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BENEATH THE SKIN: BACK FAT THICKNESS IN PIGS AND ITS ROLE IN HEALTH AND PRODUCTION

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Abstract:

The significance of back fat thickness (BFT) in pigs as a key indicator of nutritional status, metabolic health, reproductive performance, and overall well-being in commercial swine production. Utilizing advanced tools like ultrasound imaging, digital calipers, and computerized systems, producers can accurately assess and monitor BFT, facilitating targeted interventions to optimize feed efficiency, reproductive outcomes, and meat quality. BFT measurement is commonly performed at anatomical landmarks such as the last rib, last thoracic vertebra, and lumbar vertebrae, using techniques like ultrasound and calipers. The study highlights that balanced nutrition, feeding management, genetic selection, and health management are crucial for improving BFT. Moreover, optimal BFT plays a pivotal role in heat regulation, disease resistance, mobility, stress resilience, and production efficiency, directly influencing animal welfare and market competitiveness. By maintaining adequate BFT, farmers can enhance feed conversion ratios, reduce production costs, and achieve better meat quality, contributing to more sustainable and profitable swine farming practices.

Key Words: Caliper, Swine production, Scanning, Ultrasound

Introduction:

In the current era of swine production, the measurement and management of back fat thickness in pigs remain critical components of optimizing health, welfare, and productivity. Back fat thickness serves as a valuable indicator of the nutritional status, metabolic health, reproductive performance, and overall well-being of pigs in commercial farming operations. With advancements in technology and a growing emphasis on precision livestock management, producers have access to a range of tools and techniques for accurately assessing and monitoring back fat thickness. These include ultrasound imaging, digital calipers, and computerized data analysis systems, which provide real-time insights into the body condition of individual pigs and allow for targeted interventions to optimize feed efficiency, reproductive efficiency, and meat quality. Moreover, the importance of back fat thickness extends beyond production considerations, with implications for animal welfare, environmental sustainability, and market competitiveness.

What is back fat thickness?

- Back fat thickness in pigs refers to the layer of fat found beneath the skin along the back of the animal.
- The back fat thickness (BFT) serves as a reliable gauge of the pig's ability to store fat, its overall state, and its overall health.

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Position of measurement of back fat thickness:

The common positions for measuring back fat thickness:

1. **Last Rib (10th Rib):**
   This is one of the most common locations for measuring back fat thickness. It's typically measured 2.5 cm (1 inch) off the midline of the pig's back, just anterior to the last rib.
2. **Last Thoracic Vertebra (P2):**
   Another common measurement point is just anterior to the last thoracic vertebra (P2), located approximately 6.5 cm (2.5 inches) off the midline of the pig's back.
3. **First Lumbar Vertebra (P4):**
   This point is situated near the first lumbar vertebra (P4), around 8 to 10 cm (3 to 4 inches) off the midline of the pig's back.
4. **Last Lumbar Vertebra (P8):**
   Measurements can also be taken near the last lumbar vertebra (P8), which is around 14 to 16 cm (5.5 to 6.5 inches) off the midline of the pig's back.
5. **Midline:**
   In addition to specific vertebrae points, measurements can also be taken directly along the midline of the pig's back at various positions from the last rib to the base of the tail.

Method of measurement of back fat thickness:

The measurement of back fat thickness in pigs can be conducted using various methods, including:

1. **Ultrasound:**
   This non-invasive technique involves using an ultrasound probe to penetrate the skin and measure the depth of the back fat layer at specific anatomical points.
2. **Calipers:**
   Calipers are used to manually measure the thickness of the back fat layer at designated locations on the pig's body.
3. **Imaging technologies:**
   Other imaging technologies such as computed tomography (CT) scans or magnetic resonance imaging (MRI) may also be utilized to assess back fat thickness with high precision.
4. **Optical scanning:**
   Advanced optical scanning systems can provide accurate measurements of back fat thickness by analyzing images captured using specialized cameras.

How to improve back fat thickness:

1. **Balanced Nutrition:**
   Providing pigs with a well-balanced diet rich in essential nutrients, including energy, protein, vitamins, and minerals, is crucial for promoting optimal back fat deposition. Formulating diets to meet the specific nutritional requirements of pigs at different growth stages helps ensure adequate energy reserves for fat synthesis without compromising other aspects of growth and performance.
2. **Feeding Management:**
   Implementing feeding strategies that promote consistent and adequate nutrient intake is essential for supporting back fat deposition in pigs. This includes ensuring access to high-quality feed and clean water, feeding pigs according to their nutritional needs and growth potential, and monitoring feed intake to prevent underfeeding or overfeeding.
3. **Genetic Selection:**
   Selecting breeding stock with desirable genetic traits related to back fat deposition can contribute

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to improving back fat thickness in subsequent generations of pigs. Breeding programs aimed at enhancing traits associated with lean growth and meat quality while maintaining adequate back fat reserves can help produce pigs with optimal body composition and performance characteristics.

4. **Health Management:**
   Maintaining optimal health and minimizing stressors that can affect feed intake and nutrient utilization are important for supporting back fat deposition in pigs. Implementing effective disease prevention and control measures, managing environmental conditions to minimize heat stress or cold stress, and providing proper vaccination, biosecurity, and hygiene practices can help ensure pigs remain healthy and productive.
5. **Monitoring and Adjusting:**
   Regularly monitoring back fat thickness using appropriate measurement techniques, such as ultrasound or manual palpation, allows producers to assess the effectiveness of their feeding and management practices and make adjustments as needed.
6. **Environmental Management:**
   Creating an environment that promotes pig comfort, welfare, and productivity can positively influence back fat thickness. This includes providing adequate space, ventilation, and bedding materials, minimizing overcrowding and aggression, and managing housing conditions to reduce stress and promote natural behaviors.

