



Utrecht University

Veterinary Medicine



# *Environmental investigations of SARS-CoV-2 infected mink farms*

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# COVID-19 outbreaks in farmed minks in the Netherlands: One Health Approach



# Risk assessment

Public health



& Occupational health



# Environmental study on SARS-CoV-2: research objectives

-Study potential outdoor dispersion

-Gain insight into concentrations in air in mink farms including personal exposure

-Assess contamination on surfaces and materials sampled from the mink's cages





## Methods: air sampling

Active

- Inhalable dust
- Particulate Matter 10



Passive

- Settling dust



# Environmental sampling - outdoor

Consecutive long-term (4-5 days)



Upwind and downwind measurements (6 hours)

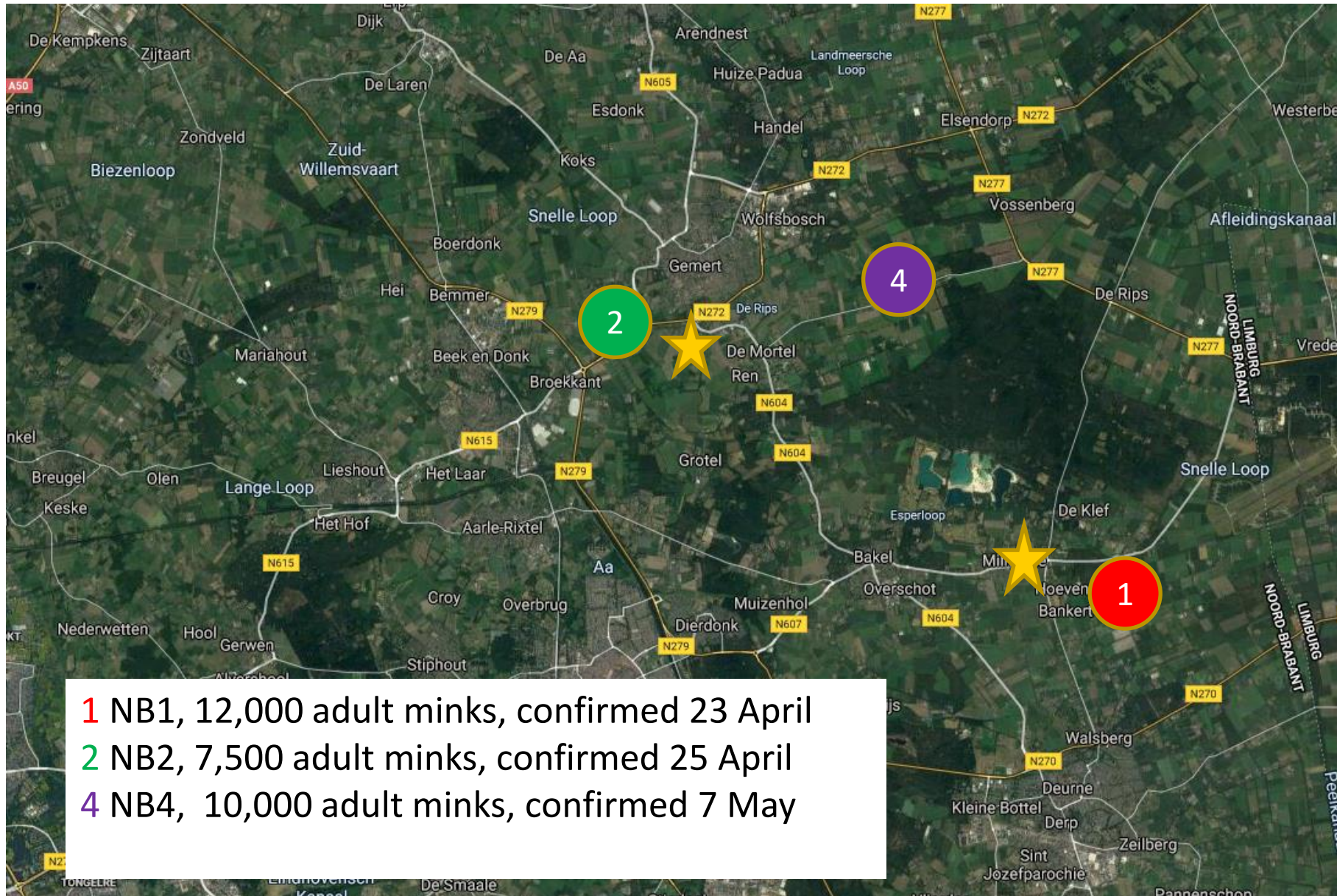


At residential sites: consecutive long-term





# Sampling period: April 28<sup>th</sup> – May 21<sup>st</sup>



- 1 NB1, 12,000 adult minks, confirmed 23 April
- 2 NB2, 7,500 adult minks, confirmed 25 April
- 4 NB4, 10,000 adult minks, confirmed 7 May



# Indoor environmental sampling → 3 visits per farm

Active air (6/8 hours) and settling dust (7 days):



Minks' housing units (alive and deceased):

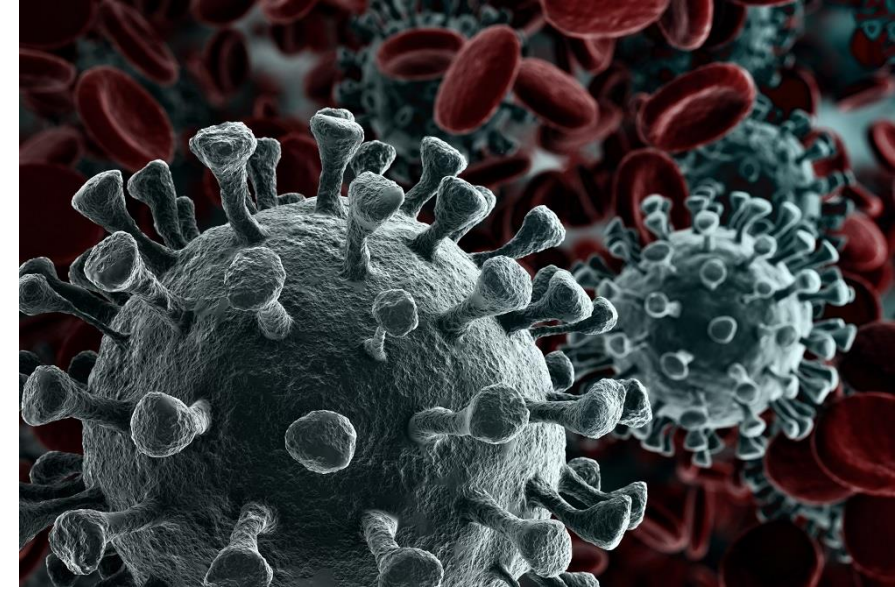


Number	Sample type
1	Swipe
2	Bedding material
3	Food residue
4	Swab of drinker cup
5	Faeces material



