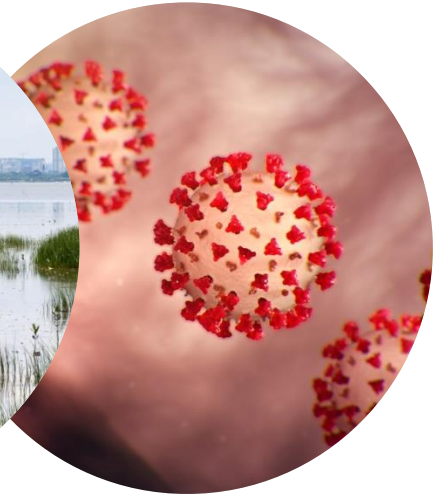


Embracing Global One Health Against Emerging Zoonoses

Prof. Wim H.M. van der Poel

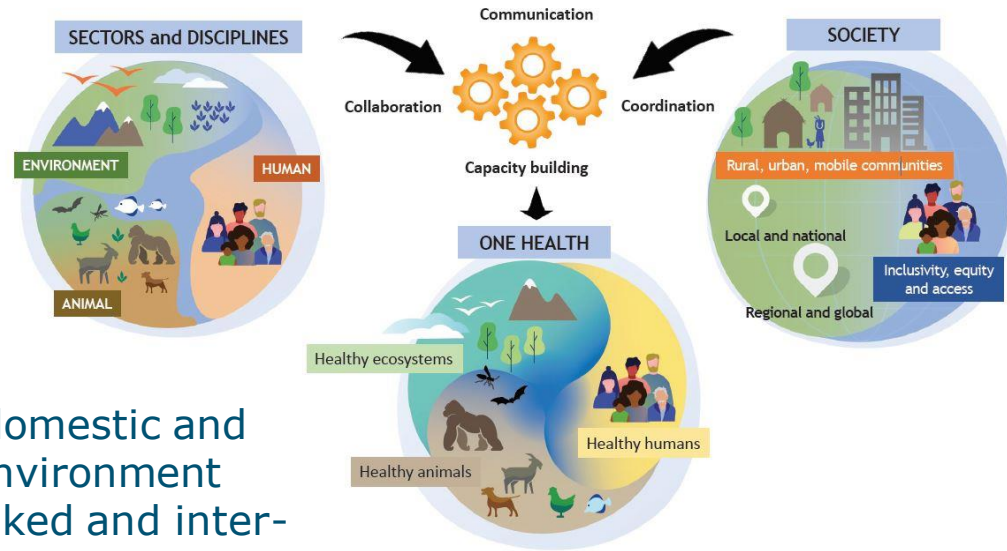
NCOH, GOHRP, EJPOH, ERRAZE, PREZODE, PAH&W, ECVM



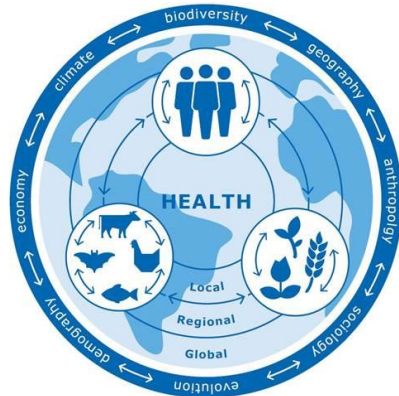
One Health, High Level Expert Panel, Definition

One Health is an integrated, unifying approach that aims to sustainably balance and optimize the health of people, animals and ecosystems

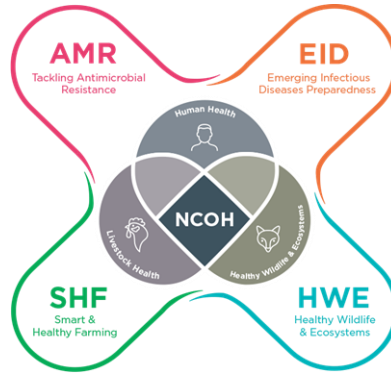
It recognizes the health of humans, domestic and wild animals, plants, and the wider environment (including ecosystems) are closely linked and inter-dependent.



Global One Health @WUR



Global One Health integrated approach
by Fresco L.O. et al. 2015
Trilateral Commission.



Netherlands Centre for One Health (NCOH)



