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Repeat breeding in bovines: A review

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Abstract
Repeat breeding is a serious reproductive condition that affects dairy cattle, and its prevalence varies depending on the environment, management style, and geographic location. A skilled inseminator should carefully handle the genitalia during insemination to avoid acquired abnormalities, treat uterine infections as necessary, administer hormone therapy to increase fertilization success and decrease embryonic mortality, and only inseminate dairy cattle after a thorough clinical examination. This will reduce the culling rate of repeat breeder dairy cattle.

Keywords: Repeat breeding, dairy cattle, uterine infections

Introduction

Repeat breeding is still a significant issue for breeders and veterinarians. The typical aetiological and risk factors for repeat breeding in cattle and buffaloes are briefly mentioned, and the potential diagnostic and treatment techniques are thoroughly detailed. Recto-genital palpation, vaginoscopy, uterine cytology, and the *in vivo* imaging method of ultrasonography could all be crucial diagnostic tools. Ultrasonography can significantly improve diagnostic accuracy, especially when treating individual cows or buffaloes, whereas vaginoscopy and palpation continue to be the only diagnostic methods available to veterinarians in many places when evaluating the most common causes of repeat breeding. On the other hand, while dealing with herds, clinicians must choose metabolic profiles and sampling to find infectious disease. The management procedures and feeding habits are important factors to take into account. Despite the advent of numerous diagnostic techniques such hormone tests, color Doppler sonography, and hysteroscopy, it is still challenging to determine the exact cause of pregnancy failure in a particular cow or buffalo since a certain percentage of animals exhibit cryptic infertility. Depending on the potential cause of repeat breeding, a therapy plan is chosen. The use of immunomodulators such Escherichia coli lipopolysaccharide, eicosanoid PGF2a, and therapy with enzymes with or without therapy with antibiotics, the utility of which is still up for debate, are among the most recent developments in the treatment of endometritis. The use of hCG, GnRH, prostaglandins, and their combinations in treatment regimens can be used to address a range of ovulatory problems. It seems that repeat breeding animals with oestrus cycle abnormalities do exhibit these ovulation asynchronies. Although lowering stress seems like a likely solution, the concentration of suprabasal progesterone during oestrus is regarded to be a significant cause to repeat breeding. Progestagens or the administration of hCG and GnRH can treat luteal insufficiency. There is a brief mention of measures to enhance management and fertilization practices.

Repeat breeding syndrome, which causes significant financial losses for dairy farmers, is still a serious issue in cattle and buffalo breeding (Bartlett *et al*., 1986; Lafi and Kaneene, 1992) [7, 43]. It has recently been determined that repeat breeding cows are a diverse group of subfertile cows with no illnesses or structural abnormalities, but they nevertheless are unable to conceive even after at least two attempts to do so. They have estrous cycles and estrous periods that are clinically normal for the reproductive system (Roberts, 1971) [60]. Repeat breeding occurs 5–32% of the time in cows and 6–30% of the time in buffaloes (Gupta *et al*., 2005) [27]. Repeat breeding in buffaloes must essentially only be taken into account during the mating season. The reasons of the repeat breeding condition have long been hypothesized to be failure of fertilization (Graden *et al*., 1968) [25] or early embryonic fatalities (Bruyas *et al*., 1993) [9], with embryonic deaths constituting the majority of reproductive loss in dairy cattle (Thatcher *et al*., 1993; Diskin *et al*., 2006) [86, 15]. More recently, it has been believed that repetitive breeding is brought on by the cow, the bull, and a number of overlapping environmental and handling factors, and that it is frequently difficult to pinpoint the true etiology

(Pérez-Marín and España, 2007) [53]. The primary factor causing decreased reproductive effectiveness, an increase in the inter-calving period, and a decrease in calf yield is uterine infections. According to Sagartz and Hardenbrook (1971) [64], endometritis affected 77% of sterile cows. Another study by Hartigan *et al*. (1972) [30] found that endometritis had histological evidence in 50% of the genital tract taken from an abattoir. According to Noakes *et al*. (2001) [2], 12.5% of subclinical endometritis in cattle contributes significantly to repeat breeder syndrome and causes significant financial loss for dairy farms. The prospective diagnostic methods and treatment strategies for recurrent breeding cows and buffaloes are the main focus of this review. Repeat breeding has a complex etiology. Prior to assessing females for repeat breeding, it is necessary to rule out any factors that could contribute to partial or complete fertilization failures due to male gamete abnormalities or hypo-function. Reproductive tract abnormalities, endocrine dysfunctions, infectious causes, management errors such as nutritional deficiencies, and compromises in artificial insemination (AI) procedures are among the causes of fertilization failure or embryonic mortality (Singh and Pant, 1998b; Singh and Pant, 1999) [75, 76].

