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Government of India
Ministry of Fisheries, Animal Husbandry & Dairying
Department of Animal Husbandry & Dairying

Krishi Bhawan, New Delhi
Dated 7th February, 2025

OFFICE MEMORANDUM

Subject: Seeking Public Comments on the Proposed Draft for Strategy Documents on the Prevention and Control of Mastitis-Regrading

The Department of Animal Husbandry and Dairying (DAHD) invites comments and suggestions on the attached draft Strategy Document for the Prevention and Control of Mastitis, developed in consultation with relevant institutes and stakeholders.

The comments/suggestions may be sent at the following Email IDs- sharma.aruna@gov.in and vivek.3323@dahd.nic.in .

The comments/inputs/feedback may be submitted within 10 days from the date of publishing the draft.

(Aruna Sharma)
Deputy Commissioner (AH)

Strategy Document on the Prevention and Control of Mastitis

Introduction:

Bovine mastitis is a common and economically significant disease affecting milch animal worldwide. It is an inflammatory condition of the udder tissue, primarily caused by bacterial, fungal, or viral infections, though physical and chemical injuries may also contribute. Mastitis remains a key issue in dairy farming, primarily due to its significant effects on milk production, quality, and animal health. It results in economic burdens through loss of milk, increased treatment costs, and premature culling.

The condition can manifest in clinical and subclinical forms, with the latter being particularly challenging to detect and manage.

i. **Clinical Mastitis:** Visible changes in udder (swelling, heat, pain) and milk (colour, blood, fibrin) with a sharp drop in milk yield

ii. **Subclinical Mastitis:** No visible changes, only detected by diagnostic tests

Subclinical mastitis is more important worldwide including India (varying from 10- 50% in cows and 5-20% in buffaloes) than clinical mastitis (1-10%).

Effective prevention, early diagnosis, and treatment are critical to controlling mastitis, ensuring animal welfare, and sustaining dairy productivity. To address these challenges, a multi-dimensional strategy that emphasizes prevention, management, and farmer education is critical for effective control. This document will explore a holistic strategy that focuses on hygiene practices, balanced nutrition, and efficient management techniques for reducing mastitis in dairy herds across India.

Pathogen and Host Factors

Pathogen Factors: Mastitis is often triggered by pathogens that can be broadly classified as **contagious** or **environmental**:

- **Contagious Pathogens:** These pathogens, such as *Staphylococcus aureus* and *Streptococcus agalactiae*, are typically spread from cow to cow during milking. Poor milking hygiene, such as using shared milking equipment without proper sanitation, is a major contributor.
- **Environmental Pathogens:** These include organisms like *Escherichia coli* that thrive in manure, bedding, and unclean housing environments. Improper housing management, such as infrequent manure removal and poor ventilation, allows these pathogens to proliferate and infect cows.
- **Other Pathogens and Causes:** Mycoplasma, fungi, virus, trauma, chemical irritant, etc.

Host Factors:

- **Susceptibility by Species, Breed and Genetics:** Crossbred cows, which are bred for high milk production, are more prone to mastitis compared to indigenous breeds. Native breeds often have a comparatively strong natural resistance for intramammary infection as compared to cross bred cattle. Buffaloes and goats, too have less prevalence but susceptible for this infection.

- **Age, Parity and Stage of Lactation:**
- The prevalence of mastitis is directly related to the increasing age and parity. Older cows are more susceptible to mastitis, because of the wider or permanently partially-open teat canal as a result of frequent milking, and older cow mammary epithelium increases the permeability due to previous infection.
- The increased risk of intra-mammary infection (IMI) probably because of teat canals lengthen and dilate with increase in lactational age. Moreover, multiparous cows are more vulnerable to mastitis than primiparous cows due to immune-incompetence.
- Stage of lactation: Cows are most susceptible to mastitis around the time of calving, during the transition period. The stress of calving, along with physiological changes in the udder and immune suppression during this period, make them vulnerable to infections.
- Nutrients and immune system: In lactating animals, there is a higher demand of energy and nutrient during lactation period for the synthesis of colostrum and milk. Inadequate supplementation of nutrients (e.g. trace elements, amino acids, vitamins etc.) may lead to immunosuppression during transition period or onset of lactation, and thus consequently increasing susceptibility to mastitis.

