

# Shoulder Lesions' Influence on Sow Behavior

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Some sows are known to develop shoulder lesions after giving birth, yet the pattern of development and healing as well as the welfare implications of these lesions is not well-understood. This study found that the size of the lesion when first noticed was related to the duration that the lesion was present and to the maximum size of the lesion before healing. This information has the potential to help guide the treatment of these animals and reduce the severity of their lesions. We monitored these sows throughout lactation and during gestation and found that the only significant behavioral difference between the sows that did and did not have lesions was that the sows without lesions were more likely to change their posture more frequently. We believe this means that more frequent posture changes may have a protective effect against lesion development. Together, the results of this study have added to our understanding of how long it takes these lesions to heal and reveal insight into the lack of behavioral alterations in sows with such lesions.

sow

shoulder lesion

lesion progression

pattern of healing

sow behavior

welfare

## 1. Introduction

Sows developing shoulder lesions, or shoulder sores, after farrowing is a well-known condition that has been reported in up to 50% of animals on some farms <sup>[1][2]</sup> and is widely considered to be a multifactorial problem. While there appears to be consensus about certain risk factors for lesion development, such as a low body condition score <sup>[2][3][4][5]</sup>, other predisposing factors may include breed, parity, and weaning weight <sup>[5]</sup>. The development of a shoulder sore can result in economic losses for producers as treatments are limited and sows with severe lesions often have their piglets weaned early, consequently negatively impacting the litter. Sow welfare is also a concern as these lesions are likely painful.

It is suspected that lesions form in a “top-to-bottom” fashion <sup>[6]</sup> where superficial tissue damage from prolonged pressure and ischemia progresses into deeper tissue layers, similar to many human pressure sores <sup>[7]</sup>. Beyond this, however, little is understood about how the lesions progress and heal. Some studies have demonstrated how different treatment choices can alter the rate of healing <sup>[5][8]</sup>, with rubber mat flooring appearing to be an effective feature of treatment plans <sup>[4][5]</sup>. However, to our knowledge, no studies have examined the daily changes lesions undergo throughout the development and healing process. In order to better implement potential treatment options and improve sow welfare, understanding factors that may affect the severity of lesions in terms of maximum size and lesion duration are essential.

Likewise, while it is suspected that the lesions themselves are painful, particularly when palpated [6], knowledge regarding the behavioral effects of shoulder lesions on sows is limited. Larsen et al. monitored sow behavior for one 24-h observation period two weeks post-farrowing and found sows spent less time lying, more time standing still, and engaged in fewer nursing sessions [9]. Documenting a sow's behavior throughout the time the wound is present would lend to our understanding of the painfulness of the sores. In particular, discovering whether a sow's posture, nursing behaviors, and location preferences are affected by the presence of a lesion is essential in evaluating the impact of such lesions on her overall welfare.

By assessing risk factors for lesion development, compiling data regarding the size of the lesion and the length of time a lesion is present while monitoring the behavior exhibited by a sow over the entirety of the lesion period, we aim to integrate these components and develop a holistic understanding of the impact of the lesions on the sow. It is hypothesized that sows with shoulder lesions will exhibit differences in behavior from similar sows without lesions, and that lesion size and duration will be related to and influenced by factors such as productivity measures and the sow body condition score.

## 2. Current Insights

20% of the sows enrolled in the study were found to have developed a shoulder lesion, which is similar to other studies, ranging from 10% prevalence as reported in Herskin [1], to 48% at peak prevalence in Davies [2], with our study reporting a prevalence intermediate to these. Our finding reinforces that these lesions impact many sows, making understanding their progression and impact on behavior worthwhile.

Shoulder lesions are a multifactorial disease process, and it can be difficult to predict which sows will develop lesions. This study supports the findings of others where there is a significant correlation between a low body condition score and the development of a shoulder lesion [2][3][4][5]. As BCS decreases, so does the amount of subcutaneous fat that cushions the prominent bony tuber of the scapular spine. Therefore, as a sow lies on her side in lateral recumbency for long periods of time during lactation, the pressure put directly on the scapular spine is focused and increased at that anatomic location, resulting in a greater chance of tissue damage and ischemia at the superficial skin and subcutaneous layers, leading to subsequent ulcer development [6][10]. Managing and maintaining an appropriate BCS in a herd is essential in lessening the incidence of severe shoulder lesions in sows and, therefore, attention should be paid to preventing a low BCS in lactating sows. Other reported risk factors, such as parity and weaned litter weight, have also been reported to increase the odds of a sow developing a lesion [5][10]. However, our study did not find that any significant risk factors associated with sow parity or productivity influenced the risk of lesion development.

