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A comprehensive review on prevalence of livestock diseases in Gujarat, India

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Abstract
Farmers in India rely almost entirely on their livestock for financial support. Farmers of all capacity depend on the revenue generated by their livestock for survival. This income comes by selling animal by products like milk, meat, and other items. In India, there are significant populations of animals on both organized and unorganized farms. Even in Gujarat, it is the prime center of revolutionary dairy sectors that is organized and cooperatively manage by the various dairy. However, the majority of the populace is disorganized and chaotic. There are many different types of diseases that are prevalent in Gujarat, India due to the country's large population. Diseases such as foot and mouth disease (FMD), bovine brucellosis, tuberculosis, bovine mastitis, equine herpesvirus (EHV), and equine piroplasmosis, amongst others, are severe diseases that cause significant economic loss to farmers. and any other relevant information so that they can protect their animals from getting sick and losing their livelihoods. As a result, the purpose of this review is to provide a succinct explanation of the significant diseases that affect livestock in Gujarat state of India and that are regularly observed throughout the course of a year.

Keywords: comprehensive, prevalence, livestock, financial

Introduction
Animal diseases are the major concerns for livestock industries. Gujarat is known for its livestock and dairy industry, contributing about 15% of milk production in India. Bovine and equine are the two important animals in Gujarat state. Bovine refers to different species like cattle, buffalo, and oxen, while equine refers to horses and donkeys. In this brief review, we will discuss the prevalence of livestock diseases in Gujarat. There has been an increase in the number of disease outbreaks, droughts, and floods in India, as well as other adverse climatic conditions. India's livestock population is at risk. There are many diseases that can harm livestock, and these diseases can have a severe influence on animal production, trade in live animals, meat, and other animal products, human health, and the process of economic growth as a whole. The production of livestock is an essential component of the Indian economy, since it helps to ensure the availability of food and supports the livelihoods of millions of people. It is absolutely necessary to maintain the health of livestock, such as bovine and horse species, in order to guarantee the continued productivity and profitability of the industry. Yet, infectious diseases continue to be a serious obstacle for the livestock business. These diseases have a negative impact not only on the physical and mental health of animals, but also on the financial security of farmers and other stakeholders. The animal disease landscape in India is positive because we were able to eradicate Rinderpest, the most feared livestock disease that wiped off herds of cattle. This is a reason to be optimistic about the situation. According to the Project directorate on animal disease monitoring and surveillance's vision 2030-ICAR, the country is currently plagued by a number of additional infectious and non-infectious diseases, all of which contribute to enormous annual economic losses.

The huge economic losses that are brought on by bovine and horse diseases, as well as the effects those diseases have on India's dairy and meat industries, are a major source of concern for livestock owners in India. Studies in epidemiology are extremely important for gaining a better understanding of the occurrence and distribution of these diseases, as well as for contributing to the creation of effective control methods. The epidemiology of bovine and equine diseases in India, as well as the significant studies that have contributed to our understanding of these diseases, were covered in this review. This article presents an overview of the epidemiological studies that have been conducted on bovine and horse illnesses in India. It focuses on the most important findings, as well as the problems and opportunities that exist

for improving disease surveillance, prevention, and management. Foot and mouth disease, which has been common in India for a significant number of millennia, is one of the key diseases from an epidemiological point of view. In India, bluetongue has developed into an endemic disease, classical swine fever (CSF) is a highly contagious and possibly lethal disease of pigs, and influenza is a respiratory illness that affects humans. Sheep and goat pox are two endemic capripox illnesses in India, which pose a serious economic threat to small ruminant output. A viruses are the cause of a considerable amount of morbidity and mortality in humans and animals all over the world.