GOH
Research
Partnership



Davis, USA



Nanjing, China



Wageningen, NL

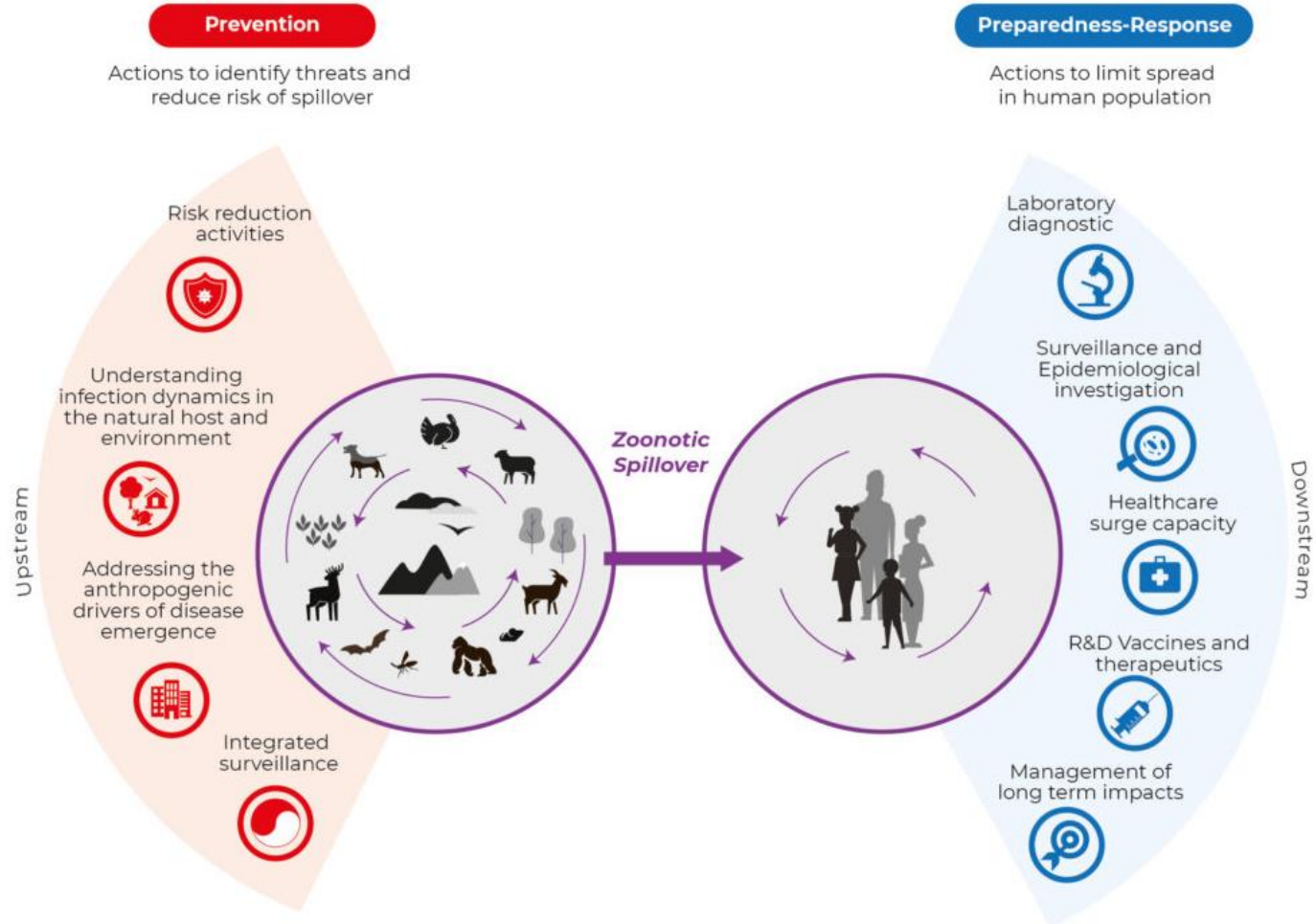


Massey, NZ

Roadmap to the One Health Agenda 2030



Preparedness Zoonotic spillover

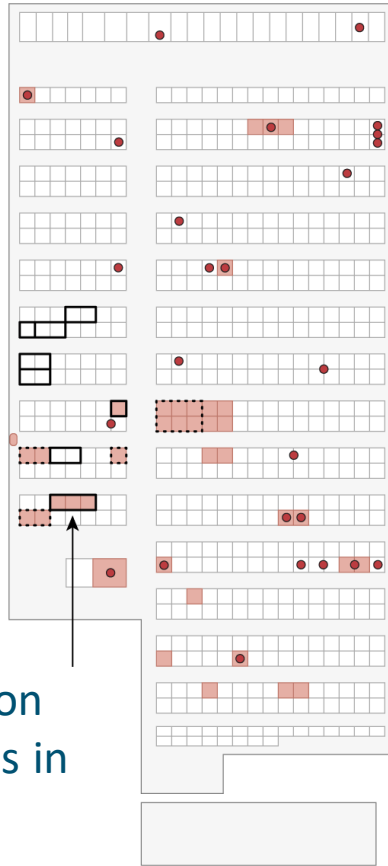




Huanan Seafood Wholesale Market

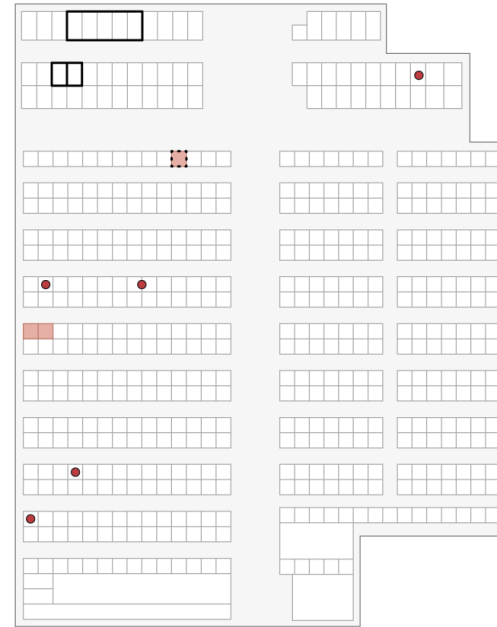


Photograph of raccoon dogs caged over birds in 2014.



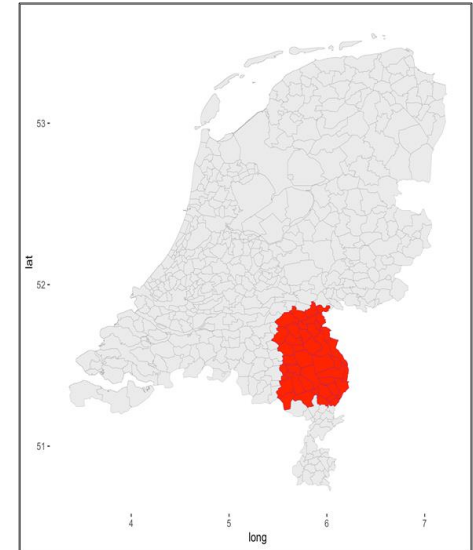
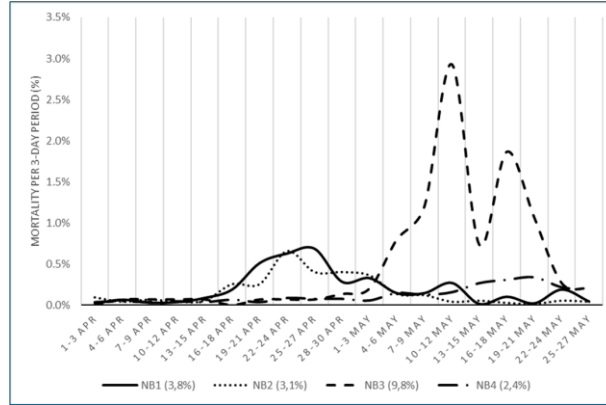
- Human cases of Covid-19
- Coronavirus found in stall
- Stall selling live mammals
- ⋯ Stall selling unknown meat

