REPEAT BREEDING AND ITS TREATMENT IN DAIRY CATTLE OF HIMACHAL PRADESH (INDIA) - A REVIEW

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ABSTRACT

Repeat breeding is a major reproductive disorder in dairy cattle and its incidence varies among different management systems, environments and regions. The culling rate of repeat breeder dairy cattle can be reduced by improving their conception rate through careful handling of genitalia during insemination to avoid acquired abnormalities, appropriate treatment of uterine infections, administering hormone therapy to improve fertilization success and lower embryonic mortality, and ensuring insemination of dairy cattle after proper clinical examination by a skilled inseminator.

Keywords: Cattle, Dairy, Etiology, Repeat breeder, Treatment

Reproductive inefficiency of cattle due to repeat breeding syndrome is an expensive hitch in profitable dairy production as the age at first calving in heifers is delayed and the intercalving interval is extended, thus leading to lowering of calf crop (Thakur *et al.,* 2006a). The reasons associated with fertilization failure or embryonic mortality includes reproductive tract aberrations, endocrine dysfunctions, infectious causes, errors in management including nutritional deficiencies and compromises in artificial insemination (AI) procedures (Singh and Pant, 1998a, 1999). In Himachal Pradesh, the proportion of dairy cattle suffering from repeat breeding syndrome due to anatomical, functional, infectious and managemental reasons was 14.74, 17.19, 55.66 and 12.41%, respectively (Singh and Pant, 1998b, 1999; Singh, 2000; Thakur *et al.,* 2006a). In this article, the reasons underlying repeat breeding syndrome in dairy cattle reared in Indian conditions and the solutions to alleviate the problem have been reviewed.

ANATOMICAL INFERTILITY

Congenital reasons are rare with only 0.11% dairy cattle reported with persistent hymen in Himachal Pradesh (Thakur *et al.,* 2006a). Acquired causes like cervical problems, ovarobursal adhesions, fibrous fallopian tubes and uterine adhesions had an incidence of 12.80, 0.81, 0.86 and 0.16%, respectively (Singh and Pant, 1998b, 1999; Singh, 2000 and Thakur *et al.,* 2006a). Moreover, a comparatively lower incidence (7.10%) of repeat breeding due to anatomical causes was reported from the adjoining state of Punjab (Singh *et al.,* 2008).

The treatment of anatomical causes of repeat breeding is difficult. However, about 28.6% conception rate was achieved in dairy cattle suffering from cervical fibrosis or partial obstructions through natural service or artificial insemination (AI) with increased concentration of spermatozoa (2-3 straws simultaneously; Singh and Nigam, 1998). Similarly, insemination on unaffected uterine horn side treated the unilateral salpingitis, though the conception chances were very low (Arthur *et al*., 2001).

FUNCTIONAL INFERTILITY

The functional causes of repeat breeding in dairy cattle mainly include delayed ovulation, anovulation and luteal insufficiency with the incidence of delayed ovulation varying between 2.38% (Jaswal and Singh, 2010) to 5.75% (Singh and Pant, 1999) in different

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parts of Himachal Pradesh. In fact, the ovarian follicles in dairy cattle ovulating at the time of AI after attaining 11.53±0.32 mm diameter were more likely to become pregnant than their cohorts ovulating a follicle with a lesser diameter, thus, suggesting a correlation of follicle diameter with pregnancy outcome in dairy cattle (Kapse *et al*., 2017).

For the treatment of functional causes of repeat breeding in dairy cattle various hormonal protocols have been developed. In prolonged estrus exhibiting repeat breeder cattle, the use of single insemination along with administration of buserelin acetate, a GnRH analogue, is sufficient, however, in the absence of hormonal treatment, the use of double insemination at 24 h interval also gives optimal results (Sharma *et al*., 2006). The administration of GnRH in these animals leads to induction of ovulation (Singh and Nigam, 1998). Moreover, in repeat breeder cattle, GnRH administration at estrus or during luteal phase (between day 11-14 post-insemination) increases plasma progesterone and delays luteolytic response, thus enhancing the embryo survival rate (Jaswal *et al.,* 2016). In fact, the treatment of repeat breeder cattle with 10.5 µg GnRH analogue or hCG on day 12 post-AI lead to an improvement in conception rate (Thakur, 2010; Jaswal and Singh, 2013).

Another option for improving the conception rate in dairy cattle with functional form of infertility is the use of ovulation induction protocol. In dairy cattle of Himachal Pradesh, the use of ovsynch protocol improved the conception rate, however, there was no impact of other protocols like doublesynch and heatsynch on fertility improvement (Kapse, 2016). Nevertheless, pre-synchronization with prostaglandin $F_{2\alpha}$ ($PGF_{2\alpha}$) followed by administration of GnRH analogue along with AI at 60 h post-$PGF_{2\alpha}$ improved conception rate in repeat breeder cattle (Sharma *et al.,* 2011).

Indiscriminate parenteral administration of progesterone as a tool to increase conception rate in normal breeding dairy cattle presented for insemination is a fast growing malpractice amongst field veterinary staff in different parts of the state. In fact, the results suggested low conception rate in normal breeding dairy cattle receiving progesterone simultaneous to insemination (Singh *et al*., 2002; Kumar *et al*., 2009).

INFECTIOUS INFERTILITY

Many specific and non-specific uterine infections are associated with either fertilization failure or early embryonic mortality in repeat breeder cattle. Non-specific infections of the genital tract invariably need some predisposing factor and generally involve an individual animal (Singh, 1998). In repeat breeder cattle, clinical endometritis and sub-clinical endometritis had an incidence of 54.15% and 1.40%, respectively, in Himachal Pradesh (Singh and Pant, 1998b; Thakur *et al.,* 2006a).