Some of the diseases, which are regularly reported from the India and from various part of the country. 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) [6]. According to Makwana *et al.* (2022) [16], HS infection might deteriorate health and result in death when it is co-infected with other viral diseases as PPR. 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) [33, 14, 15]. Regulating epidemiological data and identifying the source of unusual rotavirus strains are crucial (Makwana *et al*., 2020a; Makwana *et al*., 2020b) [14, 15]. 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) [3], Desai *et al.* (2020b) [4], Desai *et al.* 2021 [5], Joshi *et al.* (2022a) [10] and Joshi *et al.* (2022b) [11]. Antimicrobial resistance and antibiotic residual in cow milk are two of the greatest issues with bovine disease (Patel *et al.*, 2019 and Patel *et al.*, 2020) [21, 20]. 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) [2, 18, 34]. According to Sharma *et al.* (2019) [28], although other species like cattle, buffalo, camels, and pigs have also been documented to be afflicted by these bacteria, which ultimately results in losses to farmers, *Corynebacterium pseudotuberculosis* is an economically significant illness of small ruminants. The Direct Fluorescent Antibody Test was used by Patel *et al.* (2018) [19] to conduct a study for the identification of Bovine Herpesvirus-1 infection in bovine clinical samples. However, Vala *et al.* (2020) [35] described that EHV-4 is respiratory pathogen of domestic horses associated with outbreaks of respiratory disease. On other hand, Mavadiya *et al.* (2021) [17] 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. According to Tumlam *et al.* (2022a) [32], BPV1 is the virus most frequently associated with the cutaneous type of cow warts in Maharashtra. 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) [7, 8]. 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) [13, 12]. 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) [27]. 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) [24, 22, 23]. Apart from this, other well established diseases which were thought to be under control are still persisting. The world has already faced devastating economic losses from major outbreaks, such as FMD in Europe (Thrusfield, 2005) [31]; classical Swine Fever in Caribbean and Europe in 1996-2002 (Vargas *et al*., 2004) [36]; RP in Africa in the 1980s (Vargas *et al*., 2014) [37]; PPR in India and Bangladesh (Rweyemamu *et al.*, 2006) [26]; CBPP in Eastern and Southern parts of Africa in late 1990s (Thiaucourt *et al*., 2003) [30]; as well as RVF in Arabian Peninsula (Roeder and Obi, 1999) [25]. India was considered free of glanders for eight years after 1998 until there was reemergence of the disease in 2006 (Balkhy and Memish, 2003; Taylor *et al*., 2001; WHO, 2010) [1, 29, 38]. In almost all the newly emerging diseases, the animals seem to be the source of infection, serving as reservoirs (Jones *et al*., 2008) [9]. Therefore, to prevent further outbreak of diseases, government need to act in response to the outbreaks and develop regulation policies.

Bovine Tuberculosis (TB)

It is one of the most prevalent and economically significant infectious diseases in cattle in India. Bovine tuberculosis is a chronic bacterial disease that affects cattle and other domesticated animals, including humans. It is caused by the bacterium *Mycobacterium bovis* and is primarily transmitted through contaminated milk or direct contact with infected animals. The disease can cause weight loss, chronic cough, and reduced milk production in infected animals. It is a major public health concern due to the potential for transmission to humans through contaminated milk or meat. Several epidemiological studies have been conducted to estimate the prevalence and risk factors associated with bovine TB in different regions of the country. A study conducted in the state of Punjab found a prevalence of 6.24% in cattle, with age and breed being significant risk factors for the disease. Another study in the state of Tamil Nadu reported a prevalence of 8.5% in dairy cattle, with the use of shared water sources and feed being associated with an increased risk of infection. Control measures for TB in India include testing and culling of infected animals and vaccination.