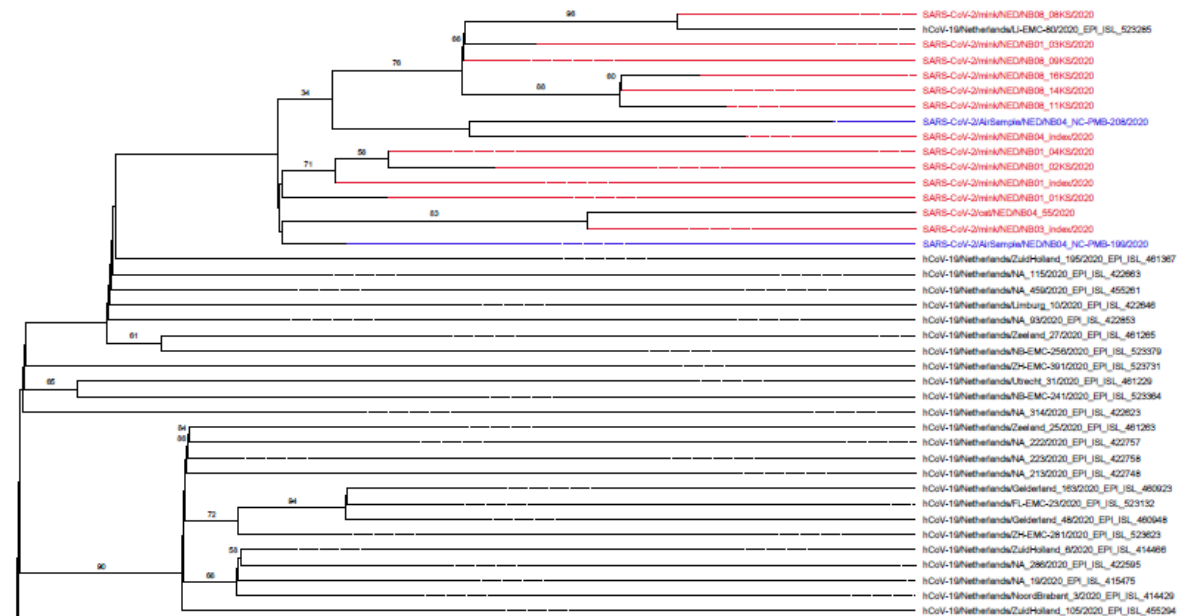
## Laboratory analyses at WBVR

- Sample processing and RNA extraction
- qPCR analyses (E-gene PCR)
- Ct<32: WGS and culturability testing