From the cervical mucus of repeat breeder cattle in Himachal Pradesh, the pure bacterial isolations reported were Escherichia coli, Staphylococcus aureus, Bacillus spp., Proteus spp., Enterobacter spp., Corynebacterium spp. and Pseudomonas aeruginosa. Moreover, mixed cultures of Escherichia coli and Bacillus spp., Escherichia coli and Staphylococcus aureus as well as Staphylococcus aureus and Pseudomonas spp. were also obtained (Singh, 1998; Singh *et al.* 1998; Sharma *et al.,* 2009). The antibiogram of bacteria isolated from repeat breeder cattle exhibited sensitivity to Gentamicin (80.6%), Tetracycline (67.8%), Chloramphenicol (61.3%), Penicillin (29.0%), Streptomycin (25.8%), Co-trimoxazole (22.6%), Nitrofurantoin (12.9%) and Ampicillin (3.2%). Moreover, the most bacterial isolates were resistant to Ampicillin (96.8%; Singh, 1998). Furthermore, the susceptibility of an organism to a given antibiotic may change if indiscriminate use of drugs is carried out (Sharma *et al.,* 2009).

Mycotic endometritis is also becoming a matter of concern in repeat breeder cattle in Himachal Pradesh (Sharma and Singh, 2012). Other researchers have also isolated fungi and yeasts from endometritic cattle

(Vlcek *et al.,* 1989). Yeasts may gain entry into the genital tract as these are widely distributed in soil, animal excreta, vegetative parts of plants and in substances that contain sugars (Hensyl and Oldham, 1982). An increase in prevalence of mycotic endometritis was attributed to regular and indiscriminate use of intrauterine broad-spectrum antibiotics, postpartum uterine contamination and compromises in hygiene during AI procedures.

Overall incidence of fungal endometritis in repeat breeder cattle in Himachal Pradesh was 15.5% with isolates of Geotrichum spp., Cladosporium spp., Mucor spp., Verticillium spp., Chrysosporium spp., Alternaria spp, Rhodotorula spp., Cephalosporium spp., Mortirella wolfii, Candida albicans, Candida tropicalis, Aspergillus fumigatus, Aspergillus ochraceous, Aspergillus niger and Rhizopus spp. (Sharma and Singh, 2012). The predisposing factors for persistent bacterial and fungal infections following decreased uterine defense mechanism are delayed uterine clearance or altered immune function (Sharma *et al.,* 2008).

The treatment of repeat breeder bovines suffering from uterine infections need proper selection of antibiotics to prevent development of resistant strains of microbes and to eliminate infection as quickly as possible (Singh *et al.,* 2004). Due to different types of infectious agents involved in uterine infections, a specific set of recommendation of drugs is impossible. A study suggested that systemic, rather than intrauterine, treatment achieves adequate concentration of an antibiotic in blood serum and endometrial tissue that is particularly necessary in cases of septic metritis. Also, systemic administration eliminates the risk of damage to genital tract and the risk of introducing new microorganisms. For the management of suspected fungal endometritis, 0.1% lugol's iodine is a successful and inexpensive therapeutic option (Sharma and Singh, 2012). The infusion of irritants in a bovine uterus with healthy endometrium may not have an adverse impact on fertility but the infusion of irritants into the uterus of cattle with diseased endometrium may adversely affect fertility.

MANAGEMENTAL INFERTILITY

Amongst etiological factors for repeat breeding, an inadequate management of the female also plays a major role. A female may fail to conceive due to causative factor(s) like improper handling of semen and faulty AI technique. In spite of all the developments in semen handling, AI procedures and training of veterinarians, the average post-AI conception rate remains below 30% in the field, thus posing a serious challenge to the future of dairying.

A survey suggested 14.75% dairy cattle as repeat breeder due to managemental causes (Singh *et al.,* 2008). Among these, 6.78% were malnourished, whereas 5.63% were repeat breeder due to incorrect time of artificial insemination (Singh and Pant, 1998b). Usually the managemental infertility is attributed to problems at farmers' level and efforts were not made to study the role of inseminators. An increase in incidence of endometritis and cervical fibrosis clearly indicated the role of inseminators involved in AI work in the field situations. In the state, the privatization of para-veterinary services was started and as an unauthorized extension of their services, para-veterinary staff started inseminating dairy cattle leading to an increase in number of cattle with ovarian adhesions, cervicitis, endometritis, perforated rectum and lacerated uterus. In fact, the incidence of repeat breeding has overtaken anestrus as a major reproductive disorder in Himachal Pradesh.

Another major managemental cause is deterioration of semen quality during transportation from semen laboratory to field institutions that is either due to mismanagement in transportation and distribution of straws from semen lab or during handling and storage of semen in field institutions. The success of AI program is linked with the prolongation of fertile life of spermatozoa under *in vitro* storage conditions. In order to evaluate semen quality as a possible cause of low conception in field conditions, straws of frozen

semen straws were procured from semen processing laboratory and were compared with straws of same bull and batch procured from the field institutions. The evaluation study revealed deteriorated semen quality during transportation and was suggested as another cause of low conception in field institutions (Thakur *et al.,* 2006b).

Inadequate training of pharmacists, insemination without proper examination and the prevalent practice of inseminating cattle otherwise unfit for AI are other managemental factors responsible for low conception under field conditions (Singh and Pant, 1998b).

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