Bovine Brucellosis

Another important zoonotic disease affects cattle in India. It is caused by the bacterium *Brucella abortus* and is primarily transmitted through contact with contaminated materials, such as aborted fetuses or milk from infected animals. Clinical signs include abortion, infertility, and reduced milk production. Diagnosis is based on the detection of the bacterium in samples such as milk, blood, or tissue. A study conducted in the state of Uttar Pradesh found a prevalence of 9.87% in cattle, with age and parity being significant risk factors for the disease. Another study in the state of Gujarat reported a prevalence of 4.28% in cattle, with the use of common grazing areas and the presence of other infected animals being associated with an increased risk of transmission. Prevention and control measures include vaccination, culling of infected animals, and strict biosecurity measures. It is also a major public health concern due to the potential for transmission to humans through contaminated milk or meat. Control measures for brucellosis in India include vaccination, testing and culling of infected animals, and strict hygiene measures. The infectious disease known as brucellosis affects animals and has significant implications for both the economy and public health. The majority of domestic animals, marine species, and human beings have all been shown to be infected with the disease. In animals, this sickness manifests itself as a reproductive dysfunction that ultimately results in abortion. There are close to 80 million rural households in India that are involved in milk production, and 75 percent of the animals used for milk production are owned by small and marginal farmers. Because humans and livestock tend to live in close proximity to one another, there is a higher risk of brucellosis being passed from animals to humans. In light of the significant impact that brucellosis has not only on people but also on animals, the government of India has initiated a National Animal Disease Control Programme to combat the illness. Regular sero-monitoring and sero-surveillance of the animal population is one of the goals that this Program aims to accomplish as part of its overall mission. The components of bovine brucellosis surveillance include the detection of brucellosis in domestic bovine, the estimation of the magnitude of brucellosis infection (i.e., prevalence), the measurement of progress towards regulatory goals, the provision of metrics to assist in evaluating compliance with Programme standards, and the provision of stakeholders and decision-makers with timely and relevant information that can be used to take appropriate action.

Bovine Leptospirosis

One of the main zoonotic illnesses brought on is leptospirosis. Yet, due to a lack of knowledge and awareness, leptospirosis is still underdiagnosed and underreported. Due to reproductive losses, decreased output, and treatment expenses, leptospirosis negatively impacts the cattle husbandry industry economically. Leptospirosis is prevalent in the southern States of India and in coastal States like Gujarat and Maharashtra, including the Andaman and Nicobar Islands, where high frequency was noted in both animals and humans18. Apart for a few isolated location-specific findings, there is no comprehensive investigation on the prevalence of leptospirosis in cattle in India that spans a wide geographic area. A total sero-prevalence of 30.8% has been recorded for bovine leptospirosis across 19 Indian States and Union Territories. Leptospirosis is the endemic diseases in India and its outbreak significantly observed in the coastal area of the states like Kerala, Tamil Nadu, Karnataka, West Bengal, Maharashtra, and Gujarat (Desai *et al.*, 2020b) [4].

Hemorrhagic Septicemia (HS)

Pasteurella multocida is the organism that is responsible for hemorrhagic septicemia (HS), an acute disease that is usually fatal in cattle and buffalo. In several locations across Asia and Africa, HS manifests as a catastrophic epizootic, causing a significant increase in both death and morbidity (De Alwis, 1992; Verma and Jaiswal, 1998). Although antibiotics are the primary therapy to cure the sickness and limit the prevalence of such microbial infection, the use of antibiotics does have some negative side effects, including the presence of drug residues in animal products and the development of antibiotic resistance. The vaccination of animals in endemic areas prior to the anticipated outbreak of HS is the other method that can be utilized for the control and prevention of HS. Because the immunity obtained through HS is serotype-specific, the selection of vaccine candidates must be based on the serotypes that are currently circulating in the target geographic areas. A wide range of approaches, including dead vaccinations (bacterins), live-attenuated vaccines, cellular vaccines, and genetically engineered vaccines, have been utilized in the process of developing HS vaccines (Verma and Jaiswal, 1998; Hodgson *et al*., 2005). On the other hand, lethal vaccines are typically utilized in the vaccination process against HS. Formalized bacterin, aluminum hydroxide gel, and oil adjuvant vaccines are all types of bacterins that are utilized in the fight against HS. Among them, the aluminum hydroxide gel vaccine and oil adjuvant vaccines elicit a good immune response, according to the research that have been carried out in many Asian nations, including India, over the course of the past few years, and these are the vaccines of choice. Makwana *et al.* (2022) [16] reported that infection of HS when co-infected with other viral diseases like PPR can worsen the health and leads to death.

