Assessment of natural vs mechanical farm ventilation using daily registered data in fattening pigs

Chantziaras I.[1], De Meyer D.[2], Klinkenberg M.[1], Van Limbergen T.[1], Vrielinck L.[2], Pineiro C., Jimenez M., Dewulf J.[1], Kyriazakis I., Maes D.[1]

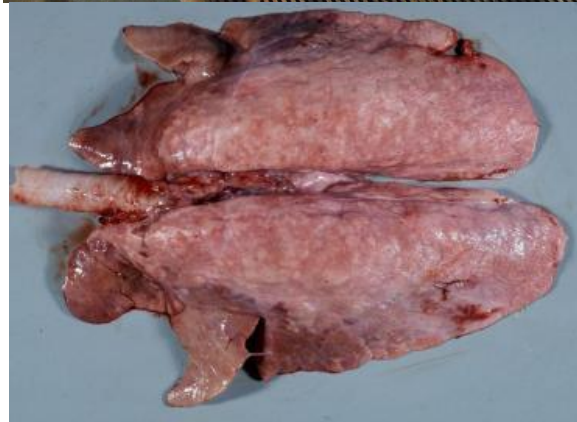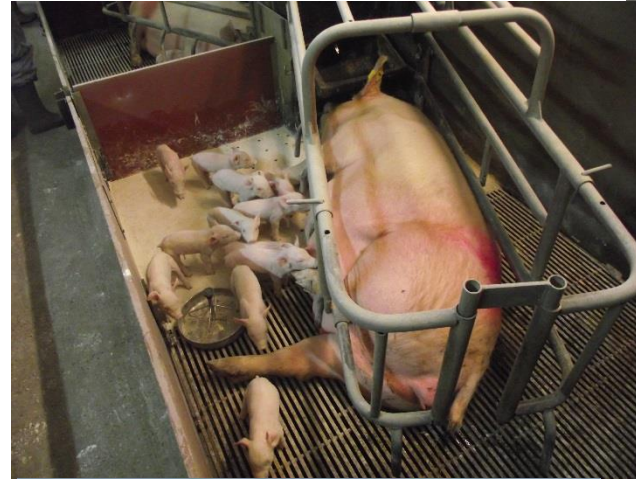[1]Faculty of Veterinary Medicine, Ghent University, 9820, Merelbeke, Belgium

