

Exposure of swine farm workers to dust during different working tasks

Nadine GUINGAND (1) Cyrielle DELAGE, Solène LAGADEC (2)

(1) Ifip-Institut du porc, La Motte au Vicomte, 35651 Le Rheu Cedex, France - (2) CRAB, rue Maurice Le Lannou, 35042 Rennes Cedex, France

Corresponding author: Email: nadine.guingand@ifip.asso.fr



In France, as in many countries in Europe, the development of intensive livestock production has been associated with increased stocking density and herd size. This has been accompanied by a rise of airborne pollutants in the ambience of plants leading to higher exposures for workers. The aim of this study was to investigate the level of workers exposure during four different working tasks which have been previously identified as the most dangerous in term of dust exposure combined with a high level of efforts. The global project, led by the Brittany Chamber of Agriculture has a total of 20 farms and 60 workers followed during two consecutive periods. Results presented in this poster concerns only 10 farms and 30 workers followed during the summer period.

Material and Methods

Four working tasks

- Task 1: Postnatal piglet husbandry practices: various interventions were provided on piglets in order to increase piglets survival and sow welfare: tail docking, teeth clipping or grinding, castration and antibiotic injection
- Task 2: weaning of piglets: 3-4 weeks after birth, piglets are weaned from the sow and moved to others rooms
- Task 3: post-weaning piglet feeding: during the first days after weaning, farmers distribute meal feed to piglets
- Task 4: fattening pigs sorting: 13-15 weeks after weaning, farmers sort heaviest pigs for slaughter

Measurements and recording

- Information on working tasks (type, duration)
- Stable characteristics (type of floor, ventilation system, number and size of fan, slurry management, air treatment...) and number of animals per category
- Dust concentrations (TSP, PM₁₀, PM_{2.5}, PM₁) measured by GRIMM spectrometer and CIP10
- NH₃, CO₂ and H₂S concentrations measured by using direct-reading diffusion tubes (Dräger)
- Temperature and hygrometry measured inside and outside buildings (Conrad DL-121 TH)



Photo 1: on the left: personal air sampler during the teeth clipping – on the right: dust measurements with Grimm spectrometer

Results

High variability between tasks

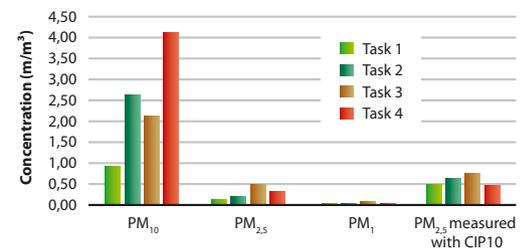
- Average duration task was 49±38 minutes.
- The minimum value was logically obtained for the task 3 (manual distribution of feed for post-weaning piglets) with 13±4 minutes and the maximum value for the task 1 (post natal piglet husbandry practices) with 83±42 minutes.
- Highest average NH₃ concentrations measured during pigs sorting (table 1), directly linked with the heavy weight of pig and slurry stored in the pit.
- NH₃ concentrations lower than the occupational exposure limit imposed by the French legislation on working conditions
- No hydrogen sulfide detected during task and appropriate levels of CO₂ showing the correct management of ventilation inside buildings
- TSP between 1.7 ± 1.0 mg/m³ for task 1 and 240.0 ± 42.0 mg/m³ for task 3
- PM_{2.5} measured with CIP10 were slightly above those measured in the ambience
- Lowest concentrations of particles (all fractions) during task 1
- Highest concentrations of PM₁₀ during task 4 directly linked with animal weight

Table 1: Gaseous concentrations per task

Task	NH ₃ (ppm)	CO ₂ (%)	H ₂ S (ppm)
Task 1	2.6±1.8	0.11±0.10	nd
Task 2	4.0±1.3	0.10±0.10	nd
Task 3	3.8±3.0	0.13±0.09	nd
Task 4	8.8±5.6	0.12±0.08	nd

nd: non detected

Figure: Dust concentrations per task



Conclusion

In our study, the highest concentrations of particles and ammonia were measured during the pig sorting. High levels of exposure were combined with an intense physical activity of farm workers. It appeared as the most risky task for workers. At the opposite, postnatal piglet husbandry practices generated the lowest levels of particles and ammonia showing a lower level of risk for workers. Nevertheless, it was the longest task in term of duration.