Anatomical Infertility

The anatomical causes of repeat breeding are challenging to cure. Congenital causes- these defects include principally the anomalies or segmental aplasia of: the oviduct, which is rare, the uterus, the cervix and the vagina. These defects largely cause failure of fertilization by preventing the union of gametes. Bilateral defects result in sterility. Lack of a normal endometrium some time leads to early embryonic death as fertilized ovum could not form attachments. Acquired causes- ovarobursal adhesions, fibrous fallopian tubes, and uterine adhesions. However, a conception rate of about 28.6% was attained in dairy cattle with cervical fibrosis or partial blockages using natural insemination or artificial insemination (AI) with enhanced spermatozoa concentration (two to three straws at once; Singh and Nigam, 1998) [74]. Unilateral salpingitis was treated with insemination on the unaffected uterine horn side, however the likelihood of conceiving was extremely low (Arthur *et al*., 2001) [2].

Genetic Problems and Immunoinfertility

A few experts believe that chromosomal abnormalities are an etiological factor that contributes to infertility (Ayalon, 1978) [3]. A low incidence of about 5 percent of grossly abnormal ova were observed in repeat breeding cow. A factor contributing to unsuccessful fertilization attempts in both cattle and buffaloes is immunological incompatibility of the sperm and egg caused by the development of anti-sperm antibodies (Deo and Roy, 1971; Saeed *et al*., 1995) [14, 63].

Functional Infertility/Hormonal Dysfunction

In dairy cattle, delayed ovulation, anovulation, and luteal insufficiency are the main functional causes of repeat breeding. Various hormonal treatments have been created to treat the functional causes of repeat breeding in dairy cattle. Buserelin acetate, a GnRH analogue, and single insemination are both sufficient methods for treating prolonged estrus in repeat breeder cattle, though double insemination at 24-hour intervals also produces the best results in the absence of hormonal treatment (Sharma *et al*., 2006) [6]. When GnRH is administered to these animals, ovulation is induced (Singh and Nigam, 1998) [74]. Furthermore, GnRH injection during the luteal phase or at estrus (between days 11 and 14 post-insemination) boosts plasma progesterone and delays the luteolytic response in repeat breeder cattle, increasing the embryo survival rate (Jaswal *et al*., 2016) [36]. In fact, 10.5 g of GnRH analogue or hCG given to repeat breeder cattle on day 12 after AI improved the conception rate (Thakur, 2010; Jaswal and Singh, 2013) [85, 35]. The adoption of an ovulation induction strategy is another approach for raising the conception rate in dairy cattle with functional infertility. The application of the ovsynch protocol increases the conception rate in dairy cattle, whereas other protocols, such as doublesynch and heatsynch, had no effect on fertility improvement (Kapse, 2016) [38]. However, pre-synchronization with prostaglandin F2 (PGF2) followed by the injection of GnRH analogue together with artificial insemination (AI) at 60 hours after PGF2 increased conception rates in repeat breeder cattle (Sharma *et al*., 2011) [67].

