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Common Diseases of Cattle and Their Control Measures

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Abstract

Cows play a leading role in global agriculture since they constitute both essential livestock in industrialized and developing countries. Nevertheless, the natural vulnerability to a variety of infectious factors leads their society to significant economic and health challenges. In this article, we outline most important cattle diseases and categorize them under three broad classifications: viral, bacterial and parasitic, evaluate their clinical manifestation and route of infection and outline a series of control measures: vaccination, surveillance, control of vectors and biosecurity which have shown to work well. This understanding of these pathogens and how they are dealt with has been delicately important to the protection of the herd, the provision of food security and the prevention of the greater community-health impacts of uncurbed disease transmission.

Keywords: Biosecurity, Epidemiology, Livestock, Vaccination

Introduction

The diseases of cattle (table 1) present a continuous challenge of livestock wellbeing and economies in farming especially in such resource-limited environments. Such conditions deteriorate productivity, lowering yields of milk, reproduction and growth rates (Molla and Delil, 2015). Viral diseases of which the most devastating of them: Foot and Mouth Disease (FMD), Lumpy Skin Disease (LSD) and Bovine Viral Diarrhea (BVD) cause acute outbreaks and significant economic losses due to the high rates of transmission and the challenges of control (Barman *et al.*, 2020; Sharma *et al.*, 2023). Chronic illnesses are also caused by bacteria, *e.g.*, *Brucellosis* and *Hemorrhagicsepticemia* that are often associated with persistent productivity of losses and failure of reproductive efficiency (Hodnik *et al.*, 2021a). Diseases such as Theileriosis and Babesiosis are also parasitic diseases that are still endemic in many tropical and subtropical areas, thus reducing the productivity of the local breed (Sharma *et al.*, 2023). Combination of therapeutic interventions and preventive measures-routine vaccination, improvement of farm hygiene and vectors control will therefore be required to gain effective control. Use of effective surveillance and selective informing of farmers form two columns that provide timely identification of disease in cattle and initiation of concerted and evidence-based response. The current manuscript provides a presentation of key bovine pathogens, arranged by etiological groups and a systematic review of empirically based control measures to be realized at once, in the course of operations.

Major Viral Diseases

1. Foot and Mouth Disease (FMD)

Foot and Mouth Diseases (Figure 1a) emerge as an extremely transmissible viral infection due to the Foot-and-Mouth Disease Virus (FMDV). The disease impacts split-hoofed species including cattle, buffalo, sheep and pigs. Fever and drooling accompany the emergence of painful vesicles on mouth, feet and teats which transform into ulcers leading to lameness and decreased milk production. Adult mortality rates remain low while calf mortality rates soar because of myocarditis. The transmission of the virus occurs through aerosol particles, direct physical contact and contaminated surfaces. The implementation of control measures such as mass vaccination along with movement restrictions and strict biosecurity protocols serves to prevent disease spread while mitigating potential economic and trade losses (Sharma *et al.*, 2023).

2. Lumpy Skin Disease (LSD)

The Lumpy Skin Disease Virus (LSDV) (Figure 1b) induces a viral sickness in cattle known as Lumpy Skin Disease (LSD).

Article History

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Table 1: Common cattle diseases and their control measures

