



Infertility in Dairy Cattle: New Ways to Improve Fertility and Increase Milk Production

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INTRODUCTION

Healthy reproduction is the foundation of a profitable dairy farm. A cow or buffalo should ideally produce one healthy calf every year. Failure to conceive after repeated breeding or irregular estrus is commonly described as infertility or subfertility. It reduces milk production and increases feeding, treatment and maintenance costs. Advances in veterinary science, nutrition and reproductive technologies can help farmers overcome these problems and improve herd productivity.

Why Does Infertility Occur?

Infertility is usually multifactorial. Important causes include poor nutrition and mineral deficiency, silent or irregular heat, repeat breeding, uterine infections after calving, retained placenta, ovarian cysts, delayed breeding after calving, poor heat detection, heat stress and improper timing of artificial insemination. Infectious diseases such as brucellosis, leptospirosis, campylobacteriosis (vibriosis), trichomoniasis, infectious bovine rhinotracheitis (IBR), bovine viral diarrhoea (BVD) and neosporosis can cause infertility, abortion, repeat breeding or weak calves. Vaccination, testing of breeding bulls, disease-free semen and biosecurity are important preventive measures.

Warning Signs Farmers Should Never Ignore

Warning signs include absence of heat for several months after calving, repeated return to heat after insemination, need for three or more inseminations, abnormal or foul-smelling vaginal discharge, difficult calving or retained placenta, poor body condition, long interval to first heat, reduced mounting behaviour, abortion, weak or premature calves and suspected uterine swelling or infection. Early veterinary examination can prevent serious reproductive problems.

Economic Impact of Infertility

Failure to conceive on time lengthens the calving interval, resulting in fewer calves and reduced lifetime milk production. Additional expenses arise from repeated artificial insemination, veterinary treatment, medicines and feeding non-pregnant animals. In severe cases, animals may need to be culled and replaced. Timely diagnosis and proper reproductive management therefore improve farm profitability and sustainability.

Heat Stress: A Hidden Cause of Infertility

High environmental temperature and humidity reduce feed intake, cause negative energy balance, suppress estrus expression, lower conception rates and increase early embryonic loss. High-producing cows are particularly vulnerable because milk production generates additional body heat. Shade, adequate ventilation, fans or sprinklers and continuous access to clean drinking water help reduce heat stress and maintain reproductive performance.

Balanced Nutrition: The First Step Towards Better Fertility

Good nutrition is one of the most effective approaches to infertility management. High-producing animals often lose body weight after calving because energy use for milk production exceeds intake, weakening reproductive function and delaying normal estrous cycles. Farmers should provide balanced energy and protein, good-quality green and dry fodder, clean water, daily mineral mixture and salt. Maintaining an ideal Body Condition Score (BCS) improves conception.

Transition Cow Management and Micronutrients

The transition period, from about three weeks before calving to three weeks after calving, is critical for future fertility. Adequate energy intake and prevention of milk fever and ketosis help reduce retained placenta, uterine infections and delayed ovarian activity. Calcium supports uterine contraction; phosphorus supports estrous cycling and conception; selenium reduces retained placenta and embryonic loss; zinc supports uterine healing and embryo

development; copper and manganese support reproductive function; and iodine helps maintain normal reproductive cycles. Vitamins A, D, E and B12 also contribute to reproductive tract health, calcium metabolism, antioxidant protection and energy metabolism.

Modern Diagnostic Technologies

Ultrasonography helps detect pregnancy, examine ovaries and uterus, and diagnose ovarian cysts, uterine infections and embryonic loss. Blood or milk testing for progesterone and pregnancy-associated glycoproteins (PAGs) can support early pregnancy and reproductive diagnosis. Veterinarians may also use vaginal examination, rectal palpation, uterine cytology, bacterial culture, endometrial biopsy in valuable breeding animals, blood biochemical and metabolic profiling, progesterone assays and PAG testing. These investigations help identify causes and guide targeted treatment.

Wearable Sensors, AI and Hormonal Treatments

Smart neck collars, pedometers, ear tags and activity monitors can record movement, temperature and rumination and help detect silent heat. Mobile applications can alert farmers about the appropriate time for artificial insemination. Hormonal synchronization protocols such as Ovsynch, Presynch and CIDR help synchronize ovulation, improve heat detection, increase conception rates and reduce repeat breeding. These treatments should be used under veterinary supervision.

Preventing Uterine Infections and Improving Biosecurity

Uterine infections after calving are major causes of infertility. Clean calving areas, hygienic artificial insemination, prompt treatment of retained placenta, regular post-calving reproductive checks and timely veterinary treatment support healthy uterine recovery. Newly purchased animals should be isolated before introduction into the herd, and vaccination and deworming schedules should be followed. Untreated metritis and endometritis can lead to repeat breeding and infertility.

Advanced Reproductive Technologies and Genetic Improvement

Artificial insemination improves breeding efficiency, embryo transfer allows superior cows to produce more offspring, and in vitro fertilization can produce embryos under laboratory conditions, particularly in genetically valuable animals with fertility problems. Genetic selection using semen from proven fertile bulls and avoiding close breeding can reduce inherited reproductive problems. Modern genomic selection can identify animals with superior fertility, disease resistance and milk-production potential at an early age.

Future of Dairy Farming

Precision dairy farming is making reproductive management more efficient through sensors, mobile applications, artificial intelligence and genomic selection. These tools allow earlier detection of health and reproductive problems and more timely breeding decisions. When combined with good nutrition, heat detection, disease prevention and veterinary care, they can improve fertility, shorten calving intervals, increase milk production and enhance farm profitability.

Practical Tips for Farmers

Farmers should observe animals daily for heat signs; provide a balanced ration with mineral mixture and adequate clean water; maintain proper body condition; reduce heat stress with shade and cooling; maintain hygienic calving and breeding practices; treat retained placenta and uterine infections promptly; perform pregnancy diagnosis at the recommended time; follow vaccination and deworming schedules;

perform artificial insemination at the correct time; and arrange regular reproductive check-ups.

When Should Farmers Call a veterinarian?

Veterinary advice should be sought when no heat is observed within 60 days after calving, conception fails after two or three inseminations, vaginal discharge persists for more than two weeks after calving, abortion occurs, difficult calving is followed by poor recovery, retained placenta persists beyond 12–24 hours, or ovarian cysts or uterine infections are suspected.

Myths and Facts About Infertility

A repeat breeder cow should not automatically be culled; many can conceive after proper diagnosis, nutritional correction and treatment. Repeated insemination does not compensate for poor heat detection or incorrect timing. Mineral supplementation is needed routinely, not only when animals appear sick. High milk production can be associated with negative energy balance, which may delay estrus and reduce conception if nutrition is inadequate.

CONCLUSION

Infertility in dairy cattle is a major challenge but can be managed through balanced nutrition, accurate heat detection, disease prevention, timely veterinary intervention, modern diagnostics, hormonal therapies and improved breeding practices. An integrated approach involving farmers, veterinarians, nutritionists and extension workers can improve conception rates, calf health, milk production, farm profitability and long-term sustainability.