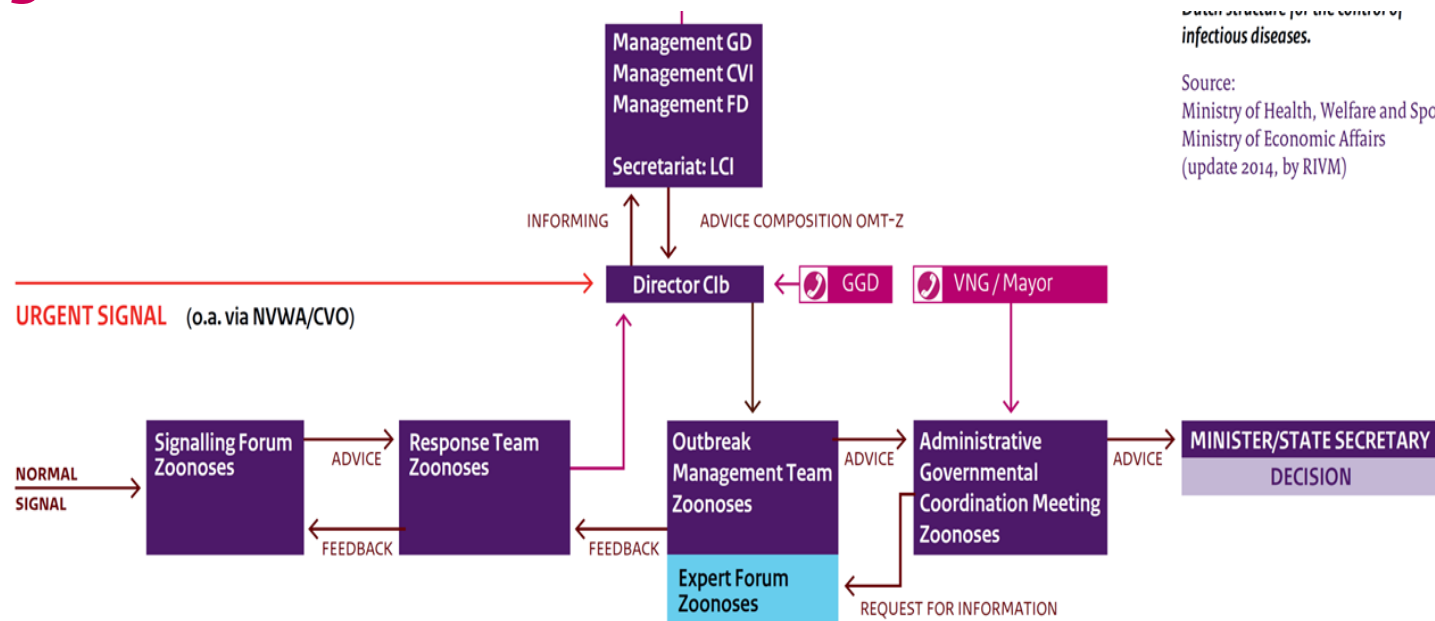


- > Recommendations to improve signaling and control of emerging zoonoses: the One Health approach



- > Implementation medical-veterinary integrated risk analyses structure of zoonoses in 2011

Zoonotic disease structure in the Netherlands *from signalling to decision-making*



Source:
Ministry of Health, Welfare and Sport
Ministry of Economic Affairs
(update 2014, by RIVM)

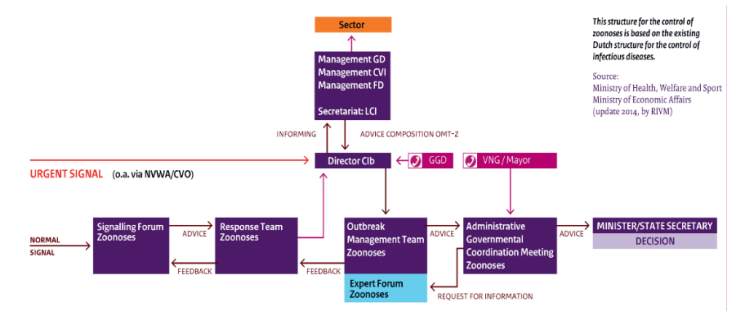
- National Institute of Public Health and the Environment (RIVM), Bilthoven
- Public Health Service, of Area Health Authority (GGD)

- Netherlands Food and Consumer Product Safety Authority-NVWA
- Wageningen Bioveterinary Research, Lelystad
- Faculty of Veterinary Medicine, Utrecht University, Utrecht
- Dutch Wildlife Health Centre (DWHC), Utrecht
- GD Animal Health (GD), Deventer
- Center Monitoring Vectors-NVWA



