

Reproductive Disorders in Bovines: An Overview

**Gopal Sarkar¹,
Mousumi Namasudra¹,
Jitendra Singh Gandhar²,
Amit Kumar^{3*}**

¹Veterinary Officer, Department of
Animal Husbandry, Government of
West Bengal, India

²Assistant Professor, Department
of Veterinary Medicine, Uttar
Pradesh Pandit Deen Dayal
Upadhyaya Pashu Chikitsa Vigyan
Vishwavidyalaya Evam Go-
Anusandhan Sansthan, Mathura,
Uttar Pradesh, India

³Scientist, ICAR–Indian Institute
of Agricultural Biotechnology,
Ranchi, Jharkhand, India



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*Corresponding Author

Amit Kumar*

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INTRODUCTION

Reproductive performance is one of the most important indicators of herd productivity and economic sustainability in cattle and buffalo production. A fertile female should attain puberty at the appropriate age, exhibit regular estrous cycles, conceive after one or two inseminations, complete pregnancy successfully, and resume cyclic ovarian activity shortly after parturition. Failure at any stage of this reproductive process reduces production efficiency and significantly increases the cost of animal management. Consequently, reproductive disorders represent one of the leading causes of economic loss in bovine enterprises worldwide (Hafez and Hafez, 2013). The occurrence of reproductive disorders is influenced by several interacting factors, including genetics, endocrine disturbances, nutritional imbalance, infectious diseases, metabolic disorders, environmental stress, and poor management. High-producing dairy cattle are particularly susceptible because the physiological demands of early lactation often induce a negative energy balance that delays ovarian activity and reduces conception rates (Lucy, 2001). Buffaloes experience additional reproductive challenges owing to their seasonal breeding pattern, silent estrus, delayed puberty, and greater sensitivity to heat stress, all of which contribute to lower reproductive efficiency than cattle (Baruselli et al., 2020).

1.1 Female animal disorders

Among ovarian disorders, anestrus is one of the most common causes of infertility in bovines. It is characterized by the absence of visible estrous behavior due to inactive ovaries or failure of ovulation. Nutritional deficiencies, inadequate body condition, postpartum negative energy balance, endocrine dysfunction, and mineral deficiencies are major predisposing factors. Animals affected by anestrus exhibit prolonged calving intervals and delayed breeding.

Diagnosis is based on reproductive history, rectal palpation, ultrasonography, and progesterone estimation. Management involves improving nutrition, correcting mineral deficiencies, and administering hormonal therapies such as gonadotropin-releasing hormone (GnRH), progesterone-based synchronization protocols, or prostaglandin F_{2α} when appropriate (Noakes et al., 2019). Repeat breeding syndrome is another economically important reproductive disorder characterized by failure to conceive after three or more inseminations despite regular estrous cycles and apparently normal reproductive organs. The condition results from poor semen quality, inaccurate estrus detection, improper insemination timing, subclinical uterine infections, early embryonic mortality, hormonal imbalance, or nutritional deficiencies. Repeat breeders increase breeding costs and reduce lifetime productivity. Successful management requires careful reproductive examination, uterine health assessment, correction of nutritional deficiencies, treatment of uterine infections, and optimization of insemination practices.

Postpartum uterine diseases are among the most common reproductive disorders affecting dairy cattle. Metritis is an acute bacterial infection involving all layers of the uterus, usually occurring within the first week after calving. Affected animals present with fever, fetid uterine discharge, depression, reduced feed intake, and decreased milk production. The disease is commonly associated with bacterial pathogens such as *Escherichia coli*, *Trueperella pyogenes*, and *Fusobacterium necrophorum*. Clinical endometritis develops later during the postpartum period and is characterized by purulent uterine discharge without systemic illness. Chronic uterine inflammation interferes with implantation and embryo survival, thereby reducing conception rates. Early diagnosis using ultrasonography, uterine cytology, and bacterial culture facilitates timely treatment with prostaglandins,

antimicrobial agents, and supportive therapy (Sheldon et al., 2019).

Pyometra is characterized by the accumulation of purulent material within the uterus in the presence of a functional corpus luteum. Because progesterone maintains cervical closure and suppresses uterine contractions, infected uterine contents accumulate without external discharge. Animals generally fail to exhibit estrus and remain infertile until luteolysis occurs. Administration of prostaglandin F_{2α} to induce regression of the corpus luteum, combined with appropriate antimicrobial therapy when indicated, is the preferred treatment. Pregnancy-related disorders also contribute substantially to reproductive wastage. Early embryonic mortality is responsible for many cases of repeat breeding and often results from poor oocyte quality, chromosomal abnormalities, endocrine insufficiency, heat stress, or infectious agents. Abortions may occur due to infectious diseases such as brucellosis, leptospirosis, infectious bovine rhinotracheitis, bovine viral diarrhea, campylobacteriosis, and neosporosis, as well as non-infectious factors including nutritional deficiencies, toxins, trauma, and severe environmental stress. Accurate laboratory diagnosis is essential for implementing effective disease control measures.

Dystocia, or difficult calving, remains an important cause of neonatal mortality and postpartum reproductive disorders. Maternal factors such as inadequate pelvic size, uterine inertia, or incomplete cervical dilation, together with fetal oversize or abnormal presentation, contribute to prolonged labor. Dystocia increases the risk of retained fetal membranes, metritis, delayed uterine involution, and reduced fertility during the subsequent breeding season. Retained fetal membranes, defined as failure to expel the placenta within 12–24 hours after calving, further predispose animals to bacterial uterine infections and delayed resumption of ovarian cyclicity. Prompt obstetrical assistance,

supportive therapy, and hygienic postpartum management reduce these complications.

1.2 Male animal disorders

Male fertility is equally important in maintaining herd reproductive efficiency. Bulls affected by orchitis, epididymitis, testicular degeneration, poor semen quality, or accessory gland infections may exhibit reduced fertility despite normal libido. Routine breeding soundness examinations, including semen evaluation, scrotal circumference measurement, and reproductive tract examination, are therefore recommended before each breeding season.

2. Diagnostic methods

The diagnosis of reproductive disorders has advanced considerably over recent decades. High-resolution transrectal ultrasonography permits real-time evaluation of ovarian structures, uterine pathology, pregnancy status, and fetal development. Hormonal assays measuring progesterone and estradiol concentrations aid in assessing ovarian function, while molecular techniques such as polymerase chain reaction (PCR) have enhanced the diagnosis of infectious reproductive diseases. In addition, reproductive biotechnologies including estrus synchronization, fixed-time artificial insemination, embryo transfer, ovum pick-up, and in vitro embryo production have significantly improved reproductive management in modern bovine production systems.

3. Preventive strategies

Prevention remains the most effective strategy for controlling reproductive disorders. Balanced nutrition, adequate energy intake during the transition period, supplementation of essential minerals and vitamins, timely vaccination, strict biosecurity, proper heat detection, hygienic calving management, and regular reproductive examinations collectively improve fertility and reduce economic losses. Early diagnosis and prompt treatment further

minimize the long-term impact of reproductive diseases on herd productivity.

CONCLUSION

Reproductive disorders continue to be a major challenge for bovine production systems worldwide. Their multifactorial nature necessitates an integrated approach involving nutrition, disease control, reproductive management, and modern diagnostic technologies. Continued advances in reproductive physiology, molecular diagnostics, and assisted reproductive technologies are expected to enhance fertility, improve herd productivity, and contribute to sustainable livestock production. A comprehensive understanding of reproductive disorders is therefore essential for veterinarians, researchers, and livestock producers seeking to maximize reproductive efficiency and ensure profitable bovine farming.

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