

Review Article

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A Review on Estrous Detection and Associated Challenges in Farm Animals

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SUMMARY

Estrous detection is the process of identifying when a female animal is in estrus, which is the period of sexual receptivity during the estrous cycle. Accurate and timely detection of estrus is critical for reproductive management in farm animals. This article review focuses on the challenges associated with estrous detection in farm animals and aims to evaluate the various methods of estrous detection, assess the factors affecting estrous detection accuracy, and identify and improve the challenges associated with estrous detection. The review examines the different techniques and technologies available for estrous detection, including visual observation, automated monitoring systems, hormonal assays, and ultrasonography. It also assesses the factors that affect estrous detection accuracy, such as timing, labor requirements, and the use of technology. The review identifies the challenges associated with estrous detection, including accuracy, timing, and labor requirements, and proposes potential solutions. Besides the Researchers and farmers seeking to optimize breeding programs and increase herd productivity can gain valuable insight from this review on estrous detection in farm animals.

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Introduction

The estrus sign is an external sign of ovulation, which is internal and invisible. Ancient people observed estrus in herds of cattle, but not specifically about mating. It comes from the Greek word oistros, meaning a gnat, a member of the Family Oestridae, whose buzzing during summer caused cows to become hyperactive, usually showing frenzied behavior. The following are the most commonly reported behavioral characteristics, standing to be mounted, mounting other cows, rubbed rump and tail-head, chin resting, restlessness, increase in agonistic interactions, sniffing of the vagina of herd-mates, flehmen reaction (wrinkling of the nose and curling of the lip), frequent micturition, tail raising, bellowing, mounted but not standing [1].

Estrous detection is a critical component of reproductive management in farm animals. Timely and accurate identification of estrus, the period of sexual receptivity in females, is crucial for successful breeding programs and maximizing reproductive efficiency. During estrus, females exhibit specific behavioral, physiological, and physical changes that signify their readiness to mate. These changes include increased activity, vocalization, mounting behavior, vulvar swelling, and changes in vaginal mucus characteristics. By detecting estrus, farmers and animal breeders can optimize the timing of artificial insemination or natural mating, leading to higher conception rates and more efficient use of resources. Moreover, effective estrous detection allows for the identification of animals experiencing reproductive disorders or suboptimal estrus cycles, enabling timely intervention and improved overall herd health and productivity" [2].

One of the most common methods of estrous detection in farm animals is visual observation, which involves monitoring animals for physical signs of estrus such as vaginal discharge, mounting behavior, and vocalization. However, visual observation can be time-consuming and labor-intensive, particularly in large herds. In addition, some animals may exhibit subtle or atypical signs of estrus, making detection more difficult. To address these challenges, researchers have explored the use of automated monitoring systems such as activity meters and electronic nose devices [3,4].

In addition to accuracy, another challenge associated with estrous detection is the timing of breeding. In some cases, animals may exhibit signs of estrus but not be ready for breeding, leading to decreased conception rates and increased costs. To address this challenge, researchers have explored the use of synchronization protocols to induce estrus in animals at a predetermined time [3,4].

This review focuses on the overview of the current state of estrous detection, and technologies available for estrous detection in farm animals, including visual observation, automated monitoring systems, hormonal assays, and ultrasonography. The review will also examine the challenges associated with estrous detection, including accuracy, timing, and labor requirements, as well as potential solutions to these challenges. It is important to consider the economic implications of estrous detection and associated challenges. Inaccurate or inefficient detection methods can result in decreased herd productivity and increased costs, while effective detection methods can improve breeding efficiency and profitability. There for the objectives of this seminar is:

- To evaluate estrous detection methods in animals.
- To assess factors affecting estrous detection accuracy.
- To identify and improve estrous detection challenges.

Estrous Detection in Farm Animals

Estrous Detection Methods in Farm Animals

Estrous detection is a critical component of reproductive management in farm animals, as it allows farmers to identify the optimal time for breeding and maximize herd productivity. However, accurate estrous detection can be challenging, as it requires careful observation and interpretation of behavioral and physiological cues. In recent years, advances in technology have led to the development of different methods for heat detection such as heat mount detectors, development of activity monitoring systems, heat detection intensity and accuracy with activity systems, silent heats in activity monitoring systems, walking activity related to ovulation, activity monitoring systems on the neck versus on the leg, accelerometer, and rumen temperature monitoring systems and other tools to aid in estrous detection [5,6].

Visual observation for estrus detection and calving is an activity that requires labor and time, which is an increasingly difficult resource due to several other farm management activities. In this way, automated estrous and calving monitoring devices can increase animal productivity with less labor when applied correctly. Infrared thermography has recently emerged as a technique that does not depend on monitoring physical activity. Furthermore, infrared thermography is a non-invasive, user-friendly, and stress-free option that aids in the detection of estrus in dairy animals. Factors such as breed, management system, feed type, feeding, and watering frequency significantly varied among different study sites [7].