In farrowing, we appreciated a significantly increased frequency of postural changes in CON sows compared to LES sows. Since shoulder lesions are caused by local trauma and ischemia, as described in Dahl-Pedersen [6], sows who are frequently changing posture are less likely to experience prolonged scapular tuber contact with the ground and, therefore, less likely to develop ischemia and subsequent ulcerations. Rolandsdotter [11] supports our findings, stating that sows that exhibited longer uninterrupted bouts of lying behavior on days 0 and 2 post-

farrowing were more likely to develop shoulder lesions. Larsen, however, reported an increase in postural changes and restlessness in sows with shoulder lesions and argued that this is a sign of discomfort secondary to the lesions. However, the increase in postural changes in LES sows was not significant in that study and there was no mention of the lengths of uninterrupted bouts of lying time. A study that includes lying behaviors of sows both before and after developing lesions would be necessary to determine whether the frequency of postural changes should be considered as a risk factor for lesion development rather than a sequela.

No difference was found in the amount of time LES sows spent lying on the side with a lesion versus the side with no lesion when sows were in farrowing, and this finding is mirrored in other studies [9]. There was also no significant effect of lesion presence on the amount of total time a sow spent lying sternally, lying laterally, standing, sitting, or number of nursing sessions. Interestingly, this finding is not supported by Larsen, where they demonstrated that sows with shoulder lesions spent significantly less time lying in lateral recumbency and less time nursing. In Larsen et al. [9], sows were monitored for a full 24 -h at one common time point, approximately two weeks post-farrowing. It could be that a longer single continuous observation period may have generated such differences. However, we monitored sow behavior until the lesion healed completely, including lactation and in the gestation pen. We found that there was no significant difference in location preference or posture between LES sows and CON sows before or after weaning. Thus, measurements at multiple time points showed no postural differences between LES and CON sows leading to the conclusion that these behavioral measures were not indicative of a welfare impact due to these lesions. Notably, Dahl-Pedersen et al. [6] reported significant pain-related responses to palpation of traumatic neuromas that were likely results of lesions, but there has yet to be any evidence confirming or denying pain associated with the presence of active ulcers. Our findings in this study do not provide sufficient evidence to allow us to deny that sows experience pain associated with active shoulder lesions, but our data does show that behavior associated with posture is not impacted by the presence of a shoulder lesion.

One aspect of the disease process that has received little attention has been the pattern of progression and healing of these ulcers. In general, the understanding is that lesions are likely to develop within a few days to weeks after farrowing and will quickly heal after weaning. However, few studies have followed lesions throughout their entire progression, and even fewer have followed lesions until they have healed completely [2][5]. By measuring lesions from the day they developed until the day they healed, we were able to obtain a more comprehensive picture of the pattern of progression and healing that a shoulder lesion follows. We found that the median number of days a lesion was present, from initial appearance until healing, was  $24 \pm 2.2$  days, with a range from one to 129 days. Zurbrigg et al. [5] reported an average healing time of 32 days if sows received no treatment (rubber mats or stainless-steel plates), 25 days with rubber mat treatment, and 39 days with stainless steel treatment. Meanwhile, Davies et al. [2] reported a maximum healing time of 68 days. While the median time to healing in our study is on the lower end of what has been reported, 129 days to heal is quite long, and similar lengths have not been reported in other studies. We did not find that any of the factors studied here had an impact on the time it took for a lesion to heal, though a longer duration was correlated with larger maximum lesion size.

We determined that the size of the lesion on the day it was first discovered was significantly correlated to the maximum size of the lesion. Kaiser et al. [8] reported similar findings, stating that the size of a lesion on day 1 was

significantly associated with the size of the lesion on day 14 and day 21. Our data also showed that lower parity animals had larger lesions, as did sows with a BCS 3 or 4 compared to sows with a BCS of 2. Sows that were lame also had larger lesions. These findings suggest that a larger sow with a lesion that puts more weight on her shoulder is likely to develop a lesion that is significantly larger in area. Likewise, lameness may predispose a sow to decrease her time spent moving, leading to prolonged pressure on the shoulder and an increase in lesion size. In opposition to our findings, Davies tended to see that a decrease in BCS and an increase in parity resulted in more severe lesions [2]. However, this data was not always significant or consistent, and he discussed the importance of freedom of movement, scapular tuber depth, and other potential environmental factors contributing to the severity of shoulder lesions [2]. Our findings further confirm that BCS is critical in decreasing the risk of lesions but also indicate that lesion size can be influenced by maintaining a healthy BCS in lactating sows and not allowing them to become over-conditioned. Future studies should prospectively examine the relationship between postural changes and lesion development, which could lead to methods of prevention, as well as other possible measures of welfare such as cognitive bias, which could give more insight into the affective state of sows with shoulder lesions.

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