

# Remote meat control –

Can technology take us closer?

Swedish Food Agency

# Meat inspection today



# Why do we need a meat inspection?

- What is the main purpose?
- Why are veterinarians involved?



# The challenges today

- Ante-mortem inspection and Post-mortem inspection performed on-site
- Small-scale abattoirs and game-handling establishments, often located on remote areas
- Scarse veterinary resources
- Logistic hurdles

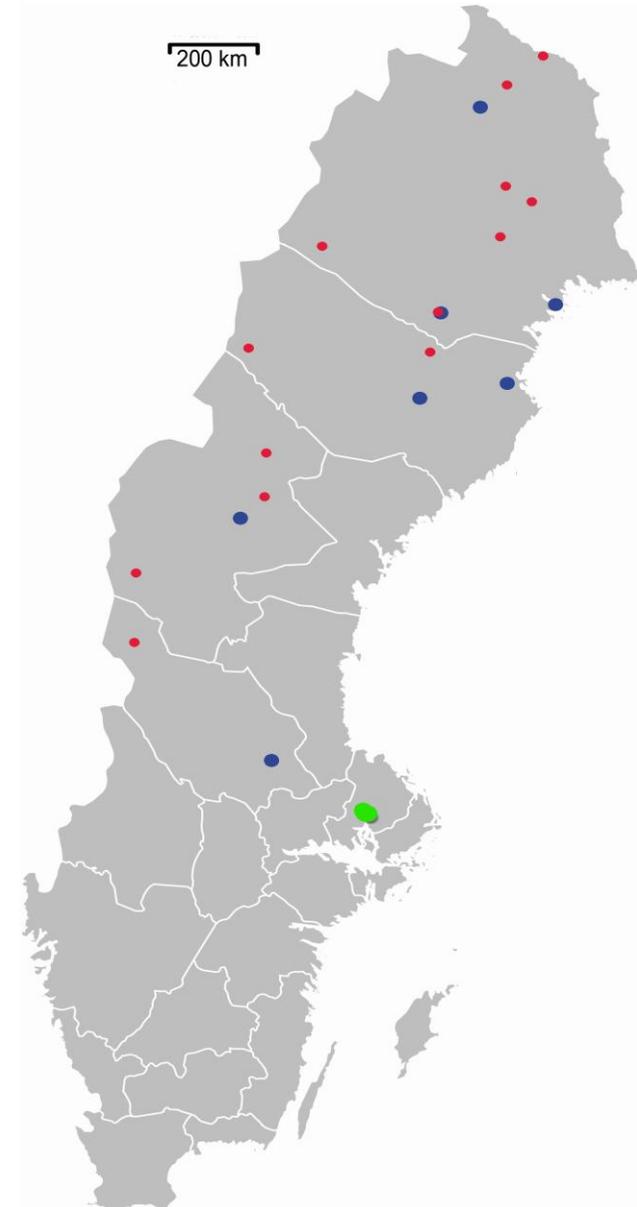
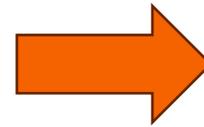


# Why perform control at a distance?

- Better sustainability of official controls
- Higher level of resilience
- Better logistics for food business operators
- Lower costs of control

Swedish conditions in the north:

- The red dots show sites where reindeer slaughter is performed
- The blue dots show the SFA offices
- The green dot is our main office



