

**Indian Farmer**

Volume 12, Issue 09, 2025, Pp. 596-603

Available online at: www.indianfarmer.net

ISSN: 2394-1227 (Online)

Original article**Disease management in livestock****Sajad Ahmad Sheikh^{1*}, Saroj Rai², Shoib Kirmani³ and Karan Chhabra⁴**^{1&2}Ph.D, Livestock Production Management Division, NDRI, Karnal, Haryana³Ph.D, Horticulture, SKUAST-K⁴M.Sc. Agrometeorology, CCSHAU, Hissar*Corresponding author: sheikhsajad628@gmail.com

Received: 23/09/2025

Published: 28/09/2025

ABSTRACT

Livestock health is a cornerstone of sustainable animal husbandry and global food security. Disease outbreaks in cattle, sheep, goats, poultry, and other farm animals can cause significant economic losses, reduce productivity, and threaten human health through zoonotic transmission. Effective disease management requires a combination of preventive, diagnostic, and therapeutic strategies, supported by good husbandry practices and strong veterinary infrastructure. This article highlights the major aspects of livestock disease management, including biosecurity, vaccination, nutritional support, diagnosis, treatment, and farmer awareness, emphasizing their importance in improving productivity, animal welfare, and economic sustainability. Effective disease management in livestock is critical to ensuring animal health, farm productivity, and food safety.

INTRODUCTION

Livestock production plays a vital role in rural livelihoods, nutrition, and the agricultural economy. However, disease is one of the biggest constraints to efficient livestock rearing. Infectious diseases such as foot-and-mouth disease, brucellosis, mastitis, and parasitic infestations, along with metabolic disorders, reduce productivity, increase mortality, and result in higher treatment costs. Poor management, unhygienic housing, climate stress, and lack of preventive healthcare further aggravate disease incidence. To ensure profitable and sustainable livestock farming, disease management must focus not only on treatment but also on prevention, early detection, and control.

Types of Diseases in Livestock

- ✓ Infectious diseases—bacterial (brucellosis, mastitis), viral (FMD, PPR), and parasitic (helminths, ticks).
- ✓ Metabolic and nutritional disorders—milk fever, ketosis, mineral deficiencies.
- ✓ Reproductive disorders—repeat breeding, retained placenta.
- ✓ Zoonotic diseases—rabies, tuberculosis, and brucellosis.

Key early signs of common livestock diseases to watch for include the following:

Respiratory Diseases (e.g., Bovine Respiratory Disease—BRD)

Nasal discharge, Rapid or laboured breathing, Coughing, depression, or lethargy. Reduced appetite, Fever above 104°F (40°C)

Digestive Disorders (e.g., Bloat, Scours/Calf Diarrhoea)

Swelling on the left side of the abdomen (bloat), Signs of pain or restlessness, like kicking at the belly Watery, foul-smelling diarrhoea (scours), Dehydration symptoms such as sunken eyes and dry mouth

Foot and Limb Issues (e.g., Foot Rot)

Sudden lameness, Swelling and redness around hooves, Foul odour from infected feet, Reluctance to move

Udder Infections (e.g., Mastitis)

Swollen, hot, or hard udder, Clotted or discoloured milk, A cow showing irritability or pain, Calf refusing to nurse

Chronic Conditions (e.g., Johne's Disease)

Persistent diarrhea, Weight loss despite good appetite, Poor coat condition

General Signs to Monitor

- Unexplained deaths in the herd
- Sores or ulcers, especially on feet or in the mouth
- Excessive salivation or drooling
- Reduction in milk yield or egg production
- Staggering, severe lameness, or head drooping
- Sudden weight loss

Principles of Disease Management

Disease Prevention and Biosecurity

A fundamental element of disease management is biosecurity, which aims to prevent the introduction and spread of infectious agents within and between farms. Strategies include:

- Purchasing animals only from trusted, low-risk sources and quarantining new arrivals for 21 to 30 days.
- Segregating different age groups and avoiding mixing of animals from various sources to reduce cross-infection risk.
- Limiting contact with wild animals, pests, and non-resident farm visitors to minimize disease vectors.

- Implementing physical barriers, strict hygiene protocols, and proper manure management.

Conceptual biosecurity: Focuses on physical isolation, such as siting facilities away from public roads and other farms, and limiting common vehicle/facility use.

Structural biosecurity: Involves infrastructure like fencing, barriers, and facility design that minimize animal exposure to external risks.