Environmental factors

Environmental factors are also equally important and their effective management can significantly support in the prevention and control of mastitis. Numerous environmental conditions and dairy practices may serve to render the udder more susceptible to infection by bacterial agents. The two important factors of heat stress namely temperature(heat) and humidity directly responsible for the occurrence of mastitis. Housing of animals is positively associated with an increase in new cases of mastitis.

Importance and Economics of Mastitis

Mastitis affects milk quality and can result in financial losses on several fronts. For instance, a high-yielding cow suffering from mastitis can experience a 3-4 kg reduction in daily milk yield, leading to a loss of Rs. 306 to Rs. 458 per cow, per day, for farmers. Besides, losses due to discarded milk during the treatment come to be between Rs. 150 to 200.

1. **Milk Contamination and Disposal:** Milk from cows with clinical mastitis cannot be sold or processed, leading to direct income loss.
2. **Milk Yield Reductions:** Subclinical mastitis leads to a significant drop in milk production, often undetected due to the absence of visible symptoms, but resulting in cumulative losses over time.
3. **Decreased Milk Quality:** Mastitis even at the subclinical level results in decrease in the desirable components of the milk such as lactose, fat, casein and solids not fat (SNF), which has major economic implications.
4. **Veterinary Costs:** Repeated veterinary visits, treatments, and labor costs associated with managing infected animals add to the economic burden.
5. **Premature Replacement:** Cows that do not respond to treatment may be replaced earlier than planned, leading to additional costs in replacing them with new animals.

Challenges in Mastitis Management

Managing mastitis is complicated due to:

- **Diverse Pathogens:** A wide range (>137) of microorganisms including bacteria, fungi, yeast, virus etc are responsible for causing mastitis, resulting managing the disease becomes difficult. Moreover, resistance of pathogens against commonly used antibiotics and blind therapeutic approaches are the other challenges in this direction.
- **Antimicrobial Resistance (AMR):** The over and/or indiscriminate use of antibiotics has led to increased cases of antimicrobial resistance, making treatment less effective over time. The more frequently antibiotics are used without proper guidance, the higher the risk of resistance.
- **Detection Challenges:** Delay in the diagnosis of mastitis especially subclinical mastitis, since clinical mastitis causes visible changes in the milk and udder, which is easily noticed by the farmers. Subclinical mastitis can persist unnoticed for long time without routine testing (such as CMT, SCC), meaning the infection continues to affect milk quality and production without the notice of farmers.
- **Lack of awareness:** Mastitis is a managemental disease, which severely affects the production and causes very high economic losses due to lack of awareness among dairy farmers about basic knowledge of this disease.

Mastitis Control Strategies: A Holistic Approach

The strategy for the prevention and control of mastitis should be effective, holistic and comprehensive. Mastitis may be included by the States/UTs for support under Assistance to States for Control of Animal Diseases (ASCAD) component of Livestock Health & Disease Control Programme (LH&DCP) for effective control at all levels to improve the milk quality and reduce economic losses to the dairy farmers.

1. Hygiene Practices: Implementing stringent hygiene practices during milking is the cornerstone of mastitis prevention:

- **Udder and Teat Preparation:** Udder and teat, before milking should properly be cleaned with clean water using jet spray or pipe and wiped with clean cotton cloth or paper towel to ensure that dirt is not introduced into the milking system.
- **Pre-Milking & Post-Milking Teat Dipping:** To prevent the introduction of dirt and bacteria into the milk system, make sure the teats are cleaned and dried before milking. Iodine- or chlorhexidine-containing teat dips create a barrier to keep infections out of the teat before, during, and after milking. The animals should not be allowed to sit down for at least 40-45 minutes so that teat orifice is closed properly.
- **Equipment Sanitation:** Milking machines and equipment should be thoroughly cleaned and sanitized after each use to prevent the spread of contagious pathogens between animals.

Actionable Points: A dairy cooperative could organize farmer field schools to demonstrate best practices such as how to properly clean and dip teats, how to operate, maintain and clean milking machines along with showcasing effective housing layouts that support hygiene.

2. Housing Management: The environment where cows are housed has a significant impact on the incidence of mastitis:

- **Clean and Dry Floor and Bedding:** Cows should be housed on clean, dry floor and bedding that is changed regularly. Wet and dirty bedding harbors environmental pathogens.