OMT-Z during Sars-CoV-2 in minks

- > April 2020: 1st notice Sars-CoV-2 in sick/dead minks GD, Deventer
- > Direct to CVO ministry LNV
- > Confirmation WBVR in Lelystad
- > Notification and measurements
- > Screening minks and early warning system GD
- > New farms infected > Request CVO/ministries OMT-Z risk public health in **June en July 2020**. Advice OMT-Z
- > BAO > Ministries > august 2020 production stop before 2021 en control infected farms
- > January 2021: mink production ended

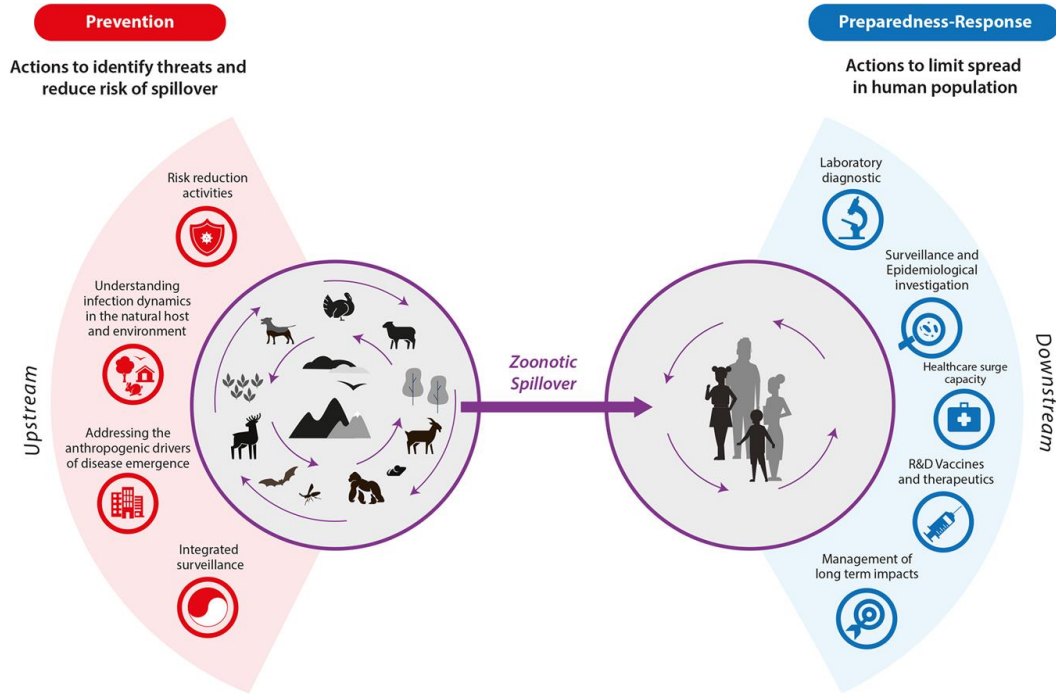




2021 Zoonoses insight and 2022 National Action plan

Report Zoonoses insight

VWS en LNV juli 2022



Prevention of zoonotic spillover: From relying on response to reducing the risk at source

Authored by the members of the One Health High-Level Expert Panel (OHHLEP) Wanda Markotter Thomas C. Mettenleiter Wiku B. Adisasmito, Salama Almuhairi, Casey Barton Behravesh, Páipé Biliogouli, Salome A. Bukachi, Natalia Casas, Natalia Cediel Becerra, Dominique F. Charron, Abhishek Chaudhary, Janice R. Ciacci Zanella, Andrew A. Cunningham, Osman Dar, Nilish Debnath, Baptiste Dzungu, Elmoubasher Farag, George F. Gao, David T. S. Hayman, Margaret Khaitsa, Marion P. G. Koopmans, Catherine Machalaba, John S. Mackenzie, Serge Morand, Vyacheslav Smolenskiy, Lei Zhou [view less]