XINHUA ROAD



Worobey et al., 2022

SARS-CoV2 in farmed mink, Netherlands



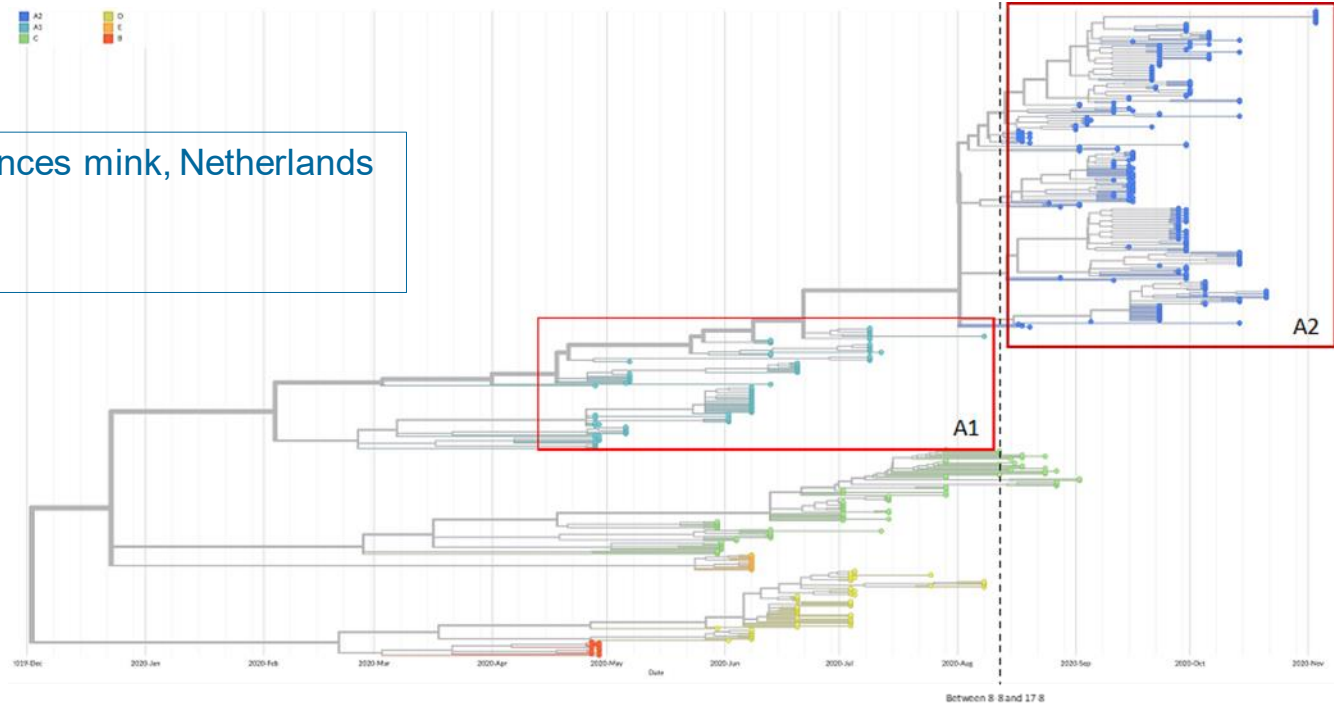
Screening of human contacts PCR and serology of employees/family in 16 mink farms

- 43/88 (49%) PCR positives
- 38/75 (51%) seropositive
- 66/97 (68%) PCR positive and/or seropositive
- Virus sequences obtained of 7 infected people
- All sequences related to mink sequences



