

Title: DEVELOPMENT OF AN INTEGRATED COMPUTERIZED SENSING SYSTEM FOR REPRODUCTIVE MANAGEMENT OF THE SWINE BREEDING HERD – NPB FFAR #19-093

Investigator: Robert V. Knox

Institution: University of Illinois

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Scientific Abstract

Evaluation of electrical impedance spectroscopy to determine swine herd reproductive status using the accuracy of ultrasound and hormonal assays as diagnostic tools.

Raquel F. Vinas, Lidia S. Arend, Gustavo S. Silva, Aaron J. Lower, Joseph F. Connor, Bhalerao Kaustubh, André Furugen Cesar de Andrade, Robert V. Knox

Management of fertility determines production efficiency. Important fertility measures include detection of estrus (DE), early pregnancy confirmation (EPC), and day of farrowing (DF) with few tools available to diagnose or predict. Electrical impedance spectroscopy (EIS) uses an array of frequencies to determine tissue resistance in relation to change. Our objective was to determine if EIS can predict reproductive events. The study was conducted for DE using weaned sows (n=135) scanned on Days 1-7; EPC used inseminated sows (n=135) scanned on Days 18-20; and DF used pregnant sows on Days 113 to farrowing. The EIS device used a four-electrode transducer with an internal processor and connected to a mobile device for operation, reading, and data storage. The device obtained impedance (Ω) and phase data for analysis from 42 frequencies between 1,000 and 29,000 Hz. The device was disinfected and inserted into the vagina with scans requiring ~20 s. Data were uploaded to a server and stored on a website for labelling and analysis. Accuracy was based on DE, EPC on Day 30, and DF. Data were analyzed in RStudio using GLM with logistic regression to generate log-likelihood estimates for r^2 and associated P values. Predictive models for DE, EPC, and DF included EIS, day of measure, and parity. For DE, prediction was greatest 1 day before and on estrus ($r^2=0.98$), moderate 3 to 4 days before estrus ($r^2=0.59$) and not predictive ≥ 4 days before estrus. For EPC, the measures for EIS were not predictive due to limited numbers of non-pregnant sows (3%). For DF, prediction for 1 day before was ($r^2=0.98$), for 2 d ($r^2=0.89$), and for 3 d ($r^2=0.51$). Our preliminary results suggest impedance of the sow vagina can be used to predict events, but more data for failures and days will be needed to improve prediction.

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