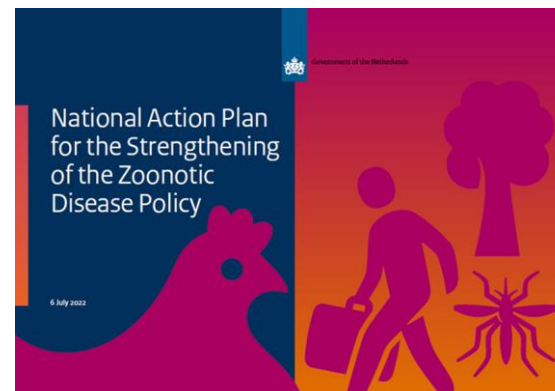
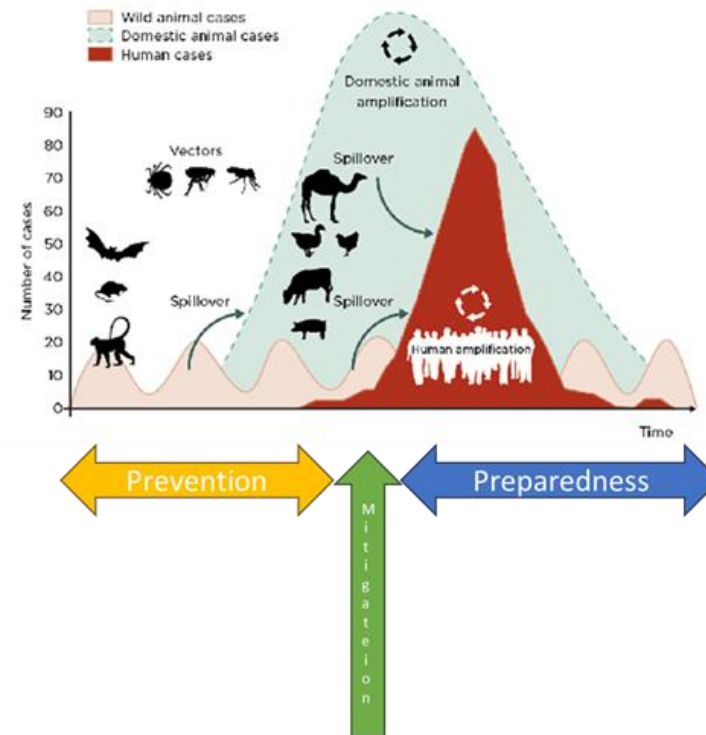
Published: October 5, 2023 • <https://doi.org/10.1371/journal.ppat.1011504>



Pandemic Prevention & Preparedness 2022-2026

Human Pandemic Preparedness

- > Strengthen diagnostic landscape
- > Strengthen surveillance landscape
- > Strengthen supra-regional collaboration
- > Pandemic Prevention
- > Strengthen Zoonoses from signalling to response (Zoover)





Strengthen Zoonoses from signalling to response Zoover programme 2022-2026: 9 themes

1H-signaling

1H surveillance

1H datasharing/ICT

Prioritising Zoonoses

Innovation/research

International

Respon

Environment

Zoonoses literacy



Signalling and responding to zoonotic threats using a One Health approach: a decade of the Zoonoses Structure in the Netherlands, 2011 to 2021

Zoover: improve 1Health signalling

2022: Evaluation 2011-2021
2023: Recommendations 2024

ZOÖNOSEN, van signalering tot besluitvorming

Joke van der Giessen¹, Frits Vlaanderen¹, Titia Kortbeek¹, Corien Swaan¹, Hans van den Kerkhof¹, Els Broens², Jolianne Rijks³, Miriam Koene⁴, Mauro De Rosa⁵, Mathilde Uiterwijk⁶, Marieke Augustijn-Schretlen⁷, Catharina Maassen¹

1. Centre of Infectious Disease Control of the National Institute for Public Health and the Environment (Cib-RIVM), Bilthoven, The Netherlands
2. Faculty of Veterinary Medicine, Utrecht University, Utrecht, The Netherlands
3. Dutch Wildlife Health Centre (DWHC), Utrecht University, Utrecht, The Netherlands
4. Wageningen Bioveterinary Research (WBVR), Lelystad, The Netherlands
5. Netherlands Food and Consumer Product Safety Authority (NVWA), Utrecht, The Netherlands
6. Centre for Monitoring of Vectors (CMV), Netherlands Institute for Vectors, Invasive plants and Plant health (NIVIP), Netherlands Food and Consumer Product Safety Authority (NVWA), Wageningen, the Netherlands
7. Royal GD, Deventer, The Netherlands