- **Ventilation:** Dairy farm should have proper ventilation to reduce the animal stress and increase productivity. Proper airflow reduces moisture and the proliferation of bacteria in barns, especially in hot and humid conditions.
- Heat stress management particularly for cross-bred cows is of utmost importance during extreme summer as it directly impacts milk production. This can be achieved using shower and fans

Actionable Points: Smallholder dairy farms could receive support for affordable bedding solutions, such as the use of sand or other absorbent materials or rubber mats, and training on how to set up adequate ventilation in local climatic conditions.

3. Regular Monitoring and Early Detection:

- **Somatic Cell Count (SCC) Testing:** Regular SCC testing should be adopted as a standard practice to detect subclinical mastitis. An SCC of 200,000 cells/mL or higher indicates infection, even when no outward symptoms are visible. Bulk Tank Milk SCC is the best indicator of a herd udder health. An automatic somatic cell counter i.e Fossomatic automatic cell counter will support in detection of mastitis.
- **Community Initiatives:** These initiatives can involve grassroots animal health workers, community workers, para-vets visiting farms to educate and assist farmers in performing regular checks, such as the California Mastitis Test (CMT; For details Please see *Annexure I*).
- **Mobile Veterinary Units (MVUs):** These units maybe equipped with diagnostic kits like CMT to offer affordable, accessible testing in remote areas.

Actionable Points: Setting up a program to monitor milk quality at collection centers could incentivize farmers to adopt best practices and regularly test their herds for mastitis.

4. Balanced Nutrition and Transition Period Management:

- **Nutritional Support:** High-yielding cows need diets rich in energy, vitamins, and minerals, particularly during the transition period. Special attention should be given to maintaining calcium and phosphorus balance with the anionic diet to support udder health. Preference should be given to provide transition feed during transition period(-21 days to +21 days of calving).
- **Stress Reduction:** Reducing stress by providing comfortable calving areas, limiting cow movement post-calving, and ensuring adequate nutrition can reduce the chances of mastitis developing.

Actionable Points: Collaborating with local veterinary services and extension agencies to offer tailored feeding plans for high-risk cows, especially during the transition period. The farmers should be made aware about the regular use of area-specific mineral mixtures so that immunity is maintained in the animals to fight against pathogens.

5. Antibiotic Stewardship and AMR Control:

- **Targeted Use of Antibiotics:** Antibiotics should only be used based on culture and sensitivity tests (CST) to ensure the right drug is selected for the specific pathogen. This reduces unnecessary use of broad-spectrum antibiotics.
- **Promotion of Ethno-Veterinary Practices:** Incorporating natural remedies such as turmeric, garlic, and aloe vera for mild cases can reduce the reliance on antibiotics, especially in subclinical infections. Farmers may register in the 1962 Bharat Pashudhan app for details of ethno-veterinary practices
- **Avoiding Over-the-Counter Antibiotics:** Educating farmers and veterinary professionals about the importance of prescribing antibiotics only by trained personnel to avoid misuse or overuse.

Actionable points: Farmer training programs can include demonstrations on using herbal preparations for mastitis treatment, along with the appropriate methods of administration. . Additionally, awareness campaigns can highlight the importance of adhering to withdrawal periods after antibiotic use to ensure milk safety and compliance with food safety standards.

6. Education and Awareness Campaigns: Educating farmers on best practices is crucial for long-term prevention:

- **Awareness and Education Campaign:** AI technicians, milk recorders, and supervisors may be educated about the importance of Clean Milk Production and best hygienic practices. Under the National Program for Dairy Development, training on Clean Milk Production and improved hygiene practices is being provided to farmers.
- **Post milking feeding:** Promote the feeding of green fodder after milking to avoid immediate sitting of animals on the contaminated floor. Teat orifice is remains open after milking upto one hour.
- **Prompt Reporting:** Milk recorders and AI technicians who observe any abnormal health events or signs of mastitis in their operational areas should promptly report these observations to the designated or government-appointed Animal Health Officer.
- **Milking Hygiene and Equipment Maintenance:** Regular training should be provided to farmers on cleaning milking equipment, teat dipping, and proper udder care.
- **AMR Awareness:** Campaigns should emphasize the importance of avoiding unnecessary antibiotics and the risks of residues in milk.
- **Milk Sample Collection for Culture and Sensitivity Testing:** Farmers should be trained about how to collect milk samples for CST as it is an important step to get true results.
- **Peer Learning Sessions:** Organizing peer learning sessions where experienced farmers share their practices and success stories in mastitis prevention with others in their community.

