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Review Article

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A brief review on current and required disease control policies for livestock animals

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Abstract

Each year, a wide array of potentially fatal diseases cause illness in millions of livestock kept as milk purpose by farmers. Even stray cattle and buffaloes poses high risk of diseases transmission. They are among the most vulnerable population to the transmission of zoonotic illnesses. The demand for milk is increasing and the dairy industry is becoming increasingly widespread and its shortage is not in the not too distant future. Every year because of illness to milking dairy animal, farmers have to bear economic losses; even it reaches in millions at national level. To stop the losses, There must be a diseases control policies at state and national level. In addition to it, the close relationship that exists between humans and their domesticated animals poses the greatest possible threat of the development of a variety of infectious diseases. Because of the rise in the number of households with milch animal, the state animal department and the government of India need to actively review the situation across the state. They should also give the utmost importance to the process of formulating new policies and putting them into effect, both for the purpose of improving the regulation of diseases that are prevalent among the population and to reduce the risk of zoonotic transmission. Our aim of current review is to bring such policies in action that utterly helps in eradicating of most common diseases of livestock. In the current review, we summarize the most common livestock diseases and potential zoonotic diseases, and emerging diseases, as well as current and potential policies that need to be implemented.

Keywords: Livestock, Animal diseases, Diseases control policies, Prevention, Eradication.

Introduction

Farmers in India rely almost entirely on farming and their livestock for financial support. Farmers of all sizes depend on the revenue generated by their livestock for survival. This income comes by selling of milk, meat, and other items. Large numbers of cattle can be found on both organized and unstructured farms in India. The majority of the populace is disorganized and chaotic. There are many different types of diseases that are prevalent in India due to the country's large population. Diseases such as foot and mouth disease (FMD), bovine brucellosis, tuberculosis, bovine mastitis, among others, are major diseases that cause

significant economic loss to farmers. Other diseases includes, emerging and new threats are always a risk for livestock. Farmers need to be informed about diseases, their symptoms, how to avoid and treat them, and any other relevant information so that they can protect their animals from getting sick and losing their livelihood. Above all, there is major role of state and central government for policies making, law and rules regulation formation to prevention and control of diseases. Currently, there is nationwide FMD and Brucella control program is implemented and run by central government. Under this program, susceptible bovine of certain age is vaccinated against the FMD and Brucella. However, there are many deadly diseases are endemic which also require attention. The purpose of this review is to provide a succinct explanation of the significant diseases that affect livestock in India and that are regularly observed throughout the course of a year with new diseases control policies for livestock health.

Bovine Brucellosis

India's cattle are afflicted by a significant zoonotic illness. It is primarily spread through contact with contaminated materials, such as aborted fetuses or milk from sick animals, and is brought on by the bacterium Brucella abortus. Abortion, infertility, and decreased milk production are clinical symptoms. The presence of the bacterium in samples like milk, blood, or tissue serves as the basis for diagnosis. According to a research done in the state of Uttar Pradesh, the disease affects cattle at a prevalence of 9.87%, with parity and age being the two main risk factors. Another study in the state of Gujarat found a prevalence of 4.28% in cattle, and it was found that using shared grazing grounds and the presence of additional infected animals were both related with a higher risk of transmission. Vaccination, the killing of diseased animals, and stringent biosecurity procedures are all examples of prevention and control techniques. Due to the possibility that it could be transmitted to people through tainted milk or meat, it is also a significant public health risk. In India, brucellosis is controlled by vaccination, testing, the killing of affected animals, and stringent sanitary regulations. Animals are susceptible to the infectious disease brucellosis, which has serious consequences for the economy and public health. It has been demonstrated that the majority of domestic animals, marine species, and people are all infected with the illness. This disease causes a reproductive disorder in animals that ultimately leads to abortion. In India, milk production is a part of close to 80 million rural households, and small and marginal farmers own 75% of the animals used in milk production. There is a larger chance of brucellosis being transmitted from animals to humans since people and livestock frequently coexist in close quarters. The Indian government has started a National Animal Disease Control Program to fight the disease because of the enormous effects that brucellosis has on both people and animals. One of the objectives of this program's overarching mission is the regular sero-monitoring and sero-surveillance of the animal population. The detection of brucellosis in domestic bovine, estimation of the extent of infection (i.e., prevalence), measurement of progress toward regulatory goals, provision of metrics to aid in evaluating compliance with program standards, and provision of stakeholders and decision-makers with timely and pertinent information that can be used to take appropriate action are all included in the bovine brucellosis surveillance process.