Time calibrated maximum likelihood phylogeny

- 485 SARS-CoV-2 sequences mink, Netherlands
- TimeTree, NextStrain

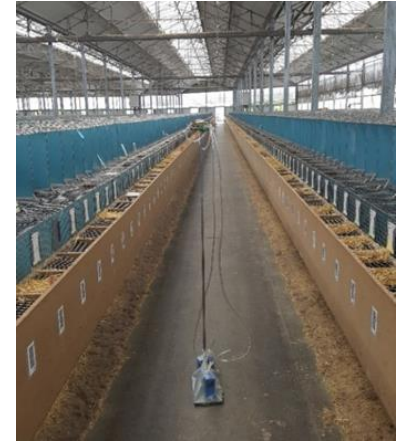


Air samplings, mink farms and environment

Inhalable dust, PCR analyses



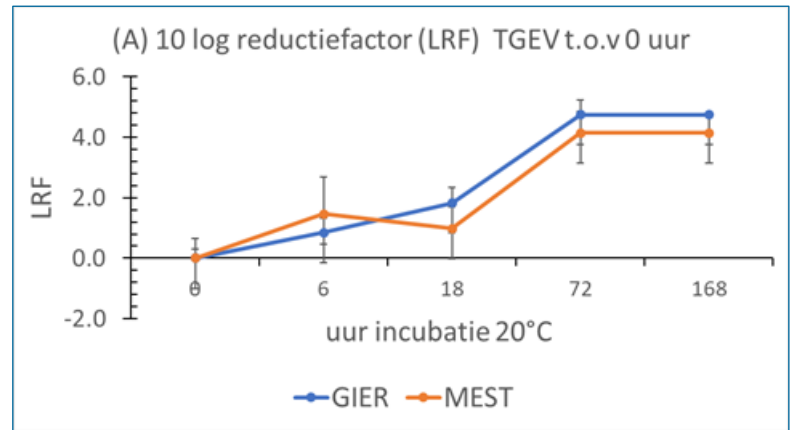
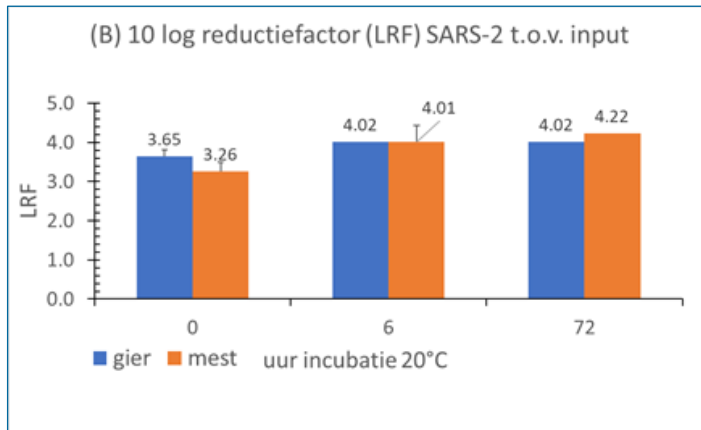
Active air sampling



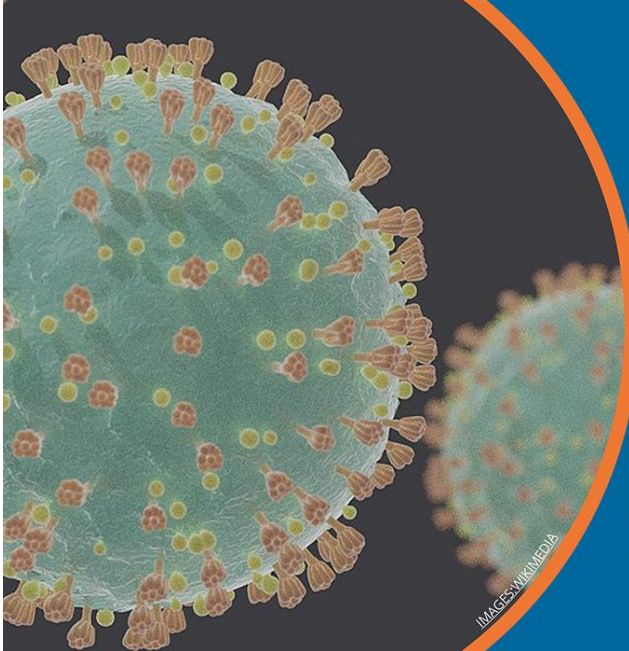
Stationary sampling


SARS-CoV2 stability in mink manure

- Reduction (LRF) of infectivity of spiked TGEV (A) and SARS-CoV2 (B) in stable manure and liquid manure from a coronavirus free mink farm (PCR)
- SARS-CoV2 not recovered after 6 hours at 20C



COVRIN Project



**ne
HEALTH EJP
COVRIN**

JOINT INTEGRATIVE PROJECT:
One Health research integration
on SARS-CoV-2 emergence, risk
assessment and preparedness












**Project output tools
available online**

IMAGES: WIKIMEDIA

Two main integrative research objectives:

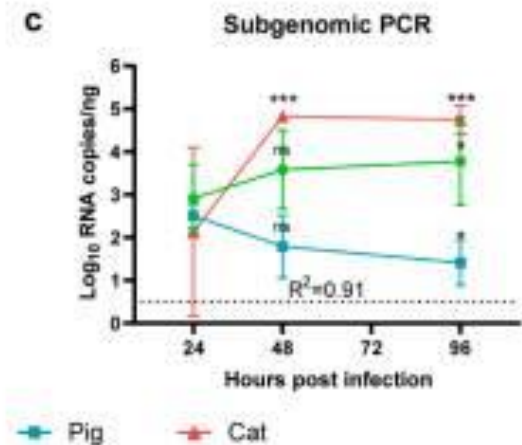
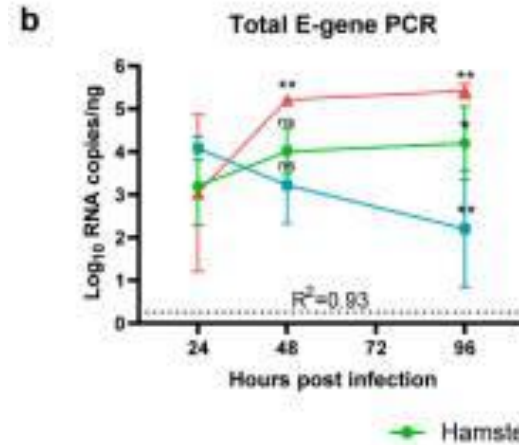
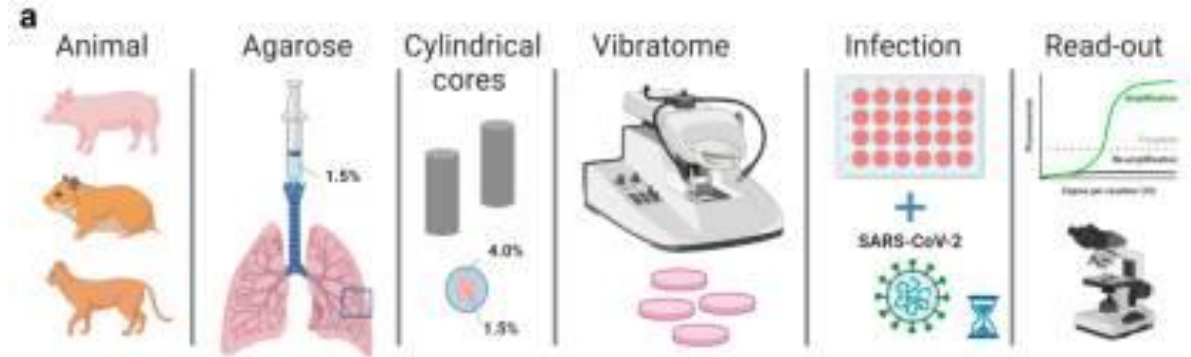
- To identify drivers for the emergence and spread of SARS-CoV2
- To generate data and build models for risk assessment of SARS-CoV2

