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Anoestrus in bovines: A review article

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Abstract
Anoestrus cannot be regarded as a disease but is rather a sign or a symptom of some suboptimal (e.g. management or nutrition) or pathological (e.g. chronic debilitating diseases or uterine and ovarian diseases) conditions. It is a functional disorder of reproductive cycle in cattle and buffalo which is characterized by absence of overt signs of estrus and also affecting the livestock enterprise to a great extent. Incidence of anestrous is more in buffalo than the cattle, and problem is severe during summer. This article reviews the etiology, types, diagnosis, treatment and prevention of anoestrous condition.

Keywords: Anoestrous, ovarian disease, etiology, diagnosis, treatment

Introduction
Anoestrus is one of the major causes of economic losses in both the dairy and beef industries [1]. It is one of the most commonly occurring reproductive problems in cattle and buffalo in India, affecting livestock productivity and economics to a great extent. The problem is more severe in sub urban and rural areas of the country. It is a functional disorder of the reproductive cycle which is characterized by absence of overt signs of estrus manifested either due to lack of expression of estrus or failure of its detection. It should be kept in mind that also pregnant cows do not cycle and will not be seen in heat. Especially in herds with a poor management and in those in which a bull has entrance to the cows, attention has to be paid to pregnant cows. Anestrus is observed in post pubertal heifers, during pregnancy, lactation and in early postpartum period in adult animals. The condition may be associated with uterine pathology such as pyometra, fetal resorption, maceration and mummification. Expression of estrus is also influenced by seasonal changes, stress and aging. In heifers, it poses a herd problem possibly due to low plane of nutrition, stress of seasonal transition or extremes of climatic conditions. Expression of overt signs of estrus is greatly affected by heat stress in buffaloes. Modern feeding and managemental practices also accentuate the problem in commercial dairy farms. Incidence of anestrus though varies in the different managemental system but it is more in buffalo than the cattle, and especially during summer. Anestrus is a multi-causative factors associated problem but its occurrence signals the inadequate nutrition, environmental stress, uterine pathology and improper managemental practices. Diagnosis of the condition is based on the exploration of the different causative factors responsible for it [2]. Anoestrus indicates the lack of this typical oestrus expressionat an expected time. It is a normal phenomenon in association with some physiological conditions (e.g. before puberty and during pregnancy), but becomes pathological when the duration exceeds the generally accepted average [3]. The present articles describes the types, causes, diagnosis and treatment of anestrous.

Types of Anoestrus
There are four different clinical forms of anoestrus namely (i) Silent heat (ii) Cystic ovarian disease (iii) Ovarian a function (hypo-function) (iv) Corpus luteum pseudo graviditatis [4].

Suboestrus: It is unobserved or silent heat. Cows suffering from suboestrus are not seen in heat at the expected time after parturition although they are cycling regularly, as can be proven by progesterone profile analysis and rectal examination [5]. Suboestrus is the main reason why cows are not seen in heat within 60 days after calving.

True anoestrus: Cows in true anoestrus are characterized by low progesterone levels in milk and blood and inactive ovaries or ovaries with poor follicular growth [5].

Prolonged periods of ovarian quiescence and anovulation are mainly due to lowered plasma LH levels. As a consequence, factors that suppress LH pulse frequency during the post-partum period will delay the first ovulation and lead to anoestrus. Although many stress factors are known to impair oestrus in the dairy cow by reducing the LH pulse frequency, it is generally accepted that malnutrition and an excessive Negative Energy Balance (NEB) are the main causes of delayed ovarian function after calving. Decrease in plasma LH levels caused by a lowered sensitivity of the pituitary to GnRH stimulation.

Pyometra: Pyometra is characterized by a progressive accumulation of pus in the uterus in the presence of functional ovarian luteal tissue, usually a corpus luteum or rarely a luteal cyst. During parturition the uterus is invaded by several kinds of bacteria like Gram-negative anaerobic bacteria (especially *Fusobacterium necrophorum* and *Bacteroides melaninogenicus*) and *Actinomyces pyogenes.* In cows with disturbed uterine defence and involution processes, as after a retainedplacenta, the self-clearance mechanism of the uterus can be perturbed. An exudative purulent response is generated in the endometrium and the ability of the uterus to produce or transport a sufficient amount of prostaglandins to cause luteal regression is compromised. As a result, the corpus luteum persists and since the genital tract remains under the continuous influence of progesterone without an intervening oestrus, the infective process progresses and a purulent exudate accumulates in the uterus.
Cows which suffer from pyometra show little or no signs of ill-health. The main reason for them being examined is the absence of cyclic activity and sometimes the presence of an intermittent vaginal discharge. The diagnosis will be based on the anamnesis and on an extensive clinical examination.

Cystic ovarian disease: Another common pathological condition leading to post-partum anoestrus in dairy cows concerns cystic follicular degeneration or cystic ovarian disease (COD). Cows are diagnosed as being affected by COD when they have one or more fluid-filled ovarian structures (cysts) of at least 2.5 cm in diameter that persist for at least 10 days in the absence of a corpus luteum, combined with cyclic irregularity characterized by anoestrus or nymphomania. Pathological ovarian cysts (follicular cysts and luteal cysts) arise as the result of anovulation of follicles. Cystic Ovarian Degeneration (COD) in dairy cattle occurs most frequently during the early post-partum period (30 to 60 days after calving), at the time of resumption of normal ovarian activity.