Role in Health and Production:

1. **Nutritional Status:**
   Back fat thickness serves as an indicator of the pig's nutritional status, reflecting its energy balance and overall dietary adequacy. Back fat thickness is a valuable indicator of a pig's nutritional status because it reflects how well the pig's energy intake matches its energy expenditure. When a pig consumes more energy than it expends, the excess energy is stored as fat, leading to an increase in back fat thickness. Conversely, if a pig's energy intake is insufficient to meet its energy needs, it will mobilize stored fat reserves, resulting in a decrease in back fat thickness.
2. **Metabolic Health:**
   Optimal back fat thickness correlates with metabolic health in pigs, as it indicates a balance between energy intake and expenditure. When a pig's energy intake matches its energy expenditure, it maintains a stable body condition, including an appropriate level of back fat thickness.
3. **Reproductive Performance:**
   Back fat thickness is pivotal in dictating the reproductive success of breeding sows due to its role in facilitating essential reproductive processes. Sufficient fat reserves provided by adequate back fat thickness are paramount for the synthesis and regulation of reproductive hormones crucial for orchestrating the estrous cycle, ovulation, and successful embryo implantation. Moreover, these fat reserves serve as an energy source critical for sustaining pregnancy and supporting fetal development. When back fat thickness is optimal, it signifies that the sow possesses the necessary metabolic resources to initiate and maintain reproductive processes effectively.
4. **Heat Regulation:**
   Adequate back fat thickness serves as a vital component in helping pigs regulate their body temperature, acting as a natural insulator against temperature fluctuations and aiding in the

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mitigation of heat stress. The layer of back fat beneath the skin acts as a thermal buffer, helping to retain body heat in cooler conditions while also facilitating heat dissipation during periods of elevated temperatures. Thicker back fat provides enhanced insulation, reducing heat loss and helping pigs maintain a stable internal body temperature despite external weather variations.

5. **Meat Quality:**

   Back fat thickness significantly influences various aspects of meat quality, including marbling, tenderness, and juiciness, which are critical factors in determining consumer preferences and market value. Marbling, the intramuscular fat within the meat, contributes to flavor, juiciness, and overall eating experience. Adequate back fat thickness correlates positively with marbling, as it reflects the pig's capacity to deposit fat within the muscle tissue. Additionally, back fat serves as a source of moisture and flavor during cooking, enhancing the tenderness and juiciness of the meat. Therefore, pigs with optimal back fat thickness tend to produce meat with superior marbling, tenderness, and juiciness, meeting consumer expectations for high-quality pork products and commanding premium prices in the market

6. **Feed Efficiency:**

   Monitoring back fat thickness is integral to optimizing feeding strategies and enhancing feed efficiency in pig production systems. By assessing back fat thickness, farmers can gauge the nutritional status and energy reserves of pigs, allowing for precise adjustments to feeding regimens. Pigs with adequate back fat reserves are more likely to efficiently convert feed into lean muscle mass, resulting in improved feed conversion ratios and reduced feed wastage. Conversely, pigs with excessive back fat may indicate overfeeding, leading to inefficiencies in feed utilization and increased production costs.

7. **Disease Resistance:**

   Proper back fat reserves are integral to bolstering immune function and enhancing disease resistance in pigs, thereby promoting overall health and welfare. Adequate back fat thickness indicates the presence of energy reserves necessary for supporting immune system function, including the production of antibodies and cytokines essential for combating pathogens. Consequently, maintaining proper back fat thickness is paramount for safeguarding pig health and welfare, ultimately contributing to sustainable and resilient swine production systems.

8. **Mobility and Comfort:**

   Adequate back fat thickness plays a crucial role in promoting mobility and ensuring the comfort of pigs by providing cushioning and support to the spine and joints. The layer of back fat acts as a natural padding, helping to absorb shock and distribute pressure evenly along the pig's body during movement. This cushioning effect helps reduce the strain on the spine and joints, minimizing the risk of injuries or lameness associated with excessive stress or repetitive movements. Pigs with optimal back fat thickness experience less discomfort and fatigue while standing, walking, or engaging in other physical activities, allowing them to move more freely and exhibit natural behaviors. By supporting mobility and reducing the likelihood of musculoskeletal problems, adequate back fat thickness contributes to improved welfare and overall quality of life for pigs in production system

9. **Stress Resilience:**

   Pigs with sufficient back fat reserves demonstrate enhanced resilience to various stressors, including

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transportation, handling, and environmental changes, thereby promoting their overall well-being. Adequate back fat thickness serves as a reservoir of energy that can be mobilized during times of stress, providing pigs with the metabolic resources needed to cope with and adapt to challenging conditions. This additional energy buffer helps pigs maintain physiological stability and recover more effectively from stressful events, minimizing the negative impact on their health and welfare.

10. **Production Efficiency:**

Adequate back fat reserves signify a balance between energy intake and expenditure, ensuring that pigs receive sufficient nutrients to support growth, reproduction, and overall well-being. Pigs with optimal back fat thickness are more efficient at converting feed into lean muscle mass, resulting in higher yields of high-quality meat products.

Conclusions:

In conclusion, back fat thickness in pigs plays a multifaceted role in modern swine production, impacting various aspects of health, welfare, and productivity. Through advancements in technology and a comprehensive understanding of its significance, producers can effectively manage and optimize back fat thickness to enhance pig performance, meet consumer demands, and foster sustainable agricultural practices in the dynamic landscape of the swine industry.

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