Exploration of using animal-based parameters (activity level and respiratory health status) collected by sensors to monitor pig welfare on farm

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Introduction

Monitor animal behavior and farm environment in real-time and continuously

Facilitate objective decision-making for producers

Prevent disease outbreaks in time and improve animal welfare

Mostly used in experimental farm settings (Stygar et al., 2021)

Develop more accurate and implementable on-farm sensor technology

ClearFarm

A **platform** to control animal welfare in pig and dairy cattle farming

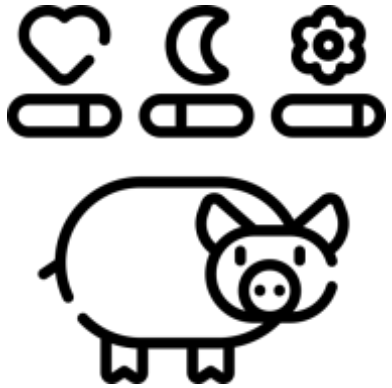
ClearFarm

Objective

- Parameters collected from PLF sensors *vs.* Reference indicators reflecting animal welfare

  - **PLF Sensor parameters:**
    - Activity level
    - Respiratory Health Status (ReHS)

  - **Reference indicators ('ground truth'):**
    - Aggression-related skin lesions (Turner et al., 2006)
    - Salivary biomarkers (Cerón et al., 2022)



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Animals & housings

One batch in each farm

	Nursery farm	Fattening farm
Number of pens	2	4
Number of pigs/pen (Stocking density: pig/m^2)	100 (0.26)	13 (0.77)
Pen size (m x m)	10.5 x 2.5	4 x 2.5
Number of Peek Analytics®	2	2
Number of SoundTalks®	2	1

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PLF Sensors

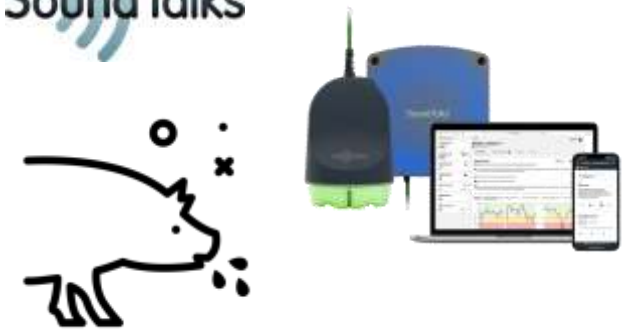
COPEEKS

Peek Analytics®

- Temperature
- Humidity
- CO_2
- NH_3

- Activity level
- Posture
- Areas of interest

SoundTalks



SoundTalks®

- Temperature

- Respiratory Health Score (ReHS)

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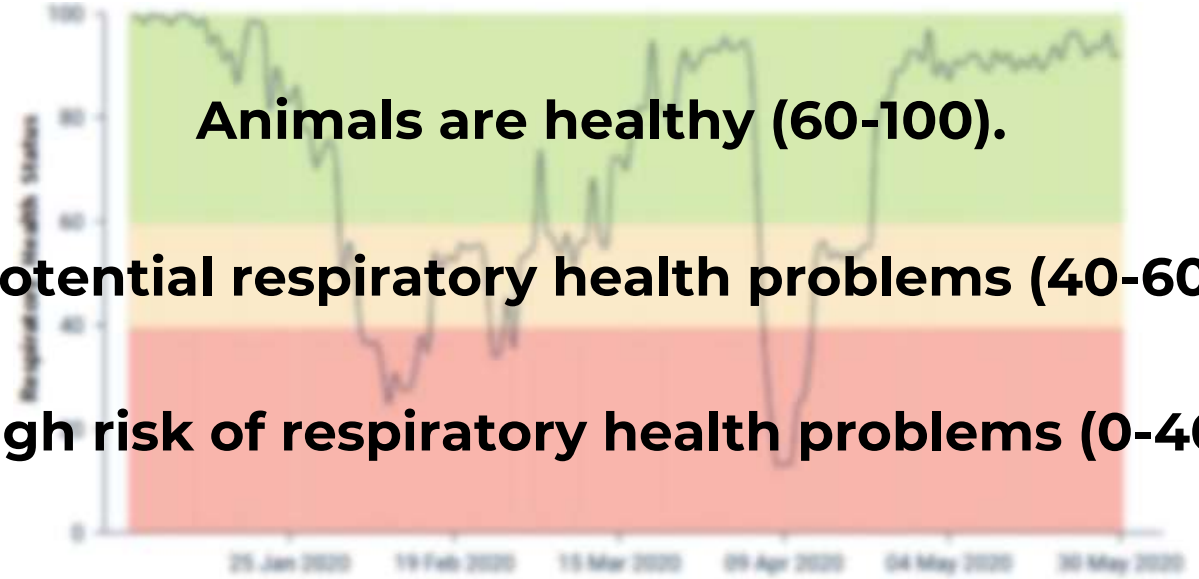
Animal-based parameters

- **Peek Analytics®**
  - Activity level of animals

- **SoundTalks®**
  - Respiratory Health Score (ReHS)



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Reference indicators

Nursery farm: 54 days

n=60
30 ♂ 30 ♀

Fattening farm: 78 days

n=60
30 ♂ 30 ♀

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Statistical analysis

- Generalized linear models (GLMs)
  - **Model 1:**
    - Response variable: Activity level/ReHS
    - Explanatory variables: Date*, Temperature*, Humidity*, CO_2*, and NH_3*
  - **Model 2:**
    - Response variable: Skin lesions/Salivary biomarkers
    - Explanatory variable: Date*, Temperature*, Humidity*, CO_2*, NH_3*, and Activity level/ReHS*

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Results

- Salivary biomarkers:
  - Stress – cortisol, salivary α-amylase (sAA), oxytocin
  - Stress related to pain and discomfort – butyrylcholinesterase (BChE)
  - Inflammatory – haptoglobin (Hp)
  - Immune function - adenosine deaminase (ADA)
- Temperature ↑, Humidity and NH_3 ↓ → Activity ↑
- Humidity ↓, CO_2 and NH_3 ↑ → ReHS ↑
- Activity ↑ ≈ Ear lesions, total lesions, Hp, BChE ↑ ; oxytocin ↓
- ReHS ↑ ≈ Hp, sAA ↑

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Discussion and Conclusion

- Animal-based parameters, activity level and ReHS, were associated wit the environmental change

- Animal-based parameters, especially activity level, were also associated with the reference indicators

- The change of activity level and respiratory health may reflect the change of environmental conditions, which can affect aggression and physiological status of pigs

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Thank you!

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