Automated oestrus detection (AOD) technologies have been identified as having the potential to increase reproductive efficiency on dairy farms and to contribute to overcoming some of the limitations of the traditional visual oestrus detection methods. Automated monitoring systems, such as activity meters and pedometers, have been developed to aid in estrous detection and reduce labor requirements. These systems use sensors to detect changes in activity levels and other physiological parameters, which can indicate the onset of estrus.

Hormonal assays, such as progesterone and estrogen assays, can also be used to aid in estrous detection. These assays measure the levels of hormones in blood or milk samples, which can provide insight into the timing of estrus [5]. Ultrasonography is another tool that can be used to detect changes in reproductive organs and aid in estrous detection [8].

Factors Affecting Estrous Detection Accuracy

Accurate estrous detection is influenced by various factors related to the animals, environment, and management practices. The main factors that affect estrus detection accuracy are animal-related factors, environmental factors, and management-related factors. Animal-related factors like breed and species differences, age and parity, Health and reproductive disorders. Environmental factors such as housing conditions and facilities, Social interactions and group dynamics and Seasonal and climatic influences. management-related factors such as nutrition and feeding practices, stress and handling procedures, and use of synchronization protocols. Nutritional status and feeding practices play a significant role in estrous behavior and detection accuracy. Inadequate nutrition, imbalanced diets, and abrupt changes in feed can disrupt hormonal balance and estrous expression [9].

Challenges in Estrous Detection of Farm Animals

Inherent Difficulties in Detecting Estrus in Farm Animals

Detecting estrus in farm animals can be challenging due to the subtle behavioral changes exhibited by females during this period. In cattle, for example, the signs of estrus may include increased activity, mounting behavior, and vocalizations, which may not always be easily discernible. These subtle changes require trained observers and careful monitoring to accurately detect estrus. Estrus in farm animals typically lasts for a relatively short period, making timely detection crucial for successful breeding. In pigs, estrus duration can be as short as 24 to 48 hours, while in dairy cows, it typically ranges from 6 to 12 hours [10,11]. The limited timeframe poses a challenge in identifying and capitalizing on the optimal breeding window. Estrous expression varies among individual animals, further complicating the detection process. Some animals may exhibit more pronounced signs of estrus, while others may show minimal or atypical behavior [12,13].

Technology-Related Challenges

Electronic systems, such as activity monitors and automated detection devices, offer the potential for improved estrous detection. However, challenges remain in terms of their reliability and accuracy. Studies have reported instances of false positives and negatives with these systems, leading to suboptimal detection rates. While advanced technologies hold promise for improved estrous detection, their cost and accessibility can pose challenges for widespread adoption, particularly in smaller-scale farming operations. The high cost of equipment and maintenance, as well as the need for technical expertise, can limit the availability and practicality of these technologies [14].

Human Factors and Expertise

The accuracy of estrous detection heavily relies on the skill and experience of animal caretakers or farm personnel responsible for observing and identifying estrous signs. Lack of training and familiarity with subtle behavioral cues can lead to missed or misinterpreted estrus events. Educating farm personnel about the estrous cycle, signs of estrus, and proper detection techniques is crucial for accurate estrous detection. Research has shown that training programs and workshops focusing on estrous detection can significantly improve detection rates in farm animals [15].

Strategies to Improve Estrous Detection

Estrous detection plays a crucial role in reproductive management of farm animals, and improving the accuracy of detection methods is essential for maximizing breeding efficiency. Hence, various strategies are used to enhance estrous detection in farm animals, focusing on advancements in detection methods, addressing animal-related factors, improving management practices, and providing training and education programs for personnel. Enhancing Detection methods and technology such as development of more accurate and user-friendly electronic systems, integration of multiple detection methods for improved accuracy [16].

Addressing Animal-Related Factors such as breeding and selection for improved estrous expression, monitoring and managing reproductive disorders, improving Management Practice such as optimal nutrition and feeding regimens, reducing stress and improving handling procedures [17].

Conclusion

In conclusion, the review on estrous detection and associated challenges in farm animals provides a comprehensive overview of the various methods and technologies available for estrous detection, as well as the associated challenges and potential

solutions. The review evaluates the different methods of estrous detection in animals, assesses the factors that affect estrous detection accuracy, and identifies and examines the challenges associated with estrous detection. The review proposes potential solutions to these challenges, such as the use of automated monitoring systems and the optimization of timing and labor requirements. By examining the current state of estrous detection in farm animals, this review provides valuable insights for farmers and researchers seeking to optimize breeding programs and improve herd productivity. Overall, the review highlights the importance of accurate estrous detection in farm animals and the need for continued research and innovation in this field.

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