Disease	Type	Cause/Agent	Key Symptoms	Control Measures
Foot and Mouth Disease	Viral	Aphthovirus	Vesicles, fever, lameness	Vaccination, movement control
Lumpy Skin Disease	Viral	Capripoxvirus	Skin nodules, fever	Vector control, vaccination
Bovine Viral Diarrhea	Viral	Pestivirus	Diarrhea, abortion	Biosecurity, testing, culling
Infectious Bovine Rhinotracheitis	Viral	Herpesvirus	Nasal discharge, abortion	Vaccination, isolate affected animals
Rabies	Viral	Lyssavirus	Neurological signs, drooling	Vaccination, control of stray dogs
Brucellosis	Bacterial	*Brucella abortus*	Abortion, infertility	Vaccination, test and cull
Bovine Tuberculosis	Bacterial	*Mycobacterium bovis*	Cough, weight loss	Testing, culling, hygiene
Mastitis	Bacterial	Multiple bacteria	Swollen udder, abnormal milk	Milking hygiene, antibiotics
CBPP	Bacterial	*Mycoplasma mycoides*	Fever, coughing	Vaccination, movement restriction
Hemorrhagic Septicemia	Bacterial	*Pasteurella multocida*	High fever, nasal discharge	Vaccination, supportive treatment
Theileriosis	Parasitic	*Theileria annulata*	Swollen lymph nodes, fever	Acaricides, vaccination
Babesiosis	Parasitic	*Babesia bigemina*	Fever, red urine	Tick control, anti-protozoal drugs
Trypanosomiasis	Parasitic	*Trypanosoma* spp.	Anemia, weakness	Vector control, trypanocidal drugs
Fascioliasis	Parasitic	*Fasciola hepatica*	Jaundice, weight loss	Deworming, pasture management
Ectoparasitic Infestations	Parasitic	Ticks, lice, mites	Itching, anemia, secondary infection	Acaricides, grooming, clean environment

Nodules appear on the skin alongside fever symptoms while lymph nodes swell and nasal discharge occurs with anorexia. The ulceration of lesions initiates secondary infections which then degrade milk and meat quality. Its transmission occurs primarily through mosquito and biting fly vectors while occasional direct contact spread also happens. The rate of mortality remains low but the economic impact from decreased productivity stands as a major issue. Vaccination using both homologous and heterologous pox vaccines combined with insect control measures and movement restrictions forms the basis for control (Barman *et al.*, 2020; Mitra *et al.*, 2025).

3. Bovine Viral Diarrhea (BVD)

The causative agent behind Bovine Viral Diarrhea emerges from Bovine Viral Diarrhea Virus (BVDV) (Figure 1c) which belongs to the *Pestivirus* genus. This disease strikes cattle in all age categories and production systems causing diarrhea along with fever and nasal discharge while also inducing reproductive problems and weakening their immune response. The disease poses exceptional danger because it creates persistently infected (PI) animals that release the virus throughout their entire lives. In PI animals the deadly mucosal disease emerges causing both ulceration and hemorrhages. Bovine Viral Diarrhea (BVD) results in fetal abortions alongside occurrences of stillbirths and congenital anomalies. The management of PI animals requires their detection and elimination alongside vaccination efforts and strict biosecurity measures to avert both transmission and reinfection (Barman *et al.*, 2020; Hodnik *et al.*, 2021a).

4. Infectious Bovine Rhinotracheitis (IBR)

Infectious Bovine Rhinotracheitis (IBR) (Figure 1d) is caused by Bovine Herpesvirus type 1 (BoHV-1). It primarily affects the upper respiratory and reproductive tracts, causing fever, nasal discharge, conjunctivitis, coughing and abortions in pregnant cows. The virus remains latent in sensory ganglia and can reactivate during stress. Transmission occurs through respiratory droplets, semen, or direct contact. Bulls may develop balanoposthitis; cows, vulvovaginitis. IBR is a major concern in breeding herds due to its impact on fertility. Control strategies include vaccination, biosecurity and test-and-cull programs to maintain herd health and prevent outbreaks (Hodnik *et al.*, 2021a; Sharma *et al.*, 2023).