Leptospirosis

Leptospirosis is one of the major zoonotic diseases that it causes. Leptospirosis is still underdiagnosed and underreported, although this is due to a lack of education and awareness. Leptospirosis has a significant financial impact on the cattle husbandry business because of reproductive losses, lower productivity, and treatment costs. The Andaman and Nicobar Islands, where high frequency was reported in both animals and humans, as well as the southern Indian States and coastal States like Gujarat and Maharashtra, are prone to leptospirosis18. There is no thorough examination on the prevalence of leptospirosis in cattle in India that spans a large geographic area, save from a few isolated location-specific observations. Bovine leptospirosis has a sero-prevalence of 30.8% overall throughout 19 Indian States and Union Territories. (2017) Balamurgan et al. Leptospirosis is an endemic illness in India, and the states of Kerala, Tamil Nadu, Karnataka, West Bengal, Maharashtra, and Gujarat have seen a considerable increase in cases (Desai *et al*., 2020c).

Hemorrhagic Septicemia (HS)

The organism that causes hemorrhagic septicemia (HS), an acute illness that typically kills cattle and buffalo, is Pasteurella multocida. HS emerges as a devastating epizootic in numerous regions of Asia and Africa, leading to a sharp rise in both mortality and morbidity (De Alwis, 1992; Verma and Jaiswal, 1998). The use of antibiotics does have certain drawbacks, such as the presence of drug residues in animal products and the emergence of antibiotic resistance, even if they are the primary therapy to treat the illness and reduce the occurrence of such microbial infections. The third strategy for the control and prevention of HS is the immunization of animals in endemic areas prior to the predicted HS outbreak. The choice of vaccine candidates must be based on the serotypes that are currently prevalent in the targeted geographic areas because the immunity acquired through HS is serotype-specific. The process of creating HS vaccines has involved a variety of techniques, such as dead vaccinations (bacterins), live-attenuated vaccinations, cellular vaccinations, and genetically altered immunizations (Verma and Jaiswal, 1998; Hodgson *et al*., 2005). On the other side, the procedure of immunizing against HS often involves the use of deadly vaccines. The three main types of bacterins that are used in the combat against HS are formalized bacterin, aluminum hydroxide gel, and oil adjuvant vaccines. According to studies conducted over the past few years in various Asian countries, including India, the oil adjuvant vaccination and the aluminum hydroxide gel vaccine, among them, elicit a good immune response, and these are the vaccines of choice. According to Makwana *et al.* (2022), HS infection might deteriorate health and result in death when it is co-infected with other viral diseases as PPR.

Neonatal calf diarrhea

The majority of neonatal diarrhea cases are determined to be rotavirus-related. Human and animal gastrointestinal pathogens include group A rotaviruses (Tumlam *et al*., 2019; Makwana *et al*., 2020a; Makwana *et al*., 2020b). Regulating epidemiological data and identifying the source of unusual rotavirus strains are crucial (Makwana *et al.*, 2020a; Makwana *et al*., 2020b). They often afflict calves between the ages of 4 and 14 days, though infections can be found earlier or later than this. The villus epithelial cells of the small intestine are infected and killed by

rotaviruses. As a result, the nutrients are not properly absorbed by the body. Asymptomatic infections can develop in mature cows and older calves. At calving time, viral discharge in cows is very prevalent. This is one method by which an infection could spread further on a farm. Calves that are ill with diarrhea will be the main source of contamination once an outbreak has started. In 4- to 30-day-old calves, coronaviruses are a prominent cause of diarrhea. The bovine coronavirus, which causes respiratory infections, neonatal diarrhea, and winter dysentery, has at least three distinct strains. On the other hand, the disease's winter dysentery and neonatal calf strains can infect both people and cattle. By infecting the small intestine, damaging the villous epithelial cells, and spreading to other cells, coronaviruses can cause villous atrophy in calves. They also penetrate the large intestine's epithelium. The large intestine is affected by coronaviruses, therefore colitis symptoms like straining may be connected to an infection with these viruses. Similar to rotavirus, coronavirus can infect asymptomatic individuals and spread through their feces to calves. Of the two, rotavirus is the more prevalent. After an epidemic has been identified, clinically affected calves are the main source of the virus. Animal coronavirus can be quickly identified utilizing the quick, low-cost, and practical rapid lateral flow assay test, according to Desai *et al.* (2020a), Desai *et al.* (2020b), Desai *et al.* 2021, Joshi *et al.* (2022a) and Joshi *et al.* (2022b).

