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# Fine dust particles concentration increase during feeding time in a pig barn

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## INTRODUCTION

Airborne particle concentrations within livestock environment can be influenced by a wide complexity of variables:

1. The type of administered feed (heber et al, 1988),
2. Type of feed processing (costa et al., 2007),
3. Animal skin and hair, litters, faeces (mankell et al., 1995),
4. Ventilation rate (wang et al., 2000),
5. Air distribution (maghirang et al., 1994).

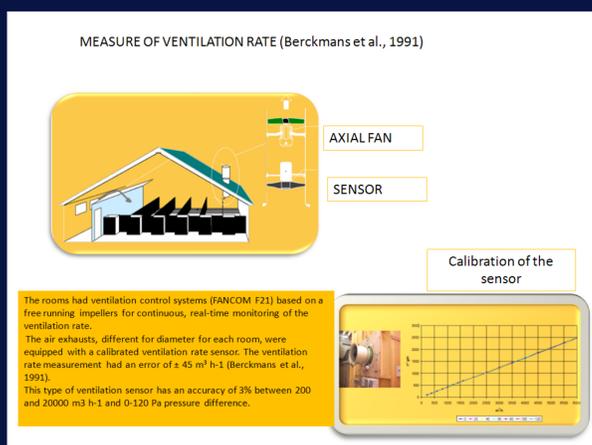
The activity level of reared animals contribute in a variable proportion to dust in animal buildings, moreover, animal activity induced by external inducements can rise or re-suspend dust particles in animal houses.

## OBJECTIVE

The aim of this study was to evaluate the contribution of animal activity to dust concentration peaks in a fattening pig room, with particular regard to fine dust (PM<sub>10</sub> and smaller particles, up to 0.25 µm), alveolar, thoracic and respirable dust.

## MATERIALS & METHODS

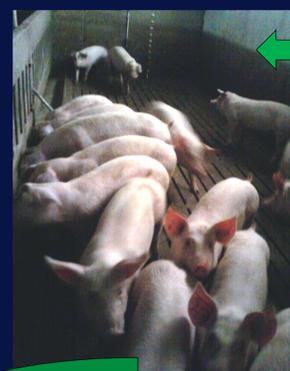
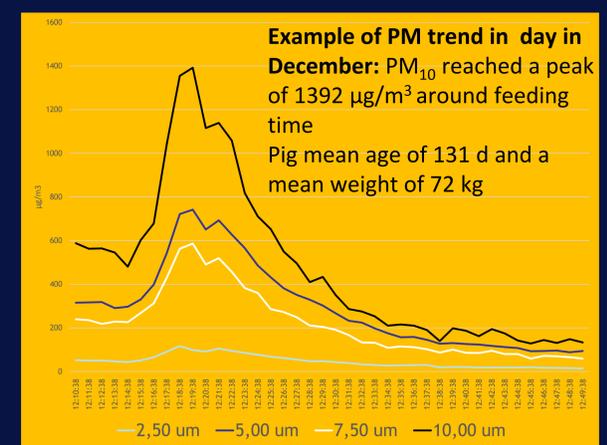
- A fattening room, with 363 pigs (35-105 kg)
- Animals were reared on concrete slatted floor in 16 boxes.
- During the trial, dust was measured through a GRIMM Portable Laser Aerosol Spectrometer Model Mini-LAS 11-R, to evaluate dust particles ranging from 0.25 µm to 30 µm, in mass and in counts.
- The instrument measured also alveolar, thoracic and respirable dust continuously.
- Measurements were performed at a height of 50 cm, at the respiratory apparatus level of pigs.
- In the barn, the liquid feeding was released three times a day.
- The piggery had a ventilation control system (FANCOM) based on a free running impellers (type Fancom FMS), for continuous, real-time monitoring of the ventilation rate.
- The room was equipped with three chimneys (16200 m<sup>3</sup>/h).