[2]Vedanko bvba, 8750, Wingene, Belgium

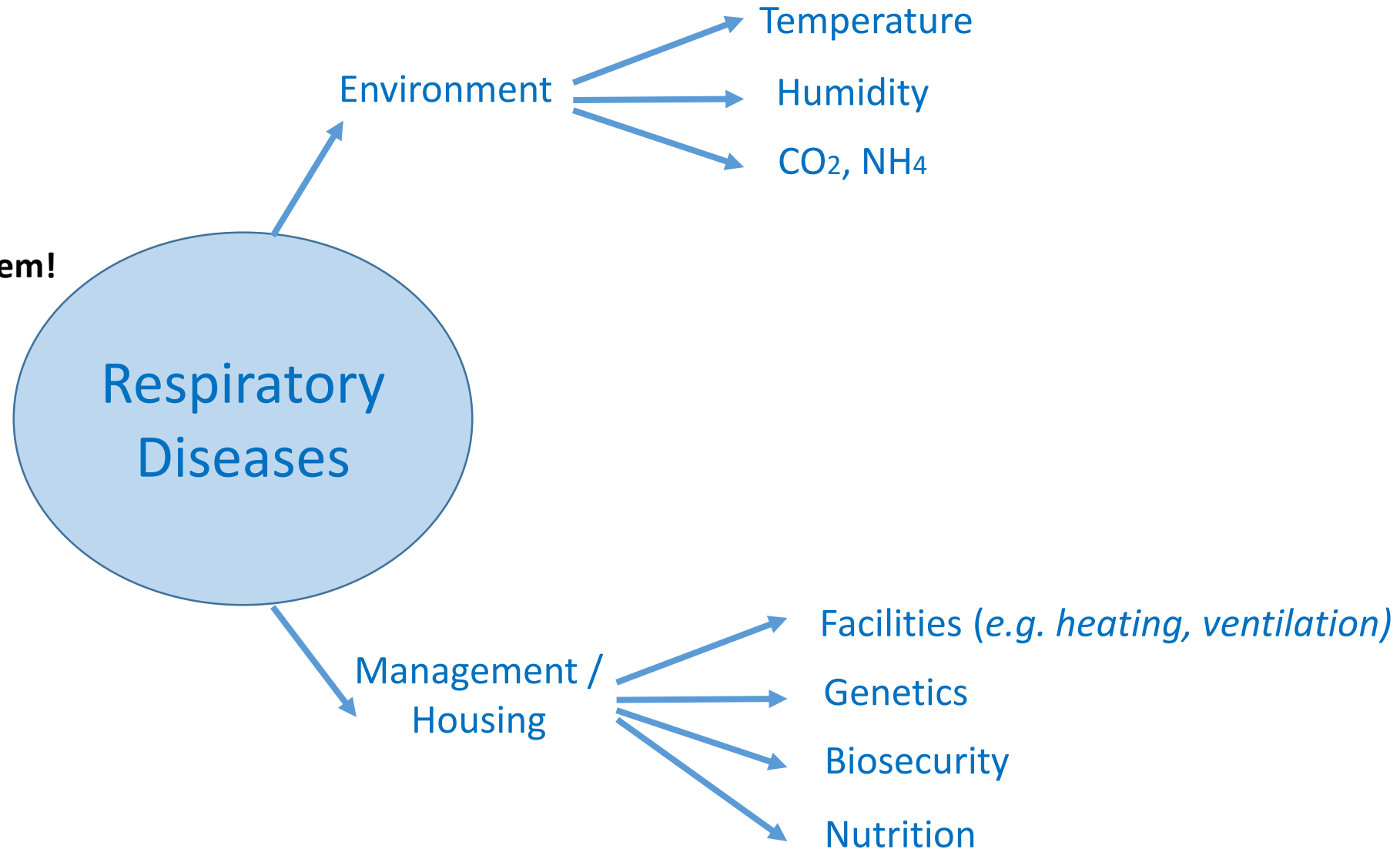[3]PigCHAMP Pro Europa, Segovia, Spain

Introduction

- Intensive pig farming
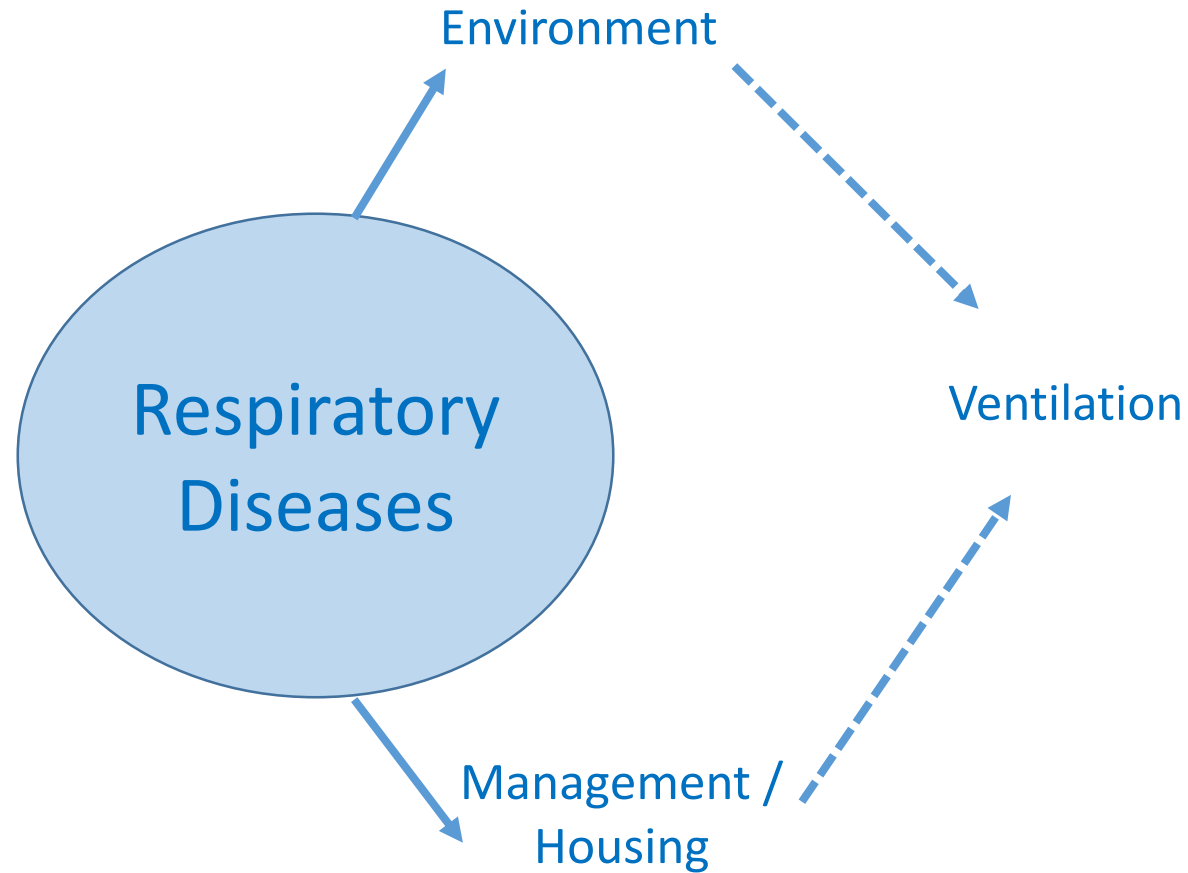
  - **Driven by production goals**

