Review Article

Prevalence, Classification, and Management of Anestrus in Cattle and Buffaloes in India: An Updated Review

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Abstract: Anestrus, defined as the absence of overt estrus or heat signs, is a major reproductive disorder affecting cattle and buffaloes in India, significantly impacting fertility and productivity in the livestock sector. In India, where buffaloes constitute a large portion of the dairy industry, anestrus is particularly prevalent due to their inherent reproductive physiology and environmental stressors. The condition can be classified into true anestrus, caused by hormonal imbalances or poor nutrition, and silent estrus, where ovulation occurs without visible signs. Key contributing factors include nutritional deficiencies (especially energy, protein, and minerals), postpartum complications, seasonal variations, poor heat detection, and management practices. Diagnosis involves rectal palpation, ultrasonography, and hormonal profiling. Treatment strategies commonly include nutritional supplementation, hormonal therapies (e.g., GnRH, PGF2α protocols), and improved herd management. Addressing anestrus through integrated reproductive health programs, farmer education, and timely veterinary intervention is essential to enhance reproductive efficiency and milk production in Indian cattle and buffalo populations.

Keywords: Anestrus; Cattle and Buffaloes reproduction; Silent estrus; Hormonal therapy; Dairy cattle management.

INTRODUCTION

Reproductive efficiency is a key determinant of productivity in dairy and beef industries, particularly in a livestock-dependent country like India. Among the various reproductive disorders, anestrus—the failure of animals to exhibit estrus—is one of the most common and economically significant problems affecting both cattle and buffaloes [1]. This condition leads to prolonged calving

intervals, reduced conception rates, and ultimately, lower milk yields and herd profitability [1].

In India, buffaloes account for over 50% of the total milk production [2], making their reproductive performance crucial to the dairy sector. However, buffaloes are more prone to anestrus compared to cattle [1, 3] due to factors such as poor heat expression, seasonal breeding tendencies, and sensitivity to environmental stressors. The prevalence of anestrus is further aggravated by suboptimal nutrition, inadequate heat detection, poor management practices, and limited access to veterinary care, particularly in rural areas.

Understanding the etiology, diagnosis, and management of anestrus is vital for improving reproductive performance. A comprehensive approach involving nutritional correction, hormonal therapy, improved estrus detection, and better herd management can significantly reduce the incidence of anestrus and improve overall reproductive efficiency. This article explores the causes, prevalence, diagnostic approaches, and current management strategies of anestrus in cattle and buffaloes under Indian conditions, with an emphasis on practical, field-applicable solutions..

Incidences of Anestrus in India:

In India, anestrus is one of the most frequently reported reproductive disorders in both cattle and buffalo, with incidence varying widely depending on species, breed, management, and environmental factors. The reported incidence in buffaloes ranges from about 9% up to ~85% under different conditions [3-5]. For example, in a large survey of over 6,000 Murrah and upgraded Murrah buffaloes around Jabalpur, Madhya Pradesh, the overall incidence of postpartum anestrus (including true anestrus + sub-estrus) was 29.12% [4]. In that same study, incidence was much higher in unorganized rearing (≈ 40.15%) than in organized farms (≈ 25.84%), and management quality (good vs moderate) also played a role [4].

In crossbred dairy cattle, the incidence tends to be lower but still considerable. For instance, a study in Meghalaya (North-Eastern India) of 576 crossbred cows found that about 33.85% of animals were affected by one or more reproductive disorders; among those, 31.79% had anestrus[6]. In another recent field study of 157 postpartum cows around Jabalpur, the prevalence of anoestrus (i.e. failure to show estrus 90+ days postpartum) was found to be 19.10% overall, with incidence somewhat lower in organized farms (≈ 15.78%) than in unorganized conditions (≈ 22.22%)[7].

Management, nutrition, season, and housing appear to influence incidence strongly. Studies show that worse managemental condition, unorganized farms, and adverse seasons (especially summer) associate with higher anestrus [1, 8]. For buffaloes in the Jabalpur study, the incidence was highest during summer (≈ 66.28%), much less in rainy (≈ 22.51%) and winter seasons (≈ 11.25%)[8]. Also, buffaloes seem more vulnerable under heat stress, low nutrition etc. Crossbred cattle also show variation: in the Meghalaya study

differences by breed, age, parity were significant, indicating that older or specific cross types may have higher incidence [6].

Classification of Anestrus: Anestrus is mainly classified into physiological and pathological anestrus.