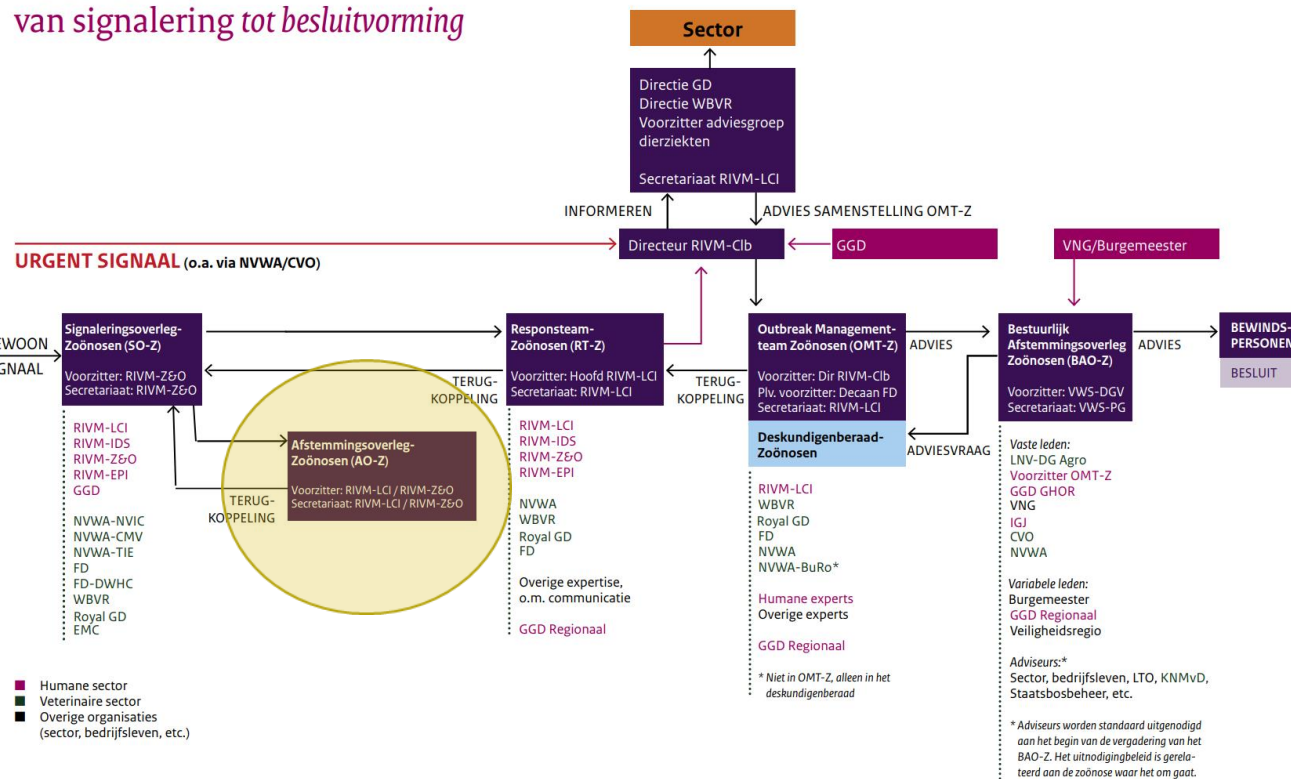
Correspondence: Joke van der Giessen (joke.van.der.giessen@rivm.nl)

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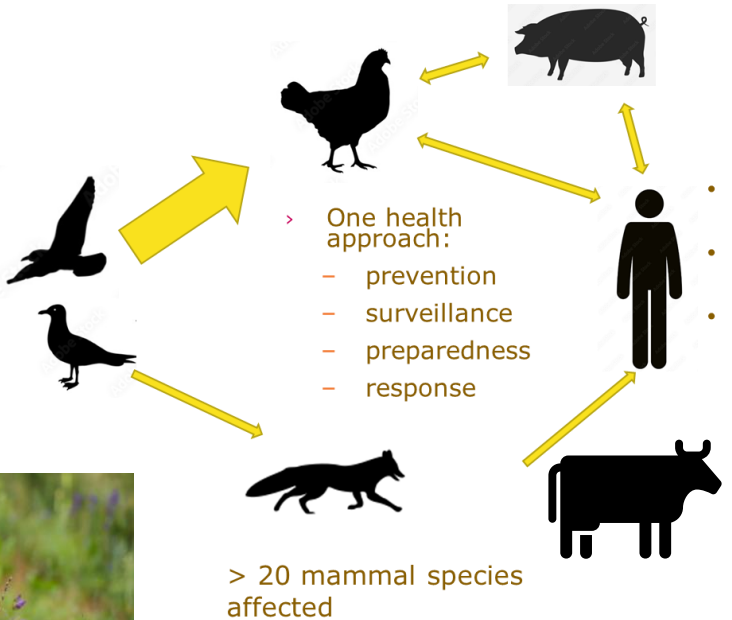
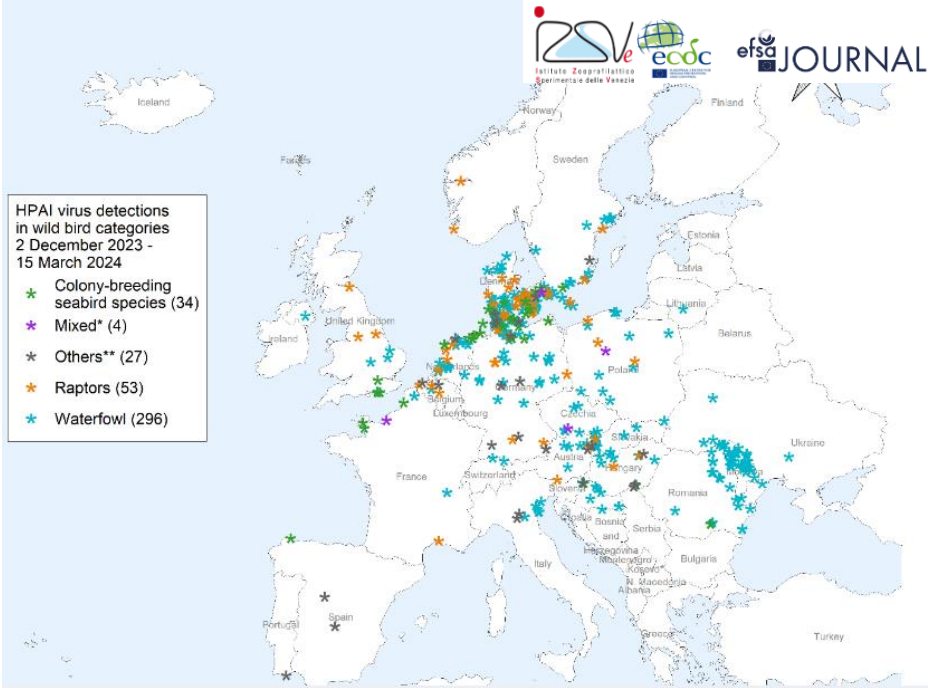
Article submitted on 30 Dec 2021 / accepted on 27 May 2022 / published on 04 Aug 2022

