



Infectious Causes of Bovine Repeat Breeding

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Repeat breeding is a major reproductive disorder in dairy cattle and buffalos leading to large economic losses to the dairy farmers. A repeat breeder cow looks apparently healthy and has regular estrous cycle; however, it does not conceive when bred three times continuously, either with a bull of well-known fertility or inseminated artificially with excellent semen quality. The incidence of repeat breeding in dairy cows, worldwide, ranges from 5 to 35% and Indian scenario is no different, although it is slightly lower in Jammu and Kashmir (4-28%). The potential causes of the repeat breeding mainly include infections like subclinical endometritis, nutritional deficiency, specially trace minerals and vitamin A, age of the dam, improper heat detection, and endocrine dysfunctions. Farmers face huge economic losses by repeat breeding because the costs of herds management and rearing are increased by increment of expenses of unsuccessful frequent artificial insemination, extended length of the days open as well as culling and replacement of those cows that can't conceive. Additionally, treatment of the repeat breeding with antibiotics and hormones increases the expenses beside its public health hazard and its inconsistent results.

Infections and lesions associated with repeat breeding and infertility

The non-specific bacterial infection of the reproductive tract in cattle is the main cause of repeat breeding. The non-specific infectious agents during pre and postpartum periods frequently invade the female genital tract and produce lesions like vaginitis, cervicitis, endometritis, ovaritis, ovaritis and salpingitis, chronic metritis and pyometra. The importance of vaginitis as a cause of infertility has promoted a difference of opinion in veterinary and artificial insemination circles. The opinion of those believing that vaginitis is relatively unimportant is based principally on observations regarding granular venereal disease. Granular venereal disease is so universal and so frequently seen in pregnant animals that veterinarians and others examining the genital organs of cattle may conclude that it does not deserve too much consideration as a cause of delayed breeding. When granular vaginitis is severe and accompanied by purulent exudation, there usually exists an anterior vaginitis with cervicitis which interferes with fertility.

Cervicitis is a frequent lesion in repeat breeding cows. Clinically, there can be distinguished three grades of cervicitis. The mildest form is frequently associated with vaginitis but may exist as an independent lesion. Pathology is confined to the region of the external os. The folds of the external os show congestion, edema, and streaked hemorrhages of the folds are frequent. The cervical opening is usually dilated with the first annular ring protruding as a dark red or purplish-red mass. Rectal palpation will reveal the body and internal portion of the cervix to be of normal size and consistency. A more serious form of cervicitis will show more marked congestion of the cervical folds and greater protrusion of the annular rings. The entire cervix feels swollen on rectal examination. Endometritis is a basic lesion in most of these cases. The most serious and usually incurable form of cervicitis

is the chronic indurated cervix associated with chronic metritis. In chronic cervicitis a poor prognosis should be given.

Most cases of incurable infertility are included in the group of those having chronic metritis, pyometra, ovaritis, and ovaritis and salpingitis. Cows with bilateral ovaritis and with bilateral ovaritis and salpingitis should be salvaged. Often these lesions produce systemic diseases and as such can't be directly classified a cause of repeat breeding. The basis of treatment of repeat breeding cows in the absence of other lesions is the treatment for apparent or suspected endometritis.

Endometritis

Endometritis is a superficial inflammation limited to the endometrium and extending no deeper than the stratum spongiosum. Histologically, endometritis is characterized by disruption of the surface epithelium, infiltration with inflammatory cells, vascular congestion, and stromal edema, with varying degrees of lymphocyte and plasma cell accumulation in the superficial layers. Endometritis occurs in two forms I,e clinical endometritis and Subclinical endometritis. Clinical endometritis is defined by the presence of purulent genital discharge after 21 d postpartum, by presence of mucopurulent discharge after 26 d postpartum in the absence of systemic signs, or both. It was recently proposed that the term “purulent vaginal discharge” be used instead of clinical endometritis. Subclinical endometritis is defined as inflammation of the endometrium, usually determined by endometrial cytology, with the absence of purulent vaginal discharge identified by vaginoscopy. In animals without clinical signs, the disease is diagnosed by measuring the polymorphonuclear cell proportion on a slide made from cells collected by cytobrush or uterine lavage techniques.