The entire process of establishing pregnancy, including ovulation of a healthy, competent egg, fertilization, implantation, and the growing of an embryo in the uterus, is based on a complicated chain of rhythmic hormone release and binding (Purohit *et al*., 2000) [58]. The development of pregnancy may fluctuate or be impacted by a little hormonal variation. The main contributors to repeat breeding in dairy cattle appear to be irregular ovulation caused in part by poor luteinizing hormone (LH) secretion, a protracted standing oestrus, or incorrect steroid genesis (Kutty and Ramachandran, 2014; Walsh *et al*., 2007) [59, 22, 88]. In addition to low luteal progesterone, which is thought to be responsible for 50% of embryonic deaths in summer buffaloes (Campanile *et al*., 2005) [12], elevated plasma prolactin levels during the summer appear to be an important aspect of buffalo reproduction. This hormone is known to suppress progesterone concentrations (Roy and Prakash, 2007; Singh and Chaudhary, 1992) [62, 73]. Currently, importance is placed on the suprabasal concentrations of progesterone (higher basal progesterone at oestrus) at oestrus in dairy cows (Inskeep, 2004; Bge *et al*., 2002) [34, 5], which may result in pregnancy failures due to early embryonic deaths or a lack of signal transduction between the mother and embryo and compromise thyroid function during the summer (Bahga and Gangwar, 1989) [6]. For the buffalo, these reports are mainly unavailable. The steroid release is also naturally low during oestrus in the buffalo (Gupta and Prakash, 1990) [29], and behavioral oestrus is linked to high progesterone levels (Danell, 1987) [13]. Because of the ovulation-insemination mismatch, increased progesterone lowers conception rates.

Infectious Infertility

Infectious pathogens that are present in the genital tract can also interfere with early embryo development and fertilization. When these organisms are present in pathologically high concentrations, they may create poisons or make the uterine environment unfavorable for pregnancy. When endometritis is present in a moderate to mild form and there are pus flakes or flocculent material in the cervicovaginal mucus discharge during oestrus, infections must be suspected. Subclinical infections, on the other hand, remain clinically undetectable but can still interfere with conception. Numerous specific and non-specific uterine infections in repeat breeder cattle have been connected to early embryonic death or failed fertilization. Non-specific genital tract infections normally require a predisposing condition and typically affect a single animal (Singh, 1998) [73]. Numerous studies have shown that a wide range of bacteria, viruses, fungi, and protozoa can interfere with conception (Sheldon *et al*., 2006; Földi *et al*., 2006) [71, 21], with bacteria being a particularly frequent issue.

Escherichia coli, Bacillus spp., Staphylococcus aureus, Proteus spp., Pseudomonas aeruginosa, Corynebacterium spp., and Enterobacter spp. pure bacterial isolates have been found in the cervical mucus of repeat breeder cattle (Singh, 1998; Singh *et al*. 1998; Sharma *et al*., 2009) [73, 69]. The antibiogram of repeat breeder cattle revealed sensitivity to the following medications: 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%). Additionally, the majority of bacterial isolates (96.8%; Singh, 1998) were resistant to ampicillin. Additionally, indiscriminate drug usage can alter an organism's susceptibility to a specific antibiotic (Sharma *et al*., 2009) [69]. From endometritic cattle, other researchers have also isolated fungi and yeasts mycotic endometritis. Due to their widespread distribution in soil, animal excrement, plant vegetative parts, and sugar-containing substances, yeasts can enter the vaginal tract (Hensyl and Oldham, 1982) [32]. An increase in the prevalence of mycotic endometritis has been associated with frequent and indiscriminate intrauterine broad-spectrum antibiotic use, postpartum uterine infection, and hygiene failures during AI operations. Delay in uterine clearance or altered immune function are risk factors for chronic bacterial and fungal infections after impaired uterine defense mechanisms (Sharma *et al*., 2008) [70]. In order to avoid the emergence of resistant strains of bacteria and to eradicate illness as early as possible, the treatment of repeat breeder bovines with uterine infections requires careful selection of antibiotics (Singh *et al*., 2004) [77]. It is impossible to recommend a precise set of medications because there are numerous distinct infectious agents that might cause uterine infections. According to a study, systemic treatment, as opposed to intrauterine, results in an acceptable concentration of an antibiotic in blood serum and endometrial tissue, which is especially important in situations of septic metritis. Additionally, the possibility of genital tract injury and the risk of introducing new germs are both eliminated by systemic administration. 0.1% lugol's iodine is an effective and affordable treatment option for the management of suspected fungal endometritis (Sharma and Singh, 2012). Fertility may not be negatively impacted by the injection of irritants into a bovine uterus with healthy endometrium, but it may be negatively impacted in animals with sick endometrium.