Zoonoses structure including the AO-Z (Avian influenza in cattle USA; psittacosis; alveolar echinococcosis; swine influenza)

Development of Horizon scanning to focus on drivers of emergence >25 years



Avian influenza (H5N1)



- sporadic human infections
- public health risk in the EU is low
- risk is low to moderate for occupationally or otherwise exposed people

Author: EFSA
Data sources: ADIS, WOAH
Date updated: 15/03/2024



March 2024: Avian influenza in dairy cattle and goats USA
Signalling forum: risk profile to ministeries



Zoover: 1Health surveillance systems/datasharing

Development One Health surveillance systems:

Psittacosis

Porcine influenza

HEV

West Nile

Foodborne pathogens

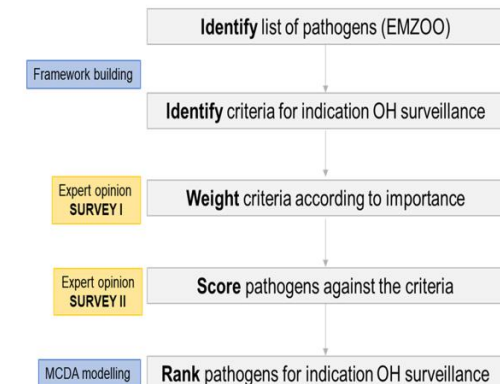
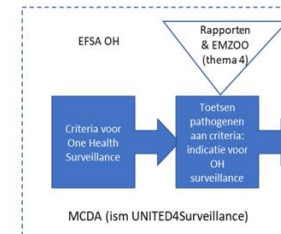
Sewage

Legionella

Criteria for new OH surveillance systems:



MCDA



Disease X: syndrome surveillance and lab preparedness



Example One Health surveillance porcine influenza

Aim: implement surveillance of influenza A viruses in pigs with clinical samples collected by veterinarians 2022-2023 and compare with human influenza A viruses.

Design: sentinel veterinary network collecting 200 pooled saliva and nose swabs tested by PCR. PCR +: cell culture, WGS, antiviral susceptibility, antigenic characterization

Set up a joint online database/platform for the sequences and a small set of contextual data.

Add a set of public reference sequences from humans and pigs as background for the molecular analysis.





Results OH surveillance porcine influenza

90 pig farms included national distributed north-middle-south part
57.9% of the saliva samples was PCR positive
28.5% of the nose swabs were PCR positive



Influenza subtype	Subtype
H1N1	74
H1N2	51
H3N2	1
Onbekend (geen HA sequentie verkregen)	3
Totaal	129

H1viruses different clades:
Clade 1A.3.3.2 (Classical Swine lineage)
Clade 1C.2.1 en 1C.2.2 (Eurasian Avian lineage)
Clade 1B.1.2.1 (Humane Seasonal lineage)

H3 virus close related circulating in Germany in pigs in 2015-2016



Online database/platform

Host

Sampling date

Region (North/Middle/South)