# How would it work?

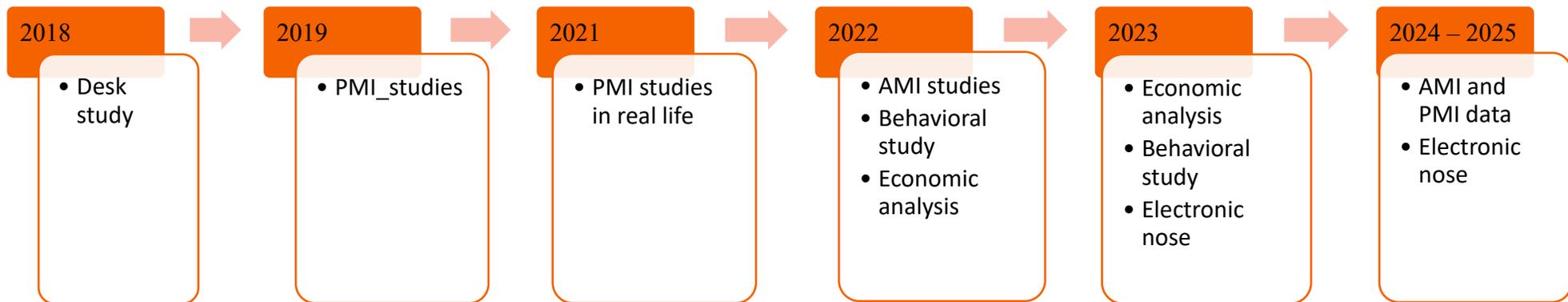


Sender



Receiver

# Timeline of the project



*Almqvist et al., 2021*

*Kautto et al., 2022*

*Kautto et al., 2023*  
*Kautto & Comin., 2023*  
*Almqvist et al., 2023*  
*Hunka et al., 2023*

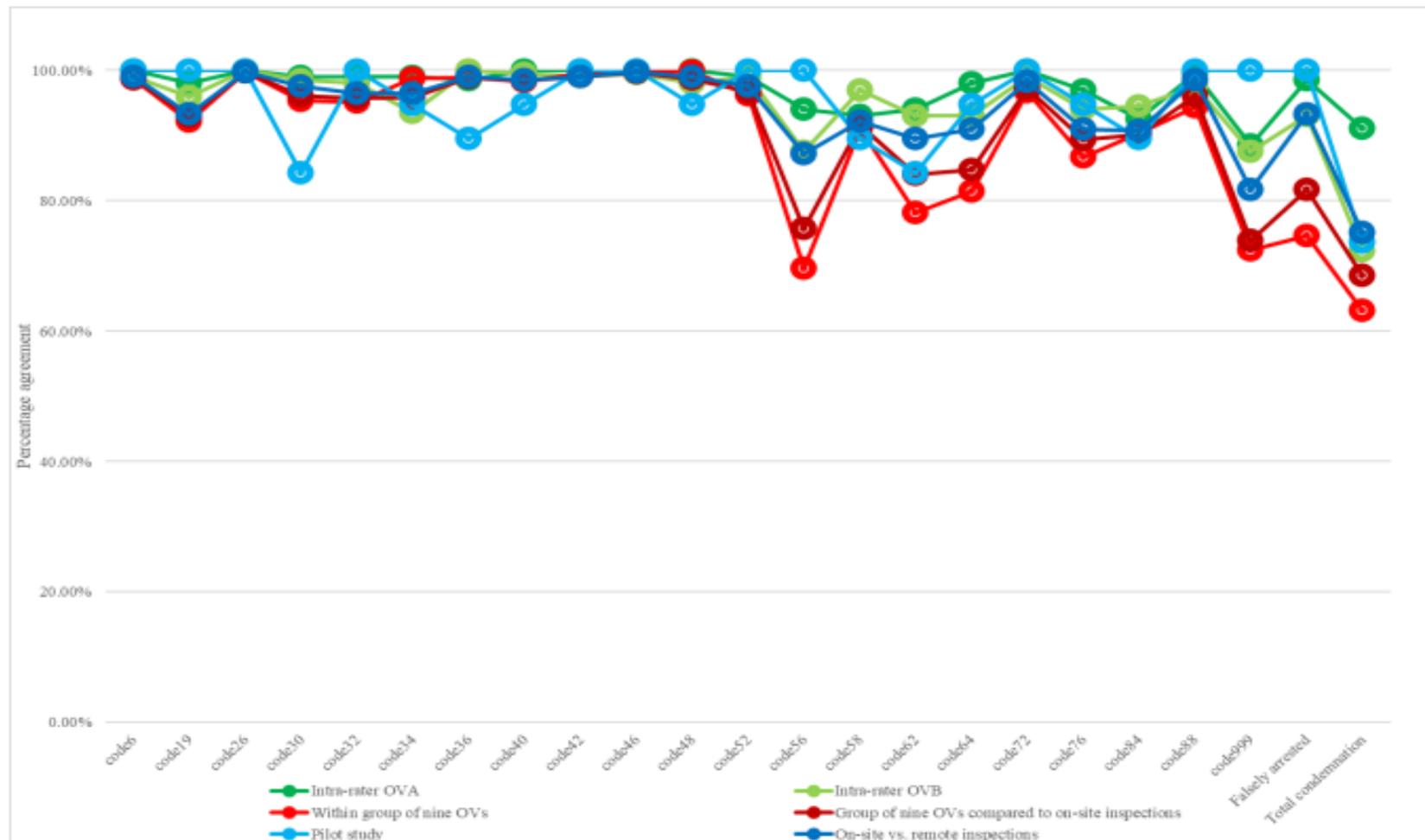
*Daniel et al., 2024*  
*Hansson et al., 2025*  
*Livsmedelsverket, 2025*

