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Estrus Synchronization in Pigs

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Introduction

Estrus synchronization is a technique that involves managing the reproductive cycles of sows to bring them into estrus (heat) at the same time and making it easier to the fixed time insemination and increase the efficiency of breeding programmes. This practice is especially beneficial in the tropical regions where the environmental stress factors such as heat and humidity affect the reproductive performance. Estrus synchronization helps to optimize the herd fertility, improve the timing of insemination and enhance the overall reproductive management on the farms. Estrus synchronization in pigs involves with use of hormonal treatments or managemental strategies to regulate the sow's reproductive cycle. By synchronizing the estrus of sows, the farmers efficiently manage the breeding, reduce the labour costs and improve the timing of insemination. This technique has become increasingly important in the tropical regions where the high temperatures and humidity disrupt the natural estrus cycle of pigs. In the tropical climates, the factors such as heat stress, poor nutrition and seasonal variations in the daylight leads to irregular estrus cycles. Estrus synchronization helps to mitigate these challenges to ensure that sows are bred at optimal times which in turn reducing the risk of infertility and improving the herd productivity.

Causes for estrus synchronization

1. Heat stress: In the tropical regions, the high ambient temperature and humidity disrupt the normal estrus cycle leads to irregularities in the heat expression and ovulation.
2. Seasonal variations: In some tropical areas, the reproductive performance varies during the different seasons with reduced fertility during the hot and humid months.
3. Management and labor efficiency: Synchronizing the estrus in sows helps in grouping animals for the breeding and efficient use of boars especially when the artificial insemination (AI) is used. This reduces the time and labour needed for the managing estrus detection.
4. Improved reproductive performance: Synchronization enhances the likelihood of inseminating the multiple sows at once and maximizing the use of semen and increasing the chances of successful conception.

Methods of estrus synchronization

1. Progestagen-based methods
   - ❖ Progesterone (Progestagens): The use of synthetic progesterone such as altrenogest (commonly marketed as Regumate) is a widely used method to synchronize the estrus in pigs. Sows are given oral doses of progestagen for 14-18 days which suppresses the estrus. After the treatment ends, the sows will come into heat within 2-4 days.
   - ❖ Altrenogest (Regumate): This method is especially popular for the synchronizing sows and gilts and is the most commonly used progestagen-based protocol. It is particularly effective in preventing the sows from returning to estrus prematurely.
2. PGF2α (Prostaglandin) injection: This hormone is used to induce estrus in sows by causing the regression of the corpus luteum (the structure that prevents the onset of estrus). When PGF2α is injected, it initiates the estrus within 2-4 days. It is combined with other methods like progestagens or gonadotropins for the better results.
3. Gonadotropins: PMSG (Pregnant Mare Serum Gonadotropin) or eCG (Equine

Chorionic Gonadotropin) and hCG (Human Chorionic Gonadotropin): These hormones stimulate the follicular development and ovulation. When combined with PGF2α, they can be used for the synchronization of estrus especially in the breeding sows and gilts. Gonadotropins are typically used in combination with other treatments.

4. Boar exposure: Natural boar exposure triggers the estrus in sows and gilts especially when combined with hormonal treatments. Boars are used as a stimulus to induce the estrus or help to detect the heat in the synchronized groups of sows.

Combination treatments: A combination of the above methods such as the use of progestagens followed by PGF2α is used to ensure more precise synchronization and better control over the timing of estrus. **Steps for estrus synchronization in pigs**

1. Administer hormonal treatment: Depending on the method selected, administer the progestagen or PGF2α injection as directed.
2. Boar exposure: After administering the hormones, introduce a boar to stimulate the estrus in the synchronized group of sows.
3. Monitor heat signs: Monitor the synchronized sows for signs of estrus (standing heat, swollen vulva, increased activity) to determine the best timing for insemination.
4. Artificial Insemination (AI): Once the sows show signs of estrus, AI should be performed to ensure fertilization. Insemination is done at the optimal time (24–36 h after the onset of estrus).
5. Follow-Up: After insemination, continue to monitor for signs of pregnancy (non-return to estrus). Non-pregnant sows should be re-synchronized.

Clinical symptoms to watch for during estrus synchronization

1. Standing heat: The sow or gilt will stand immobile when pressure is applied to the back (indicating she is ready for mating).
2. Swollen vulva: The vulva will appear enlarged and slightly red or pink.
3. Restlessness: The sow will show signs of agitation such as pacing or mounting other sows.
4. Increased vocalization: Sows in estrus become more vocal especially when they are in the presence of a boar.

Successful estrus synchronization

1. Behavioral changes: Observation of estrus behaviour such as standing heat is the most common sign that synchronization has been successful.
2. Hormonal testing: Blood or vaginal samples are taken to measure the hormone levels such as progesterone or estradiol helps to confirm the timing of estrus.
3. Ultrasound: In some cases, ultrasound is used to assess the follicular development and confirm that the sow is in estrus.