Typing tool: HA and NA subtype, internal segment lineage

Project sequences:
126 porcine strains

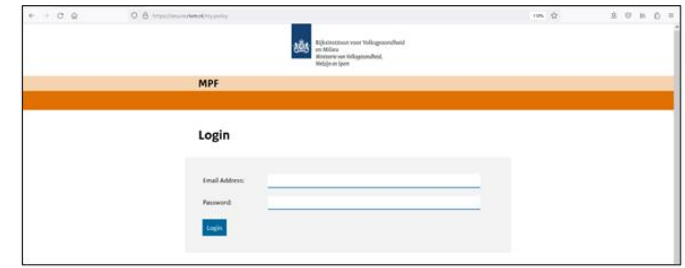
Reference sequences (public):

Porcine vaccine strains

Recent Dutch human strains H1N1 and H3N2

10 Dutch strains of known infections of humans with porcine strains (1993-2023)

Porcine influenza strains from other countries



Case Nr	Submission Date	Host	HA Subt...	NA Subt...
A/Netherlands/5/93	14-08-2023	Human	H2v	H2v
A/Netherlands/25/93	14-08-2023	Human	H2v	H2v
A/Swine/Netherlands/386/96	14-08-2023	Human	H1v	H1v
A/Swine/Netherlands/477/93	14-08-2023	Human	H1v	H1v
A/Netherlands/2315/2016	14-08-2023	Human	H1v	H1v
A/Netherlands/Gent-193/2019	14-08-2023	Human	H1v	H1v
A/Netherlands/11748/2022	14-08-2023	Human	H1v	H2v
A/Netherlands/20370-1b/2020	14-08-2023	Human	H1v	H1v
Influenza A/Swine/Netherlands/GDE0104/2022	26-07-2023	Pig	H1	H2
Influenza A/Swine/Netherlands/GDE0087/2023	26-07-2023	Pig	H1	H1
Influenza A/Swine/Netherlands/GDE0082/2023	26-07-2023	Pig	H1	H1
Influenza A/Swine/Netherlands/GDE0081/2023	26-07-2023	Pig	H1	H1
Influenza A/Swine/Netherlands/GDE0077/2023	26-07-2023	Pig	H1	H1
Influenza A/Swine/Netherlands/GDE0076/2023	26-07-2023	Pig	H1	H1
Influenza A/Swine/Netherlands/GDE0075/2023	26-07-2023	Pig	H1	H2
Influenza A/Swine/Netherlands/GDE0057/2022	26-07-2023	Pig	H1	H2

Visualization and analysis tools



[Incidence plot](#)



[Pie chart](#)



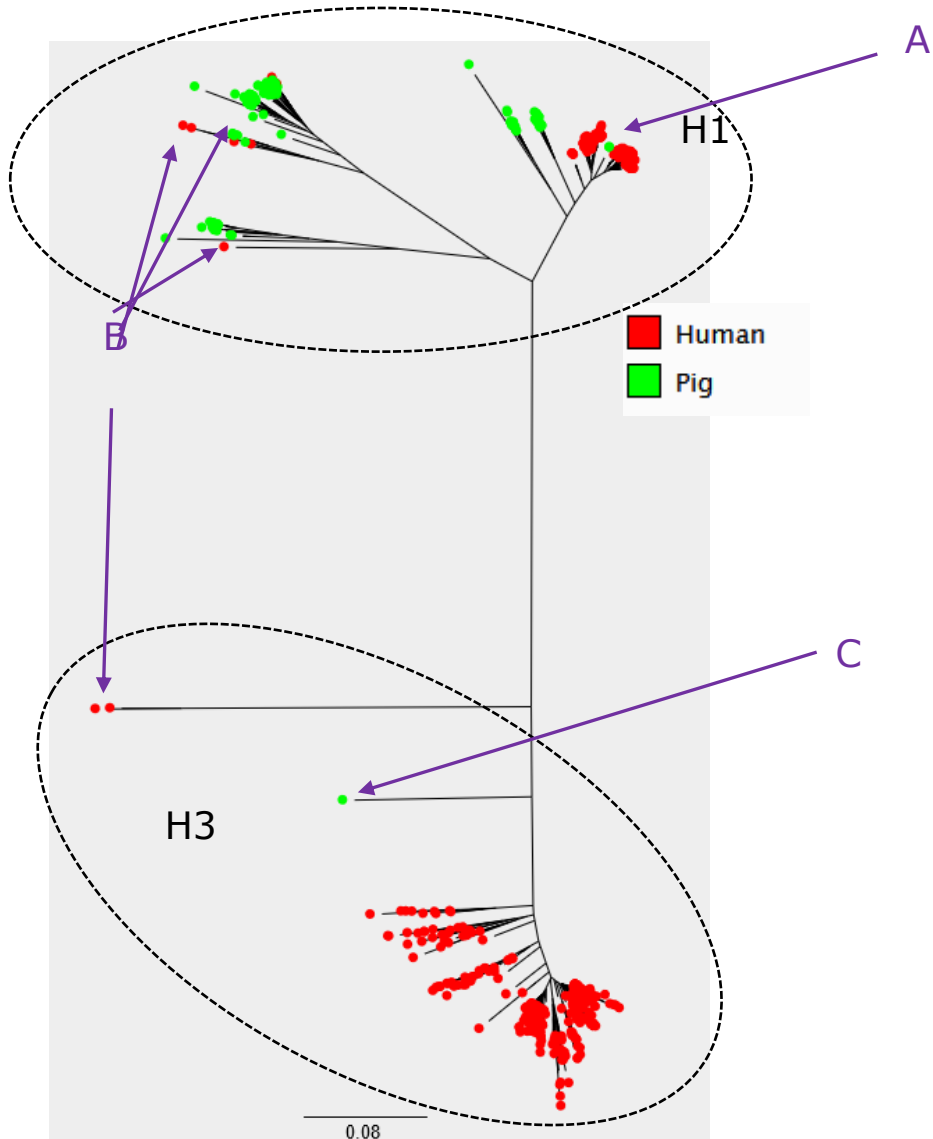
[Phylo](#)



