Heat Lamp vs. Heat Mat as Localized Heat Source in Swine Farrowing Crate

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Summary and Implications

Three, 40-crate farrowing rooms were selected for this comparison study. Half of each room used heat lamps for localized piglet heating while the other half of each room used heat mats. Sixteen turns over 12 months were monitored for power use, piglet mortality, and average weight gain. The only significant impact of either localized heating system was on the power use, where the mats were 36% lower than the lamps.

Introduction

Swine farrowing operations face the unique challenge of maintaining two distinct thermal environments in the same facility. A sow and her piglets have very different thermal needs. Piglets require a dry, draft-free space at 32.2-35°C (90-95°F), while sows prefer a temperature of 15.5-18.3°C (60-65°F). To meet these two needs, the room temperature is often kept in the 18.3-23.9°C (65-75°F) range and localized heating is provided to the piglets. There are two main methods of localized heating in the U.S. swine industry, heat lamps and heat mats. There has been some work in the past examining the two heating systems. Due to the current size of litters at weaning (~10 per litter), a larger heated area may be needed to fit all the piglets. The typical 0.3 by 1.2 m (1ft by 4ft) heat mat might not provide enough area; hence 0.3 by 1.5 m (1ft by 5ft) heat mats were used in this study. The objective of this study was to quantify the effects of localized heating type – mat or lamp on piglet mortality, rate of gain, and electric power use in modern swine farrowing rooms.

Materials and Methods

For this study, three 40-crate farrowing rooms were equipped with 125W heat lamps in half of the crates and 290W 0.6m x 1.5m (2ft x 5ft) double heat mats shared between two crates in the other half of the crates (Figure 1). A temperature dependent, variable output controller regulates the power supply to the mats. The lamps were controlled on/off by the room ventilation system controller and turned off when the room temperature exceeded the set point by 5.5°C (10°F). Electricity use of each half of the rooms was measured separately with electric meters and piglet performance was recorded by farm personnel and our research group.
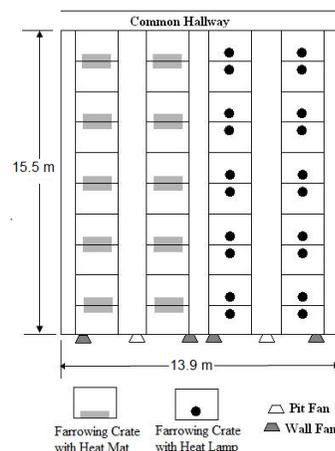

Figure 1. Dimensions and layout of the farrowing rooms with 20 crates utilizing heat mats and 20 crates utilizing heat lamps (1 m = 3.28 ft).

Results and Discussion

The average weight gain (AWG) for piglets reared on heat mats versus heat lamps for the pre-weaning period is shown in Figure 2. There was no significant difference (P=0.63) between the two systems. The AWG (±SE) was 224 g/d (±5.7) and 220 g/d (±5.9) for the mat and lamps, respectively. Figure 3 shows the comparison of mortality rates between the mats and lamps. Again, there was no significant difference (P=0.59) between the two systems. Overall, the pre-weaning piglet mortality (±SE) was 7.8% (±0.4%) with heat mats and 7.4% (±0.5%) with heat lamps. The turn-by-turn power use values are shown in Figure 4. The cumulative power use per turn (±SE) was normalized to the specific mass of weaned piglets. The mats consumed an average of 0.66 (±0.06) kWh per kg (0.3 (±0.03) kWh per lb) weaned piglet while the lamps consumed 1.05 (±0.04) kWh per kg (0.48 (±0.02) kWh per lb) weaned piglet. This reduction was significant (P<0.0001) and resulted in a 36% reduction in power use by the mats compared to the lamps. With an assumed electricity rate of $0.07 per kWh, this represents a $0.026 per kg of weaned piglet or $0.14 per weaned piglet savings by the mats. This study also included thermographical (IR) images of piglet usage of the mats and lamps. Analysis of these images is ongoing and will be published as a part of the final results of the project.
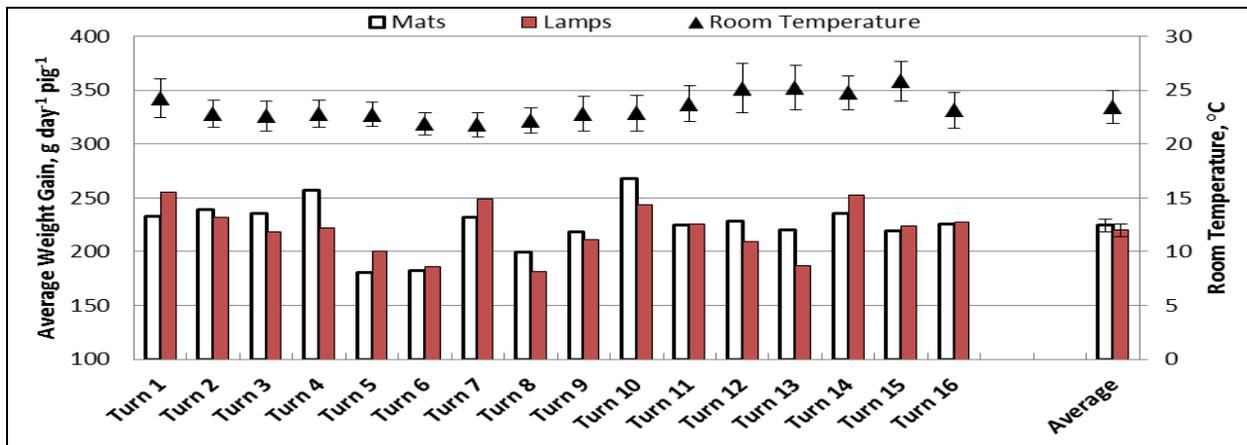
Acknowledgments