Bovine Mastitis

Mastitis, commonly known as mammary gland inflammation, affects the majority of dairy cattle herds worldwide and is the most common and expensive disease. However, an infection caused by bacteria or other microbes, such as fungi, yeasts, or even viruses, is the most prevalent cause of mastitis. Inflammation of the gland can be brought on by a variety of circumstances, including physical damage and emotional stress. Infections are brought on by microbes that have entered the mammary gland through the teat canal and started to multiply there. Antimicrobial resistance and antibiotic residual in cow milk are two of the greatest issues with bovine mastitis (Patel *et al.,* 2019 and Patel *et al.*, 2020). The most pressing issue facing farmers is the rise of antimicrobial resistance, which has been seen in E. coli isolated from newborn piglets and parasitic and anthelmintic drugs (Bhinsara *et al*., 2018; Muglikar *et al*., 2019; Tumlam *et al*., 2022b). According to Sharma *et al.* (2019), although other species like cattle, buffalo, camels, and pigs have also been documented to be afflicted by this bacteria, which ultimately results in losses to farmers, *Corynebacterium pseudotuberculosis* is an economically significant illness of small ruminants.

Foot and Mouth Diseases (FMD)

India is home to the highly contagious viral disease FMD, which affects pigs, sheep, goats, and cattle. It is primarily spread by direct contact with diseased animals or contaminated objects, such as tainted feed or water, and is brought on by the FMD virus. Clinical symptoms include fever, foot and mouth blisters, and a decrease in the amount of milk or meat produced. The diagnosis is made based on the virus being found in samples like saliva or blood. Vaccination, isolation of diseased animals, and stringent biosecurity procedures are all examples of prevention and control techniques. One of the most contagious viral illnesses afflicting cattle in India is foot and mouth disease. Because of decreased milk supply, weight loss, and in severe

cases, even death, the condition can result in large economic losses. The best defense against FMD is vaccination, and India has many FMD vaccinations on hand.

Herpes virus Infection

The infectious respiratory condition known as Infectious Bovine Rhinotracheitis (IBR) is caused by the bovine herpesvirus-1 (BHV-1). Both young and aged animals may be impacted. This virus can also cause encephalitis, conjunctivitis, abortions, generalized systemic infections, and respiratory illness. Acute upper respiratory tract inflammation is a hallmark of IBR. The Direct Fluorescent Antibody Test was used by Patel *et al*. (2018) to conduct a study for the identification of Bovine Herpesvirus-1 infection in bovine clinical samples. Out of 116 clinical samples (44 cattle and 72 buffaloes) analyzed, fluorescence was seen in 14 (12.09%) samples, and these samples were reported to be positive for Bovine herpesvirus-1. However, Vala *et al.* (2020) described that EHV-4 is respiratory pathogen of domestic horses associated with outbreaks of respiratory disease. They conducted study to diagnose an EHV-4 infection among domestic horses using polymerase chain reaction. Total 12 nasal swabs were collected from horses showing symptoms of respiratory disease, unthrifyness and fever. DNA was extracted from all samples and it was subjected to polymerase chain reaction for identification of EHV-4 DNA in samples. Four samples found positive for having EHV-4 infection revealed single compact band of 189 bp. On other hand, Mavadiya *et al.* (2021) conducted sero-epidemiological study on equine piroplasmosis in horses at south Gujarat and reported that 62.71% of horses having presence of antibodies by cELISA. Sero-prevalence of piroplasmosis in horses was found significantly (P <001) associated with different breeds of horses whereas non-significant difference was observed between age and sex of the horse which might cross reactively and misdiagnosed with other diseases.