A. Physiological Anestrus refers to a natural, temporary, and non-pathological condition during which the animal does not exhibit estrus (heat) and does not ovulate, due to normal physiological processes. It is not associated with disease or reproductive tract abnormalities and is often self-limiting. Physiological anestrus is divided into Ovulatory anestrus and non-ovulatory anestrus.

1) Ovulatory Anestrus: Ovulatory anestrus (also known as silent estrus or silent ovulation)[1] is a condition in which the animal ovulates normally, but does not show visible or behavioral signs of estrus (heat), making estrus detection difficult or impossible without hormonal or ultrasound monitoring.

Causes of Ovulatory Anestrus: High progesterone levels from a persistent corpus luteum or early pregnancy. Poor estrus detection practices (e.g., infrequent observation).Subtle or weak estrus expression, especially in buffaloes. During hot climates, summer stress reduces activity. Postpartum hormonal imbalance – estrus behavior may resume after ovulation has already restarted. Low estrogen production by the follicle – not enough to trigger estrus behavior.

Key Features: In Ovulatory anestrus ovulation occurs, and corpus luteum (CL) may be present. No external signs of estrus (e.g., mounting, restlessness, vaginal discharge) are seen. The animal appears to be in anestrus based on behavior, but is actually cycling. Commonly misdiagnosed as true anestrus if proper detection methods are not used.

Diagnosis: Ultrasonography to detect ovarian structures (e.g., corpus luteum).Progesterone assay elevated levels indicate ovulation has occurred. Use of heat detection aids like tail paint, pedometers, teaser bulls.

Management: Improve estrus detection by more frequent observation, trained staff. Use hormonal synchronization protocols (e.g., Ovsynch, CIDR).Nutritional and stress management to improve estrus expression.

2) Non-Ovulatory Anestrus in Cattle and Buffaloes: Non-ovulatory anestrus refers to a condition in which the animal fails to ovulate and does not exhibit signs of estrus (heat) [1]. This is typically due to inactive or underdeveloped ovaries, and it reflects a true anestrus condition, where the reproductive cycle has not resumed or has been suppressed.

Key Characteristics: No ovulation occurs and follicles either do not develop or fail to mature. No corpus luteum (CL) is present on the ovaries. No estrus signs are observed. Ovaries are often smooth and inactive on rectal palpation or ultrasonography. It is a true physiological or pathological condition, not just a failure to detect heat.

Causes of Non-Ovulatory Anestrus: Nutritional Deficiency leading to inadequate energy, protein, or minerals (e.g., phosphorus, copper) [1, 3, 9]. Negative energy balance, especially postpartum inactivity leading to extended uterine involution or lack of hormonal signaling after calving. Hormonal Imbalance causing Low GnRH or LH release from the hypothalamus/pituitary. Follicles fail to develop beyond small stages. Stress and environmental factors casing heat stress, poor housing, or transport stress. More common in buffaloes during hot and humid seasons. Prepubertal Stage in heifers that have not yet reached sexual maturity. Suckling effect especially in buffaloes, frequent suckling suppresses GnRH/LH, delaying ovarian activity.

Diagnosis: Ultrasonography shows small, undeveloped follicles or completely inactive ovaries. Rectal palpation indicates smooth ovaries with no palpable structures. Progesterone assay showing consistently low levels indicate absence of luteal activity.

Management: Supplement energy, protein, and minerals. Use of GnRH, progesterone (CIDR), or combined protocols like Ovsynch. Reduce stress and improve general health and body condition score (BCS). Timely treatment of uterine infections or metabolic issues.

B. Pathological Anestrus: Pathological anestrus is a form of anestrus in which the absence of estrus and ovulation is caused by an underlying disease or abnormal condition of the reproductive tract or endocrine system. Unlike physiological anestrus, this condition does not resolve on its own and requires veterinary diagnosis and treatment.

Key Characteristics: Ovarian or uterine pathology is present. Reproductive cycle is disrupted due to disease or anatomical abnormalities. No visible estrus signs and no ovulation. Often results in prolonged infertility or subfertility. It may be associated with other systemic or reproductive signs (e.g., abnormal discharge, repeat breeding, poor condition).

