

HOW TO IMPROVE FERTILITY RATE IN CATTLE

Important Tips to
Improve Conception
Rate in Cattle



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1 INTRODUCTION

The first successful experiment of impregnating an animal (a dog) induced by Artificial Insemination (AI) dates back to the year 1780, conducted by [Lazzaro Spallanzani](#), an Italian biologist. In 1899 and later, [Ilya Ivanov](#), an ambitious Russian biologist furthered his study and experiments in AI and fertilized a horse artificially. His test gained a remarkable success, concluding on a fact that a semen sample from a stallion could fertilize up to 500 mares by the technique unlike 20-30 by natural conception. The method quickly became popular and spread across many countries worldwide. Since then, it has been tested on other species of animals including cattle, honeybees, turkeys, pigs, sheep, and zoo animals too. It is seen that the invention and evolution of Artificial Insemination technique have undoubtedly brought genetic improvement in farm animals; something that the farmers strive for.

Artificial Insemination is a common practice in agriculture and dairy farming. It involves collecting semen sample from a bull (or tup or stallion or buck or anything else) to breed a female counterpart, against using a live sire. The collected semen is frozen in 'straws' for future use and an AI worker, or a vet introduces it to the animal at an appropriate time when it is in ovulation (heat) cycle.

But, what happens if the cows aren't bred? You have no milk or meat. So yes, it's an important aspect for you to consider if you own a dairy farm—doesn't matter if you run it with a single cow or hundred. If you want the best milk (in quality and quantity) and a new cow to sell every year, you'll need to plan breeding programs for your milch cows all year round. But, how do you go about? Is that all you need to consider if you opt for AI versus natural mating?

An elaborate discourse of the subject is explained beneath to help you achieve a clarification of the factors and practices involved in and around dairy herd reproductive management, and how they enable you to multiply the fertility rate in your cattle.

2 BREEDING

2.1 Heat Detection

The success rate of conception in a cow majorly depends on its heat cycles. For a cow to be efficient in reproductive performance, the farmer must detect its heat cycle and inseminate it at the right time. Missing heat cycles lowers the rate of conceiving, hence your farm output. Also, failure in identifying cows in heat and breeding the ones not in heat incurs a financial loss due to prolonged calving periods and overhead semen expense. Here are the signs you should look for to determine if your cow is in heat or not.

2.1.1 Mounting Heard-mate

It is the most accurate sign that is also easily visible. During the course, a cow stands mounted by the other cow and moves a bit forward due to the weight exerted by the mounting cow. This phase is called 'Standing Heat' which lasts for 15 to 18 hours and is a sexually intensive period for an estrous cow. Though mounting is not the only vital sign of heat, you must observe other parameters of cows exhibiting standing behavior.

2.1.2 Discharge of Mucus

Mucus is produced in the cervix as a result of increased estrogen levels during and after the estrous. It hangs out of the cow's vulva as a long, viscid strand, often smeared over the thighs, tail, flank, or region between the anus and vagina. At times, the mucus may not surface on the outside due to insufficient palpation during insemination and therefore, may have to be removed explicitly.

2.1.3 Reddening and Swelling of Vulva

The interior region of vulva grows wet and red while the exterior swells up. Though these symptoms occur before the heat and persist for about after that, these aren't counted as definite signs of estrous.

2.1.4 Bawling, Trudging and Restlessness

Just before a cow comes into heat, it experiences physiological changes like the development of ovarian follicles (Proestrus) while the cows in heat become restless and trudge behind other cows for mounting. During the heat, the estrous cows are more fidgety, alert, and standing, unlike the cows, not in heat that lie down and rest. Though the cows bawl time and again during estrous, these are not decisive indicators of heat but must be paid closed attention to.

2.1.5 Fluffed-up Hair and Grubby Legs

As an upshot of the activity, the hair on the rump and tail-head are rubbed and ruffled, showing the skin. The flanks and thighs may be smudged with mud or dung all over.