Vaccination and Immunity Enhancement

Vaccination programs designed with veterinary guidance are crucial to building herd immunity against common diseases. Key practices include:

- Proper vaccine selection and schedules for the specific health challenges of the farm.
- Proper storage and handling of vaccines to maintain efficacy.
- Boosting immunity through nutrition and management of stress, as well as ensuring adequate colostrum intake by newborns.

Parasite Control

Parasitic control is a crucial component of livestock disease prevention, involving a combination of management practices and targeted treatments to reduce parasite burdens and minimize their impact on animal health and productivity. Fasciolosis in livestock is estimated to cause significant economic loss at US \$3.2 billion per annum worldwide, mainly due to condemnation of livers at abattoirs, mortality in infected flocks, persistently depressed growth and feed conversion efficiency, loss of productivity, impaired fertility, and also the cost of treatment (Spithill et al.). A well-planned and consistent deworming schedule is essential for controlling parasitic diseases in livestock. Newly introduced animals should be quarantined for 4-6 weeks and treated with appropriate anti-parasitic drugs to prevent introducing new parasites into the herd. Rotate pastures frequently (e.g., move animals before parasite larvae become infective, within 4-7 days). Maintain well-ventilated, clean, and dry animal housing with proper air circulation to reduce parasite survival. Avoid overcrowding to prevent high parasite loads. Use feeders and waterers that minimize contamination by feces. Proper manure management through composting to kill parasite eggs and larvae. Avoid grazing in wet or swampy areas where parasites thrive.

Use tools like the FAMACHA scoring system to monitor anemia caused by parasitic infections such as barber pole worm. Treat only animals that require it (targeted selective treatment) to reduce the risk of parasite resistance. Certain anti-parasitic drugs like benzimidazole, levamisole, and ivermectin have developed resistance (FAO 2004; Terrill et al. 2001; Kaplan 2004). Therefore, an integrated approach becomes obligatory to control internal parasites with objective to harvest the optimum productivity from grazing herds. Keep accurate records of treatments and responses to guide management decisions.

Hygiene and Sanitation

Good hygiene and sanitation act as a fundamental, cost-effective barrier against infectious diseases in livestock. These practices contribute substantially to healthier animals, reduced veterinary costs, enhanced food safety, and sustainable farming operations.

- **Routine Cleaning:** Remove manure, spilled feed, bedding, and dirt daily from animal pens, stalls, and feeding areas. Keep facilities dry and well-ventilated.
- **Disinfection:** Apply approved disinfectants regularly on surfaces, equipment, and vehicles that contact animals. Common disinfectants include bleach, cresol, phenyl, and other veterinary-grade solutions.
- **Personal Hygiene:** Farm personnel should wash hands thoroughly after handling animals or contaminated materials and wear clean clothing and footwear when entering animal areas.
- **Visitor Control:** Limit farm visitors and require protective gear like boots and coveralls to reduce pathogen introduction.
- **Proper Waste Management:** Dispose of animal wastes, dead animals, and contaminated materials safely to prevent environmental contamination and disease spread.
- **Equipment Maintenance:** Clean and sterilize animal health tools and prevent sharing without proper sanitation between animals.
- **Rodent and Insect Control:** Implement integrated pest management and maintain clean feed storage to minimize disease vectors

Proper Stocking Density



Proper stocking density is a crucial measure in controlling disease in livestock by ensuring animals have enough space for normal behavior, reducing stress, and minimizing disease transmission risk. It helps in reducing stress and improving immunity, preventing increased contact and pathogen spread, maintaining adequate rest and proper feeding, limiting environmental contamination, and supporting reproductive and productive performances.

Accurate Record-Keeping

Accurate record-keeping is fundamental to animal disease prevention, as it helps in monitoring health status, managing treatment records, tracking disease outbreaks, and making informed decisions for herd health management. It supports early disease detection and monitoring, vaccination and immunization tracking, traceability and disease control, and improved veterinary care.