Ventilation rate calibration and monitoring

## RESULTS

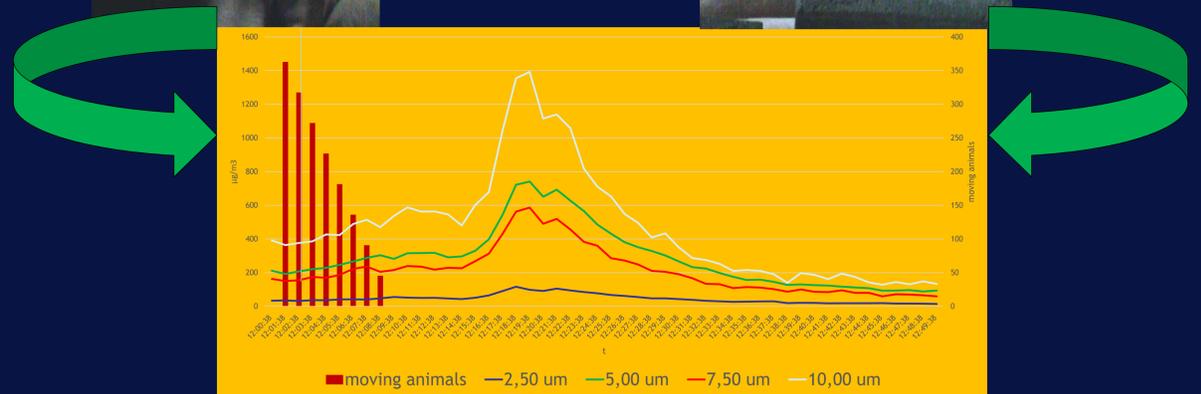
Environmental condition in the barn	Monitoring period: November- January	
Building	Floor	Slatted
	Manure removal	Vacuum system
Animals	Mean LW at the beginning(kg)	34
	Mean LW at the end (kg)	93
	Animals	363
	Feed	Liquid
Environment	Mean Temperature inside (° C)	18.7 (15.03; 21.00)
	Mean RH %	61(52;92)
	Mean temperature outside (° C)	7.11 (5.4-12.00)
	Mean RH %	59 (35;93)
Mean PM <sub>10</sub> concentration	Mean ventilation rate (m <sup>3</sup> /h)	7905
	(µg/m <sup>3</sup> )	780



Pigs excited before feed release



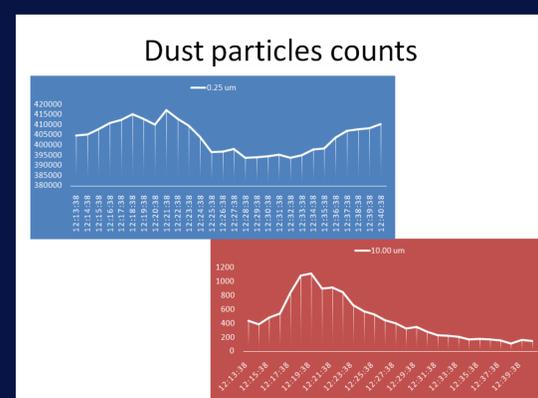
Pigs eating aligned at the trough



The trend of PM<sub>10</sub>, with a peak of dust concentration occurring 18 minutes after increased animal activity, was measured also for particles with aerodynamic size of PM<sub>0.5</sub>, while smaller particles kept a constant trend with values around 8 µg/m<sup>3</sup>.

A «Lag time» of 18 minutes from the beginning of animal activity for feed release to feeding time was detected, in 10 minutes most dust particles settled and dust concentration turned to around 200 micrograms/m<sup>3</sup> with all animals resting.

Mean value of inhalable particles was 2668 µg/m<sup>3</sup>, 1347 µg/m<sup>3</sup> of thoracic particles, 308 µg/m<sup>3</sup> of alveolar particles: a severe environmental situation, occurring for around 40 min before and after feed release.



## CONCLUSIONS

The trial revealed that dust level increase is linked (with a lag time) to animal activity during feeding time. A similar environmental condition occurs during workers and vets inspection (even more during vaccination). At this point, preventive actions to contain dust concentration increase are needed to guarantee the health status of animals and workers.