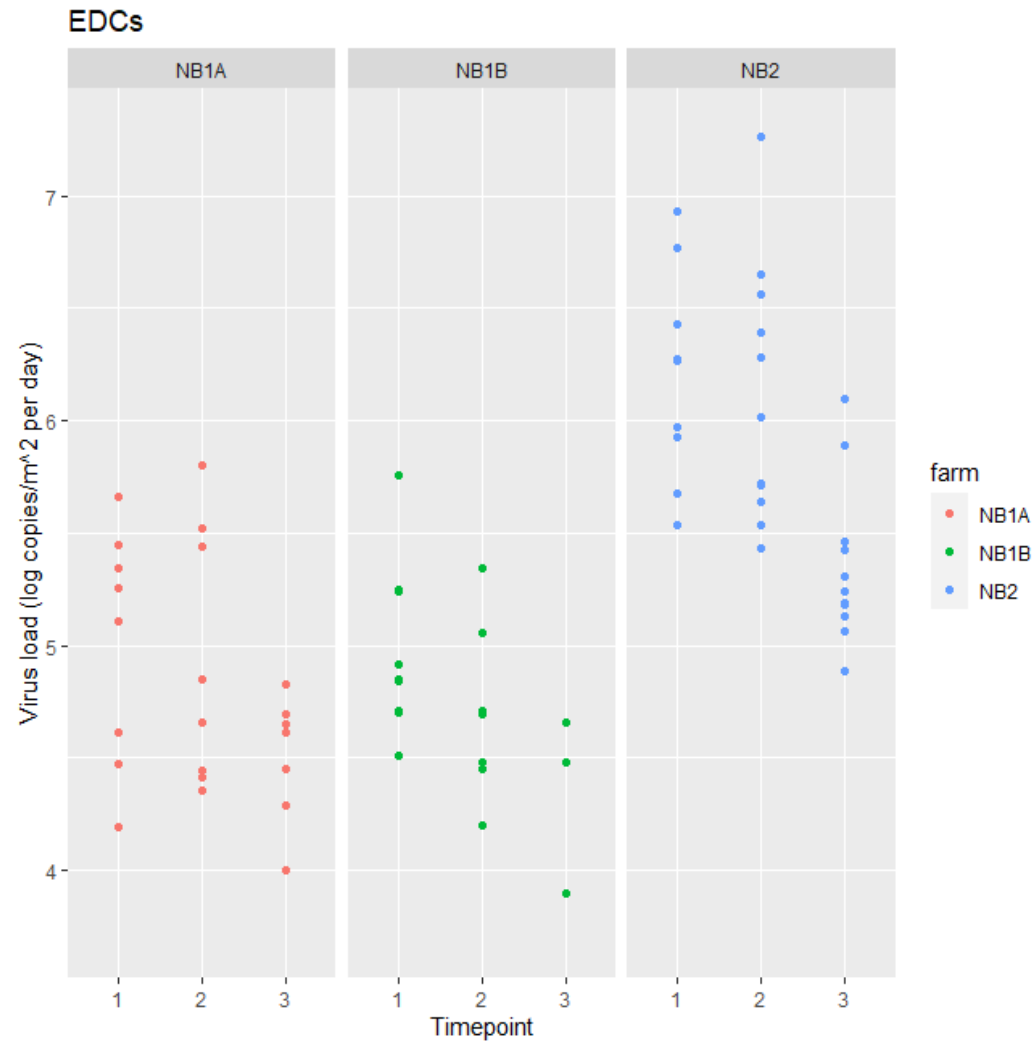


# Results: Active air samples inside farm

- SARS-CoV-2 RNA detected in inhalable dust
  - Personal: 19% (3/16)
  - Stationary: 18% (6/33)
- ND/lower concentrations in PM10
- Virus sequences air samples cluster together with mink samples collected at same farm