Nutritional Support

- **Balanced Diets:** Properly formulated feeds supplying essential macro- and micronutrients strengthen the immune system—the primary defense against infections. Key nutrients include vitamins A, D, and E, along with trace minerals such as zinc and selenium, all contributing to better disease resistance.
- **Protein and Energy:** Adequate protein supports tissue repair and immune function, while sufficient energy intake prevents weight loss and helps animals fight infections effectively.
- **Gut Health:** Nutrition that promotes a healthy gut microbiome, such as fiber-rich diets and probiotics, reduces gastrointestinal diseases and metabolic disorders, enhancing nutrient absorption and immune response.
- **Stage-Specific Nutrition:** Different life stages (e.g., lactation, pregnancy, growth) have unique nutritional needs. Tailoring diets accordingly prevents common metabolic diseases like milk fever or ketosis, especially in dairy cattle.
- **Supplementation:** Mineral and vitamin supplements can fill dietary gaps, improving immunity and preventing diseases such as respiratory infections and coccidiosis.



Animal health camp (distribution of mineral mixtures)

Disease Surveillance and Early Detection

Ongoing monitoring enables early identification of health problems, allowing timely interventions. Methods include:

- Routine observation of animals for clinical signs of illness.

- Recording health events and maintaining detailed vaccination and treatment records.
- Utilizing diagnostic tools and laboratory services for confirmed disease identification.
- Embracing digital tracking systems for efficient data collection and reporting.

Outbreak Control and Response

In the event of disease outbreaks, rapid and coordinated responses are vital:

- Isolating affected animals and restricting movements to contain disease spread.
- Administering treatments or vaccinations as appropriate.
- Collaborating with veterinary authorities and following prescribed protocols for notification and control.
- Reinforcing biosecurity measures post-outbreak to prevent recurrence.

Recent innovations in livestock disease diagnostics

Recent innovations in livestock disease diagnostics have significantly advanced the speed, accuracy, and convenience of detecting animal diseases. Key cutting-edge technologies include:

Artificial Intelligence (AI): AI algorithms analyze samples rapidly and with high accuracy, such as detecting parasitic eggs in fecal samples and enabling predictive diagnoses. This reduces human error and allows for near real-time disease detection on farms.

Microfluidic Devices: These compact chips analyze very small fluid samples (e.g., blood) right at the point of care, offering faster results and reduced costs compared to conventional lab tests. They enhance early detection by bringing diagnostics close to animals.

Molecular Diagnostics: High-precision techniques analyze genetic markers and proteins to identify pathogens accurately. Efforts are underway to make these advanced methods available at the farm level, improving diagnostic precision and timeliness.



Biosensors: Portable, highly sensitive biosensors detect disease biomarkers quickly through biological signals. They provide non-invasive, real-time monitoring of infectious diseases like bacterial, viral, and parasitic infections, revolutionizing early detection and intervention.

Next-Generation Sequencing (NGS): This high-throughput genetic sequencing technology rapidly decodes pathogen DNA, helping understand disease evolution and aiding precise diagnosis. It's increasingly applied in veterinary diagnostics for complex infections.

Wearable Sensors and Environmental DNA/RNA (eDNA/eRNA): Sensors monitor vital signs and environmental nucleic acids to identify disease signs early. These systems offer continuous monitoring, supporting proactive health management.

Big Data and Predictive Analytics: Integrating data from various diagnostics, farm records, and sensors enables pattern recognition and early warning systems. Personalized alerts and trend analyses help farmers anticipate outbreaks and optimize herd health.

These technologies collectively empower faster, cost-effective, and more accurate disease management in livestock, improving animal welfare and farm productivity in 2025 and beyond.

CONCLUSIONS:

In conclusion, effective disease prevention in livestock relies on a holistic approach integrating vaccination, biosecurity, parasitic disease control, proper stocking density, hygiene, and nutrition management.

Vaccination programs build herd immunity, reducing susceptibility to infectious diseases and minimizing outbreaks. Rigorous biosecurity practices prevent the introduction and spread of infectious agents by controlling animal movements, visitor access, and equipment sanitation. Parasitic disease control through quarantine, pasture management, targeted deworming, and nutritional support reduces parasite burdens and enhances animal resilience. Maintaining proper stocking density mitigates stress and limits pathogen transmission caused by overcrowding. Good hygiene and sanitation, including routine cleaning, disinfection, waste management, and vector control, lower environmental pathogen loads and protect animal health. Nutrition management ensures animals receive balanced diets that strengthen immune function, support growth, and improve disease resistance. Together, these preventative measures form a comprehensive framework that promotes healthier livestock, higher productivity, reduced veterinary costs, and sustainable farm operations. Implementing this integrated strategy is essential for protecting animal welfare, ensuring food safety, and supporting the livelihoods of livestock farmers worldwide.

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