Control of issues related to estrus synchronization

1. Non-response to hormonal treatment: If sows do not respond to the hormonal treatments, a different protocol needs to be tried or the underlying cause (stress, illness, poor nutrition) should be addressed.
2. Heat stress management: In tropical regions, the heat stress hinders the synchronization process. Provide cooling systems and ensure the proper ventilation to reduce the stress levels.

Improvement of estrus synchronization issues

1. Optimal nutrition: Ensure that sows and gilts are well-nourished with a balanced diet that supports the optimal reproductive health.
2. Reduce environmental stress: Provide adequate housing that protects the animals from the excessive heat and humidity. Proper ventilation and shade are essential in the tropical climates.
3. Proper management: Follow the established guidelines for the estrus synchronization protocols and ensure that the farmers and workers are well-trained in recognizing the estrus signs and conducting AI.

Table Methods of Estrus Synchronization in Pigs

Method	Description	Application	Reference
Boar exposure (Boar effect)	Introducing the mature boars to prepubertal gilts can stimulate the onset of estrus through sensory cues such as sight, sound and smell. This method is effective when gilts are between 160 to 180 days old.	Used for natural estrus induction particularly in gilts.	Pork Information Gateway
Hormonal Treatments (PG600®)	Administration of hormones like PG600® (a combination of serum gonadotropin and chorionic gonadotropin) induces the estrus in prepubertal gilts and weaned sows. This is used in conjunction with boar exposure to enhance effectiveness.	Effective in stimulating ovarian activity.	Pork Information Gateway
Progestagen Treatments	Oral administration of progestagens, such as altrenogest (Regumate®) suppresses the estrus and upon withdrawal leads to a synchronized return to estrus. This method is commonly used in cycling gilts and sows.	Commonly used for synchronization of cycling gilts and sows.	Brüssow and Wähner (2011)
Prostaglandin (PGF2α) Treatments	Induces luteolysis leads to estrus in cycling sows. Less effective in pigs due to their unique corpus luteum response.	Used in combination with other hormones for controlled breeding.	Pork Information Gateway
Weaning Management	Sows naturally return to estrus 4-7 days post-weaning. Controlled weaning schedules help to synchronize the breeding.	Standard practice in commercial swine production.	Pork Information Gateway

Monitoring and record-keeping: Keep the detailed records of each sow's estrus cycle, hormonal treatments and insemination

4. timing for the better future management.

Factors affecting the estrus synchronization in pigs in tropical regions

Environmental factors

❖ Heat stress: High temperatures (>30°C) reduce the feed intake leads to poor body condition and delayed estrus. Heat stress disrupts the hormonal balance which in turn affects the follicular development and ovulation. Heat stress is reduced with use of cooling systems (fans, sprinklers), shade and adjusted feeding schedules.

❖ Humidity and seasonal variations: High humidity increases the heat stress effects, reducing the fertility. Seasonal changes in the tropical regions affect the sow fertility and hormonal response. These variations are controlled with use of breeding programmes that should be aligned with the favourable weather conditions.

❖ Nutritional factors

- ➢ Energy and protein deficiency: Inadequate nutrition leads to poor follicle development and low estrus response. Balanced feeds with sufficient energy, protein and minerals need to be supplied.
- ➢ Mycotoxin contamination in feed: High humidity in the tropical areas increases the mould growth leads to mycotoxin contamination (zearalenone) which disrupts the reproductive hormones. Use of toxin binders and proper feed storage helps to control the mycotoxin.

❖ Management factors

- ➢ Boar exposure effectiveness: High temperatures reduce the boar activity and pheromone effectiveness in stimulating the estrus. Ensure boar exposure in cooler parts of the day and use hormonal support if necessary.
- ➢ Housing and stocking density: Overcrowding increases the stress, reducing the efficiency of estrus synchronization. Proper space allocation and stress-free environments improve the reproductive success.
- ➢ Weaning management: Delayed weaning or poor post-weaning nutrition prolongs the anestrus in sows. Controlled weaning schedules and adequate lactation nutrition improve the estrus synchronization.

❖ Health and disease factors

- ➢ Reproductive infections: Tropical conditions favour the spread of reproductive diseases (leptospirosis, brucellosis). Vaccination programmes and biosecurity measures.
- ➢ Parasitic infections: Internal and external parasites weaken the sows, delaying estrus. Routine deworming and parasite control are needed.

❖ Hormonal response variability

- ➢ Reduced hormonal efficacy: High temperatures and metabolic stress alter the response to hormonal treatments like PG600® or altrenogest. Adjust the dosages based on body condition and ensure proper administration.
- ➢ Genetic variability: Some pig breeds have different reproductive responses under the tropical conditions. Select breeds with better heat tolerance and fertility traits.

Conclusion

Estrus synchronization in pigs in the tropical regions is a powerful tool for improving the breeding efficiency and reproductive success. By using the hormonal treatments, combined with good management practices, farmers synchronize the estrus, optimize AI and increase the overall productivity of the herd. However, attention must be paid to the environmental challenges of the tropical climate such as heat stress which in turn affects the reproductive performance. With proper care, the synchronization helps to ensure that pigs breed at optimal times leads to better herd health and higher productivity.