# Results: 82% of settling dust samples positive (75/92)



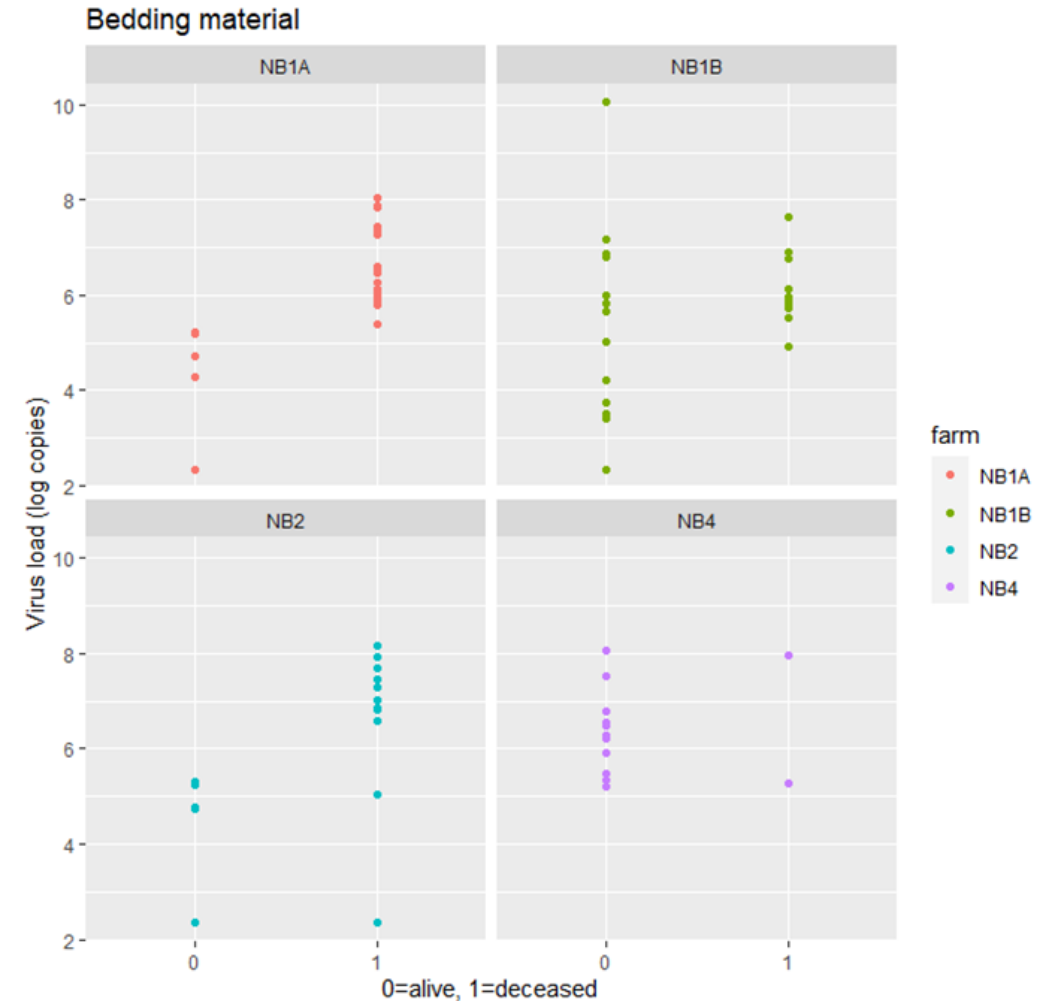
Variable	Virus load (log copies)		
	Ratio	95% CI LB	95% CI UB
Farm NB1A (indicator)	.	.	.
Farm NB1B	0.38	0.13	1.10
Farm NB2	18.00*	5.60	59.00
Timepoint 1 (indicator)	.	.	.
Timepoint 2	0.25*	0.13	0.52
Timepoint 3	0.05*	0.02	0.09
Positioned in close proximity to minks	3.00	1.00	9.00