    - **Challenges?**

Introduction

- Respiratory diseases

  - **A multifactorial problem!**

Respiratory Diseases

Environment
- Temperature
- Humidity
- CO_2, NH_4

Management / Housing
- Facilities (*e.g. heating, ventilation*)
- Genetics
- Biosecurity
- Nutrition

Introduction

- Study focus

Respiratory Diseases → Environment → Ventilation → Management / Housing → Ventilation

Study aim

- To assess the effects of ventilation type (mechanical vs natural) on

  - **Respiratory disease** → Use of daily recorded data!

  - **Welfare** → Use of a welfare assessment score!

Study set up

- Use of a farrow-to-finish commercial farm in West Flanders, Belgium

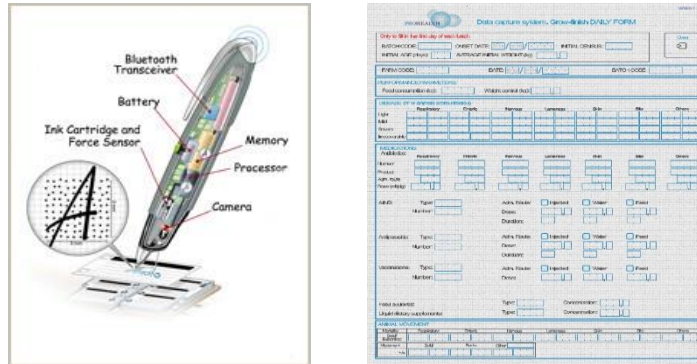- 3 successive production batches (from 08/2015 to 12/2016)