2.1.6 Chin Resting and Back Rubbing

Cows often rub their chins over the haunch or back of the cows they're mounting to test for receptivity. The cows must be closely watched for standing behavior.

2.1.7 Snuffling Genital and Head Raising

Cows in estrus and proestrus are likely to indulge in sniffing the genitalia and licking vulva of its herd-mates followed by raising head and curling lips of the vulva.

2.1.8 Reduced Feeding and Milk Production

A few studies show that the cows decrease their feed intake resulting in less milk production when in estrus though a slight surge in the milk yield is observed as the end of heat approaches. However, several other factors too affect the decreased milk output in cows. Therefore, the symptom mentioned alone cannot be considered responsible for the same.

2.1.9 Metestrous Bleeding

As the metestrus bleeding begins, the cows discharge bloody mucus and blood from the vessels through the uterus (variable amongst cows) after estrus for one to three days, owing to increased estrogen levels during the heat though it doesn't dictate it didn't conceive. Such cows must be carefully observed to detect their return heat in the next 18 to 19 days.

2.2 Dry Period

The dry period is the most crucial stage of the cow's lactation cycle as it prepares the cow and her udder for the successive lactation. More than 70% development of the calf in the cow's womb takes place during the last trimester of parturition. Thus, drying off the cow helps retain sufficient energy, recover and repair mammary tissues, and cure existing infections (if the cows have been treated with antibiotic dry cow treatment (DCT)).

The studies show that about 60% mastitis cases in cows occur during the dry period. As the udder is vulnerable to infections, the cows, therefore, must be painstakingly dried off ahead of calving to inhibit any abnormalities from contaminating the udder health. A period of six to eight weeks between drying off and calving is recommended for the revitalization of udder tissue.

The cow and its udder are susceptible to undesirable diseases during the dry period which is why close monitoring and good management practices are essential. Let's walk through the practical measures to be taken during the dry period that could help you diminish the risk of infections.

2.2.1 The dairy cow's pregnancy in India lasts for 283 days and 310 days for the buffalo, on an average including a variation of ten or more days (considered normal). The ideal period of drying the animal is 45-60 days before the foreseen date of calving. And the time to commence the dry period is calculated accordingly.

2.2.2 Body condition scores change gradually over the course of entire lactation so the conditioning should be carried out when lactation is about to end. Since the cow puts on more fat during the lactation, she should be dried off with the body condition score of 3.5 to 4.0. Feed less concentrates to the fat cows and more to the thin cows to maintain the ideal body weight of the cows during the lactation.

2.2.3 Toward and during the dry period, the milk yield of the cow must be decreased to increase the chances of successful dry off. Cutting down the supply of green fodder and concentrate mixture will help in reducing milk production in cows. Feed more roughage and fibrous food containing hay, silage, etc. and less protein-rich diet.

2.2.4 An alternative method is to stop feeding grains or forage to the cows for one or two days and then terminate milking. It is recommended to treat the cows for mastitis regularly while drying off and in the last milking session. Carefully watch the udder for any abnormal swelling for

two to three weeks post drying off. Call in a veterinary as it can be an indication of developing mastitis.

2.2.5 Keep the dry cows separate from the rest of the herd to provide sufficient space for exercise.

2.2.6 Feed appropriate quantity of food including roughage and concentrates to the cows to refrain from underfeeding or overfeeding. Limit the weight gain up to 45kg between lactation and calving. There may arise problems like milk fever, weakened appetite, lactic acidosis, or clinical ketosis if the cows become overweight.

2.3 Calving

The last 45-60 days of the gestation period, i.e. the last trimester, are the most critical days for both the cow and soon-to-be-born calf. It is the most challenging phase of calving which requires careful attention, efforts, knowledge, skills, and management. Measures implemented during this time can significantly influence the fetus health, survival chances, and post-birth functioning of the calf along with the future breeding performance of the cow. Lowering stress and problems related to calving can help cows give birth quickly and in less pain. Here are the good practices that must be executed to efficiently manage the transition period (from 3 weeks before calving until 3 weeks thereafter) and ensure smooth calving time and birth of a healthy calf.