[Geographical plot](#)



Swine HA sequences compared to human reference sequences



The diversity within porcine sequences is larger than within recent human H1 strains

- A: Infection of a pig with a human influenza A(H1N1) pdm09 virus
- B: Strains of humans infected with porcine influenza
- C: The one porcine H3N2 strain found during the project.



Antigenic and antiviral tests

- Not all porcine strains could be antigenically characterized with the available sera
- No resistance was found against Oseltamivir or Zanamivir



Next steps OH surveillance porcine influenza

- Structural One Health surveillance porcine influenza
- Combining online platform with Strong1H (EU4H) project on Avian Influenza in (wild) mammals and outdoor pigs
- In depth phylogenetic analyses, reassortment analysis
- Update of the sera needed for antigenic characterization



Strengthening OH Zoonoses Strong1 H

One Health surveillance in animals and the environment

Direct grant EU4H single application
The Netherlands



Response to zoonotic threats

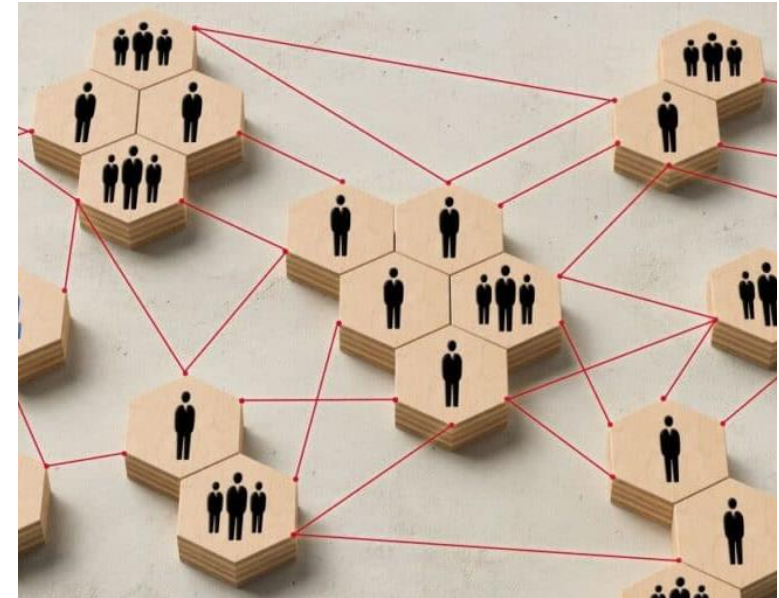
- › Timely response is important, especially for zoonotic diseases with pandemic potential: One Health approach
- › Lessons learned after a simulation exercise of HPAI outbreak.
- › Needs between domains :
 - Strong networks
 - Regular contacts in a quiet phase
 - Timely sharing of essential data
 - Coordinated communication strategy





Zoover: Strengthening response 2023-2026

- > **Stimulate partnerships and network activities** between the different domains at regional and national level
- > **Initiate training and simulation exercises** at regional and national level to strengthening the response to zoonotic threats
- > **Improve the link between national and regional level**, stimulate knowledge sharing and cooperation
- > **Renew national response guidelines**, Vademecum zoonosis and cooperation agreements