Nutritional Inadequacies

Lack of energy is one of the nutritional inadequacies that has been linked to pregnancy failure (Hegazy *et al*., 1997; Goff, 2006) [31, 24], excess of dietary protein (Elrod and Butler, 1993; SF, 1997) [18, 23], and deficiencies in micronutrients (Smith and Akinbamijo, 2000) [81]. Such as calcium, phosphorus and iodine (Purohit, 2008) [57]. Cobalt, copper, zinc and magnesium (Hidiroglou, 1979) [33], vitamin A (Wang *et al*., 1988) [89] and selenium and vitamin E (Purohit, 2008) [57]. Lack of vitamin A and b-carotene or an overabundance of bodily metabolites including glucose, urea, albumin, globulin, and non-esterified fatty acids may have a direct or indirect impact on follicle growth, conception, and embryonic development (Bugalia and Sharma, 1990) [10]. There are rare descriptions of poor diet and repeated reproduction in buffaloes (Purohit, 2008) [57]; More so than in buffaloes, dairy cows' nutritional management for optimum postpartum fertility (Tamminga, 2006) [76] appears to be different from that of buffaloes because the resumption of postpartum oestrus is more crucial for cows than it is for buffaloes, who only resume it 90 days after calving in 39-49% of cases (El-Wishy, 2007) [19], with the remainder remaining in anoestrus for 150 days.

Managemental Infertility- Among the etiological causes of repeat breeding, poor female management is a significant contributor. A female may experience infertility as a result of one or more causal factors, such as incorrect handling of semen and poor AI technique. The average post-AI conception rate in the field remains below 30%, posing a significant threat to the viability of dairying despite all advancements in semen handling, AI techniques, and veterinarian training. According to a survey 14.75% of dairy cattle are repeat breeders as a result of management-related factors (Singh *et al*., 2008)

. 6.78% of them were underweight, whereas 5.63% of them were repeat breeders as a result of improper artificial insemination timing (Singh and Pant, 1998b) [75]. Inseminators' roles were not studied, and managemental infertility is typically attributed to issues at the level of farmers. Increased cases of endometritis and cervical fibrosis made it very evident that inseminators were playing a part in actual AI work conditions. The state began the process of privatizing paraveterinary services, and as an unauthorized expansion of their offerings, paraveterinary staff began artificially inseminating dairy cattle, which increased the number of cattle with ovarian adhesions, cervicitis, endometritis, perforated rectum, and lacerated uterus. Another important management factor is the degradation of the quality of the semen during transportation from the laboratory to the field institutions. The inappropriate handling and storage of semen at field institutions or the improper transportation and distribution of straws from semen laboratories might be blamed for this. The success of an AI program is correlated with the spermatozoa's ability to remain viable for a longer period of time while being stored *in vitro*. As another contributing factor to low conception in field institutions, the evaluation study found that the quality of the semen degraded during transportation (Thakur *et al*., 2006b) [84]. Other management issues related for low conception under field conditions include inadequate training of pharmacists, insemination without a proper examination, and the common practice of inseminating calves otherwise unsuited for AI (Singh and Pant, 1998b) [75].

Miscellaneous

High environmental temperatures (Badinga *et al*., 1993) [4], size of herd/type of housing, season, age (Tripathi *et al*., 1999) [87], environmental pollutants (Abd-El-Ghaffar *et al*., 1994) [1], milk yield, lactation and difficult calvings (Shiferaw *et al*., 2005) [72], metabolic disorders (Roche, 2006) [61], postpartum metritis and ovarian cysts (Kim and Kang, 2006) [41] are a few of the other risk factors that may enhance the prevalence of repeat breeding in cattle and buffaloes. According to Dobson *et al*. (2001) [17], stress has been identified as a factor in decreased reproductive effectiveness. Hormonal factors commonly affect fertility regardless of the type of stressor. The hypothalamus-pituitary-gonadal axis's normal operation may be compromised in stressful circumstances on all levels (Dobson and Smith, 2000) [16, 81]. Numerous aspects of contemporary dairy farming have been noted as potential stresses, including high milk production, postpartum disorders, an insufficient energy supply, inflammations and infections, lameness, social aspects, transportation issues, and heat stress. According to Gröhn and Rajala-Schultz (2000) [26], dairy cows with high milk yields, high parities, and calving in the winter were at risk for a number of reproductive problems that ultimately delayed insemination and conception.