Actionable Points: Partnering with dairy cooperatives and veterinary schools to develop farmer-focused materials (pamphlets, videos) that explain mastitis prevention and the importance of monitoring

7. Biosecurity Measures:

- **Pasteurization:** To prevent the transmission of mastitis pathogens through milk, strict protocols should be in place to ensure milk is pasteurized before consumption.

- **Segregation:** Cows with chronic, untreatable mastitis should be segregated to prevent the disease from spreading to healthy animals.
- **Milking Order:** Healthy cows should be milked first then affected ones.
- **Milking pattern of infected animals:** Infected quarters/animals should be milked out in the last to avoid transmission of contagious pathogens.

Actionable Points: Developing a biosecurity protocol in collaboration with milk processing units to ensure that all milk sold meets safety standards. Additionally, provide training to farm workers on implementing and adhering to biosecurity measures effectively.

8. Breeding Program: Selecting animals that show resistance to mastitis can significantly improve herd health. Genetic selection focuses on traits like:

- **Breeding programs:** Implement selective breeding programs in Progeny Testing programs focusing on traits associated with mastitis resistance, such as udder conformation, somatic cell count and milk composition. Mastitis resistance traits, including Somatic Cell Score, should be integrated into the Genomic selection criteria for bulls along with major production traits.
- **Udder and Teat Conformation:** Animals with better udder and teat structure are less prone to injury and infection.
- **Health and Longevity:** Breeding programs should aim to balance production traits with traits that enhance health and resistance to diseases like mastitis.

Actionable points: In the future, Dairy cooperatives could offer incentives for farmers to use semen from bulls with proven resistance to mastitis, promoting genetic improvement within local herds. Further, cooperatives could organize awareness programs on the advantages of genetic selection for mastitis resistance.

9. Dry Cow Therapy: The dry period is a critical time in the management of dairy cows, as it plays a vital role in maintaining udder health and preventing mastitis in the subsequent lactation. Effective management during this phase is essential to reduce the incidence of both clinical and subclinical mastitis, which often develops during this period. By implementing these management practices during the dry period, dairy farmers can significantly reduce the incidence of mastitis in their herds, leading to healthier cows, improved milk production, and reduced reliance on antibiotics (For details please see **Annexure II**)

10. Research and Development:

- **Vaccine development:** There is urgent need of development of indigenous vaccine by including maximum number of highly prevalent mastitis causing bacteria. However, success rate of vaccine is also a challenge due to multi-etiological nature of the disease.
- **Alternative to Antimicrobials:** With growing concerns over antimicrobial resistance (AMR), there is an urgent need to explore alternative approaches to manage bovine mastitis effectively. Research is focusing on non-antimicrobial strategies such as the use of immunomodulators, probiotics, and bacteriophages to enhance the natural defense mechanisms of dairy cattle.
- **Precision Farming & Sensors:** Additionally, the application of precision farming technologies, including automated sensors for early detection and monitoring of udder health, enables timely interventions that reduce reliance on antimicrobials.

Actionable Points: Efforts to develop an indigenous mastitis vaccine targeting a broad range of prevalent bacteria through collaboration between research institutions, universities, and the private sector. Explore non-antimicrobial alternatives like immunomodulators and probiotics, while promoting precision farming technologies, such as automated sensors, for early detection and reduced reliance on antimicrobials.

Monitoring and Evaluation:

Effective mastitis control requires ongoing monitoring and evaluation:

- **Data Collection:** SCC levels, treatment outcomes, antibiotic use, and culling rates should be recorded regularly.
- **AMR Surveillance:** Surveillance of antimicrobial resistance patterns helps refine treatment protocols and guides antibiotic usage.

Actionable Points: Establishing a centralized database that records mastitis incidents and SCC data from farms across the region will allow for targeted interventions and policy decisions. KVKs and regional centers can be assigned to collect data from the field and report to the central agency.