2.3.1 Pre-calving

2.3.1.1 Set up a comfortable and warm bedding for pregnant cows to rest and minimize physical stress. Also, building an isolated shelter with hygienic flooring and environment that keeps the harshness or varying seasons at bay is equally essential. It keeps the cows happy, helps in maintaining overall health, and prevent any uncalled-for infections or injuries.

2.3.1.2 Provide fans and sprinklers keep the cows cool and comfortable during extreme heat.

2.3.2 During Parturition

2.3.2.1 As the time of calving approaches, the cows must be moved to the calving pen and be closely watched for the signs of the onset of labor. The typical indications that indicate parturition include udder development, swelling of teats, springing of the vulva, disappearing pelvic ligaments, mucus discharge, labored breathing and moaning, and behavioral changes like self-isolation.

2.3.2.2 If there's no evidence of the water bag (allantochorion) billowing out within the 20 hours of the onset of labor pains, you may need to consult a veterinarian to assist the cow.

- 2.3.2.3** The uterus and abdomen begin contracting to lift and move the calf out of the cervix. If the contractions seem to cease for over 2 hours after the water bag breaks, you might need veterinary advice. Such deferrals may cause development of uterine prolapse, milk fever, or downer cow syndrome, therefore, timely vet intervention is indispensable.

2.3.3 Post Calving

- 2.3.3.1** The amnion bag (fetal membrane) containing the calf appears after the water bag has protruded. The cow ejects uterine contents and the amniotic membrane within 4 to 12 hours after calving depending upon any complications faced during the birth. If the amnion bag is retained, veterinarian help should be called for.
- 2.3.3.2** After delivery of the calf, the cow will continue expelling mucosal membranes, and much of it would be seen hanging out of the vulva. The placenta or the fetal membrane must be removed and decomposed at a safe place to avoid being eaten by the cow or predators.
- 2.3.3.3** Clean and disinfect the pen area to reduce the chances of infection, and prepare proper bedding for the cow and calf to lie down and relax. Feed good food to the cow to revitalize the energy lost during calving.
- 2.3.3.4** Udder Edema is prevalent in the periparturient period that occurs due to physiological and metabolic changes. During this time, forages high in Magnesium, Zinc, and Vitamin E content must be regularly fed to the cows. Frequent hot compressions and massages help in removal of excess fluid by stimulating blood flow.
- 2.3.3.5** The first milk of cows after calving, called Colostrum, must be ingested by the calf within 1-2 hours of its birth or at most 6 hours. Colostrum contains antibody or immunoglobulin concentrates that safeguard and immune the calf against diseases. However, there're times when either the cow is too thin to secrete enough milk or the calf is stressed out due to long delivery session to feed on the cow's milk by itself. Hence, the cow's colostrum must be stored and frozen for the calf to obtain essential nutrients from the milk when it's stable and survive post-birth respiratory diseases and/or other likely infections.
- 2.3.3.6** Dip the calf's navel in a sterile iodine solution immediately after its birth. It protects the calf from against diseases occurring during the early days of life.
- 2.3.3.7** Vaccinate the calf at birth to help build immunity against pathogens causing respiratory illnesses.

3 CATTLE DISEASES AND TREATMENT

Cattle diseases are a detriment to the dairy industry at large. These diseases cause massive pecuniary loss to the dairy industry and the farmers. Plus, the production and cattle health damages often call for grinding recoupment. These diseases affect and harm the herd health, are contagious—and seldom prove fatal. Hence, the dairy farmers must hold enough knowledge on cattle diseases, and be aware of appropriate preventive and control measures to treat the affected animals. They must purchase only healthy animals and inquire about their history of diseases and particular medication. By employing

thorough, adequate sanitation, management, feeding, and vaccination practices at the farm, the dairy farmer can avert epidemics to a considerable extent. Establishing sufficient housing space, and providing enough food and water helps dairy animals to remain in good health, build immunity, and ensure speedy recovery if they fall ill. Here, we delineate some common cattle diseases and their symptoms, treatment and preventive measures which can be helpful in curbing the mentioned damages.