# Remote PMI-study

## Materials and methods

- 400 pig carcasses and organs
- PMI filmed and checked again after six months

Variation between veterinarians not depended on the method of PMI



See further Almqvist 2021, PhD, thesis No.2021:72 , Swedish Univ. Agr. Sciences.

# Remote PMI – on the production lines

## Materials and methods

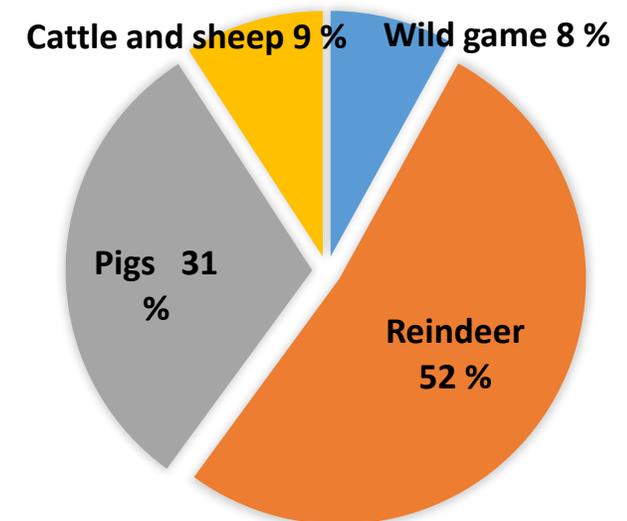
- Smartphone – WiFi on-site, fiber net (100 MB)

## Conclusions

- Food safety, animal health and welfare not compromised
- Smart phone a useful device
- Good technical assistance on-site needed



Kautto et al, 2022. J of Parasitology



In total 3273 carcasses, in six establishments

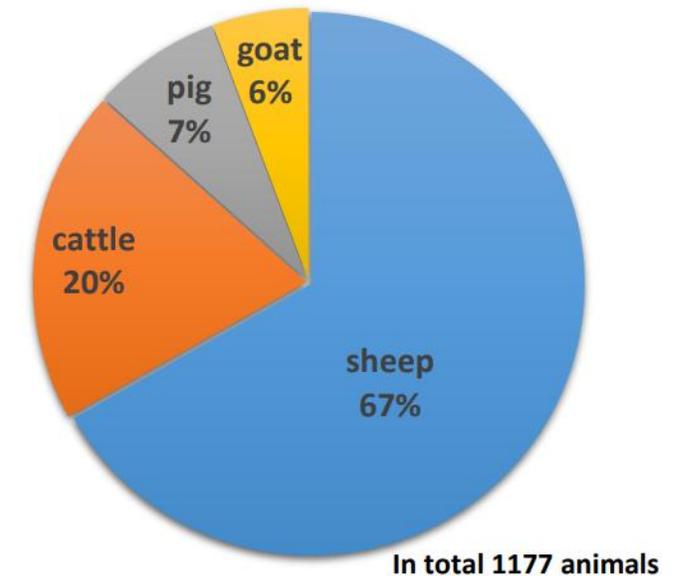
# Ante-mortem inspection – at abattoir

## Materials and methods

- Commercial soft ware (FaceTime®)
- WiFi in lairage, fiber (100 Mbit/s) at abattoir

## Conclusions

- Inspection method do not affect negatively the possibility to find incompliances
- Emissions can be reduced in a great amount (89 % in this study)



# Ante-mortem inspection – pig slaughter

## Materials and methods

- Large-capacity abattoir processing pigs
- Inter-rater variability between two raters
- One person who was holding the smartphone camera whilst conducting an on-site ante-mortem inspection, and
- One remote rater (OV) conducting a remote ante-mortem inspection over a live video feed
- A total of 4032 pigs were inspected

## Results

- Overall agreement between raters and kappa-value based agreements were almost perfect

## Conclusions

Remote AMI is a feasible and flexible option provided the OVs are trained and aligned in their assessments.