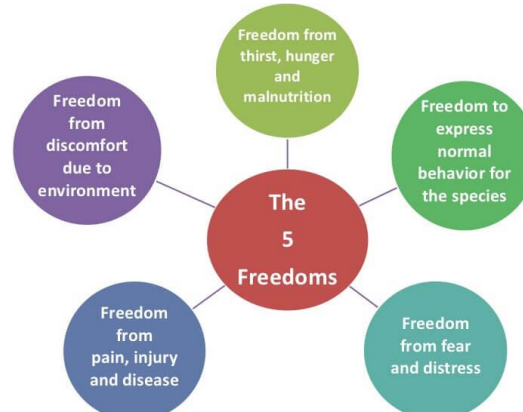# Measuring data

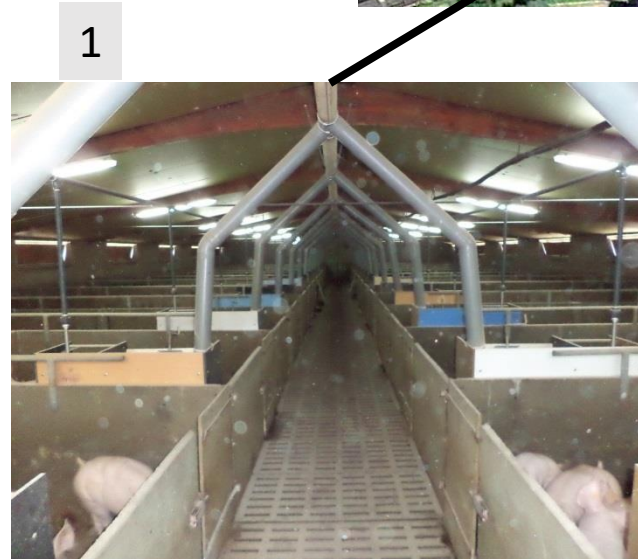- Environmental data

- Respiratory health data

- Welfare data
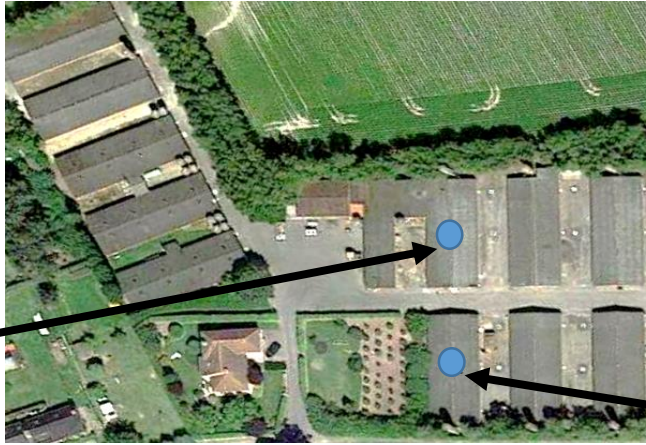
Welfare Quality®
Assessment protocol for pigs

Farm

- Comparing 2 fattening units:

  - Each unit : +/- 440 pigs

  - Each pen +/- 15 pigs

  - **IDENTICAL:** Genetics, biosecurity, nutrition, heating and floor type, vaccinations, anthelminthic treatments, stocking density, health management …
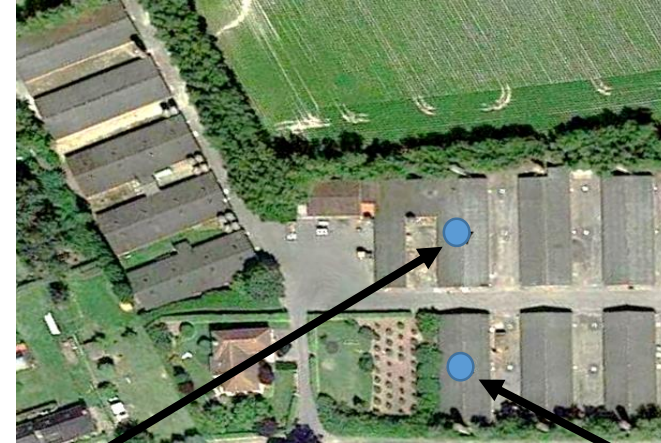
Farm

Unit 1

- **mechanical ventilation**

Air inlet:
- valves on both side-walls of the building

Air outlet:
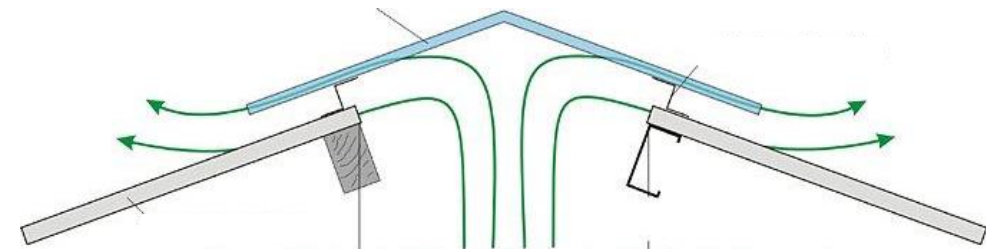- Ventilators on the front and the back side of the building