3.1 Anthrax

Anthrax is a common disease in livestock caused by a rod-shaped bacterium called *Bacillus Anthracis*. The bacteria spore-forming is commonly found in soil and infects herbivorous animals while grazing. Once transmitted into the animal body, the bacteria begin multiplying inside and kill the host within a few days. There are three types of Anthrax: Gastrointestinal, Pulmonary, and Cutaneous that affect intestine, lungs and skin respectively. The dead bodies of animals who have died of Anthrax carry living bacteria and act as active agents of transmitting the bacteria to the healthy animals. Hence, if the carcasses of dead animals are not disposed-off correctly and soon, the animals that are alive and well become more susceptible to ingesting the bacteria from. Anthrax is a highly infectious disease and can prove fatal in a matter of few hours if an appropriate course of treatment and medicines is administered too late.

3.1.1 Symptoms

- Weakness
- Difficulty in breathing
- Convulsions
- Blood discharge
- Mild fever
- Stomach pain and muscle aches
- Cardiac distress
- Staggering
- Suffocation
- Fluid swellings
- Progressive swelling of throat and neck



3.1.2 Treatment

- The delay in antibiotic treatment of Anthrax lowers the chances of survival so early treatment of the same is vital. The primary treatment includes large doses of intravenous antibiotics like penicillin, ciprofloxacin (fluoroquinolones), doxycycline, vancomycin, or erythromycin.
- In the case of Pulmonary Anthrax, the infected animals should be treated with early antibiotic prophylaxis to prevent possible death.

3.1.3 Prevention

- Vaccinate cattle against Anthrax to prevent further occurrence of the disease
- Avoid overgrazing. You may practice rotational grazing to ensure that grass is available all-round the year especially during the drought
- Wash, clean, and disinfect tools and wearables that have come in contact with infected soil and animals
- Maintain separate equipment and attires for sick and healthy animals
- Inhibit usage of disinfectants containing calcium as it is an ideal source of preserving bacteria spores
- Ensure that the antibiotics are not administered together with vaccines

3.2 Black Quarter

Black Quarter or Blackleg is a severe infection in animals caused by an anaerobic and motile bacterium called *Clostridium Chauvoei*. It is a soil-borne bacteria similar to *Bacillus Anthracis* which contaminates soils, pastures and water. It is most liable to make its appearance in the monsoon that increases the environmental distribution of this bacteria. Black Quarter is the most common infection persisting among young bovines aged between six months and two years while the older cows suffer a milder form of the disease—causing death in severe cases. A predominant source of the bacteria is contaminated pasture which gets ingested into the intestine by the animals while grazing. The infection causes significant swelling in the limb while developing lameness on the infected leg. Once the signs of Black Quarter start appearing, the animals live for a short while and succumb to the infection within 12 hours to 1 or 2 days.

3.2.1 Symptoms

- The marked rise in temperature
- Loss of appetite
- Dullness
- Failing to keep up with the herd
- Tense and painful local swelling on some part of the body, more often a hind-quarter
- Crepitation
- Lameness
- Weakness and depression
- Rapid breathing
- Occasional convulsions



3.2.2 Treatment

There's no particular remedy for Black Quarter since the rapid progression of the disease makes any treatment useless. However, antibiotics could be administered to the animals in the early stage as a control measure, albeit they may suffer from permanent abnormality due to partial damage or annihilation of muscles.

