

Comparison of Urination Frequency of Grower-Finisher Pigs to Ammonia Emission

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Summary

A computer model can predict ammonia emissions if the number of urine puddles in a room is known. Seventy-two pigs were observed for 26 h at three different times during their grow-finish phase. Urination frequency was similar for males and females and did not change with age. The maximum number of events was between 12h00 and 20h00. Early morning events were rare. Emissions from the room cannot be directly linked to the urination pattern at this point, as puddles will emit ammonia for many hours.

Introduction

Ammonia is a well-known nuisance compound and is the product of urea breakdown in urine puddles and slurry. Therefore, number and location of urine puddles in a grower-finisher room with partially slatted floor is related to ammonia concentration in the room. If the number of puddles is known, it will be possible to calculate how much ammonia is being emitted over a 24-hr period. In agreement with the literature, the contribution of faeces to ammonia emissions is negligible.

The objective of this experiment was to determine the number of urinations per pig per hour to quantify the number of puddles on the floor.

Experimental Procedures

Behaviour measurements were taken during one growth cycle of grower-finisher pigs. One room with six pens (12 pigs per pen) was observed on three occasions at an average pig weight of 50, 64 and 77 kg. There were three pens of females and three pens of males. Each pen was observed for eight minutes each hour, for 26 hr total (10h00 to 12h00 the following day). Observers sitting outside the pen recorded the number of urinations and defecations per pen. Lighting was reduced to 1.6 W/m² from 19h00 until 7h00 the following morning, to mimic night conditions with enough light to see activities.

Ammonia concentration in the room was measured periodically during each observation period with an infrared analyser. Ventilation

rate was calculated by fan rotational speeds and room static pressure.

Results and Discussion

For females, the maximum number of urinations per pig per hour was 1.3 at approximately 16h00. From 3h00 to 5h00, only one in 10 pigs would urinate in an hour. Similarly, the highest number of male urinations per hour was 1.5 at 11h00. At 4h00 there were no observed urinations by males (Figure 1). The data from males and females were similar enough that it will be possible to combine data to develop an overall pattern of urination frequency. Defecation frequencies were similar to urination frequencies.

Even though larger pigs may excrete more urine, data shows that for the three different average weights, the frequency is the same.

Figure 2 compares urination frequency pattern to ammonia emission for the same period. Between 16h00 in the afternoon and 08h00 the following day, ammonia emissions varied in a range of 4 to 5 mg/s. Over that time, urination frequency oscillated between 2 and 3 Event/h per pig and went down to 0 Event/h per pig for three hours (03h00 to 06h00). Even if no urine was excreted for three hours, room emissions stayed relatively the same. Emission from a puddle can continue for many hours, so further investigation into the emission pattern from a single puddle may help explain why there is little variation in ammonia emission when there is a greater variation in urination frequency.

Implications

By monitoring and observing the urination frequency of grower finisher pigs, it will be possible to develop a curve to predict the number of urinations by a pig on an hourly basis. This will be important when trying to predict ammonia emission from a room since the urine puddles on the floor contribute significantly to the overall ammonia production in a room. Since there is no direct correlation between the number of urinations and the ammonia emission, further investigations into the release of ammonia from individual puddles over time will be required in order to predict the ammonia emissions to the environment, based on the number of pigs and their urination frequency.

Acknowledgements

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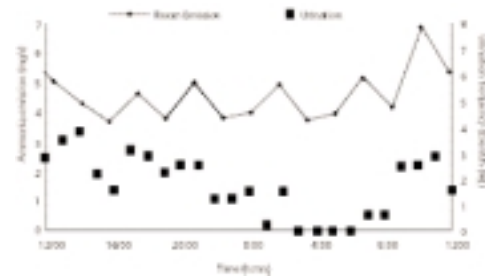


Figure 2: Room ammonia emissions and urination frequency from October 18th to 19th, 2001.

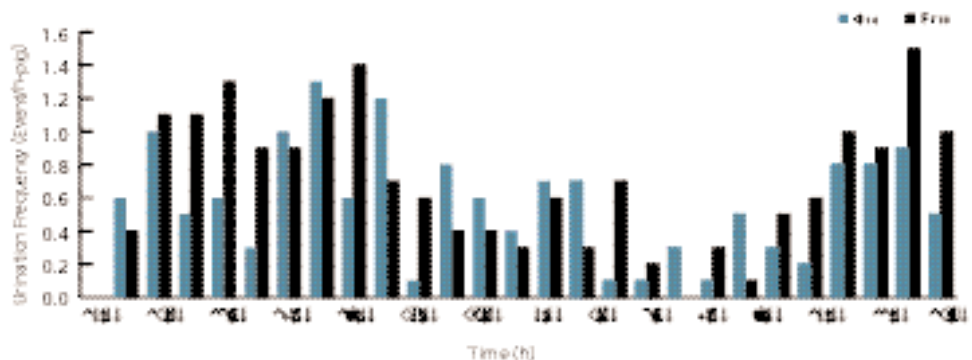


Figure 1: Average urination frequency for males and females.

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