Diagnostic Methods

Given the vast range of factors that can lead to repeat reproduction, the following diagnostic techniques have been briefed in this review:

Tests To Evaluate Uterine Health

Uterine pH - The uterine lumen's pH varies greatly throughout the oestrus cycle, with the lowest pH happening two days before ovulation, although it is known that at oestrus, the pH is 7.30 (Mather, 1975) [45]. Although it might be challenging to get samples of uterine secretions, several studies have noted that this can act as a partial predictor of the uterine milieu where typical gamete transit and embryo development can take place. According to Ocon and Hansen (2003) [47], embryonic development is compromised by a pH drop from 7.2 to 6.9-7.1. Cows and buffaloes with metritis, however, exhibit pH levels between 8.23 and 8.80 (Pateria and Rawal, 1990) [51]. In repeat breeder cows, vaginal mucous had a pH of 8.5+1.16 as opposed to 7.2+1.10 in regular breeding cows (Gupta *et al*., 1981) [28]. Protein-rich diets change the uterine environment by decreasing the levels of magnesium, potassium, and phosphorus in uterine secretions as well as the pH of the uterus (Jordan *et al*., 1983; Elrod and Butler, 1993) [37, 18]. Microbiology of the uterus The uterine lumen typically harbors a wide range of bacteria, but only when their populations are high do they become clinically apparent in the form of purulent mucus, flakes of pus, and changes in the odor of the vaginal discharges. Numerous investigations have demonstrated that recurrent breeding cows and buffaloes typically have mixed infections in their uteri (Osman *et al*., 1983) [50]. One of the main contributors to infertility in both cattle and buffaloes seems to be subclinical uterine infection. Inadequate uterine secretion collecting techniques and poor diagnostic accuracy have been incorporated into the diagnostic tests that are used to assess these subclinical uterine infections (endometritis). One such test, known as the "white side test," boils cervical mucus from suspected cows with metritis or endometritis in the presence of sodium hydroxide solution. If the color changes to yellow, the reaction is thought to be favorable. This test is based on a link between the quantity of leucocytes in the mucus and the degree of yellowness (Popov, 1969) [46]. Yellow is supposed to indicate a positive response if the color changes. This test is based on a correlation between the amount of leucocytes and mucus yellowness (Popov, 1969) [46]. Campylobacter is a challenging microbe to identify, however with the widespread use of AI, their relative abundance is negligible. When a herd's fertility is in doubt, it is frequently preferable to use the right tools to randomly sample certain cows' uteri in order to identify the likely aetiological agent. However, these procedures take a lot of time, and they frequently fail to identify the root of an animal's repeated reproduction.

Uterine biopsy and cytology: Uterine biopsies that are carefully performed can frequently show the level of cellular infiltration and/or changes in cellular shape as well as endometrial alterations (Begum, 2020) [8]. Histological sections produced from biopsies that were recovered from repeat breeding cows show supranuclear vacuolations and glandular secretions (Ohtani and Okuda, 1995) [49]. Dysplasia of the epithelial lining and neutrophil and lymphocyte infiltration are two changes seen in cows with endometritis (Mann and Lamming, 1994) [44]. Endometritis of varied degrees has also been seen in the biopsies of buffaloes that have repeatedly bred (Sinha *et al*., 1983) [28]. The presence of microorganisms was associated with the histological results of inflammatory alterations and fibrosis (Purohit, 2008) [57]. During both clinical and subclinical uterine inflammation, the proportion of polymorphonuclear leucocytes (PMNs) increases. The fluid can be recovered by centrifuging the fluid to concentrate the cells in a small amount of medium, which enables efficient cellular concentration and a good slide preparation. The fluid can be recovered by flushing the uterus with small amounts (2–5 ml) of fluid or using a commercially available cytobrush. According to endometrial cytology, there doesn't seem to be a standard for classifying endometritis and identifying uterine health. Finding PMNs >18% at 20–33 days after delivery matched the criteria for subclinical endometritis, while >10% met the criteria at 39–47 days after delivery (Kasimanickam *et al*., 2004) [39]. Only 5% of women developed endometritis between 40 and 60 days after giving birth (Gilbert *et al*., 2005) [23]. Repeat breeding cows and buffaloes typically brought to the veterinarian are part of a broad group of creatures that gave birth between 60 and 120 days earlier. It is therefore uncertain how endometrial cytology will contribute to the identification of subclinical endometritis in these animals.