Major Bacterial Diseases

1. Brucellosis

Brucellosis (Figure 2a) emerges as a bacterial disease of extreme contagiousness caused by *Brucella abortus* in cattle populations. The reproductive system becomes the main

a) Foot and Mouth Disease (FMD)

b) Lumpy Skin Disease

c) Bovine Viral Diarrhea (BVD)

d) Infectious Bovine Rhinotracheitis

Figure 1: Major viral diseases of cattle

target where it induces late gestation abortions while causing retained placenta, stillbirths, infertility and decreased milk production. Bovine males can experience testicular inflammation which leads to decreased reproductive capabilities. The bacterium exits through milk, uterine discharges and aborted materials creating a serious zoonotic threat to humans who can acquire undulant fever by consuming unpasteurized milk. The transmission occurs *via* consumption, mucosal contact, or aerosol inhalation. Control measures encompass female calf vaccination using the S19 strain along with test-and-slaughter protocols for infected herds and public education on milk hygiene (Sharma *et al.*, 2023).

2. Bovine Tuberculosis

Mycobacterium bovis from the Mycobacterium tuberculosis complex induces bovine tuberculosis as a persistent ailment (Figure 2b). The condition induces granulomatous lesions primarily within pulmonary regions and lymphatic nodes which result in persistent coughing, weight reduction, diminished productivity and overall body wasting. The disease exhibits an extended incubation period while transmission occurs *via* respiratory droplets and contaminated feed, water or milk. The disease possesses zoonotic characteristics allowing human infection *via* raw milk consumption or direct animal interaction. The diagnostic process includes tuberculin skin testing alongside gamma-interferon assays and postmortem lesion identification. The management approaches encompass periodic diagnostic testing combined with elimination of detected cases alongside stringent biosecurity measures at the farm level (Sharma *et al.*, 2023).

3. Mastitis

Mastitis (Figure 2c) refers to a condition that is inflammatory of the udder and is mostly due to massive onset of bacteria species that includes *Staphylococcus aureus*, *Escherichia coli* and *Streptococcus agalactiae*. It is divided into subclinical or clinical. Clinical mastitis presents as palpable mastitis or salient swelling, increase in temperature through the mammary glands as well as pain, blotted or discolored milk and low milk volume. 'Subclinical mastitis' on the other hand is a term used to describe a situation where milk yield

is impaired without any clinical evidence to indicate the mastitis problem, but then becomes clinically undetectable when diagnostic test is absent. Transmission of contagious mastitis is often caused through milking by the transfer of microorganisms with the contaminated human hands or milking equipment. Such predisposing factors as poor levels of hygiene, prolonged teat injury and milking in lessoptimal ways are seen. Strict sanitation regimes, systematic screening by somatic cell count analyses, the post-milking use of teat dips and intentional dry cow therapy will be required to control the situation. In turn, increased attention is currently drawn to the growing popularity of antibiotics-resistant isolates (Sharma *et al.*, 2023).

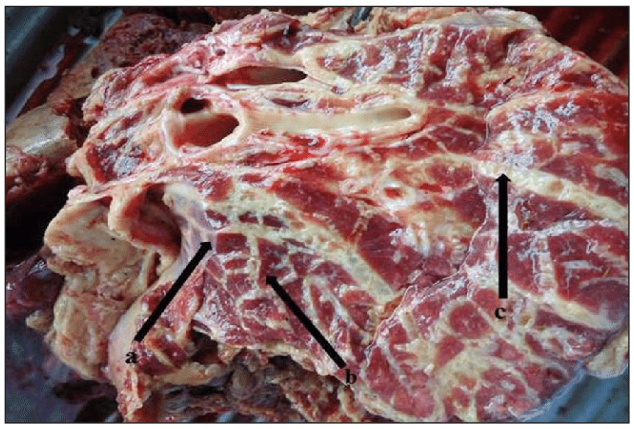
4. Contagious Bovine Pleuropneumonia (CBPP)