SARS-CoV2 susceptibility animals

Animal species		Clinical signs	Virus replication	Excretion infectious virus	
Non human primates		✓	✓	✓	
Cats		✓	✓	✓	
Ferrets, Mink		✓	✓	✓	
Raccoon dogs			✓	✓	
Hamsters		✓	✓	✓	
Fruit bats			✓	✓	
Cattle			(✓)		
Swine			(✓)		
Rabbits			✓	✓	
Dogs			✓	✓	
Chicken					

Precision Cut Lung Slices (PCLS) to test susceptibility to SARS-CoV-2









Gerhards et al., 2021



Current collections of animal samples (NL)

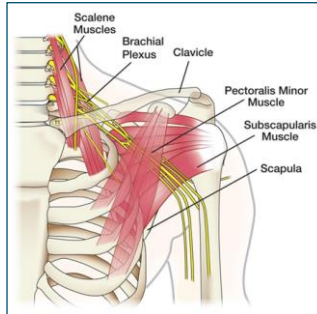
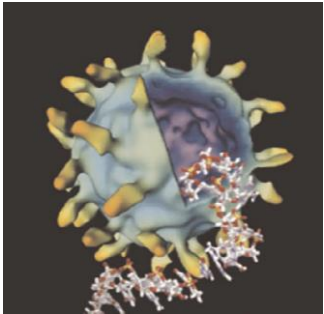


Table 2
Species specific overview of animal samples currently collected in the Netherlands.

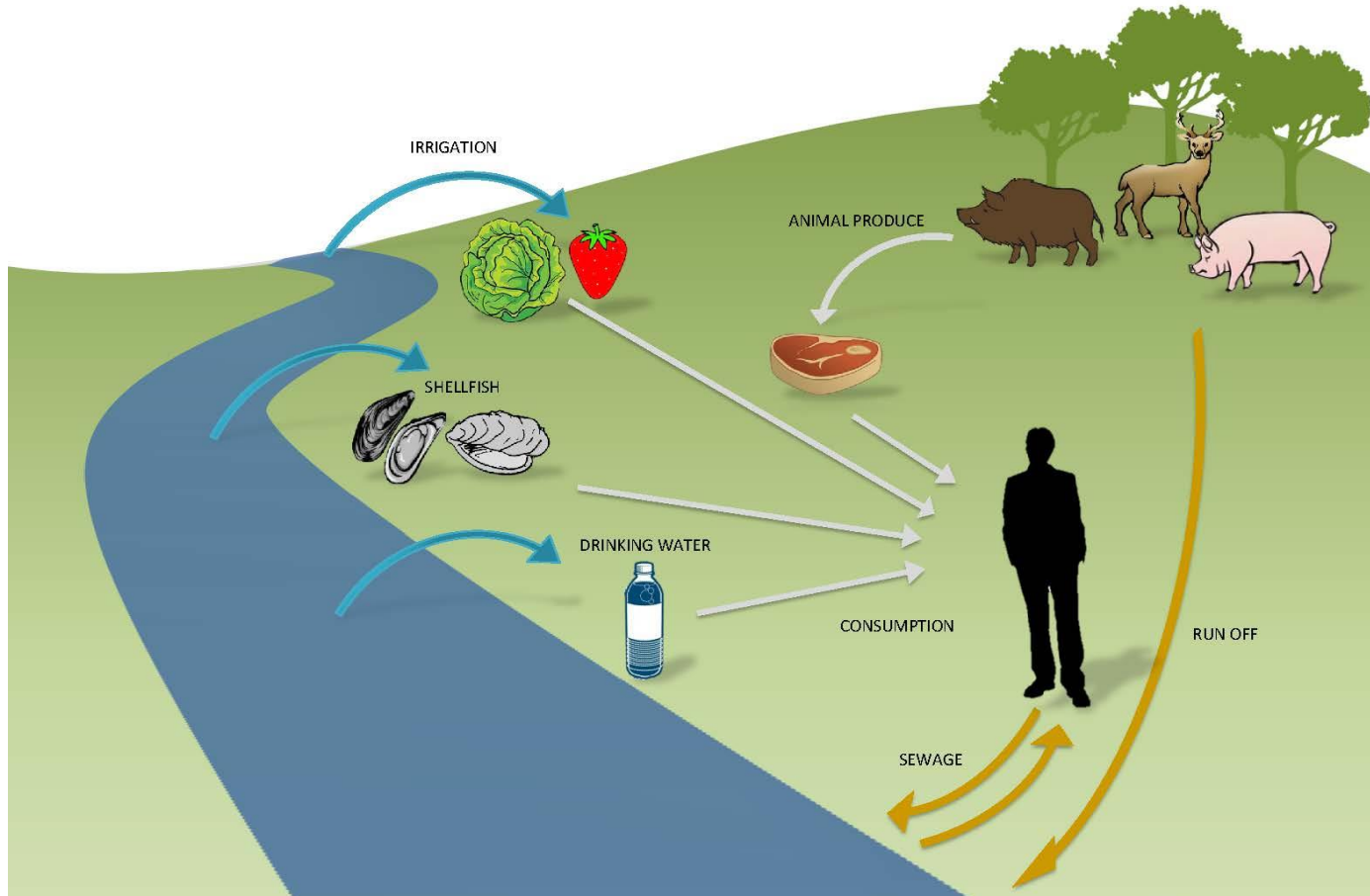
	Livestock			Companion animals		Wildlife		
	 Poultry	 Ruminants	 Pigs	 Horses	 Pets	 Wild birds	 Other	 Wild boar
Sampling characteristics								
Surveillance / other sampling strategy*	Yes + pathology	Yes + pathology	Yes + pathology	No (diagnostic)	No (diagnostic)	Yes + pathology	No (pathology)	Yes
Objectives of surveillance/ monitoring protocol(s)**	1. Monitoring free status 2. Early-warning 3. Vaccination status	1. Monitoring free status 2. Early-warning 3. Monitoring prevalence	1. Monitoring free status 2. Early-warning 3. Monitoring prevalence	NA	NA	1. Early-warning	NA	1. Monitoring free status 2. Early-warning
Examples of pathogens/ diseases in surveillance or monitoring	<i>Salmonella</i> , avian influenza, Newcastle disease	Bluetongue, bovine spongiform encephalopathy, <i>Brucella</i>	Classical- and African swine fever, <i>Salmonella</i>	NA	NA	Avian influenza, arboviruses	NA	Classical- and African swine fever, Aujeszky's
Spatial coverage	All provinces (clustered)	All provinces (clustered)	All provinces (clustered)	All provinces	All provinces	All provinces	Specific regions Depending on species	Specific regions
Sample size	>20.000/month	>5000/month	>2000/month	>1000/month	>2000/month	500–1000/month	<100/month	+ – 100/month
Sample characteristics								
Sample type(s)	S, B, Sw, F, O	B, S, M, O, F	S, O	B, S, Sw, F, O	B, S, Sw, F, O	S, Sw, O	S, O, Sw, F	B, O, S
Storage method & time	1 week – 1 month (positive samples 1 year - infinity), cooled (frozen –70/–80 °C)	1 week – 1 month (positive samples 1 year - infinity), cooled (frozen –70/–80 °C)	1 week – 1 month (positive samples 1 year - infinity), cooled (frozen –70/–80 °C)	<2 weeks, cooled (4–8 °C)	<2 weeks, cooled (4–8 °C)	>1 year, frozen (–20/–80 °C)	>1 year, frozen (–20/–80 °C)	>1 year, frozen (–20/–80 °C)
Metadata available	Location, species, sampling date	Location, species, sampling date	Location, sampling date	Variable (not mandatory)	Variable (not mandatory)	Location, species, sampling date, age, sex, disease status	Location, species, sampling date, age, sex, diseases status	Location, sampling date, age, sex
Anonymization required	Yes	Yes	Yes	Yes	Yes	No	No	No

