

The Weak Sow Index: A new method for optimal use of clinical information in sow herds

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Introduction

A HIGH MORTALITY in sow herds indicates health problems in the herd. This is a major problem in modern pig production world wide, affecting the farmer's economy and the welfare of individual sows.

Several disorders, such as shoulder ulcer, contusion of legs and injuries to the skin affect the health status of individual sows, and increase the risk for the sow to die suddenly or become euthanized.

Generally, the health status of individual sows is vaguely characterized based on presence or absence of diseases. In order to classify sows in regard to their health status, and hence risk of mortality, there is a need to develop a coherent framework which combines information about several diseases from an easy and valid clinical protocol.

Objective

The objective of this study is to develop a Weak Sow Index (WSI) that characterizes the health status of an individual pregnant sow using information from a simple clinical examination at sow level. The WSI expresses the probability of the sow to die or become euthanized.

Causal structure of the model

The WSI is modeled using a Bayesian network approach. A Bayesian network makes it possible to combine and present clinical information in a systematic way despite the potential incomplete nature of such data. In general, a Bayesian network model is a graphical model where all interdependencies are described using conditional probability distributions.

The causal structure of the model for the WSI is developed using biological knowledge and information obtained from published literature (literature references not presented). Figure 1 represents the preliminary model for the WSI of a sow.

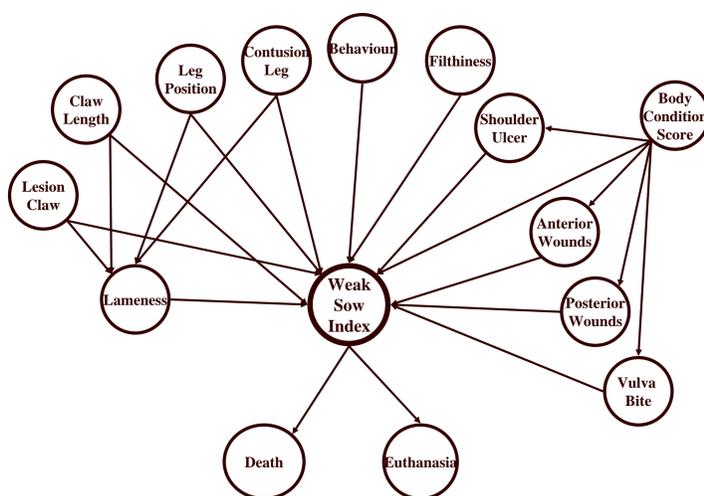


Figure 1: The Weak Sow Index (WSI) is modeled using information of clinical signs. The WSI expresses the risk of a sow to die or become euthanized. Arrows indicate the causal relations in the model

The WSI node

The WSI node combines clinical information of an individual sow, and is defined as a hypothetical variable on an arbitrary scale in the Bayesian network.

A low value for the WSI identifies a strong sow with a low probability to die or become euthanized. Contrary, a high value for the WSI represents a weak sow with a high probability for sudden death or euthanasiation.

The clinical nodes

The clinical nodes in the model represent information variables which provide evidence to the WSI of an individual sow. The clinical signs included in the WSI (Figure 1) are all presented on a discrete scale.



Figure 2: A pregnant sow with multiple clinical signs. The Weak Sow Index characterizes the health status of the sow by combining clinical information

Elicitation of probabilities

To investigate the causal structure of the WSI model (Figure 1), and to estimate the quantitative associations, data from 35 Danish sow herds is used.

Origin of data

Data was collected in the period from February 2008 until August 2008. In each herd, approximately 60 pregnant sows were randomly chosen and examined for clinical signs by 6 technicians (e.g. shoulder ulcer, presence of wounds, body condition score and clinical signs related to the locomotor system).

The farmers recorded all culling (e.g. sudden death and euthanasia) and the reasons for these action in a 3 month period. Hence, information about clinical signs and culling from 3500 pregnant sows are used in the elicitation of the conditional probabilities in the model.

Data analysis

Data is analyzed using Mixed Interaction Model (MIM), which is a program for graphical modeling [2].

MIM is used to identify whether the causal links in the model are significant (Figure 1). Moreover, MIM is used to estimate the conditional probabilities that is used in the Bayesian network model.

Results and future perspectives

- The WSI will be a new tool for classifying individual sows in regard to their health status, and hence, risk of mortality, using information from several clinical signs concomitantly.
- The Bayesian network allows the WSI to be presented using available information, and expressed with less precision in case some of the clinical information is missing.
- In the future, the WSI will be included in an existing decision support system for sows [1]. When integrating in the decision support system, the model will also be used to identify clinical signs of major economical importance of individual sows.
- **By including the WSI in an existing decision support system, the foundation for making efficient economical decisions in sow herds will improve.**

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