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Underdeveloped Genitalia in Buffaloes

P. Perumal

Division of Animal Science
ICAR-Central Island Agricultural Research Institute
Sri Vijaya Puram, Andaman and Nicobar Islands
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Introduction

Underdeveloped genitalia in buffaloes is a condition in which the reproductive organs (either male or female) do not attain the expected size or function during puberty or adulthood. This leads to infertility, delayed puberty or reproductive failure. Both the male and female buffaloes are affected; however, the condition is more commonly reported in females which in turn leads to poor reproductive performance. In the tropical regions, the condition is influenced by the factors such as nutrition, genetics, environmental stresses and disease prevalence.

Causes

Several factors contribute to the underdeveloped genitalia in buffaloes. These are classified as genetic, nutritional, environmental and hormonal factors.

Genetic factors

- Inherited traits: Genetic factors play a major role in the underdevelopment of genitalia particularly if there are recessive genetic conditions affecting the sexual development. Poor breeding practices such as inbreeding increase the incidence of genetic defects related to the reproductive organ development.
- Chromosomal abnormalities: Some cases of underdeveloped genitalia are related to the chromosomal abnormalities that in turn affect the sexual differentiation leads to incomplete development of the reproductive organs.

Nutritional deficiencies

- Protein deficiency: Inadequate protein intake during growth stages interfere with the development of reproductive tissues such as genitalia.
- Mineral deficiencies: A lack of essential minerals such as copper, zinc and selenium affects the development of the reproductive system in the buffaloes. Deficiencies in calcium and magnesium also affect the proper reproductive organ function.
- Vitamin deficiency: Lack of vitamins especially vitamin A and vitamin E hinder the normal growth and development leads to underdeveloped genitalia.
- Energy deficiency: Insufficient energy intake during the growing phase of a buffalo's life leads to stunted growth like inadequate development of reproductive organs.

Hormonal imbalances

- Estrogen and progesterone imbalance: Insufficient secretion of reproductive hormones like estrogen and progesterone affect the growth of the genital organs in females.
- Growth hormones: A lack of growth hormones or an imbalance lead to poor overall growth and development of genitalia.
- Hypothyroidism: Low thyroid hormone levels interfere with the sexual development of both male and female buffaloes, leading to underdeveloped genitalia.

Environmental factors

- Heat stress: In tropical/sub-tropical regions, the buffaloes are exposed to heat stress especially during the summer months. Prolonged exposure to high temperatures disrupt the hormonal balance and delay the onset of puberty or cause underdevelopment of genitalia.

- Inadequate housing conditions: Poor housing and living conditions that do not provide sufficient protection from environmental stresses such as extreme temperatures, humidity, or exposure to disease negatively affect the reproductive development.
- Exposure to toxins or pollutants: Certain environmental pollutants such as pesticides or endocrine-disrupting chemicals affect the development of reproductive organs in buffaloes.

Infectious diseases

- Reproductive infections: Chronic infections such as Brucellosis, Leptospirosis or Tuberculosis result in underdevelopment of reproductive organs by affecting the hormonal environment or causing damage to the genital tissues.
- Viral infections: Diseases such as foot-and-mouth disease and bovine viral diarrhea (BVD) interfere with reproductive development leads to genitalia that are smaller or underdeveloped.

Incidence

The incidence of underdeveloped genitalia in buffaloes is difficult to determine as it can be a subclinical condition that is not always detected unless reproductive failure occurs.

- Poor nutrition: Buffaloes in tropical regions that are raised on suboptimal nutrition are more likely to experience underdeveloped genitalia.
- Genetic factors: Certain populations or breeds of buffaloes have a higher incidence of underdeveloped genitalia due to inherited traits.
- Managemental practices: Inadequate management practices such as poor breeding decisions, lack of veterinary care and improper housing increase the prevalence of the condition.
- Heat stress: In tropical regions, heat stress is more prevalent and its impact on the reproductive health of buffaloes lead to a higher occurrence of underdeveloped genitalia particularly in the females.

Pathophysiology

The underdeveloped genitalia result from a failure in the normal growth and development of the reproductive organs, which manifest in one or more of the following ways.