Hepatitis E virus infection

- Hepeviridae, genus hepevirus
- Quasi-enveloped virus 7-34 nm
- Difficult to propagate in cell culture
- Symptoms: fever, jaundice, hepatitis, hepatomegaly, anorexia, malaise, nausea, vomiting
- Overall case-fatality rate: 1%-4%

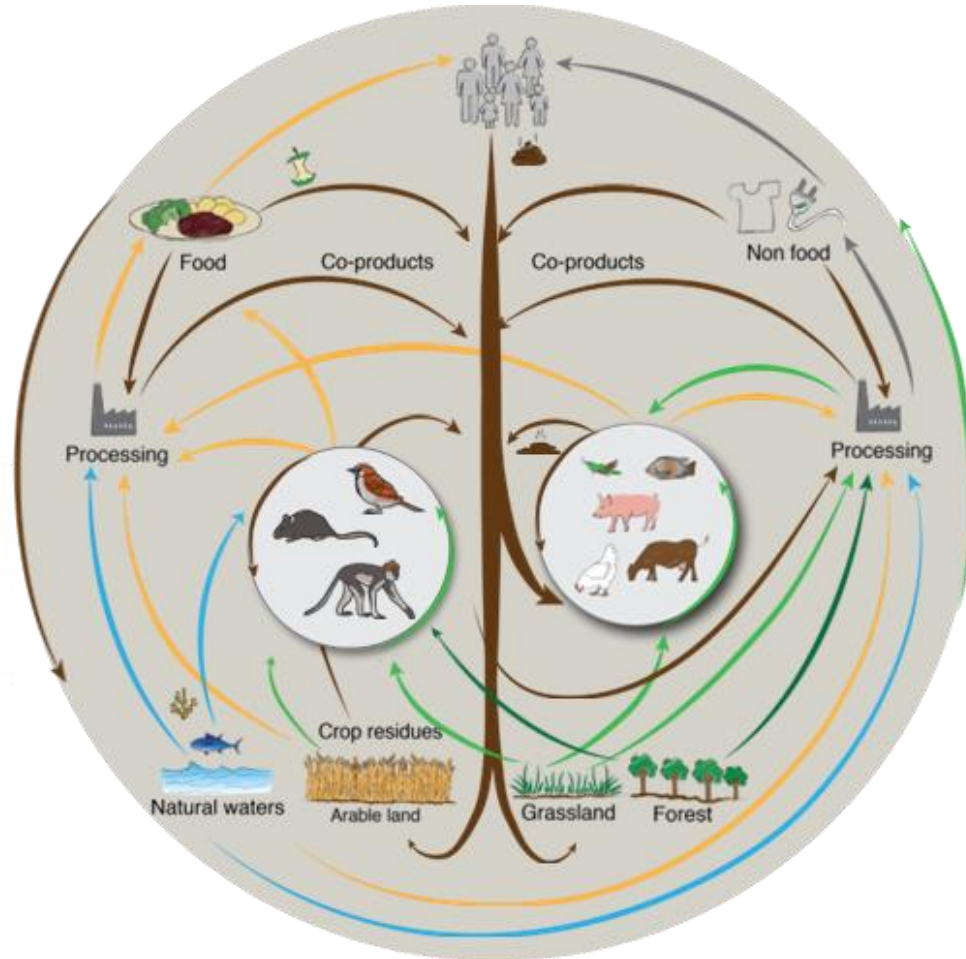


Food and environmental routes of hepatitis E virus transmission



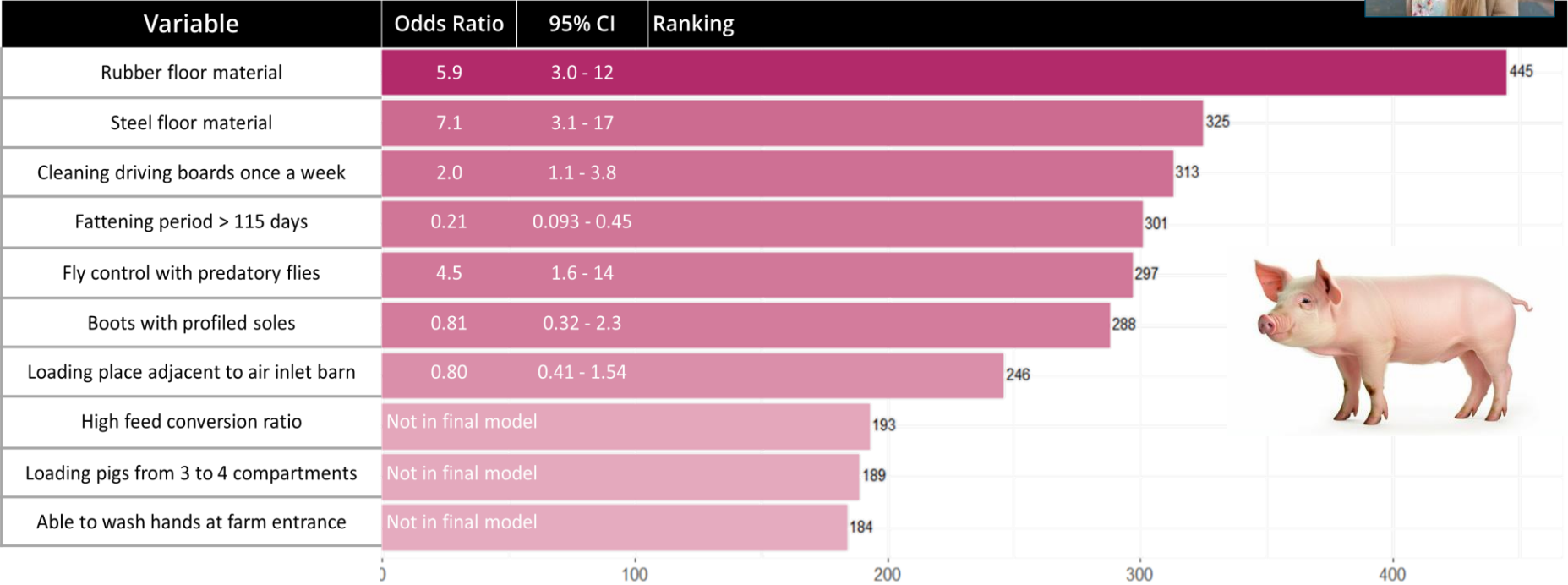
Van der Poel, 2013

Circular Food Production, Linking Health and Food Systems