Metabolic Profile

Although there is an indirect neuro-hormonal mechanism, there appears to be a complex mechanism involving the interaction of different serum metabolites with the different reproductive events, including the macronutrients (glucose, total protein, and lipids) and the micronutrients (calcium, phosphorus, various vitamins, and trace minerals) (Sonderegger and Schurch, 1977) [82]. Setting up specific clinical standards that could forecast prospective fertility is challenging. Butler (2000) [11] and Wolfenson *et al*. (1997) [90] have both highlighted the significance of negative energy balance and heat stress on reproduction. Circulating blood glucose is a crucial indicator that may have some diagnostic significance because low levels have been shown to impact IGF-1 and oestrogen synthesis by the dominant preovulatory follicle (Butler, 2000) [11]. In order to evaluate malnutrition in high-yield dairy cows, a metabolic profile analysis of different blood parameters, such as blood haematocrit, glucose, cholesterol, and calcium, is helpful (Kida, 2002) [40].

***In vivo* Imaging Techniques** Ultrasonography (USG) is by far the most significant diagnostic technique for reproductive diagnostics. The non-invasive nature of USG makes it a valuable diagnostic tool since it allows for the detection and tracking of ovarian and uterine morphological changes that would otherwise go undetected by methods like rectal probing (Gaur and Purohit, 2007) [22]. Repeat breeding cows' follicular growth patterns showed that these cows usually had two follicular waves, which corresponded to longer cycles (Perez *et al*., 2003) [42]. According to Pierson and Ginther (1984) [55], the CL can be seen by USG 3 days after ovulation, and this makes USG a reliable tool for quantifying follicles and spotting CL. Additionally, the condition of the uterus can be assessed. According to Fissore *et al*. (1986) [20], the endometrium folds clearly during oestrus, and echogenic snowy patches can be seen sonographically during uterine inflammation. Ovarian dysfunction, which includes ovarian cysts, ovulation problems, luteal dysfunction, and a longer life span of pre-ovulatory follicles, is known to be common in recurrent breeding animals (O'Farrell *et al*., 1983) [48]. Regular scanning from AI, at least at 12-hour intervals, can be used to track ovulation. This would rule out asynchrony between ovulation and insemination. Cows and buffaloes must either be reinseminated or given an ovulation induction medication in addition to AI if they don't ovulate within 24 hours of an insemination. However, ovarian function cannot be determined by a single USG examination, necessitating further scans. In order to determine whether an ovulatory follicle is present in RB cows, the USG examination must be performed at AI. It must then be repeated at 12-hour intervals to determine whether ovulation has taken place, and subsequent examinations must be performed at 4-day intervals to observe CL formation (Pérez-Marn and Espaa, 2007) [53]. The ideal follicle size at AI would range from 0.9 to 1.8 cm in buffalo and 1.5 to 2.0 cm in dairy cows, albeit this is variable (Perry *et al*., 2005) [54]. However, it has been demonstrated that follicle size has little bearing on fertility when ovulation happens spontaneously. With subclinical uterine infection (endometritis), USG can identify cows and buffaloes. Endometritis is thought to be indicated by a uterine lumen that measures 0.2 cm in diameter and contains echogenic material.