3.2.3 Prevention

- Isolate infected animals
- Dispose the dead bodies of infected animals either by burning or deep burying

- Avoid grazing in the affected pastureland
- Clean and disinfect surgical instruments, tools and wearables before and after use
- Burn the topmost layer of soil to impede the spread of bacterial spores
- Vaccinate clostridia (Blackleg) vaccination as a preventive measure against Black Quarter

3.3 Brucellosis

Brucellosis is a highly contagious disease caused by a nonspore-forming and non-motile bacteria of the genus *Brucella*. The virus is transmitted in animals when they come in contact with infected animals or ingest (eating, inhaling, drinking) the bacteria from a contaminated source. There are four species of the bacteria: *B. abortus*, *B. canis*, *B. melitensis*, and *B. suis*. *B. abortus* primarily affects the cattle by localizing and multiplying in the reproductive organs of the animals leading to reduced fertility in male bovines and abortion, stillbirth or early death of offspring due to the infected uterus in females. *Brucella* also affects the mammary glands (udder) and limb joints in animals causing the production of contaminated milk and arthritis respectively. Any vaginal discharge, body fluids, aborted fetus, unpasteurized (or infected) milk, or carcasses of infected animals are ideal sources of the bacteria.

3.3.1 Symptoms

- Birth of weak/lame calf, or abortion of calf in pregnant cows
- Retained afterbirths
- Reduced milk production
- Enlarged joints due to arthritis
- Infection in uterus post birth, and lowered conception rate
- Weight loss
- Difficulty in movement



3.3.2 Treatment

There's currently no treatment and medication available for Brucellosis infected animals. Though, animals may recover partially, the effect is lifelong and pose threats to other unaffected or healthy animals. Therefore, early detection and prevention of Brucellosis are crucial to controlling its propagation.

3.3.3 Prevention

- Vaccinate the animals with an RB51 vaccine to produce immunity and increase resistance to Brucellosis. The vaccine is effective in 70 to 80 percent of the cattle if they're moderately exposed to the disease
- For the best results, the animals should be vaccinated between 4 months to 1 year of age
- In Brucellosis affected areas, revaccinating the animals, especially the females, at 3 to 5 years interval is recommended
- Thorough sanitation and management practices must be followed at the farm
- Vaccination gives much better protection to the animals, hence, is vital in controlling, managing and eliminating Brucellosis.

3.4 Mastitis

Mastitis is the inflammation of mammary gland (also called udder), and one of the most common and costly diseases in dairy animals. Pathogens cause it, mainly bacteria like *Staphylococcus Aureus*, *Escherichia coli* (*E. coli*), *Pseudomonas aeruginosa*, etc. that flow up the teat canal, populate and increase, resulting in damage to the udder tissue. Mastitis causes heavy production losses and deterioration in milk quality. Moreover, there are significant public health concerns and risks involved due to pathogen-instigated milk-borne diseases. There are two types of mastitis: Clinical and Subclinical. While Clinical mastitis shows visible signs of abnormalities in udder (swelling, redness, or pain) or milk (clots, watery appearance, or flakes), subclinical mastitis requires diagnostic tests as no apparent signs of changes in udder or milk are noticeable. Hence, an immediate vet intervention is needed on detection of any of these.

3.4.1 Symptoms

- Swollen udder; often hard and red
- Watery milk with flakes, pus or clots
- Reduction in milk yield
- The rise in body temperature

- Lack of appetite
- Sunken eyes
- Diarrhoea and dehydration
- Inability to move



3.4.2 Treatment

Deciding the course of treatment for mastitis-infected cows depends on what type mastitis it is—clinical or subclinical—and the given magnitude. Using long-acting intermammary antibiotics and infusions, or injecting oxytocin to stimulate milk to let down can be useful in managing mastitis. Drugs like sulphonamides, penicillin and streptomycin are often administered to control the disease and are valid to a substantial extent.

3.4.3 Prevention

- It is observed that application of vaccines like Flunixin Meglumine, Ketoprofen, and Carprofen during the dry period can lower clinical coliform mastitis in the early lactation, although, they do carry adverse effects
- Maintain a good milking routine by cleaning and disinfecting cow teats with a sterilized solution before and after milking
- Maintain standard hygiene at the farm and milking pen by setting up suitable bedding and shelter for the cows
- Provide proper nutrition and water to the cows
- Milk the infected cows after the rest of the herd has been milked
- Cull chronically affected cows