Unit 2

- **natural ventilation**
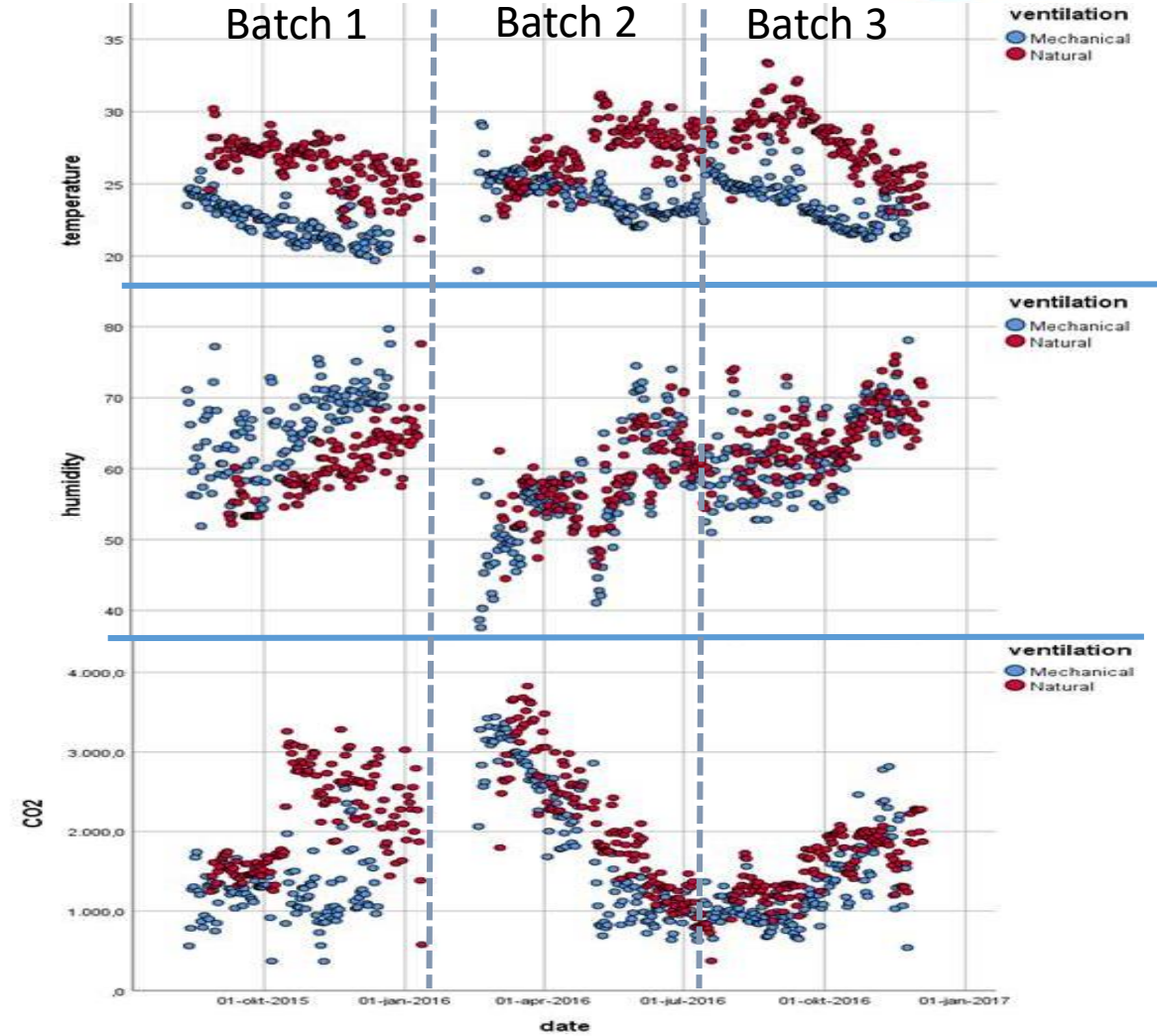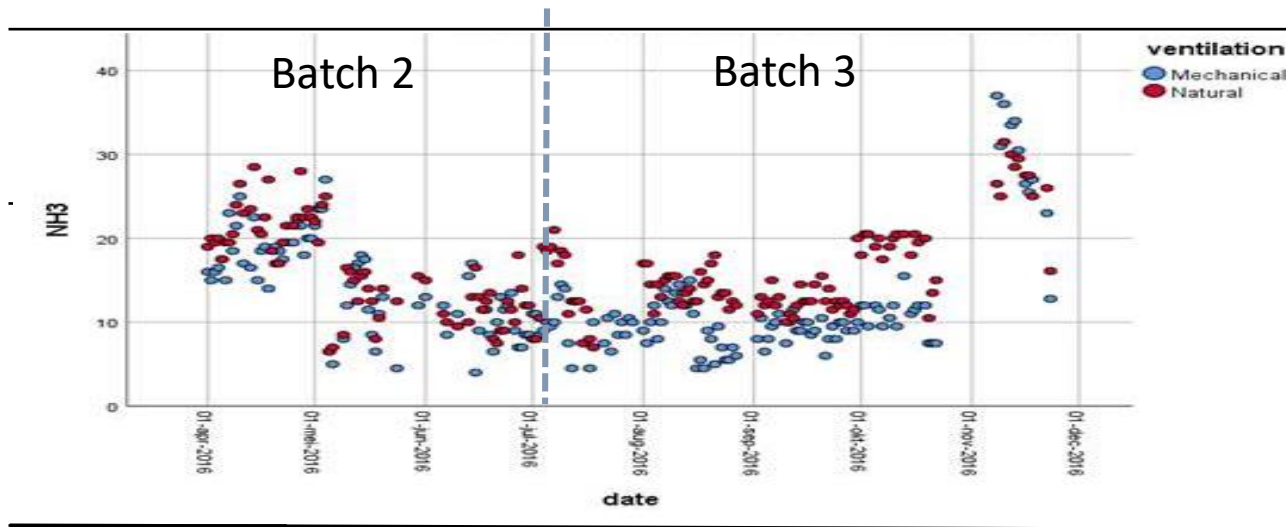
Air inlet:
- valves on both side-walls of the building

