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Anestrus is a major infertility issue in perspective of buffalo reproduction in India: A review

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Abstract
Buffalo is a major contributor to milk, meat, draught power and leather production in many countries but anoestrous is an important reproductive disorder that causes or effects reproductive performance of it. Anoestrous occur in buffaloes due to many reasons which are highlights under current review. Prevention or earlier diagnosis and treatment of anoestrous problems will improve herd production and help full in reduction in inter-calving period. Hence, current review also covered briefly about treatment and prevention of anoestrous.

Keywords: Buffalo, anoestrous, incidence, cause, treatment

1. Introduction
Buffalo is the most valuable and premier livestock species in Asian countries including India which plays a significant role in the rural agricultural economy due to its unique quality as a multipurpose species contributing toward milk, meat production and draft purpose (Barile, 2005 and Zicarelli, 1994) [6, 61]. It alone contributes approximately 96.8% of the total milk to the dairy industry in Asia (Cockrill, 1981) [8]. Buffaloes can efficiently convert poor quality and fibrous feeds into high quality protein like meat, milk and valuable by-products (Kandeepan *et al.*, 2013) [23]. Although buffaloes are well adapted to hot and humid climate, but their reproductive performance is greatly influence by heat stress (Marai and Haeeb, 2010) [30]. During hot climate reproductive efficiency of buffalo is adversely affected by certain constraints such as late maturity, poor expression of the estrous signs, irregular estrous cycle, silent heat, and seasonality in breeding, poor conception rate/early embryonic mortality and prolonged inter-calving interval (Madan, 1990) [29]. Kumar *et al*., (2013) [26] reported an estimated loss from anoestrus around Rs. 372.90 per day in buffalo.
Oestrus is defined as a type of sexual behaviour near the time of ovulation which is characterized by the acceptance of the male. Anoestrus indicates the lack of this typical oestrus expression at an expected time. It is a normal phenomenon in association with some physiological conditions (before puberty and during pregnancy) but becomes pathological when the duration exceeds the generally accepted average. In fact, post-partum anoestrus can be defined as the lack of oestrus symptoms (despite of effective oestrus detection) within 60 days after calving, while normal buffalo in exactly the same conditions already have been seen in heat.
Anoestrus is one of the major causes of poor reproductive performance in buffaloes which results in long inter calving period (Das and Khan, 2010; Devkota *et al*., 2012 and Murugavel *et al.*, 2009) [9, 10, 33]. It is generally caused by ovarian dysfunction (true anoestrous), silent ovulation and missing heat. One clinical survey reported cases of anoestrus showed that about 60% of cases were true anoestrus and 33% of cases were silent ovulation (Sah and Nakao, 2010) [49]. Low secretion of luteinising hormones might be one the reason of long postpartum anoestrous (Perera, 2011) [42].
A large variation on incidence of anoestrus in buffaloes has been reported in literatures depending upon species, breed, parity, season, level of nutrition, managemental conditions and geographic environment. In general, it has been reported between 12-29.12% in Jabalpur and Madhya Pradesh (Gupta, 2009; Kumar, 2012 and Purkayastha, 2012) [19, 25, 45] and 9.09–82.50% in other parts of country (Prajapati *et al.*, 2005; Kumar *et al.*, 2007; Jainudeen *et al.*, 1983 and Emadi *et al.*, 2003) [44, 28, 22, 15]. Incidence of anestrus is higher in adult cattle and buffalo than the heifers (Bharkad and Markandeya, 2003) [7].

Major etiological factors included that causes anoestrous in bovine are; nutrition (Mwaanga and Janowski, 2000; reported that poor and imbalanced diet reduces GnRH secretions) [34], lactation (Youngquist and Threlfall, 2007; reported in high yielders prolactin hormones secreted more which cause negative effect on GnRH secretion that causes anoestrus due to insufficient FSH and LH hormones) [59], season (Singh *et al*., 2000; observed reduced ovarian activity) [54], parity (Agarwal *et al*., 2004; explained primiparous have longer intervals to first ovulation than multiparous ones and cows with lower energy balances have longer intervals than those with higher energy balances) [1], suckling (El–Fadaly, 1980 and Honnapagol *et al*., 1993; found suppression of postpartum ovarian activity and resulting into extended postpartum anoestrus period because of suckling) [14, 21], periparturient diseases (Fonseca *et al*., 1983 and Opsomer *et al*., 2000; observed periparturient diseases such as abnormal calvings, metritis, mastitis and ketosis also influence onset of postpartum cyclicity) [16, 38] and stress factors (managemental or environmental).