Figure 2. Average weight gain (AWG) of piglets reared in farrowing crates with either heat mats or heat lamps for localized heating for each farrowing turn, the overall AWG (±SE), and the average room temperature (±SD) for each turn (1 lb = 454 g; ºF = 1.8 × ºC + 32).
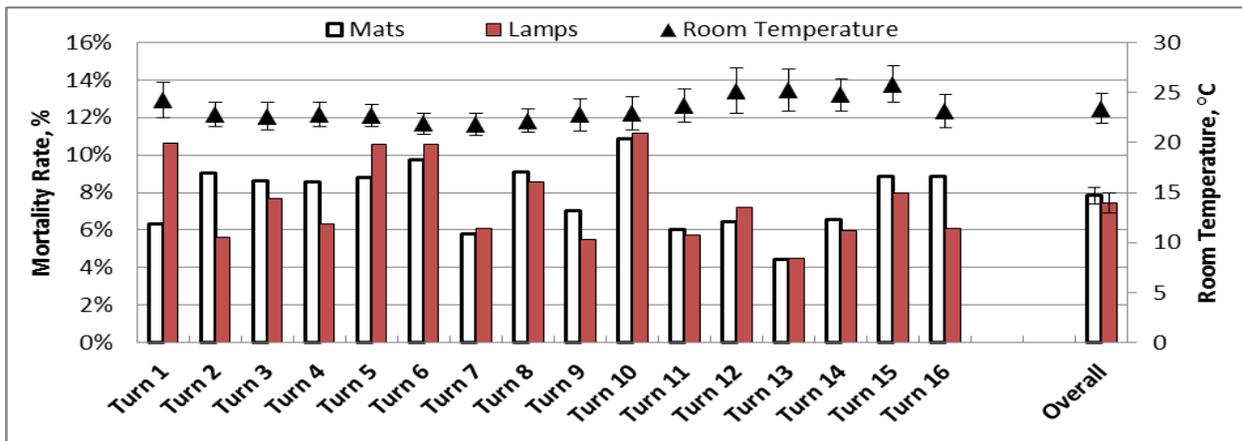

Figure 3. Mortality rate of piglets reared in farrowing crates with either heat mats or heat lamps for localized heating for each farrowing turn, the overall mortality rate (±SE), and the average room temperature (±SD) for each turn (ºF = 1.8 × ºC + 32).
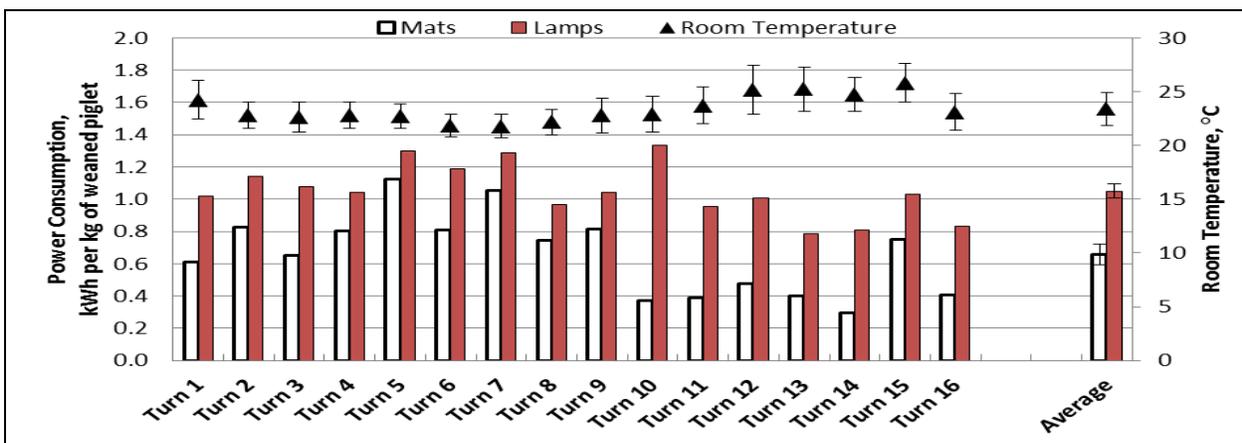

Figure 4. Power consumption per kg of weaned pig per farrowing turn for mats and lamps, the overall power consumption per kg of weaned pig (±SE), and the average room temperature (±SD) for each turn (1 kg = 2.2 lb; ºF = 1.8 × ºC + 32).