Conclusion:

By adopting a holistic strategy focusing on hygiene practices, nutrition, responsible antibiotic use, and farmer education, it is possible to significantly reduce the incidence of mastitis in dairy herds across India. The proposed interventions, combined with ongoing monitoring and evaluation, will help improve dairy productivity, animal welfare, and economic outcomes for farmers.

Annexure I

Distribution of CMT Kits and Farmer Training for Regular Use

Importance of Regular Monitoring for Early Detection

Early detection of subclinical mastitis is crucial for controlling the disease before it escalates into clinical mastitis, which can result in significant milk losses, higher veterinary costs, and premature culling of animals. Since subclinical mastitis is asymptomatic, testing milk samples from cows is one of the most effective ways to detect infections early.

The **California Mastitis Test (CMT)** is a simple, affordable, and effective tool that can be used on farms to identify mastitis in its early stages by detecting measuring somatic cell counts (SCC) in milk samples. Widespread use of CMT by farmers offers several advantages:

- **Early Intervention:** Detecting mastitis early reduces the severity of the infection, minimizing milk losses and treatment costs.
- **Cost-Effective:** CMT is relatively inexpensive, making it accessible even for smallholder dairy farmers.
- **Ease of Use:** The CMT test requires no specialized equipment, only basic training, and can be applied by farmers themselves with minimal effort.

Composition of the CMT Kit:

The California Mastitis Test (CMT) solution typically consists of the following:

1. **Detergent:** Sodium lauryl sulfate or a similar surfactant, which lyses somatic cells present in milk.
2. **pH Indicator:** Bromothymol blue or a similar dye that changes color based on the milk's pH, indicating cell count levels.
3. **Water:** Acts as the solvent for the detergent and dye.

This mixture is designed to react with somatic cells (white blood cells) in milk, forming a gel-like substance proportional to the cell count, which provides a visual indication of inflammation levels in the udder.

Distribution of CMT Kits

To ensure that farmers can regularly monitor their dairy herds, the distribution of CMT kits must be prioritized at the grassroots level. Key strategies for distribution include:

1. **Integration into Government Schemes:**
 - CMT kits should be included in government-led **animal health initiatives** and **animal husbandry programs**. The **Mobile Veterinary Units (MVUs)** and **A-HELP workers** can be equipped with CMT kits to distribute to farmers during routine visits. These kits can also be made available at subsidized rates or for free through government schemes aimed at improving animal health and productivity.

- Tri-Sodium Citrate (TSC): 100 gm packets of TSC, with a 10g dispenser, should be included in the regimen. Administering TSC orally, either in feed or water, once daily for 10 days can resolve most cases of subclinical mastitis (SCM). TSC is also classified as a GRASS (Generally Recognized as Safe) substance.
 - Providing farmers with cost-effective solutions for controlling SCM will, in turn, help reduce the incidence of clinical mastitis.
2. **Partnering with Dairy Cooperatives and KVKs:**
 - Dairy cooperatives can play a pivotal role in distributing CMT kits to their member farmers. Bulk purchasing of CMT kits by cooperatives allows for cost savings, which can be passed on to farmers. Cooperatives can also establish a **milk quality incentive program**, where farmers receive higher payments for milk that passes quality tests based on regular CMT usage. Additionally, Tri-Sodium Citrate (TSC), which is used in mastitis management, should be included in the distribution process. These kits should be supplied to KVKs and regional centers for use in the field and for sale purposes also at subsidized rates.
 3. **Collaboration with NGOs:**
 - NGOs, and dairy development organizations can be incentivized to provide CMT kits as part of extension services. These organizations can collaborate with local dairy associations to ensure that farmers in remote areas have access to these kits.
 4. **Inclusion in Veterinary Service Packages:**
 - Veterinary clinics and local animal health workers can offer CMT kits as part of service packages to farmers. This can be accompanied by routine check-ups where CMT tests are performed, encouraging the adoption of regular mastitis screening.
 5. **Availability of CMT kits on KVKs/ Regional Centers:** The kits should be made available at all the KVKs and regional centres of the country.