*Hansson et al., 2025. Remote antemortem inspection at slaughter in Sweden:*

<https://doi.org/10.3389/frfst.2025.1603989>



# Electronic nose – ongoing

Detection of abnormal odours at slaughter

- Developed in-house
- Based on AI and off-the-shelf-components

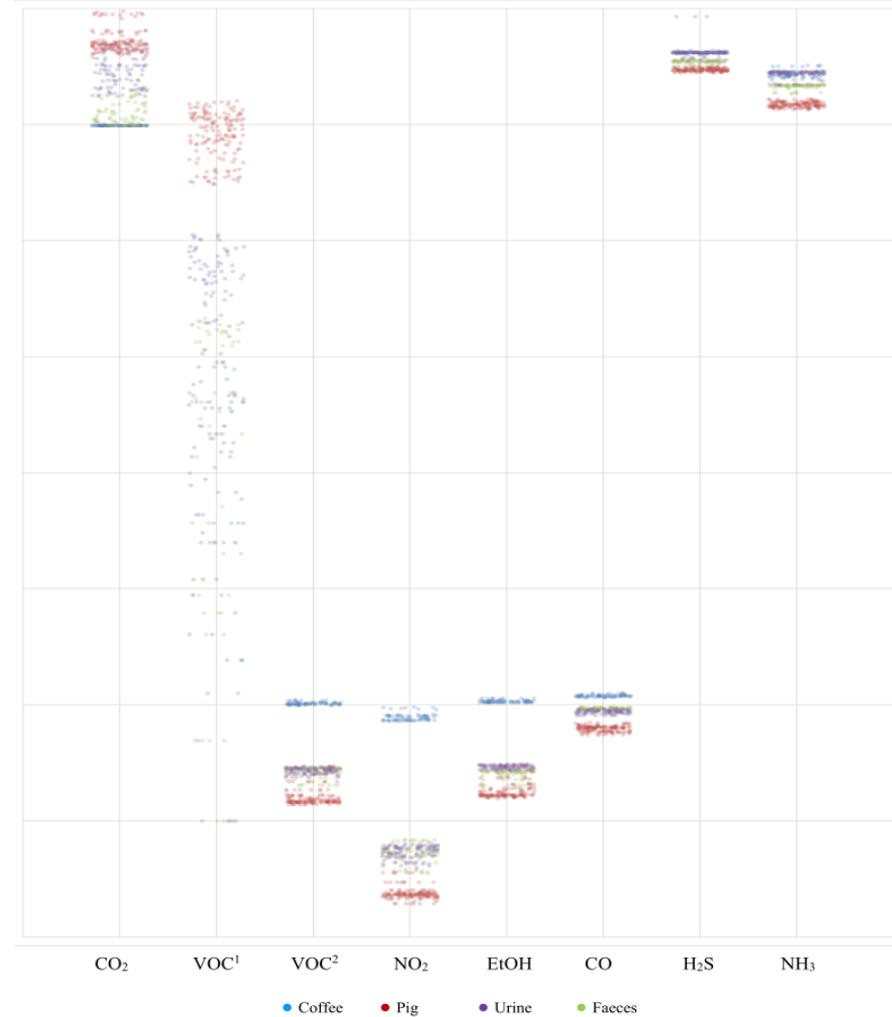
**Scents and odours are highly subjective!**

- Standardised measurements and assessments of odours at slaughter
- Reduced food waste and increased equality



The insides of the electronic nose exposed.  
11 different sensors in total.

Electronic nose readouts of sensors for specific chemicals and test-subjects



***Does a pig smell like coffee?***

Readouts from various sensors in the e-nose.  
Non-overlapping lines indicates difference in smell

# Conclusion - The future is near

- Ante-mortem and post-mortem inspections can be done remotely using smartphone and standard personal computer.
- Certain conditions needs to be met.



# Other analyses performed

- Technical issues and IT-security
- Economical analysis – obvious advantages
  - Less transportations
  - Working hours used more reasonable
- Environmental effects
  - Less CO<sub>2</sub> emissions
  - Better resilience during top season

For further information and references, please see the homepage of the Swedish Food Agency: [Remote meat control in slaughter and game handling](#)



**We thank  
the abattoirs  
and  
the game-handling  
establishments  
for the  
invaluable support  
and  
positive attitude  
to this project!**

**Project powered by:**

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