Causes of Pathological Anestrus:

Follicular cysts shows persistent, non-ovulating follicle. Luteal cysts is formed when a follicle luteinizes without ovulation[1]. Ovarian hypoplasia or dysgenesis (rare but possible in poorly bred heifers). Ovarian adhesions or tumors. Uterine Infections like endometritis, metritis, pyometra conditions alter hormonal feedback and prevent normal cyclicity [10]. Persistent infection can suppress follicular development or cause luteal persistence. Persistent Corpus Luteum (CL), CL fails to regress due to lack of prostaglandin release (often due to uterine pathology), causing prolonged progesterone secretion and inhibition of estrus. Adhesions or structural abnormalities like Uterine or ovarian adhesions following dystocia, surgery, or infections can prevent normal reproductive function. Endocrine disorders such as pituitary or hypothalamic dysfunction leading to improper secretion of GnRH, LH, or FSH.Less common, but may occur in chronic systemic illness or after toxic exposure.

Diagnosis: Ultrasonography detects cysts, uterine fluid, adhesions, etc.Rectal

palpation helps identify abnormal ovarian or uterine structures. Hormonal assays showing progesterone levels, LH/FSH levels (if needed).Vaginal exam and uterine culture to diagnose infections.

Management: Cystic ovaries are treated with GnRH (for follicular cysts) or $PGF_2\alpha$ (for luteal cysts).Uterine infections are treated with antibiotic therapy, uterine lavage, prostaglandin injection. Persistent CL is treated with $PGF_2\alpha$ to induce luteolysis. Structural abnormalities may require surgical or advanced veterinary intervention. Supportive therapy with nutritional supplementation and stress reduction.

C) Acquired anestrus is a type of anestrus that develops after an animal has reached sexual maturity and had normal estrous cycles, but later stops cycling due to external or internal factors. It is not congenital, but is developed over time as a result of environmental, nutritional, disease-related, or managemental issues.

Key Characteristics: Animal had normal estrous cycles in the past. Now exhibits no visible estrus and no ovulation. Ovaries may be inactive or show disrupted follicular development. It is caused by factors acquired during the animal's life — not from birth.

Causes of Acquired Anestrus in India: Nutritional Deficiencies are most common cause in Indian cattle and buffaloes. Inadequate dietary energy, protein, and minerals (especially phosphorus, copper, zinc).Poor body condition (BCS < 2.5) leads to suppression of ovarian function. Postpartum complications causes retained placenta, metritis, or uterine infections delay resumption of cyclicity. Extended suckling suppresses LH release, especially in buffaloes. Seasonal effect causes summer anestrus due to heat stress, particularly in buffaloes. High temperature and humidity depress hormonal activity and estrus behavior. Lactational Stress causes high milk yield animals under poor nutrition often go into negative energy balance, leading to anestrus. Seen in high-yielding crossbred cows and Murrah buffaloes.Poor Heat detection in animals may be cycling (silent estrus), but go undetected due to lack of observation or inexperienced farm staff. Hormonal imbalance causes failure of GnRH and LH secretion due to chronic stress or systemic illness.Inactive ovaries with low hormone levels (estrogen, progesterone). Managemental Issues causes frequent breeding checks, inadequate record keeping. Lack of timely veterinary care in rural areas.

Table 1: Management Strategies for Control of Anestrus in Cattle and Buffaloes

S.No	Approach	Description
1	Nutritional support	Balanced ration with energy, protein, mineral mix.
2	Hormonal therapy	GnRH, PGF2α, CIDR, Ovsynch protocol depending on ovarian status.
3	Infection control	Treat underlying uterine infections.
4	Heat stress mitigation	Shade, fans, sprinklers, especially in buffaloes.
5	Improved estrus detection	Visual observation, teaser bulls, tail paint, pedometers.

Diagnosis of Acquired Anestrus: Rectal palpation or ultrasonography can diagnose inactive ovaries or small follicles. Hormone assays shows low progesterone and estrogen. History of previously cycled but now not showing heat.

CONCLUSION

Anestrus is one of the most prevalent and economically important reproductive disorders affecting cattle and buffaloes in India, leading to prolonged calving intervals, reduced conception rates, and poor reproductive efficiency. Buffaloes are particularly susceptible due to a higher incidence of silent and seasonal anestrus. The condition is multifactorial in nature, commonly associated with nutritional deficiencies, postpartum complications, hormonal imbalances, environmental stress, and inadequate heat detection. Importantly, a large proportion of anestrus cases are acquired and management-related, making them largely preventable and reversible. Effective control requires an integrated approach involving balanced nutrition during the postpartum period, accurate diagnosis through ultrasonography and hormonal profiling, timely hormonal interventions, and improved reproductive management supported by farmer education. Strengthening veterinary services alongside good husbandry practices can substantially reduce anestrus incidence and enhance fertility, milk production, and overall profitability in cattle and buffalo production systems across India.

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