Papillomatosis in Bovine

Bovine papillomaviruses (BPVs) can cause fibropapillomas or papillomas (BPV6) (BPV1 and BPV5). The teats and udders of dairy calves have lately been found to have additional strains (BPV 7, 8, 9, and 10 as well as putative BPV types BAPV4 and BAPV9), even though these subtypes reflect the typical etiologic description of teat and udder "warts" in cattle. The most typical kind of lesion detected in dairy cattle is the flat "rice-grain" fibropapilloma, which is generated by BPV5. BPV1 or BPV6 are frequently the cause of frond-shaped warts, which have more epithelial projections on the surface of the teat or udder (udder). When they develop on the extremities of the teats, the frond-shaped variety provide the biggest obstacle. Warts are spread by an infectious virus that is often spread from person to person by using milking equipment and milkers' hands. Infected skin picks up the virus through abrasion wounds. There is mounting evidence that, with the use of more sensitive modern molecular techniques, BPV DNA can be found even in normal, healthy cow skin. The viral and host-specific factors that control when and how much various cattle develop papillomas are still poorly understood. Similar to this, it is unclear exactly how BPV2, for instance in the development of bladder wall tumors, contributes to the process of carcinogenesis. According to Tumlam *et al.* (2022a), BPV1 is the virus most frequently associated with the cutaneous type of cow warts in Maharashtra.

Disease control policies for livestock animals

To combat the new challenges of the farmers in terms of diseases outbreaks, prevention and control of diseases spread, prevention of wild animal diseases, and zoonotic diseases like influenza can only be prevented by one health policy (Desai *et al*., 2018a; Desai *et al*., 2018b). To prevent the diseases there is only way to do so it by means of complete vaccination policy across the country. Vaccine efficacy can be improved by adjuvant and use of different adjuvants can be helpful so that the vaccine can be efficacious and long lasting (Makwana *et al*., 2018; Karunakaran *et al*., 2023). Another disease of small ruminant is PPR which is highly contagious and cattle, pigs are susceptible to infection, but do not contribute to the epidemiology as they are unable to excrete virus but it is potential diseases of the livestock which causes the economic loss to the farmers (Sakhare *et al*., 2019). Other emerging diseases like monkeypox, sudan ebola virus are threat to animal population and poses the risk for zoonotic transmission (Rana *et al*., 2022; Patel *et al*., 2023a; Patel *et al*., 2023b)

The authorities are responsible for putting disease prevention strategies into action at any place, region, state or country. Rabies and other fatal diseases should be prevented through vaccination in bovine and other livestock animal as every year dog bite cases are on rise. Additionally, there should be nation-wide campaign for spreading the awareness. The government ought to establish regulations by formulating immunization policies for domesticated animals. The government must to be strict about enforcing the regulations concerning livestock, and their owners ought to do the same. In order to safeguard both animals and their owners against the spread of infectious diseases, the government ought to enact a regulation that makes it obligatory for owners to insure and vaccinate their animals. The law that requires vaccinations would be the most effective measure to take against sickness and any outbreak. The state and central governments of India have the ability to enforce the law, which will result in improved regulation of disease outbreaks, as well as public and animal health.

The following are the policies:

1) All livestock, whether owned or strays, must be vaccinated, regardless of where they live in the state.

2) There should be a state law or a central regulation that regularizes and mandates the mandatory vaccination, and if the owner/farmer does not get their animal vaccinated, the owner should be fined.

3) The government ought to offer free vaccinations to stray animals by working together with any organization dedicated to the protection of animals or by involving the community organization.

4) Online registration of livestock, including generation of a digital health card and a record of vaccinations for the purpose of disease prevention and control.

5) Regulation committee should be establish at state level separately from animal state department to control and overlook the animal health activity.

6) Block wise or regional wise positions of experts should be created which exceptionally work on animal health and towards eradication of diseases.

7) There is need of "One health" Ministry formation at central government level and separate independent "One health" state department require to form and run exceptionally for the purpose of maintaining overall health status of human, animal and contain any disease outbreaks.

8) There is need of "village adoption scheme" by team of expert from different department of state, which educate the farmers for overall animal health management and sustain harmony in animal population so that farmers can prevent their economic loss.

9) New generation students from across the discipline like, veterinary, medical, agriculture, engineer are needed to be trained in under graduation for any emergency disaster situation. They should be act as prepared force for any worst biological disaster.

10) Every year, there is an outbreak of some new diseases of animal or human, therefore, preparedness is the most significant steps that need to be consider by state and central government.

In conclusion, Animal health is the prime important factor for farmers and the economically critical. It is the responsibility of state and central government to educate, aware and support the farmers for managing their livestock. Policies are the most absolute gazette for prevention and control of diseases that ultimately helps in eradication of diseases from the country.

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