Biosecurity on pig farms

highest variables for a PCRneg and ELISAneg slaughter batch



HEV in byproducts and sausages

- Hemaglobin
- Spray dried porcine plasma (SDPP)
- Fibrinogen
- Blood/plasma

- RT-PCR detections
- 1-4 * 10E copies/gram



Boxman et al., 2017

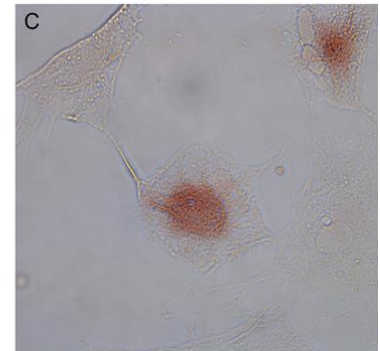
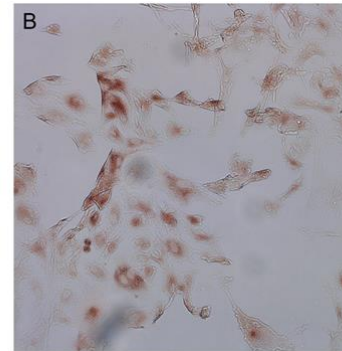
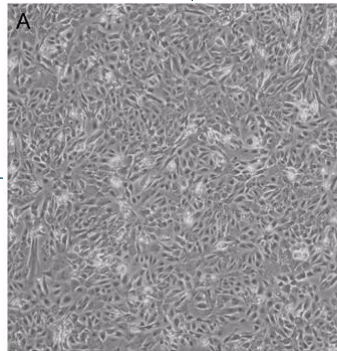
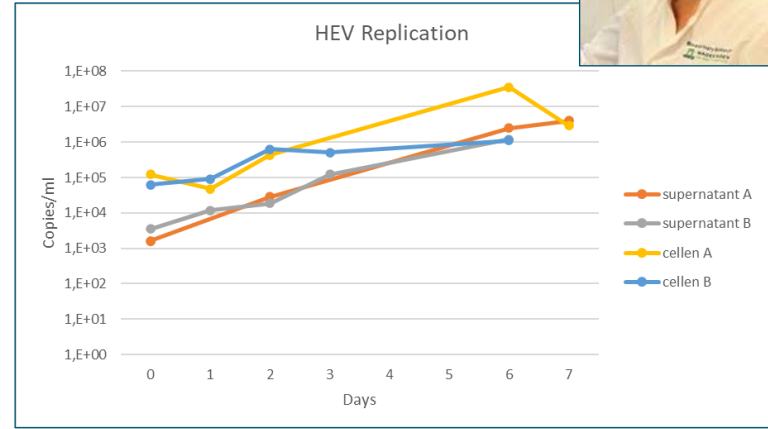
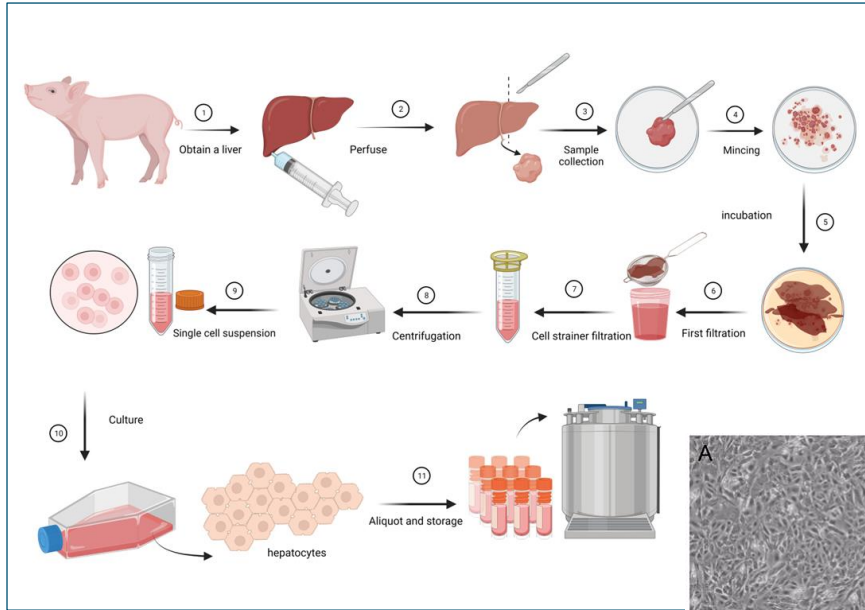
Said et al., 2017

