

projects be multidisciplinary in their approach and should include neuroscience, performance, physiology, and behavior when applicable. In addition to National Pork Board, animal welfare research funding is available through government agencies such as the US Department of Agriculture's National Institute for Food and Agriculture, Agriculture Research Service, and the Foundation for Food and Agriculture Research.

Key Words: research, swine, welfare

11 Impact of Heat Stress on Livestock and Mitigation Strategies to Improve Productivity and Well-Being.

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Extreme heat events may induce sub-optimal livestock performance and the negative impact of heat stress (HS) on animal productivity is often a symptom of a larger welfare issue. Poor welfare will occur when an individual has difficulty adapting to a stressor resulting in a greater strain response. This response may vary depending on previous HS exposure, genetics, species, or production stage and the physiological changes that occur to ensure survival may impede the efficient conversion of feed energy into animal products. The impact of HS on livestock productivity is well-documented and ranges from decreased feed intake, body weight gain, and reproductive efficiency to altered carcass composition and meat quality. As a result, decreased animal performance may cause profit losses for producers and can affect the economic sustainability of all livestock industries. Furthermore, food security may be threatened in regions that experience year round HS. Given the negative impacts of HS on livestock, appropriate mitigation strategies must be implemented to maintain productivity during times of high thermal heat loads and promote recovery after HS has occurred. Strategies to mitigate the effects of HS may vary depending on region, resources (economic and natural), and species. They can include management strategies (i.e., use of cooling technologies, etc.), genetic improvements, and nutritional additives. Mitigating the negative effects of HS is key to improving productivity, preserving proper animal welfare standards, and reducing the stress load incurred by livestock species.

Key Words: heat stress, productivity, well-being

12 The Canadian Pork Industry's Perspective on Swine Welfare Research. M. Fynn*, *Manitoba Pork, Winnipeg, MB, Canada*

The Canadian pork industry places a high priority on swine welfare and strives to continuously improve it.

Canada has a long history of producing high-quality swine welfare research from its universities and centres of excellence, much of which is highly and immediately applicable to the industry. The most recent edition of the Code of Practice for the Care and Handling of Pigs, which outlines standards of care expected at all Canadian pig farms, was developed by the industry and published in 2014. The development and implementation of the Code identified a number of priorities related to swine welfare that require further research. Other research priorities to address current welfare challenges in the Canadian pork industry have also been identified recently. These priorities include social, environmental, nutritional, and management factors that impact swine welfare.

Key Words: swine welfare, Canadian pork industry, pigs

ANIMAL BEHAVIOR, HOUSING AND WELL-BEING

13 Effect of Floor Space Allowances on Growth

Performance of Finishing Pigs Marketed at 138

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Floor space allowances for market pigs were determined 10 to 20 years ago using pigs that were marketed at a body weight of about 113 kg or less. Currently, pigs are regularly marketed at over 128 kg. In light of this increased weight, we conducted two experiments to determine if current floor space allowances apply to pigs marketed at greater than 128 kg. In Exp. 1 conducted at 5 university research stations, we evaluated the growth performance, salivary cortisol concentrations, and lesion scores of pigs weighing between 27 and 138 kg provided 0.71, 0.80, 0.89, 0.98, or 1.07 m²/pig of floor space. Within station, group size (range = 6 to 19 pigs) remained constant across floor space treatments but pen size was altered to achieve the desired space allocations. There were 14 replicate pens for each treatment and pen groups remained intact until the end of the experiment. Overall, increasing floor space allowance increased final BW (linear, $P = 0.04$) and tended (linear, $P < 0.06$) to

Table 1. Effect of floor space allowance for pigs weighing 130 kg (Exp. 2)

Trait	Floor space allowances (m ² /pig)					SE
	0.71	0.80	0.89	0.98	1.07	
ADG ¹ , kg	0.86	0.95	0.95	1.10	1.06	0.04
ADFI ² , kg	3.03	3.26	3.22	3.49	3.25	0.06
Final BW ¹ , kg	145.6	145.7	146.4	148.3	147.9	0.64

¹Linear effect of floor space; ²Quadratic effect of floor space.

increase ADG and ADFI. There were no improvements in final BW or ADG beyond 0.89 m²/pig. Neither gain:feed, salivary cortisol concentrations nor lesion scores were affected by floor space allowances. Floor space needs of pigs nearing market weight was the focus of Exp. 2 conducted at 4 research stations. Pigs weighing about 130 kg were assigned to pens that provided the same space allowances as Exp. 1. Group size ranged from 4 to 11 pigs per pen but was constant across floor space treatments within station. The study lasted 2 wk and there were 8 replicate pens per treatment. As floor space allowance increased, ADG (linear, $P < 0.01$), ADFI (quadratic, $P < 0.05$), and final BW (linear, $P < 0.01$) increased (Table 1). Based on the results of these two experiments, pigs marketed at about 138 kg require at least 0.89 m²/pig to support optimal growth performance. However, heavier pigs (about 148 kg) at the end of the finishing period require 0.98 m²/pig.

Key Words: finishing pig, floor space, swine

14 Evaluation of Floor Cooling on Lactating Sows Under Mild and Moderate Heat Stress.

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The effectiveness of sow cooling pads during lactation was evaluated under mild and moderate heat stress

conditions to reduce indicators of heat stress. The moderate heat stress rooms (n = 2) were targeted to achieve 32°C from 0800-1600 h and 27°C for the rest of the 24-hour day. The mild heat stress rooms (n = 2) were targeted to achieve 27°C and 22°C for the same periods, respectively. Yorkshire-Landrace sows were blocked by parity and BW, and assigned to two farrowing rooms which differed only in environmental temperature. Each sow was provided a cooling pad made with aluminum plate on top, a high-density polyethylene base, and eight copper water pipes. Sows received either a constant cool water flow of 0.00 (CONTROL, n = 9), 0.25 (LOW, n = 12), or 0.50 (HIGH, n = 10) L/min. Water inlet and outlet temperatures and flow rates were recorded to estimate heat removal. Respiration rates (RR) were measured for 2 -30 second intervals. Rectal temperatures (RT), skin temperatures 15 cm behind the ear (ST) and RR's were recorded every day (0700 and 1500 h) from the second day in the farrowing room to weaning. The sow RR, ST, RT and estimated heat removal were affected ($P < 0.036$) by pad treatment (PT), time of day, room temperature (RTEMP), day of lactation, and all two variable interactions. The RR increased ($P < 0.001$) as heat stress increased. The difference in heat removal between the HIGH and LOW flow rates was 16 watts (132.1 versus 116.1) in the mild heat stress rooms, but increased to 43.4 watts in the moderate heat stress rooms (181.4 versus 138.0, ($P = 0.048$ for RTEMP × PT). Sow cooling pads reduced measures of heat stress. The results indicate that the LOW flow rate is adequate from 22 to 27°C (with 40 to 45 % relative humidity) but the HIGH flow rate is needed at temperatures above 27°C.

Key Words: cooling pads, heat stress, sow

Variable	Pad Treatment	Mild – 700 h	Moderate – 700 h	Mild – 1500 h	Moderate – 1500 h
RR	CON	23	56	41	89
	LOW	21	24	29	41
	HIGH	18	20	24	27
ST	CON	35.4	37.3	37.2	37.3
	LOW	34.4	36.5	36.6	36.5
	HIGH	33.7	36.2	36.5	36.2
RT	CON	38.8	39.0	39.2	39.6
	LOW	38.8	38.8	39.1	39.0
	HIGH	38.8	38.8	39.1	39.0