Air outlet:
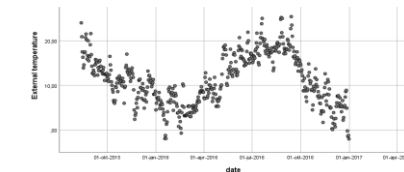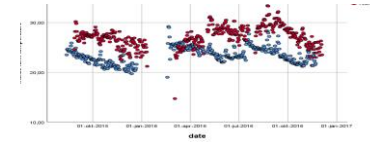- Passive ceiling ventilation
  - *via* ridge (roof)

Results

- Environmental conditions (indoor climate)

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Results

- Environmental conditions (indoor climate)

Median difference of 3.9 ^{0}C, 239 ppm CO2 and 4 ppm NH3 (p<0.001)

	Temperature ^{0}C	CO$_2$ (ppm)	NH$_3$ (ppm)
Mechanical ventilation	23.3	1254	10
Natural ventilation	26.9	1683	14

Results

- Respiratory disease

  - A median difference of 2 cases, P<0.001
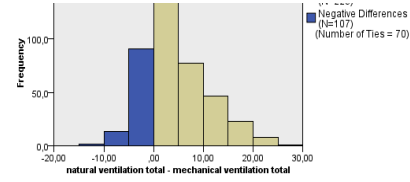
	Mechanical ventilation	Natural ventilation
Median	1 case	5 cases