Monitoring of contagious bovine pleuropneumonia (CBPP) (Figure 2d) earns its status as a deadly and extremely contagious respiratory disease of the bovine species, partly due to the pathogenic effect of *Mycoplasma mycoides* subsp. mycoides. Pathology is majorly restricted to the lung and pleura and its clinical presentation is elevated temperature and a dry cough, epistaxis (nasal discharge), tachypnea (labored breathing) and reduced locomotion. Gross lesion is characterized by widespread as well as extensive consolidation in the lungs and fibrinous pleuritis. Mainly, it is through inhalation of respiratory aerosols produced by contaminated animals and this process occurs faster in overcrowded or badly ventilated areas.Rift Valley fever (RVF) is a zoonotic viral disease with prolonged incubation period and mostly occurring in sub-Saharan countries. The fatality case rate may be up to 50% with convalescent hosts regularly functioning as carriers. The measures of prevention are based on vaccination using T1/44 strain, the adoption of test-and-slaughter schemes, quarantines as well as selective movement of animals (Molla and Delil, 2015).

a) Brucellosis

b) Bovine Tuberculosis

c) Mastitis



d) Contagious Bovine Pleuropneumonia

Figure 2: Major bacterial diseases of cattle

Parasitic Infections in Cattles

1. Theileriosis

Theileriosis (Figure 3a) emerges as a protozoan disease instigated chiefly by *Theileria annulata* (Tropical Theileriosis) which finds transmission through *Hyalomma* genus ticks. The pathogen infiltrates both lymphocytes and red blood cells causing lymphadenopathy alongside elevated fever and inducing anorexia with resultant anemia and jaundice. Young cattle along with rare breeds show higher vulnerability where death rates span 30-90% without medical intervention. Weight loss combined with persistent weakness and emaciation continues to affect individuals in chronic cases. The disease creates immune system disturbances that render animals susceptible to secondary infections. The identification process utilizes Giemsa-stained blood smears alongside PCR techniques. The control methods

for vector management include the use of acaricides along with vaccination through attenuated schizont vaccines and treatment protocols involving buparvaquone (Sharma *et al.*, 2023).

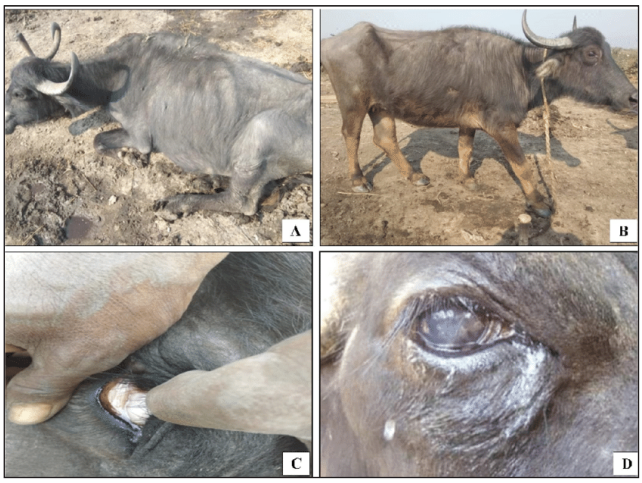
2. Trypanosomiasis

Trypanosomiasis, also called Nagana in animals, is a protozoan disease caused by *Trypanosoma vivax*, *T. congolense* and *T. brucei* and is transmitted by tsetse flies (in Africa) or biting flies (elsewhere) (Figure 3b). The parasites reside in the blood and tissues, causing cyclical fever, anemia, edema, weakness, weight loss, abortion and death if untreated. It imposes a significant burden in sub-Saharan Africa and parts of Asia. Chronicity and immune evasion is done through antigenic variation complicate control and Diagnosis is *via* microscopy or PCR. Management includes using trypanocidal drugs (*e.g.*, diminazene), vector control and keeping susceptible animals away from vector-dense areas (Molla and Delil, 2015).