Etiology

It is accepted that bovine genital infections, either specific or non-specific in nature, account for large number of pregnancy failure in cows and buffaloes. Generally, non-specific infection of the genitalia is considered to be the main cause of repeated conception failure where there is an increase in the number of microorganisms and/or in their virulence. Bacterial infection is the most important among the infectious causes of the repeat breeding, however other pathogens have been found to play an important role in subfertility of these animals. Among the bacterial agents *Staphylococcus* spp., *E. coli*, *Bacillus* spp., *Corynebacterium* spp., *Pseudo-monas* spp., *Proteus* spp., *Klebsiella* spp., and *Streptococcus* spp. have been isolated from uterine discharges of endometritic cows. Fungal endometritis is chiefly caused by *Candida* spp., *Geotrichum* spp., *Cladosporium* spp., *Mucor* spp. and *Aspergillus* spp., while Bovine herpes virus-4 and Blue tongue virus is the only two viruses associated with subfertility in cattle and buffalo.

Diagnosis

In view of the wide variety of causes that can result in RB, the accurate diagnosis and proper application of diagnostic techniques becomes more important. Some of the diagnostic techniques are highlighted below, while description of these techniques, their merits and demerits has been discussed elsewhere.

1. Record analysis
2. Visual
3. Recto-genital palpation
4. Vaginoscopy
5. Metrichck to evaluate uterine health
6. Reagent test strips for leukocyte esterase and proteins.
7. Tests to evaluate uterine health:
 - (a) Uterine pH
 - (b) Uterine microbiology
 - (c) Uterine biopsy and cytology
8. Cytobrush technique

9. In vivo imaging techniques

10. White side test

Some of these tests are laboratory tests which may not hold any importance in the field condition, however many tests like white side test and urinary test strips have the potential to replace age old method like recto-genital palpation and viginoscopy as cow side tests.

Treatment

Proper treatment of repeat breeding necessitates accurate diagnosis, however more often the first choice of clinicians seems the use of antimicrobials without diagnosis. It has been well documented that the cellular immune response in the uterus may be adversely affected by several therapeutic strategies, such as intrauterine administration of antiseptics, disinfectants, and antibiotics. It therefore becomes necessary for clinicians to identify and treat uterine diseases efficiently in order to limit their negative effects on fertility. Although antimicrobial therapy is central to treat bacterial infections, however use of antiseptics, immuno-modulators and prostaglandins in recent years have shown great promise in mitigating infectious repeat breeding.

1. Antiseptics

Weak and dilute solutions of Lugol's iodine and povidone iodine have been commonly used by clinicians for treatment of endometritis as it causes irritation of endometrium, stimulates uterine tone and mobilizes neutrophils to uterine lumen. Iodine is cheap and readily available and bactericidal, fungicidal and anti-protozoa effect in addition to its stimulatory effects on reproductive functions at ovarian level.

2. Antimicrobials

Antibiotics have been widely used for the treatment of uterine infections but the success is highly variable in terms of clearing infection and conception rate. Treatment of endometritis by antibiotics should be directed towards improving fertility. Antibiotic should be active against the main uterine pathogens and should maintain its activity in the environment of the uterus. The treatment also should not inhibit the normal uterine defense mechanism and should be well tolerated and not induce irritation in the endometrium. Indiscriminate use of antibiotics in producing animals is under critical debate as far as their residue concentrations in milk and meat and resistance in humans against antibiotics used is concerned.

3. Immuno-modulators

Immuno-modulators are considered as an alternative approach for treating uterine infections. These substances when infused into uterus activate uterine defense mechanism and initiate local immune system. The different immunomodulators used in treatment of endometritis include: E. coli Lipopolysaccharide, lysozyme and oyster glycogen. Intrauterine administration these Immuno-modulators induce PMN migration into uterine lumen.

4. Prostaglandins

Prostaglandin F2 α and its analogues are also being used as treatment of choice for endometritis. They decrease progesterone concentration, increase estrogen concentration associated with luteolysis, increase uterine contractions, enhance phagocytic activity of uterine PMNs. Luteolysis and follicular growth results in increased resistance of uterus to bacterial infections.

5. Proteolytic enzymes

Proteolytic enzymes like trypsin, chymotrypsin and papain are hydrolytic enzymes that have the capacity to split proteins and fat bonds. The immune-modulatory effect of proteolytic enzymes occurs both directly and indirectly through macrophages and monocytes raising their level of efficacy as the instigator of acute phase reaction.

6. Herbal drugs

Herbal ingredients like Aristolochia batreata, Rubia cardifolia, Peganum harmala, Camiphora molmol and Lepadenia reticulata have uterotonic, anti-inflammatory and bactericidal actions and can be used as an alternative approach for treatment of endometritis.

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