Results

- Respiratory disease

  - zero-altered neg. binomial regression

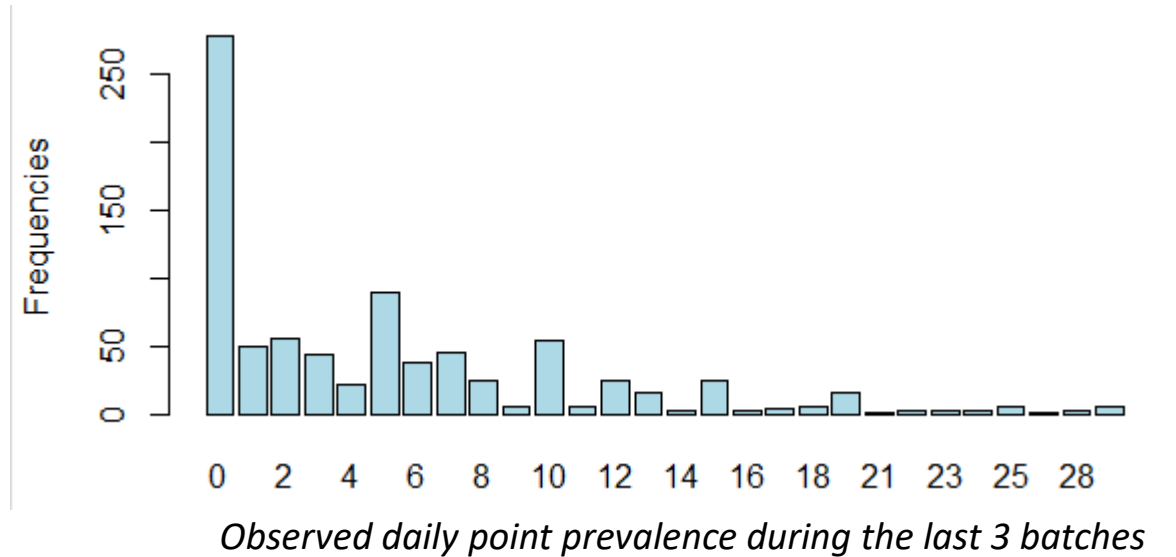|	**Natural ventilation**
	Odds ratio (95% C.I.)
Count model	**1.51 (1.35-1.68)**
Zero-hurdle model **(presence *vs* absence of a case)**	**4.15 (2.89-5.96)**

Ref. : when compared with mechanical ventilation

Frequency plot of point prevalence of respiratory disease

Observed daily point prevalence during the last 3 batches

accounted also for batch, season and age

Results

- Welfare assessments

Best welfare score is zero and the worst score is 28.

Ventilation	first assessment			last assessment		
	Mean	Median	SD	Mean	Median	SD
Mechanical	5.33	5.00	1.53	6.50	6.50	0.71
Natural	10.67	10.00	1.15	10.00	10.00	1.41

1st welfare assessment: 2-3 weeks after start of fattening period

2nd assessment: 3-4 weeks before end of fattening period
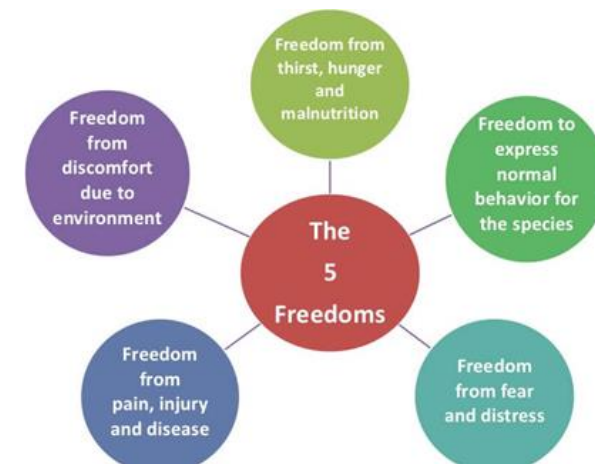
Conclusions

- Mechanical ventilation is linked with

    - ✓ favorable environmental conditions

    - ✓ lower prevalence of respiratory disease

    - ✓ better welfare conditions

Thank you for your attention!