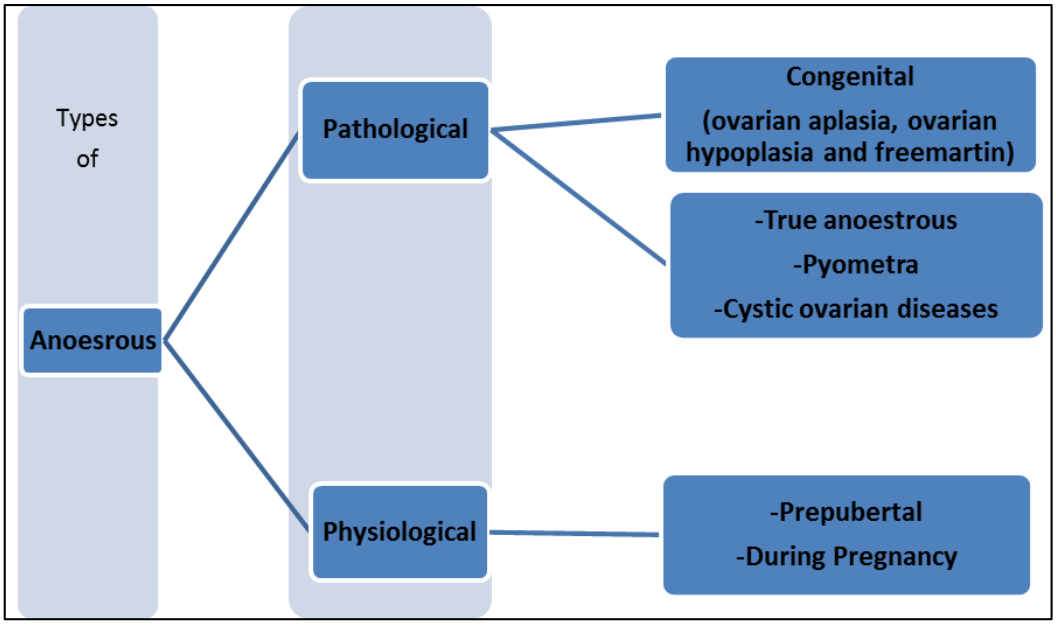

Fig 1: Sketch diagramme showing the etiology of anoestrus in buffalo.

Ovarian Pathological or clinical form of anoestrous included; congenital (ovarian aplasia, ovarian hypoplasia and freemartin), true anoestrous (Opsomer *et al*., 1996; characterized low progesterone levels in milk and blood and inactive ovaries or ovaries with poor follicular growth due to lower low LH level) [38], pyometra (accumulation of pus in uterus with presence of functional CL), cystic ovarian diseases (includes luteal cyst and cystic ovarian degeneration).

Diagnosis of anoestrous occur on the bases; history (failure of displaying the overt signs of estrus by the animals after attaining puberty or 60–90 days post-partum), progesterone estimation (Peter *et al*., 2009; stated true anoestrus is usually characterized by a lack of ovarian progesterone production) [40], per rectal examination (observed smooth small and inactive ovaries with absence of CL, in true anoestrous according to Agarwal *et al*., 2004) [1] and ultrasonographically examination (visualize pathological condition of ovaries).

Treatment of anoestrous condition should be done on the bases of their cause, but there is no single treatment is correct. Hence both hormonal and non-hormonal treatment is given to treat the anoestrous animals with various degree of success (Glotra *et al*., 1970; Deshpande *et al*., 2000, Agarwal *et al*., 2001 and Kumar *et al*., 2005) [18, 12, 2, 27].

