Quantifying Cortisol in Hair of Sows Housed in Pen and Stall Gestation

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Introduction

There is consumer pressure in the US to ban the use of gestation stalls to improve sow welfare. Welfare and management concerns with group housed sows related to injuries and stress from fighting has limited widespread adoption of group sow housing in the US.

Cortisol is a biomarker for stress, but its concentrations fluctuate diurnally and in response to stressors and may not adequately reflect stress over an extended period of time or account for individual stress response to handling during sample collection.

Blood cortisol deposits in growing hair, so frequent, repeated periods of stress leads to higher cortisol in the hair that grew during the stressful experience. Hair cortisol may, therefore, be a better indicator of chronic stress during gestation.

Objective

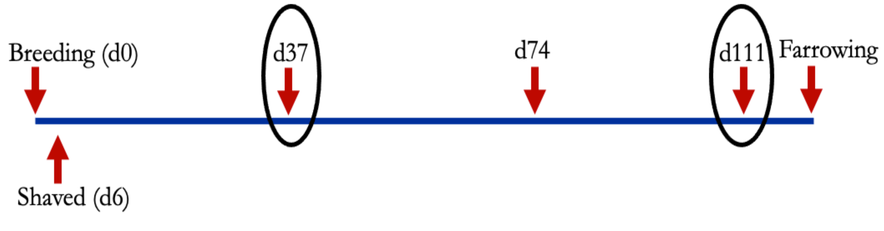
To determine the hair cortisol concentrations (HCC) of sows in two different gestation housing systems

Materials and Methods

66 sows, parity 0-6

- 34 in stalls (2ft x 6.5ft)
- 32 in group pens (28ft x 26.9 ft). Gilts were housed in one pen, and sows were split between 2 pens (10-15/pen).

Hair was shaved and collected from a 400 cm^2 section on the right hip at d6, d37, d74, and d111 of gestation. Cortisol concentration was determined in samples from d37 and d111.



Cortisol extraction: washed hair in methanol, ground using Retsch MM310 ball mill, added 0.5ml methanol per 25mg powdered hair and rotated 16-24hr, centrifuged, collected and dried supernatant. Samples analyzed using a cortisol EIA (EA65, Oxford Biomedical, Rochester Hills, MI, USA).

Using PROC MIXED procedure of SAS, the main effects of the housing system, time, and their interactions were tested, with parity as random effect. Sows were split into 3 parity groups, 0-1 (n=23), 2-3 (n=17), and ≥4 (n=26).

Results

Figure 1 **Housing**

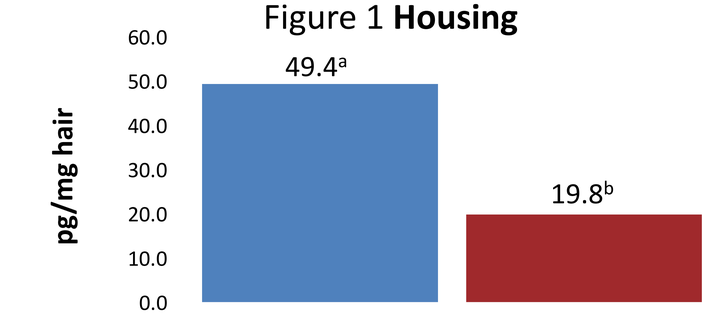






Figure 2
Treatment x Parity

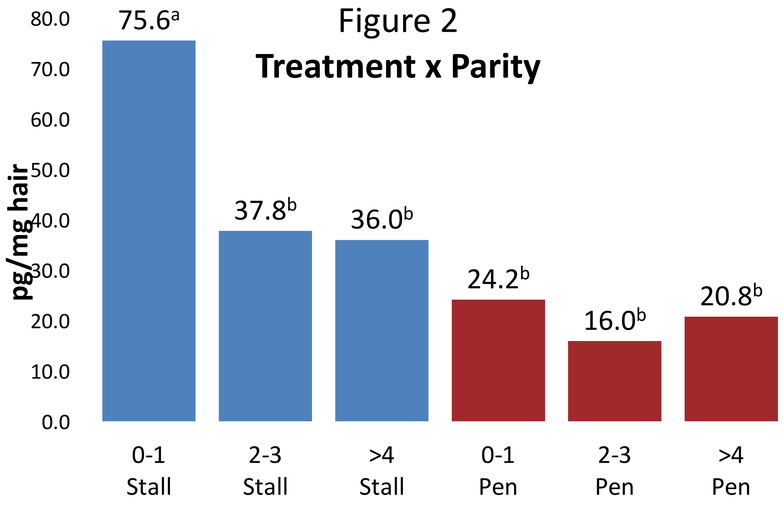


Figure 3
Time x Treatment

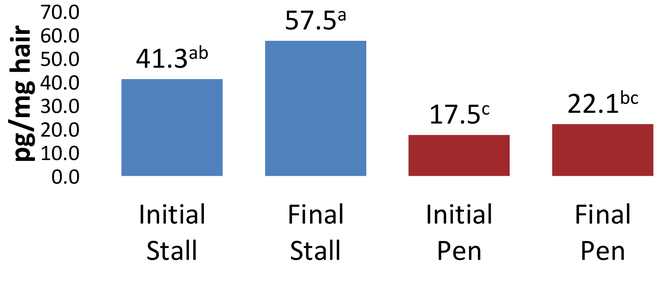
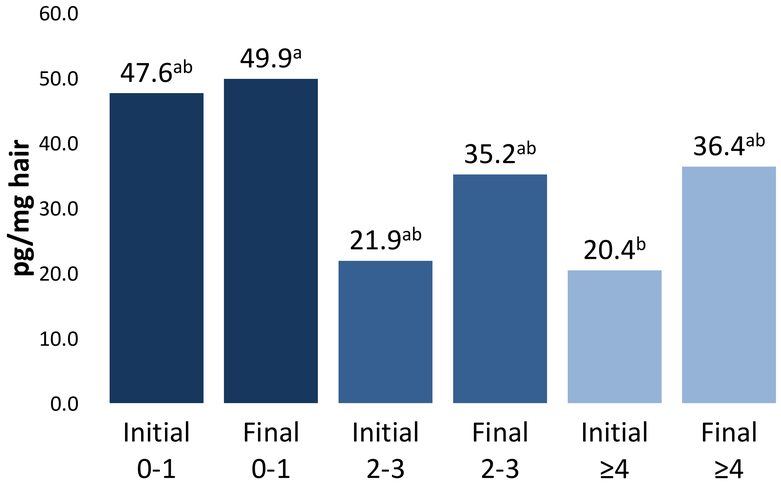


Figure 4
Time x Parity



Discussion and Implications

In this trial, sows housed in stalls had higher HCC than sows housed in group pens, which may indicate stalled sows experience greater stress during gestation (Fig 1 Housing).

Gilts and first parity sows may find stall housing more stressful, and may benefit more from a group housing system than older females that have spent multiple parities in stalls (Fig. 2 Treatment and Parity).

Given that cortisol rises in late gestation, using cortisol as a physiological marker in late gestation may be less reflective of welfare and more an indicator of pregnancy progression (Fig 3 Time x Treatment). This may be most relevant in older parity sows (Fig 4 Time x Parity) and those in stalls (Fig 3 Time x Treatment) who have a more pronounced increase in HCC in late gestation.

More data is needed to accurately measure sow stress in various housing systems, so establishing hair cortisol as a consistent measure for long-term stress may be used in conjunction with other measures in future work for improving sow welfare.

Acknowledgements

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