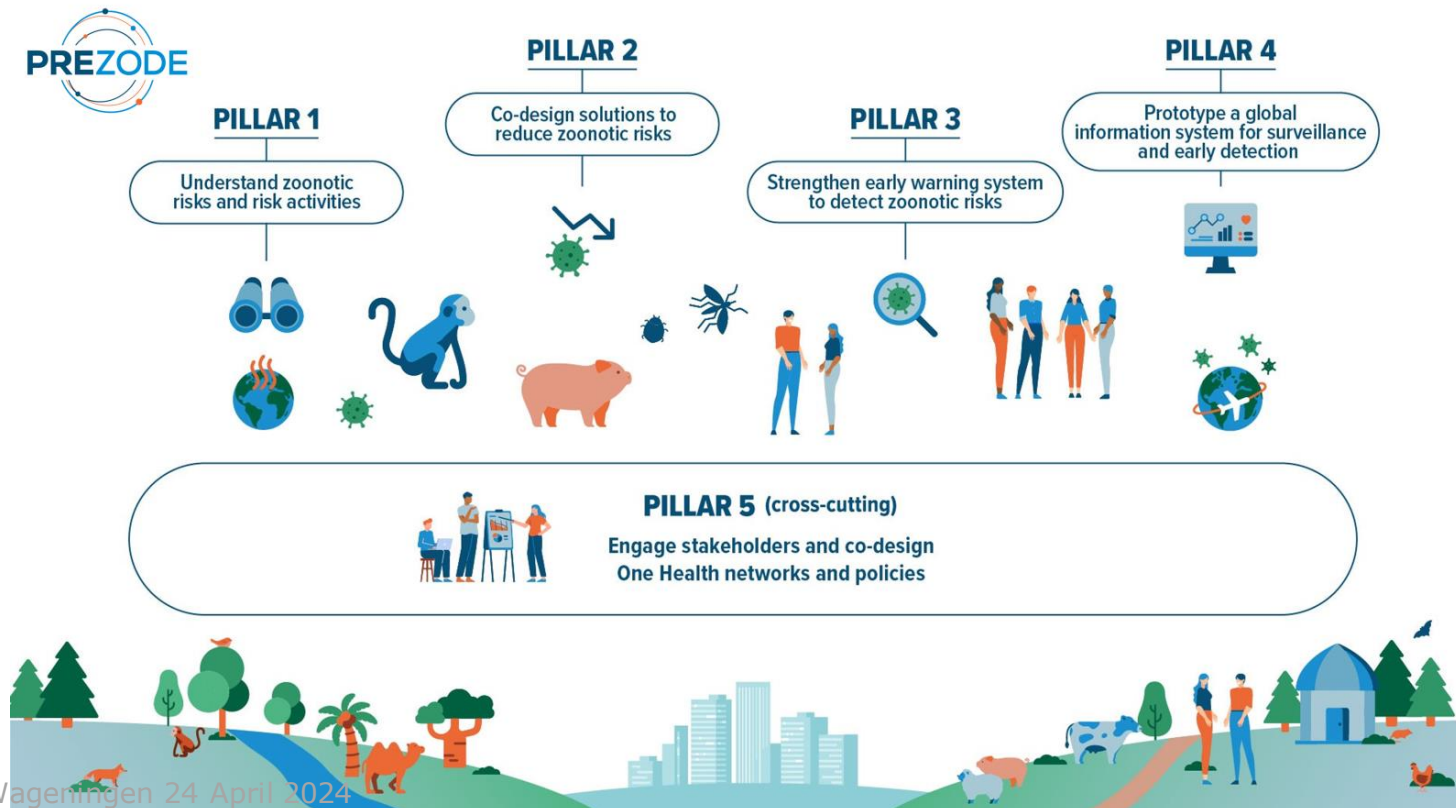


Zoover: international



Global initiatives to prevent Emerging Zoonoses

- Prezode: preventing zoonotic disease emergence (RIVM/WBVR)



Human

Animal / Environment

NL

INT

Pandemic Prevention- Pandemic Preparedness

LFI

NAP AMR

Strengthen surveillance

Strengthen Zoonoses: ZOOVER

ERRAZE

OH pact

NCOH

One health surveillance

MOOD

MedVetNet

EJP One Health

EuP preparadn. & BE READY

Joint action United4Surveillance

Strong1H: One Health surveillance

PREZODE

EVA-Global

United4surveillance surveillance

JAMRAI-II

EuP AH&W

JA wastewater

DURABLE

EU4Health – Horizon Europe – HERA

EuP sust. food

OH conference Wageningen 24 April 2024

EU-HIP

EuP AMR

WHO CC's

BEPREP

EFSAsubgroup One Health



Conclusions

- Zoonoses diseases structure in the Netherlands 2011 formalised
- Zoover: to improve zoonoses from signalling to response
 - Develop One Health surveillance systems to share and jointly assess risk of zoonoses
 - Data sharing between domains complicated, One Health legal expertise needed
- Pandemic prevention and preparedness both relevant
- International collaborations important, challenge to combine all collaborations

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- > And many others

One Health surveillance swine influenza:



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