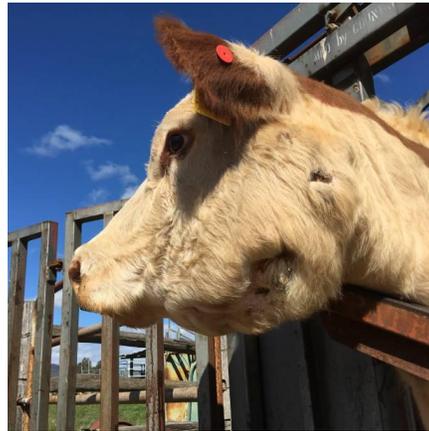
- Check all the cows for subclinical mastitis using Somatic Cell Count (SCC) test once every month
- Maintain the milking machine through regular servicing and sterilization
- Maintain records of all cows including the ones with a history of mastitis comprising SCC & Bactoscan results, treatment and medication are given, etc.

3.5 Hemorrhagic Septicemia

Hemorrhagic Septicemia is a fatal disease common in water buffalos and cattle caused by non-motile, penicillin-sensitive bacterium called *Pasteurella multocida* belonging to *Pasteurellaceae* family. The disease is typically related to the wet and humid weather. Studies have shown that the bacteria tend to survive longer in the moist conditions or environment and hence, the outbreak increases early in the wet season. The disease occurs where first animal husbandry practices are followed, and animals aren't under constant observation. The visible signs of the disease are marked by elevated body temperature, respiratory distress, edema extending toward the brisket region, severe dyspnea followed by death in 24 to 72 hours with rapid progression in congestion of lungs and severe haemorrhages.

3.5.1 Symptoms

- High rise in temperature
- Increased inflammation and redness in the gut
- Excessive nasal discharge and salivation
- Submandibular edema in throat and brisket
- Respiratory distress
- Congested mucus membrane
- Dullness and depression
- Suspended rumination
- Loss of appetite
- Rapid pulse and heart rate



3.5.2 Treatment

If the disease is in the early stage, it is receptive to sulphonamides treatment combined with antibiotics like penicillin, erythromycin, or trimethoprim although this is not the best drug. However, intramuscular administration of oxytetracycline or streptomycin is comparatively effective.

3.5.3 Prevention

- Vaccinate the animals with broth bacteria, alum-precipitated vaccine (APV), oil adjuvant vaccine (OAV), or aluminium hydroxide gel vaccines twice a year since they're useful only up to 6 months
- Isolate and treat the infected animals separately
- Avoid visiting animal markets or cattle shows with infected animals
- Dispose of the dead animals immediately following correct discarding practices
- Clean and disinfect cattle shed regularly
- Avoid exposure to harsh weather conditions for long

3.6 Foot and Mouth Disease

Foot and Mouth Disease (FMD) is a contagious viral disease affecting cloven-hoofed animals like cows, buffalos, pigs, sheep, camels, goats, and deer. The acute, infectious disease is caused by a virus of which there are seven serotypes: A, C, O, Asia 1, SAT 1, SAT 2, and SAT3. The incubation period of the virus varies between 1 to 12 days and can spread rapidly directly or indirectly through infected pastures, water, hay, or manure. The disease in the infected animals is characterized by high fever followed by the development of large, swollen blisters and vesicles primarily in the mouth (tongue, lips and palate) and on the feet and sometimes on the mammary gland. Foot and mouth lesions leave animals in immense pain and distress causing hindrance in their mobility and feeding routines. Hence, it may lead to foot deformities, permanent lameness, damage to mammary glands, and lowered productivity post recovery. The disease mostly occurs as sub-clinical or less severe infection in adult cattle, although may turn out lethal for the young calves. The virus activates at lower temperatures; it spreads more in cold, damp climatic conditions and when animals are housed jointly together.

3.6.1 Symptoms

- High fever (usually 104°F to 105°F)
- Shivering
- Frothing at the mouth with slobbering and quivering lips
- The appearance of sores and blisters in the mouth
- Severe lameness
- Lesions on feet; tender and sore feet
- Swollen testicles in male animals



3.6.2 Treatment

There's no treatment for Foot and Mouth disease as animals recover over the time.