Training Farmers to Use CMT Regularly

Effective mastitis prevention depends on farmers being able to use CMT kits consistently and correctly. A large-scale farmer education program should be rolled out across dairy regions to ensure farmers understand the importance of regular testing and know how to administer the CMT test properly. Key components of this program include:

1. **On-Farm Demonstrations:**
 - Regular **on-farm training sessions** can be organized by **extension officers, veterinary services, and A-HELP workers** to demonstrate the step-by-step process of conducting the CMT. These hands-on sessions should focus on:
 - How to properly collect milk samples from each quarter of the udder.
 - How to mix the reagent with the milk and read the test results.
 - How to interpret the results and decide on next steps (e.g., treatment or veterinary consultation).
2. **Train-the-Trainer Programs:**
 - KVKs, Dairy cooperatives and local veterinary staff can take initiatives to create Trainers within the community through a **“train-the-trainer” approach**, where selected farmers, veterinarians, and cooperative leaders receive intensive training on CMT testing and then pass this knowledge to fellow farmers. This approach ensures widespread dissemination of knowledge, especially in remote areas.

3. **Incorporating CMT into Milk Collection Centers:**
 - At local **milk collection centers**, trained staff can demonstrate the CMT procedure when farmers bring in milk for testing. This serves as an opportunity to educate farmers on how regular monitoring improves milk quality, which can translate into better market prices and reduced losses.
4. **Mobile Applications and Digital Tools:**
 - Mobile applications that guide farmers through the CMT testing process step-by-step could be developed. These apps could include features such as reminders for regular testing, video demonstrations, and platforms for farmers to record their CMT results and track udder health over time. Apps can also connect farmers to veterinarians if the test indicates infection.
5. **Educational Campaigns and Awareness Drives:**
 - **Public awareness campaigns** using radio, print media, and social media platforms can promote the importance of regular CMT testing. These campaigns should emphasize the economic benefits of early detection in terms of reducing milk yield loss, treatment costs, and AMR risks.
 - Educational material such as **flyers, posters, and videos** in local languages can be distributed at veterinary clinics, milk collection centers, and agricultural fairs to encourage routine mastitis screening.

Monitoring the Use of CMT Kits

Ensuring the sustained use of CMT kits requires continuous follow-up and monitoring:

1. **Periodic Farm Audits:** Extension workers or cooperative staff can visit farms to check whether CMT testing is being conducted regularly and guide farmers in interpreting results and taking corrective measures if necessary.
2. **Tracking and Rewarding Regular Testing:** KVKs and Cooperatives could implement **milk quality improvement programs** where farmers who demonstrate regular CMT use and good udder health management practices are rewarded through:
 - **Incentive-based pricing**, where milk with lower somatic cell counts receives higher prices.
 - **Recognition programs**, such as awards for farmers with the best mastitis control practices, encouraging peer learning and competition.
3. **Linking CMT Data to Veterinary Services:** Farmers could be encouraged to maintain **mastitis monitoring logs** where they record their CMT results over time. This data can be used to track udder health trends and flag early signs of mastitis, prompting timely intervention by veterinarians. Attempt could be made to develop a **database of CMT results** to monitor patterns and detect outbreaks early.

Conclusion: Empowering Farmers through CMT and TSC Distribution and Regular Testing

The regular use of CMT kits can drastically reduce the prevalence of mastitis by ensuring early detection and timely treatment, thus reducing milk yield losses and treatment costs. By making CMT kits widely available and training farmers on their proper use, dairy health in India can improve significantly. A combined approach of widespread distribution through government programs, dairy cooperatives, KVKs and veterinary services, along with education and incentives for regular testing, will contribute to long-term sustainable control of mastitis in dairy herds across the country.

Annexure II

Management of Cows During the Dry Period for Mastitis Control

The dry period is a critical time in the management of dairy cows, as it plays a vital role in maintaining udder health and preventing mastitis in the subsequent lactation. Effective management during this phase is essential to reduce the incidence of both **clinical** and **subclinical mastitis**, which often develop during this period. Below are key strategies for managing cows during the dry period to minimize the risk of mastitis:

1. Dry Cow Therapy (DCT)

Dry cow therapy is one of the most effective methods for preventing new infections during the dry period and curing existing subclinical mastitis:

- **Selective Dry Cow Therapy (SDCT):** Treat only cows with high somatic cell counts (SCC) or a history of mastitis with antibiotics, while using internal teat sealants for healthy cows. This method prevents unnecessary antibiotic use, helping control antimicrobial resistance (AMR).
- **Selective Quarter Therapy (SQT):** Treat infected quarters only
- **Teat Sealants:** Administer **internal teat sealants** to create a physical barrier that prevents the entry of bacteria into the udder during the dry period. This is particularly useful for cows with low SCC and no clinical mastitis. (Not available in India)

2. Proper Dry-Off Technique

- **Gradual Reduction in Milk Yield:** Before drying off, reduce the cow's milk production by adjusting the diet and reducing the frequency of milking. This helps prevent udder engorgement and the risk of bacterial infections.
- **Complete Dry-Off:** Ensure that milking is stopped abruptly after the last milking to allow the udder to fully rest and heal. Incomplete drying off can lead to increased bacterial growth.

3. Good Hygiene Practices

Maintaining a clean environment is critical to preventing environmental mastitis pathogens from entering the udder during the dry period:

- **Clean, Dry Housing:** Cows should be housed in well-ventilated, clean, and dry conditions. Regularly change bedding and ensure there is adequate drainage to prevent the buildup of moisture, which can foster bacterial growth. The flooring should be devoid of any holes which could cause water, dung and urine accumulation
- **Minimize Exposure to Pathogens:** Limit the cows' contact with contaminated bedding, manure, and other animals that could introduce mastitis-causing pathogens. Cows should be housed in low-stress environments with adequate space to prevent overcrowding.

- Ensure timely milking, preferably within seven minutes per cow. In cases where milking machines are used, proper vacuum pressure must be maintained to minimize residual milk, which can increase the risk of mastitis.
- Maintain strict personal hygiene for those handling cows. This includes regular handwashing, keeping nails trimmed, and covering hair during handling and milking.

4. Nutritional Management

Providing balanced nutrition during the dry period is essential for maintaining the immune system and promoting udder health:

- **Adequate Energy and Mineral Intake:** Ensure cows receive sufficient energy, protein, vitamins, and minerals, especially **Vitamin E** and **selenium**, which are important for boosting immune function and udder health.
- **Body Condition Score (BCS) Management:** Monitor the body condition score and avoid over-conditioning cows during the dry period. Obese cows are more susceptible to metabolic disorders and infections, which can increase the risk of mastitis.

5. Monitoring and Early Detection

Closely monitoring cows during the dry period helps in the early detection of potential mastitis infections:

- **Udder Checks:** Regularly check for signs of udder inflammation or abnormalities during the dry period, as this can indicate early stages of mastitis.
- **Use of Somatic Cell Count (SCC) Data:** Utilize SCC data from the previous lactation to identify cows that are at high risk of developing mastitis during the dry period. Implement appropriate treatment protocols for these animals.

6. Transition Period Management

The transition period, which spans three weeks before and after calving, is particularly sensitive for udder health:

- **Stress Reduction:** Minimize stress by ensuring cows have adequate space, fresh water, and a calm environment during the transition period. Stress can lower immune function and increase the risk of mastitis.
- **Calving Area Hygiene:** Ensure the calving area is clean and dry to prevent bacterial infections, as cows are especially vulnerable during this time due to changes in their immune system.

7. Preventing New Infections

Preventing new infections during the dry period is key to maintaining udder health:

- **Culling Chronic Mastitis Cases:** Identify and cull cows with chronic mastitis that do not respond to treatment. This reduces the risk of pathogen spread to other cows in the herd.
- **Biosecurity Measures:** Implement biosecurity measures, such as isolating infected cows and ensuring clean equipment, to prevent the introduction and spread of mastitis-causing pathogens.
- New Animal should be tested for SCM and treated before mixing with other animals
- Use of Teat Dips: The teats of dry-off cows after administration of dry cow therapy or without DCT should be dipped in germicidal solution for first two weeks. A separate solution should be used for lactating cows.

8. Immune Support

While vaccines against mastitis are not always fully effective due to the diversity of pathogens involved, supporting the cow's immune system through proper nutrition and management is equally important.

By implementing these management practices during the dry period, dairy farmers can significantly reduce the incidence of mastitis in their herds, leading to healthier cows, improved milk production, and reduced reliance on antibiotics.