3. Ectoparasitic Infestations (Ticks, Lice, Mites)

Ectoparasitic infestations include ticks, lice, mites and flies, which affect cattle health and productivity. Ticks cause direct damage through blood loss and skin irritation and act as vectors for diseases like babesiosis, theileriosis and anaplasmosis. Lice infestation leads to intense itching, hair loss, anemia and reduced feed efficiency. Mange, caused by mites such as *Sarcoptes* and *Psoroptes*, results in severe dermatitis and secondary bacterial infections. Control relies on integrated pest management, including regular use of acaricides, maintaining hygienic animal housing, treating affected animals and rotating chemicals to prevent resistance. Surveillance is essential for timely intervention (Hodnik *et al.*, 2021b).

a) Theileriosis



b) Trypanosomiasis

Figure 3: Major parasitic infections of cattle

Control Measures for Common Cattle Diseases

Infectious cattle diseases require a multifactorial approach to their control and this must include both the pathogens themselves and the respective ecological conditions that promote their spread.

1. Vaccination

In the modern medicine, vaccination stands as the most invaluable aspect in countering disease prevention. There is deliberate need to adhere to standardized immunization schedules in the effort to control endemic pathogens such as Foot and Mouth Disease (FMD), Lumpy Skin Disease (LSD), Brucellosis, Bovine Viral Diarrhea (BVD), Theileriosis, Contagious Bovine Pleuropneumonia (CBPP) and Hemorrhagic Septicemia (HS). Vaccinations diminish morbidity and mortality, decrease the shedding of viruses and thus impede the transmission cycles (Mitra *et al.*, 2025).

2. Biosecurity

The first line of defense against the spread of pathogen is *via* biosecurity measures. Good interventions involve disinfection procedures, limited access to animal sheds, proper disposal of carcass and placentas and avoidance of common equipment amongst the farmers. Exposure to infectious and zoonotic risks is reduced with the introduction of specific farm hygiene plans (Sharma *et al.*, 2023).

3. Regular Surveillance

Regular monitoring, detection of the disease at an early stage allow for timely intervention. Real-time monitoring, sampling and laboratory diagnosis reveal sub-clinical and emerging infections as soon as they arrive. Vaccination drives and containment zones are based on information from surveillance programs (Mitra *et al.*, 2025).

4. Vector Control

Control of vectors is a crucial measure to contain vectors of diseases carried by ticks, flies and mosquitoes. Frequent use of acaricides, insecticide sprays, environmental sanitation and pasture rotation allow the decreasing of the number of ectoparasites and thus the occurrence of such diseases as theileriosis, babesiosis and LSD (Hodnik *et al.*, 2021b).

5. Quarantine and Testing

The actual measures to prevent *Brucella* and *Mycobacterium bovis* contagions due to transmission include following the quarantine procedures as well as health screening of new cattle or sick ones before they are introduced to the existing herds. Periodic diagnostic monitoring is an essential factor

to long term herd health (Sharma *et al.*, 2023).

6. Public Awareness and Farmer Education

The central role belongs to the information of the population and the education of farmers. With the use of extension programs, farmers learn about all aspects of vaccination, detection of early symptoms and prompt reporting. With a higher degree of community involvement, national and regional control efforts are strengthened (Barman *et al.*, 2020).

Conclusion

When not controlled, even cattle diseases have the potential to enormously reduce the economical and biological efficiency of cattle strains, especially in the developing agricultural systems. The consequences are complex ones, including not only a decrease in milk production and fertility but also the increase of costs on veterinary care and risks of human diseases transmitted by animals. This paper has discussed fifteen major diseases in cattle and classifying them into viral, bacterial and parasitic disease with different cousin roles in their clinical presentations and in epidemiological issues. There are treatment interventions to many diseases, but the best methods to control these diseases have always been through integrated measures that incorporate vaccination, sanitation, routine checking and education of farmers. Early detection, control of animal movements and availability of veterinary services policies should be given priority. Further, education programs depending on the knowledge of farmers are critical to adoption of biosecurity measures and prevention. The reinforcement of such systems will minimize the use of emergency measures and increase food security in the country. Thus, a combination of veterinarians, livestock owners, researchers and policymakers should be encouraged to minimize disease burden and enhance cattle welfare at the global level.

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