Non-hormonal treatment includes; plant based heat inducers (feeding of those plants which are rich in vitamins and minerals along with have estrogenic property which is useful in restoration of cyclicity in anoestrus animals like *Murrayakoenigii*, *Nigella sativa*, *Abromaaugusta*, *Saracaasoca*etc.), Utero-ovarian massage (Romaniuk, 1973; Zduńczyk *et al*., 1992 and Rahawy, 2009; stated it is an oldest, cheapest effective method to induce estrus in bovine) [48, 60, 46], Lugol's iodine (cheaper and effective means of management of anoestrus but with variable response has been observed by Tapas *et al*., 2000; Tomar, 2004; and Gupta *et al*., 2011) [57, 58, 19].

Hormonal treatment includes; Estrogen based treatment (Saiduddin *et al*., 1968; Peters, 1984; Garcia–Winder *et al*., 1988 and McDougall *et al*., 1994 reported,in presence of dominant follicle, estrogen administration results in expression of estrus and ovulation because of its positive feedback effect over pituitary for LH surge, hence it has been used to induce ovulation) [50, 41, 17, 31], progesterone based treatment (Singh *et al*., 1988 and Azawi *et al*., 2012 stated, intravaginal progesterone releasing devices such as progesterone–releasing intravaginal device, controlled internal drug release and CueMate are effective in restoration of cyclicity; upon withdrawal progesterone source or abrupt decrease of progesterone level, stimulated normal follicular phase of the cycle is in anoestrus animals because of negative feedback effect of progesterone over hypothalamus and pituitary for LH release) [53, 4], Gonadotropic Releasing Hormone (GnRH) based treatment (Dhoble and Gupta, 1986; Sonwane *et al*., 1994; Narasimha Rao, 1997; Nautiyal *et al*., 1997 and Prahalad *et al*., 2010 reported that single intramuscular injection of GnRH analogue has been used effective in induction of estrus and concurrent ovulation with variable response between 45.5 to 87.5% within 4–22 days, by inducing ovulation, if mature follicle is present at the time of administration by inducing the LH surge) [13, 56, 35, 37, 43].

Gonadotrophins based treatment (Muneer *et al*., 2009; Prahalad *et al*., 2010 and Kumar, 2012; observed single

intramuscular injection of PMSG or eCG in low doses either alone or in combinations with others has been used successfully to treat anoestrus buffaloes) [32, 43, 25], and Prostaglandin based treatment (Nautiyal *et al*., 1998 and Singh *et al*., 2001; reported single dose of PGF2α has been used with a reasonable degree of success for management of silent estrus and in case of persistent CL in buffaloes) [37, 55].

Prevention of anoestrous condition can be achieved by providing good and balanced diet, minerals and vitamins supplementations, better management and environment (Baldi *et al*., 2000; Anita *et al*., 2003; Koley and Biswas, 2004; Selvaraju 2009; Sah and Nakao, 2010 and Kumar, 2012) [5, 3, 24, 52, 51, 25]. Improves managemental practices; detect animals under silent heat, routinely pregnancy diagnosis, regularly deworming and treating postpartum uterine infections.

Conclusion

Buffalo is the major livestock species in India. This species has better quality milk production than cattle, and this quality of this species has now drawn attention of several scientists working in the area of reproduction to improve buffalo farming. The buffalo suffers with suboptimal reproductive rhythm especially with true anestrus and silent estrus. The buffalo experienced with this kind of reproductive problems specially during summer. Moreover, several estrus synchronization protocols have now been implemented to overcome with this problem. The lower circulating melatonin level has also been found during summer than winter which suggest some role in buffalo reproduction however, no any conclusion has until now drawn. The estrus synchronization protocols especially based on progesterone in addition with GnRH played more effective role than other protocols especially in summer season. Moreover, the buffalo provided with good managemental practices had lower incidence of anestrus and silent estrus problems therefore, this review suggest that the buffalo should be provided with good managemental practices along with mineral mixture in balanced diet to improve the buffalo dairy farming in India.

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