Pregnancy: It should be kept in mind that also pregnant cows do not cycle and will not be seen in heat. Especially in herds with a poor management and in those in which a bull has entrance to the cows, attention has to be paid to pregnant cows.

Etiology

Nutrition: Nutritional status of animals affects the follicular growth, maturation and ovulation [6]. Under nutrition is the one of the most prevalent cause of anestrus in heifers. The deficiency of minerals like calcium (Ca), phosphorus (P), copper (Cu), zinc (Zn) and manganese (Mn) are also associated with anestrus [7]. Occurrence of anestrus is not only due to underfeeding or malnutrition but also occurs owing to high feed intake which promotes high metabolism and clearance of ovarian steroids (estrogen and progesterone) from body by enhancing the hepatic perfusion [8] especially in high yielders.

Lactation: High yielding cattle and buffalo shows significantly longer postpartum anestrus period or weaker signs of estrus [9]. In high yielders prolactin hormones secreted more which cause negative effect on GnRH secretion. Finally it causes anoestrus due to insufficient FSH and LH hormones [10].

Suckling: Suckling suppress the postpartum ovarian activity both in cattle [11] and buffalo [12] resulting into extended postpartum anestrus period. Moreover, postpartum anestrus is longer in continuously suckled than restricted or partial suckled cow and buffaloes [13]. Postpartum anestrus is longer in suckled beef cow than milked dairy cow. Suckling stimulates prolactin, cortisol and oxytocin secretion that have negative effect upon GnRH-LH axis. Higher level of these hormones suppresses the GnRH secretion and increases the concentration of endogenous opioid peptides; β–endorphin thus, ultimately reduces the LH pulse frequency [14] which delays resumption of postpartum cyclicity.

Season: Walsh *et al.* [15] observed that if calving has taken place in winter season, dams are prone to maximum threat of anestrus. Season cause change in photoperiod stimulation in brain. Though dairy cattle's are not seasonal breeders.

Breed: Suckled dairy cows have longer postpartum interval than suckled beef cows.

Parity: Primiparous cows have longer intervals to first ovulation than multiparous ones and cows with lower energy balances have longer intervals than those with higher energy balances [16].

Diagnosis of Anestrus

History: Based on the information *viz*., failure of displaying the overt signs of estrus by the animals after attaining puberty or 60–90 days post-partum; symptoms of estrus shown with cyclicity which subsequently ceased and revert in to anestrus.

Progesterone Estimation: True anestrus is usually characterized by a lack of ovarian progesterone production [17]. Presence of basal level (0.5–1 ng/ml) of progesterone in the blood samples at an interval of 8–10 days further confirms the diagnosis. If the concentration of progesterone is more than 1ng/ml, it is suggestive of presence of corpus luteum and anestrus in such situation might be due to unobserved estrus/silent estrus/persistent corpus luteum.

Per Rectal Examination: Pregnancy can be a prominent cause of anestrus and therefore must be ruled out by careful examination of ovary and uterus when any animals present for gynecological examinations. On per rectal examination, ovaries are smooth, small and inactive with the absence of corpus luteum in true anestrus cattle and buffaloes [14] however, follicles may develop up to prematuration stage and get atretic [18].

Ultrasonography

Ovarian pathology which is not accurately determined by per

rectal palpation can be visualized by ultrasonography. Different stages of follicular growth and type of anestrus can easily be detected by ultrasonography. Transrectal ultrasonographic examination of anestrus buffaloes cows which are not seen in oestrus for 60 or more days postpartum at 12 days revealed 45% inactive ovaries (true anestrus), 55% silent ovulation or missing heat [19].

Treatment and Prevention

Cows which are diagnosed to be in suboestrus and which have a well-developed corpus luteum should be treated with prostaglandins. Treatment of these cows will bring up to 80% off the animals into a fertile oestrus within 2 to 6 days, depending on the stage of the cycle in which they were treated.

If pyometra is diagnosed, the first choice of treatment is an injection with prostaglandins. This treatment causes regression of the corpus luteum persistens and induces oestrus and ovulation, which leads to the evacuation of the abnormal uterine content and an enhancement of uterine defence mechanisms. Relapses often occur; it is therefore advisable to treat these patients a second time with prostaglandins 12 to 14 days after the first treatment. Insemination can be started after endometrial lesions have healed, which takes 1 to 3 months [3].

Lack of LH is the primary cause of COD, general treatment of cows affected by COD is directed to stimulate luteinization of the cyst, which is usually followed by the reestablishment of a normal oestrous cycle. Biological preparations high in LH-like activity (e.g. human chorionic gonadotrophin) and exogenous GnRH, which acts on the pituitary gland to cause the release of endogenous LH, have been widely and effectively used for the treatment of both follicular and luteal ovarian cysts. Almost 80% of the affected cows exhibit afertile oestrus within 16 to 30 days, although pregnancy rates are slightly lower in comparison with those of normal cows.

Cows suffering from true anoestrus or inactive ovaries are the most difficult to treat. Therapy should be approached first by correcting underlying nutritional deficiencies or systemic diseases.

Prevention of deep Negative Energy Balance (NEB) and Shortening or eliminating the dry period may improve energy status of cows and increase reproductive efficiency [20]. Prevention of metabolic diseases in the periparturient period, heat stress [21] and management factors [22] would reduce the incidence of Anoestrum. Finally, early diagnosis of pathological conditions (e.g. chronic debilitating diseases or uterine and ovarian diseases) should be done and proper treatment should be given.

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