

**Title:** Systematic Literature Review and Needs Assessment of Housing Systems for Lactating sows and Their Litters – **NPB #11-182** **revised**

**Investigator:** Thomas Parsons<sup>1</sup>

**Co-Investigator:** Laurie Mack

**Institution:** University of Pennsylvania, School of Veterinary Medicine

**Submitted:** 1/29/2015

**Contributing Authors:** L. A. Mack,\* E. M. Baxter,<sup>†</sup> M. J. Estienne,<sup>‡</sup> A. K. Johnson,<sup>§</sup> D. C. Lay Jr.,<sup>#</sup> Y. Z. Li,<sup>||</sup> J. N. Marchant-Forde,<sup>#</sup> M. A. Sutherland,<sup>¶</sup> S. R. Webb,<sup>°</sup> and T. D. Parsons\*

**Contributing author Institutions:**

\*Department of Clinical Studies, University of Pennsylvania, School of Veterinary Medicine, Kennett Square, PA, USA

<sup>†</sup>Animal Behavior and Welfare, Animal and Veterinary Science Research Group, SRUC, Edinburgh, UK

<sup>‡</sup>Department of Animal and Poultry Sciences, Virginia Polytechnic Institute and State University, Blacksburg, VA, USA

<sup>§</sup>Department of Animal Science, Iowa State University, Ames, IA, USA; <sup>#</sup>USDA-Agricultural Research Service, Livestock Behavior Research Unit, West Lafayette, IN, USA

<sup>||</sup>West Central Research and outreach Center, University of Minnesota, Morris, MN, USA

<sup>¶</sup>AgResearch Ltd, Ruakura Research Centre, Hamilton, NZ; <sup>°</sup>National Pork Board, Des Moines, IA, USA

---

These research results were submitted in fulfillment of checkoff-funded research projects. This report is published directly as submitted by the project's principal investigator. This report has not been peer-reviewed.

---

For more information contact:

National Pork Board • PO Box 9114 • Des Moines, IA 50306 USA • 800-456-7675 • Fax: 515-223-2646 • [pork.org](http://pork.org)

---

## SCIENTIFIC ABSTRACT

The farrowing crate is one of several common animal husbandry practices facing increased public scrutiny across the globe. Like a gestation stall, people are expressing welfare concerns about practices that restrict the movements of animals and are asking for alternative housing regimes. Unlike the gestation stall, the needs of the piglets also need to be considered when assessing welfare during this phase of production. The goal of this report is to review the scientific literature relevant to North American swine production on both sow and piglet welfare in different lactational housing systems. A systematic review process was adopted in an effort to achieve quantitative data synthesis of related research findings through inverse variance weighting meta-analysis. Two study subpopulations, sows and piglets, within the population of sows and litters of modern, commercial breeds were identified, as well as 4 housing interventions (farrowing crate, hinged crate, individual pen, and group pen) and a variety of welfare outcomes that could be grouped into 3 general categories (behavior, physiology, and performance). Given the paucity of relevant peer-reviewed reports on lactational housing, meta-analysis was abandoned and qualitative data synthesis pursued. Despite the scarcity of information on this topic, the following important themes emerged from our review. Farrowing crates likely provide welfare challenges to sows during the nesting and lactation phase of this stage of production. Resulting aberrant sow behaviors such as restlessness during farrowing and unresponsiveness to piglet vocalizations can contribute to piglet mortality observed in crates. However, the emerging consensus suggests that farrowing crates can provide a welfare advantage to the piglet by limiting additional mortality, especially during early lactation. Alternative farrowing systems can, but do not always, have comparable piglet performance, perhaps related to the role of

humans in the management of these systems. A secondary goal of this review was to detail knowledge gaps in the literature. Several possibly fruitful areas of future research are described that promise to contribute to the design of a lactational housing system that best optimizes the needs of the sow, the piglet, and the farmer.