Treatment Approaches

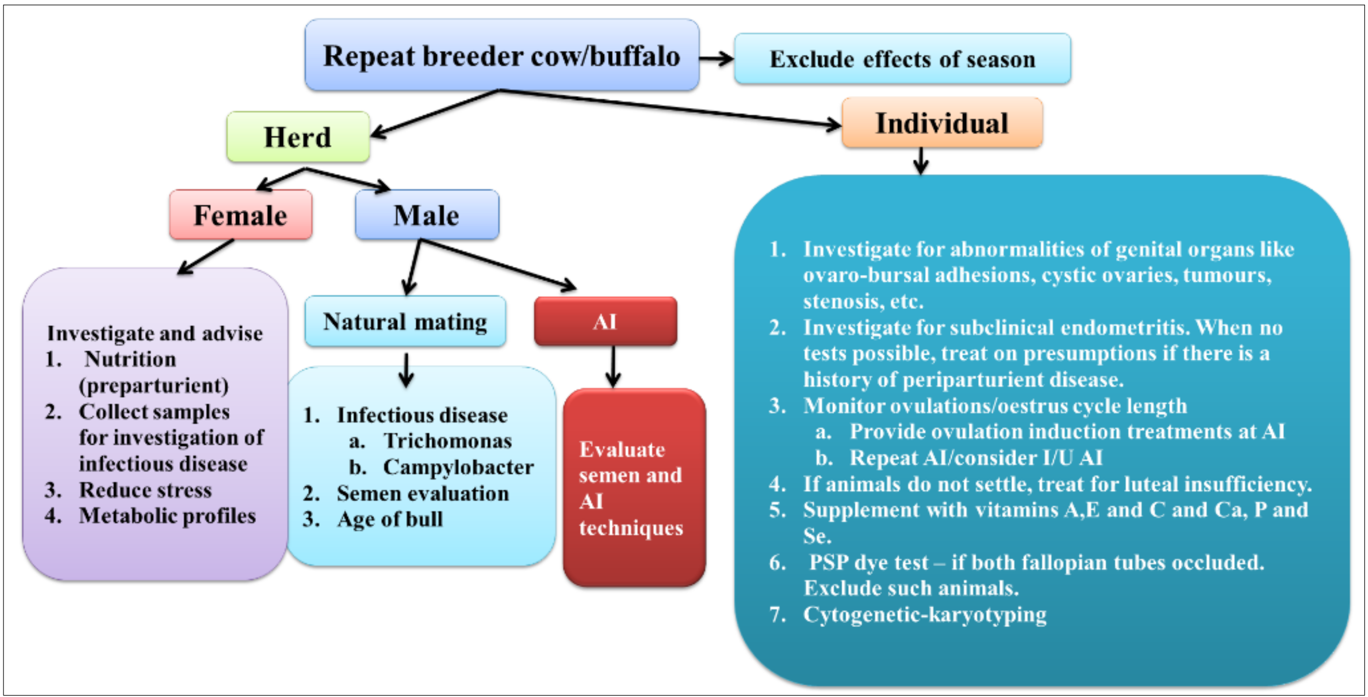

Fig 1: Diagnostic approaches for repeat breeding

When treating herds of animals or a single animal, the treatment technique is very different. Herds that have reduced fertility due to artificial or natural causes must be investigated for the presence of infectious diseases such campylobacteriosis using a random sample of animals. Additionally, the bull employed when natural service is being used needs to be looked into. Blood samples ought to be taken in order to assess metabolic profiles. The approaches to feeding recommended during the dry period and the postpartum period can assist to rectify some nutritional deficiencies, and the strategies for fighting uterine infections can lower the failure rates of fertilization or the mortality rates of embryos. When it comes to individual animal therapy, the strategy should be to cure uterine infections first, followed by ovulatory issues or corpus luteum deficiencies (Figure 1). Even with all of these treatments, a small percentage of cows or buffaloes would still experience infertility of unknown cause, which is still very challenging to diagnose or treat.

Conclusion

It can be said that repeat breeding's diagnosis and treatment remain challenging, but when looking into and treating specific cows or buffaloes, a systematic approach of battling uterine infection and treating ovarian dysfunction or luteal insufficiency would lead to the majority of animals becoming pregnant provided the management and breeding methods are optimal. To achieve high-fertility postpartum, high-producing cows must be fed, especially during the periparturient period. Stress reduction and parturition hygiene are also essential, and dairy farmers must be taught in these areas. Now, high fertility must also be prioritized while choosing cows for high productivity. We need to encourage diagnostic techniques like hysteroscopy to increase our understanding of the inner surfaces of the genital canal.

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