Hulst et al., 2017

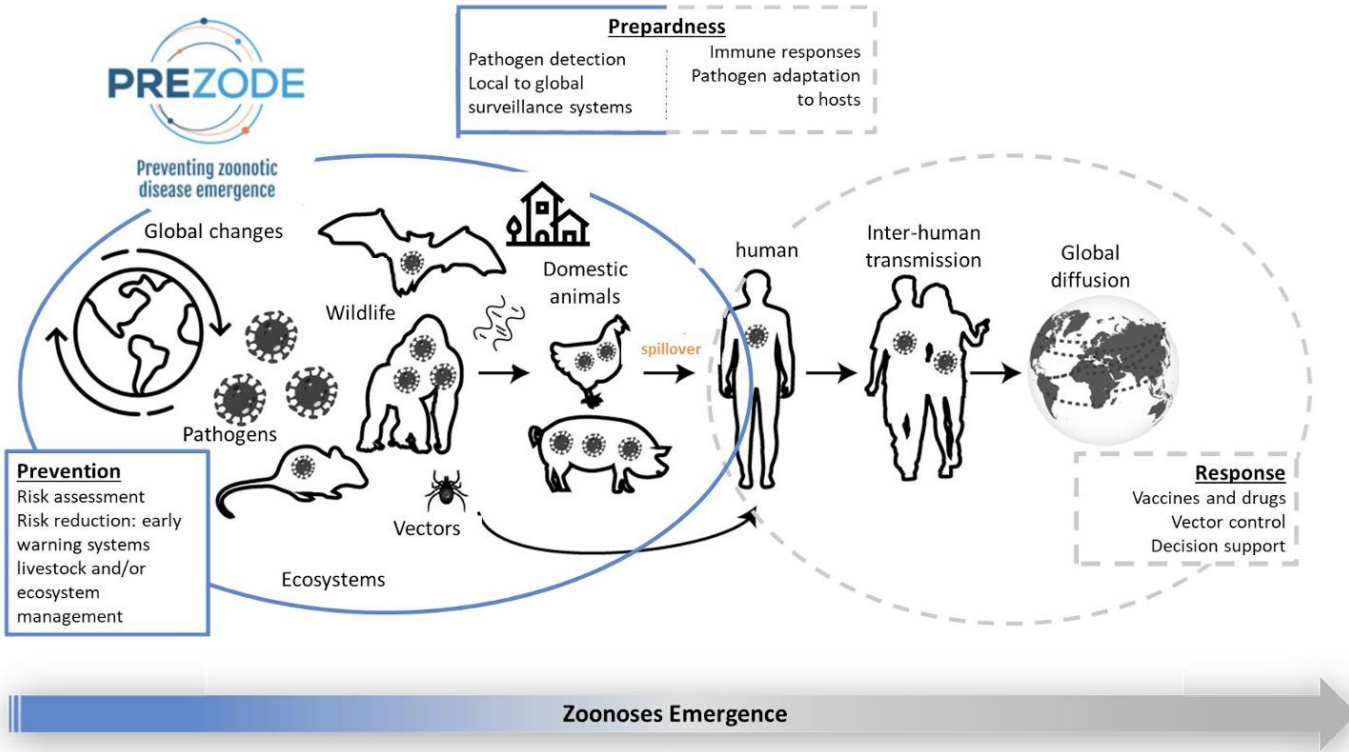
EFSA., 2017



HEV infectivity assay, primary pig hepatocytes



The need for a change in paradigm: towards PREVENTION and BOTTOM-UP approaches



Global One Health

Expert focus on zoonoses, key action points on EU level:

Operationalize a One Health approach with veterinary and medical professionals

Develop a zoonoses structure to regularly discuss zoonotic disease outbreaks

Actively **collaborate in a One Health response** to emerging zoonotic disease outbreaks

In a One Health approach, **engage all stakeholders** of all health-related research disciplines

Develop a Global One Health **systems approach**, including negative and positive factors influencing health

Establish **One Health education for** students and One Health training for professionals

Build research capacity to implement/operationalize a Global One Health approach for emerging zoonoses control

Ensure to address in a Global One Health approach **global changes** like climate change, biodiversity loss, population density increase etc.



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Reina Sikkema



Thank you for
your attention!



To explore
the potential
of nature to
improve the
quality of life