3.6.3 Prevention

- Vaccinate the animals to control the disease, especially in the endemic regions, although a vaccine against one serotype will not guard against the other
- Control the movement of infected animals and isolate them in a separate farm
- Keep and disinfect everything clean—bedding, equipment, wearable, vehicles—before and after use to lessen the transmission of the virus
- Inspect animals regularly for the signs of the disease
- Consult a veterinary doctor as soon as you notice any visible signs
- Practice proper biosecurity measures to prevent accidental entry of virus in uninfected farm

4 VACCINATION

Vaccines play an important role in preventing and controlling livestock diseases, incorporated as a part of the control strategy. Vaccinations protect the dairy herd against reproductive, clostridial and respiratory infections that cause lowered production, reduced fertility and death in cattle, and economic loss to the dairy farmers. Vaccination programs must be devised keeping in mind factors like age, body condition, and climate to enhance its efficiency, provided the program is executed on time. Hence, it is advised to work out a well-planned vaccination program with a skilled and experienced veterinary who can assist you in deciding which vaccinations will be beneficial for your dairy cattle while maintaining health and profitability. Here, we mention the vaccines that carry some potential benefits which must be considered for corresponding cattle diseases.

Disease	Type of Vaccine	Strategy	Remarks
Anthrax	Spore Vaccine	<ul style="list-style-type: none"> - First dose at the age of 6 months - A booster dose at every 12 months before the onset of monsoon 	The vaccine must be used only when cattle are grazed in endemic areas
Black Quarter	Killed Vaccine	<ul style="list-style-type: none"> - First dose at the age of 6 months - An annual booster dose for stimulation of protective immunity 	The vaccine must be administered before the onset of monsoon
Brucellosis	Cotton strain 19 (Brucella abortus live)	<ul style="list-style-type: none"> - All heifers of 4 to 12 months should be vaccinated 	Proper care should be taken as the vaccination can interfere with specific diagnostic tests
Mastitis	Flunixin Meglumine, Ketoprofen, and Carprofen for clinical coliform mastitis	<ul style="list-style-type: none"> - First dose at six weeks before calving - Second dose ten days before calving - Third dose seven weeks post calving 	
Hemorrhagic Septicemia	Oil Adjuvant Vaccine	<ul style="list-style-type: none"> - First dose at six months - Annual booster dose to ensure a high level of immunity 	The vaccine must be administered before the onset of monsoon or during an epidemic
Foot and Mouth Disease	Polyvalent Tissue Culture Vaccine	<ul style="list-style-type: none"> - First dose at four months of age Subsequent booster doses six months apart 	More (up to 4) doses of vaccine may be required according to the severity of the disease

5 CALF CARE

Successful calf rearing considerably adds to the success of the dairy farming business. The young calves, when they grow up, replace the older bulls and cows, and contribute to the farm production. Hence, it is essential that the calves are reared prudently by implementing apt health management practices that are equally cost-effective for your farm. Adequate feeding, care, housing, and medication on time can help keep calf mortality rate as low as 5%. Postnatal nutrition and care is an intensive yet imperative aspect of dairy farming. Failure in taking care of calves can prove fatal, unlike reduced production and deteriorating growth rate in older calves if not managed rightly. The health of the calf, development of its rumen functions, and overall body growth during the initial weeks of birth subsequently influence its future performance. Hence, for calf rearing to be profitable, the practice must focus on providing optimum nutrition and correct environment for the animals to attain set development target and genetic potential. Beneath, we set out some effective practices and minimum standards to manage the new-born calves.