- In female buffaloes: The ovaries are smaller than normal and the uterus is underdeveloped which in turn affect the fertility. The vagina, cervix or vulva also underdeveloped leads to challenges in the mating and calving.
- In male buffaloes: The testes are underdeveloped or too small to produce adequate sperm leads to infertility or low fertility. The penis and other parts of the reproductive system also show the signs of underdevelopment leads to difficulties with mating and reproduction.
- Hormonal disruption: The genitalia do not develop properly and hormonal imbalances such as low levels of estrogen in females or testosterone in males leads to further exacerbate the reproductive problems. This leads to delayed puberty, irregular estrus cycles or failure to conceive.

Clinical symptoms

- Delayed puberty: One of the most common signs is a delay in the onset of puberty with buffaloes showing no signs of estrus at the expected age.
- Small or underdeveloped genital organs: On examination, the genital organs appear as smaller or less developed than normal and the buffalo exhibits a lack of estrus or mating behaviour.
- Poor reproductive performance: The buffaloes with underdeveloped genitalia experience the fertility issues such as difficulty conceiving, frequent abortions or failure to carry a pregnancy to term.
- Infertility: In extreme cases, the animal completely infertile due to failure of the reproductive organs to develop fully.
- Failure to show estrus: Female buffaloes are not exhibit estrus behaviour or their estrus cycles are irregular or absent.

Diagnosis

Clinical examination

- Physical inspection: An experienced veterinarian physically examines the reproductive organs of the buffalo to detect the abnormalities in size, shape or

development. In females, a rectal examination reveals the underdeveloped ovaries or uterus.

- Observation of estrus behaviour: A lack of estrus or abnormal estrus cycles is an important indicator that genitalia are underdeveloped.

Hormonal Testing

Blood tests measure the levels of reproductive hormones such as estrogen, progesterone, testosterone to assess if hormonal imbalances are contributing to the underdevelopment of genitalia.

Ultrasound or X-ray

Ultrasonography is a useful tool for visualizing the internal reproductive organs, confirming their size and detecting any abnormalities in their structure.

Genetic Testing

Genetic tests are used to identify the underlying genetic conditions or chromosomal abnormalities that could be responsible for the underdevelopment of genitalia.

Treatment

Hormonal therapy

- Hormonal treatments (estrogen or progesterone) are administered to stimulate the development of the reproductive organs especially if there is a hormonal imbalance.
- GnRH (Gonadotropin-Releasing Hormone) analogs are also used to promote ovarian function and correct hormonal disturbances.

Nutritional support

- Improved feed: A balanced and nutrient-rich feed with adequate levels of protein, vitamins and minerals help to support the growth and development of genital organs.
- Mineral supplementation: Providing the minerals such as zinc, selenium, copper and calcium aid in proper reproductive system development.

Genetic counselling

- If genetic factors are suspected, it is useful to consider the selective breeding practices to avoid passing on genetic disorders related to underdeveloped genitalia.

Veterinary intervention

- If the underdevelopment is severe, veterinary intervention such as artificial insemination or the use of growth promoters (in consultation with veterinary experts) is necessary to improve the reproductive outcomes.

Control and prevention

Selective breeding: The breeding practices should focus on selecting animals with robust reproductive health. Avoid inbreeding and choose animals with strong genetic potential for the reproductive development.

Proper nutrition: Provide buffaloes with a balanced feed that supports growth and reproductive health especially during the critical stages of development.

Minimize heat stress: Implement measures to reduce heat stress in tropical climates such as providing shaded areas, adequate ventilation and access to the cool water.

Regular veterinary care: Regular health checks and early detection of any reproductive abnormalities help to prevent the progression of underdeveloped genitalia in buffaloes.

Conclusion

The underdeveloped genitalia in buffaloes is a significant reproductive health issue leads to infertility, delayed puberty and poor reproductive performance. Identifying the causes, diagnosing the condition early and providing appropriate treatment are essential for managing this condition. By addressing nutritional, hormonal, environmental and genetic factors, the buffalo farmers in tropical regions improve the reproductive health and productivity of their herds.