# Results: Samples of minks' housing units

Sample type	Percentage RNA detected
Swipe	100% (99/99)
Bedding material	83% (78/94)
Faecal material	54% (51/95)
Swab of drinker cup	31% (30/97)
Food residue	10% (9/90)

- Viral load associated with:
- Farm (NB4>NB1>NB2)
  - Sampling week (wk1>wk2>wk3)
  - Cage: mink alive or deceased



## Results: Samples outdoor

All air samples (N=54) collected at NB1A, NB1B, NB2 and three residential sites:

SARS-CoV-2 RNA not detected



## Results: Samples outdoor at NB4

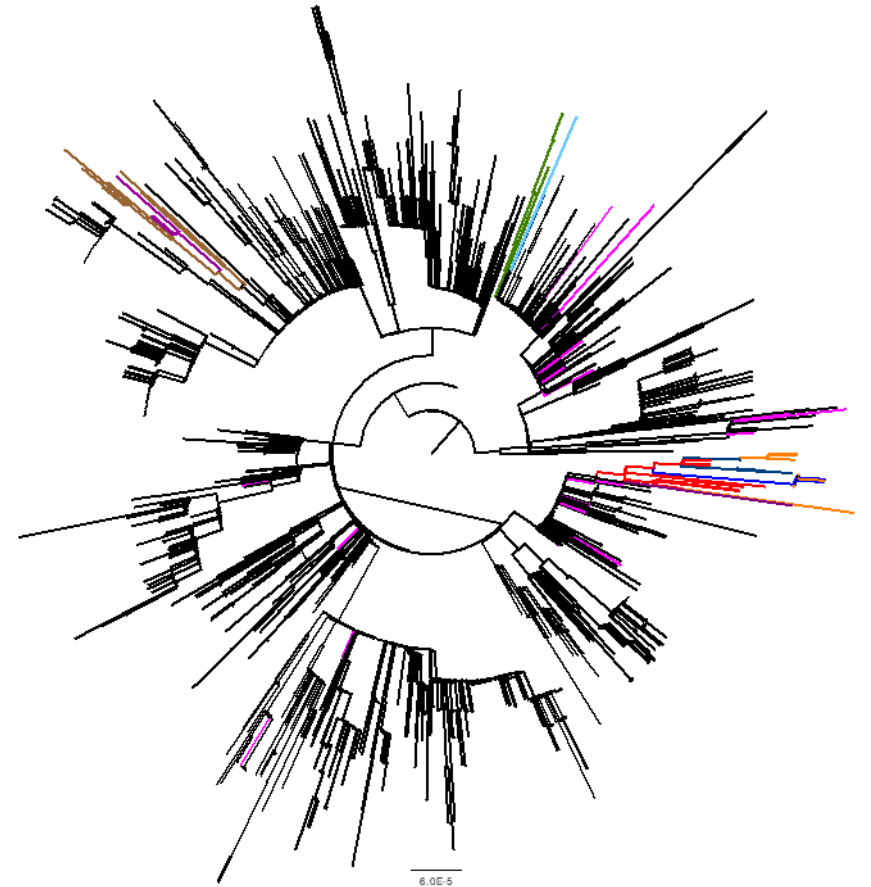
SARS-CoV-2 RNA detected in inhalable dust at measurement spots in close proximity to open entrance





## Conclusions on risk assessment public health and occupational health

- Risk of environmental exposure outside infected farms appears to be negligible
- Occupational exposure risk to SARS-CoV-2 and mink-to-human transmission within farms is likely



## Discussion

- Variation over time inside farm: environmental sampling in line with animal investigations
- Major limitation: RNA detected, no insight into infectivity
- Within-farm transmission (mink-mink, mink-human): contribution of various transmission routes unknown
- General insights: methods used, dispersion indoor
- Measures implemented: biosecurity, PPE, screening



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