- 5.1 The farmers must be observant of pregnant cows who are nearing their calving date, specifically who're due in one or two days. It will help in making appropriate preparations and set up a comfortable environment for both cow and the calf. The newborn calves must be cleaned and dried with a clean cloth or straw if the calf is to be separated from its mother immediately at birth. Besides, it stimulates blood circulation and normalizes respiration in calf's body.
- 5.2 Clear away the mucus of the calf's mouth and nose to abet breathing. Hold the calf upside down to spew out any liquid in its mouth, nose, or lungs.
- 5.3 Cut the navel of the stalk leaving three inches, remove any liquid or dirt in it, dip it into iodine solution and tie it with a thread to prevent any infection. The procedure must be repeated to avoid calf sour, navel ill or joint ill.
- 5.4 Let the cow feed colostrum to the calf within one or two hours of its birth. Store and freeze colostrum from other cows in advance to feed the same when the calf is unable to receive sufficient colostrum at birth. Artificial colostrum may also be used. Typically, a calf requires colostrum at least 10% of its body weight. It takes approx. 6 to 8 hours for the calf's small intestine to absorb antibodies in colostrum. Colostrum is high in nutrition that helps in building calf's immunity to fight against infections. Hence, it is necessary for the cows to receive colostrum through the first 12 to 24 hours of birth.
- 5.5 Ensure that the calf pen is clean and dry before the calf is moved away from the dam. If the bed is made of straw, it should be replaced with fresh, dry straw regularly. At certain times, a calf is left to feed on its dam for three to four days. However, the same may not be possible in the case of buffalos, and indigenous cows are owing to their intense apprehension for keeping their calves near them.
- 5.6 The calves should be put together in groups for social development. If they must be lodged separately say for medication and control against disease, they must be placed in proximity allowing them to see each other.

- 5.7** The calves that are kept away from their dams must be fed whole milk or milk replacer at least thrice a day to fulfil their daily nutritional requirements. The standard plan is to feed milk 10% its body weight for 56 days, 20% until 65 days, and 40% until 75 days post which the supply can be ceased.
- 5.8** Feed milk using a bottle with nipple rather than a tub or an open vessel. Make sure to wash, clean, and sterilize the bottle before and after every feeding session. Allow the calves to lick salt to inhibit cross-feeding or licking other herd-mates.
- 5.9** Begin weaning the calves off its dam and gradually encourage feeding on concentrate and roughage. Doing this enhances rumen development. Also, clean and potable water must be accessible through the day and night.
- 5.10** Numbering, ear-tagging, tattooing, or removal of extra teats of calf must be done during the initial few weeks of birth. Abstain from branding, tail docking, and nose ringing the calves or cows.
- 5.11** Avoid disbudding if not necessary. Otherwise, it should be done within a week of birth by an experienced vet using electric dehorner or hot iron and administering anesthesia followed by pain relief procedure.
- 5.12** The practice of dehorning in older cattle is distressing and should not be performed without vet supervision.
- 5.13** Perform castration, if necessary, in the early weeks and up to two months at max post birth followed by pain control treatment.
- 5.14** Take apposite preventive measures to avert any respiratory infection, diarrhea, or navel ill that most prominent causes of calf morbidity and mortality.
- 5.15** Fresh, green fodder must be fed to the calf as and when it starts nibbling solid food. Additionally, 1kg concentrate mixture per 100kg body weight can be provided from the first month of birth.
- 5.17** Implement standard vaccination and parasite control treatment after the birth by consulting a vet and devising an appropriate vaccination program.

- 5.18 The calf should be weaned off after three to four months of age or when the calf is in a position to suffice its nutritional requirements from roughage and concentrate mixture alone.
- 5.19 All the required arrangements must be made to keep away the animals from heat and cold stress or harsh weather conditions.

6 THE FINAL WORD

So far, we studied factors that significantly influence fertility in cattle, and are rudimentary in dairy herd health management. The aspect of dairy cattle reproductive management is undergoing massive change owing to extensive use of technology as one of the drivers of the change. The goal is to expand dairy output by increasing herd size and achieving higher milk yield per animal. Hence, it is essential to focus on the development of areas we discussed—breeding, disease & vaccination management, and calf care—that have a potential impact on cattle health, fertility and milk production. As genetic trends for fertility improve, new technological advancements are roped in, and better nutritional strategies are continued to be made for enhanced dairy herd management, it is likely to see maximized farm output and conception rate in coming years.

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