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SHORT COMMUNICATION

Examination of claw health is an important factor of better reproductive performance of sow

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ABSTRACT
Management is one of the areas to look upon that plays a large role in (re) productive performance in a swine herd, since the majority of (re)productive problems are not only caused by an infectious agent. Claw lesions have been suggested to be an underlying cause of lameness in swine and are crucial to the overall well-being of the sows and economic return from pig farming. If not properly treated, defective claw conditions can lead to lameness and may result in further complications. This causes a devastating loss to swine farmers by decreasing reproductive performance and longevity. By improving our understanding of the factors that contributes to sow lameness and inflammation, we can prevent these circumstances from occurring. Nutrition interventions, including the use of amino acid trace minerals complex, will surely be one of the factors in mitigation of claw lesions in the reproductive herd of swine.
Key words: *Claw, Inflammation, Lameness, Pig*

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INTRODUCTION

The overall productivity in a breeding herd is influenced by a number of well-known factors including genetics, nutrition, health status, housing, stockman ship and management. The resulting level of performance and productivity achieved by the sow herd can vary significantly depending on how these factors are managed. In reproduction, it is usually not a single factor that drives significant change. One of the greatest factors to focus on, with nutrition, is to reduce the probable inflammatory responses in gilts and sows to increase longevity of the sow herd. Claw lesions have been suggested to be an underlying cause of lameness in swine [12].

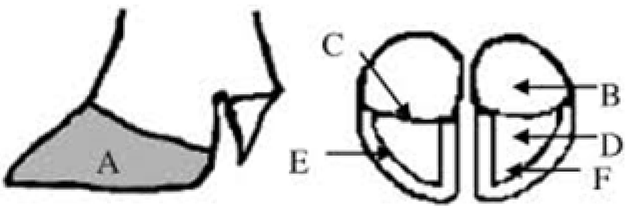

Fig.1. Illustration of the 6 areas of a claw: A = wall; B = heel, including overgrown heel; C = junction between heel and sole; D = sole; E = white line; F = toe.

A sow has 4 feet each consisting of two claws (lateral and medial claws), and each claw consists of 6 areas that have been classified as wall, heel (including overgrown heel), white line, junction between heel and sole (heel–sole junction), sole and toe (Fig. 1; [2].

SOW LAMENESS

Lameness has long been recognized as a problem in the reproductive herd. Removal of non-productive sows along with introduction of replacements is an integral part of maintaining herd productivity at a constant level. There are both economic and welfare impacts of a lower sow retention rate due to lameness.

Knowledge and understanding of lameness in swine is better understood in present days with increased focus on animal welfare research. Sows with elongated claws, claw cracks, heel erosion and overgrowth and uneven toe [3-5] lesions have been shown to significantly impact the incidence of lameness. Lameness increases odds ratios of early removal and has shown to significantly decrease sow productivity due to lameness [2,3, 6, 7].

One of the obvious consequences of lameness is reduction of feed intake due to pain and inflammation. The reduction in energy and protein consumption disrupt or change the release of hypothalamic releasing hormones (GnRH) which impacts amount of release of LH and FSH and subsequently impacts steriodogenesis of the ovary. Sows with inadequate feed intake during lactation increased the probability culling from the breeding herd [1]. Inflammatory cytokine-driven responses of the neuroendocrine system are similar and resemble those seen in starvation: reduced thyroid function, reduced levels of GH-dependent peptides, and suppression of gonadal function [28]. Lactation is one of the most energetically expensive and challenging activities that a female sex of any mammalian species can undertake. King and Dunkin [19] were first to demonstrate the linear relationship between daily feed intake during lactation and increased time required for sows to express estrus after weaning. Younger first litter gilts were more sensitive to negative effects of reduced feed intake during lactation than older gilts and multiparous sows [14].

The reproductive effects of inadequate lactation feed intake seems to be mediated through LH secretion and results in lower rate of ovulation and early embryonic mortality [19]. Body protein mass loss greater than 9 to 12% rapidly reduces ovarian function[10]. Protein restriction throughout lactation alters circulating concentrations of somatotrophic hormones and insulin at the end of lactation and negatively impacts post weaning ovulation rate [21] and limited follicular development [36]. Low feed intake during lactation involves mobilization of body tissues and can lead to an excessive loss of body weight, reducing sow longevity [15] and reproductive performance [25]. Prevention and early treatment of lameness and claw injuries will help maintain feed consumption and appetite.

INFLAMMATORY RESPONSES

Severe tissue injury induces a relatively stereotypical, pathophysiologic response manifested by fever, catabolism and sickness behaviour. Functions of all organs are altered by acute and chronic inflammatory states. Activation of inflammatory cytokines by toxins or products of cell injury leads to a variety of metabolic and endocrine changes, mediated by the direct action of cytokines on tissue function and by changes in pituitary-endocrine end organ function [28]. Many of the claw lesions and injuries fall into these inflammatory type wounds. Investigating the possible mechanisms for these lameness and foot injuries impacting reproduction becomes quite reasonable when one sees how similar lack of nutrients causes some of the same responses as an inflammatory response due to cytokine release. In livestock production, most recognize the dramatic changes to acute phase responses where dramatic changes occur in liver function such as suppression of albumin, transferrin and ceruloplasmin, and increased synthesis of proteins such as fibrinogen, C-reactive protein [13]. When an animal gets an injury, most of the changes that happen in the body are mediated by a cascade of polypeptide molecules called inflammatory cytokines. These cytokines are released from immune barrier functioning cells such as endothelial cells, specialized immune cells such as lymphocytes, monocytes, macrophages and several other types of parenchymal cells. Examples of some of these cytokines that are released are interleukin (IL)-1, IL-2 and IL-6. In addition, tumor necrosis factor-alpha (TNF-α), interferon-gamma (INF-γ) and several other cytokines with anti-inflammatory activity such as IL-10, IL-1 receptor antagonist, transforming growth factor-B all work in a synergistic reaction to regulate body metabolism to get the animal to survive. One of the major impacts of cytokines is a profound change in neuroendocrine function during inflammatory disease [27, 35].

The cytokines released during inflammatory reaction causes a decrease in GnRH which reduces the amount of FSH and LH released from the pituitary. A severe inflammatory response from a wound may release large amounts of cytokines such as TNFα which cause a direct effect on the ovary. The effect on the ovary will cause a reduction in steroidogenesis and even apoptosis of the ovarian cells and abortion. The most common reproductive anomaly found (9%) when examining reproductive tracts from cull sows was acyclic or smooth ovaries [20].

Nutritional interventions to reduce claw lesions, lameness and improve longevity:

Tomlinson *et al*. [34] reviewed how the impact of nutrition, protein, energy, macro minerals, trace minerals and vitamins have been implicated in maintaining claw health. An eight trial summary shows an improvement in feet lesion scores, improved milk production and improved reproductive performance in dairy cattle [30]. With the addition of complexed organic minerals, claw health was improved in the dairy cow by feeding complexed minerals [23, 24]. These examples suggest that nutrition may play an important role in supporting the immune system and in improving lameness and reproductive performance.

CONCLUSION

Claw lesions have been suggested to be an underlying cause of lameness in swine and are crucial to the overall well-being of the sow. If not properly treated, defective claw conditions can lead to lameness and may result in further complications. This causes a devastating loss to swine farmers by decreasing reproductive performance and longevity. By improving our understanding of the factors that contributes to sow lameness and inflammation, we can prevent these circumstances from occurring. Nutrition, including the use of amino acid-complexed trace minerals, will surely be one of the factors in mitigation of claw lesions in the reproductive herd of swine.

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