Neonatal Calf Diarrhoea

The majority of cases of diarrhea in newborns are diagnosed as being caused by rotaviruses. Group A rotaviruses are human and animal gastrointestinal pathogens (Tumlam *et al*., 2019; Makwana *et al*., 2020[a]; Makwana *et al*., 2020[b]) [33, 14, 15]. It is very important to regulate epidemiological data and tracing the origin of uncommon rotavirus strains (Makwana *et al*., 2020[a]; Makwana *et al*., 2020[b]) [14, 15]. Generally they affect calves 4 to 14 days old, but infections can be detected either side of this age range. Rotaviruses infect and kill the villus epithelial cells of the small intestine. Because of this, the body is unable to properly absorb the nutrients. Asymptomatic infections may arise in older calves and in adult cows. In cows, discharge of virus is particularly common around the time of calving. This is one of the ways that an infection might continue to spread on a farm. After an outbreak has begun, the primary source of contagion is going to be calves that are sick with diarrhea. Coronaviruses are a significant cause of diarrhea in 4- to 30-day-old calves. There are at least three different strains of the bovine coronavirus that are responsible for respiratory infections, newborn diarrhea, and winter dysentery. On the other hand, the winter dysentery and neonatal calf strains of the disease are able to infect both humans and calves. Coronaviruses can cause villous atrophy

in calves by invading the small intestine, destroying the villous epithelial cells, and spreading to other cells. They also infiltrate the epithelium of the big intestine. Since coronaviruses impact the large intestine, symptoms of colitis like straining may be related with infection with these viruses. Coronavirus, like rotavirus, may be transmitted to calves through the excretion of asymptomatic people who are infected with the virus. Rotavirus is the more common of the two. Once an outbreak has been established, the primary source of virus are calves that have been clinically impacted. Desai *et al.* (2020a) [3] and Joshi *et al.* (2022) reported that animal coronavirus can be rapidly detected by using rapid lateral flow assay test which is fast, cheap and on the filed useful tool.

Bovine Mastitis

In dairy cattle herds across the majority of the world, mastitis, also known as inflammation of the mammary gland, is the condition that is both the most prevalent and the most costly. Inflammation of the gland can be brought on by a variety of factors, including physical trauma and emotional stress; however, the most common cause of mastitis is an infection brought on by bacteria or other microorganisms, such as fungus, yeasts, or even viruses. Microorganisms that have made their way through the teat canal and have begun to proliferate in the mammary gland are the cause of infections. One of the biggest problem of the Bovine mastitis is the antimicrobial resistance and antimicrobial residue in bovine milk (Patel *et al*., 2019 and Patel *et al*., 2020) [21, 20]. Increasing antimicrobial resistance even in parasitic and anthelmintic drug (Bhinsara *et al*., 2018) [2], resistance in *E. coli* isolated from newborn piglet (Tumlam *et al.*, 2022b) [34] are the most critical problem of farmers. Sharma *et al.* (2019) [28] described that *Corynebacterium pseudotuberculosis* is an economically important diseases of small ruminants, though other species like cattle, buffalo, camel and pigs have also been reported to be affected by this bacterium which ultimately causes the losses to farmers.

Rabies

The zoonotic disease known as rabies is characterized by a rapid onset, a progressive course, and an unavoidable fatality. It has significant negative effects on India's public health and economy. In India, approximately 97% of human cases of rabies are caused by dogs, followed by 2% caused by cats and 1% each caused by jackals, mongooses, and other animals. The bite of a rabid dog is the most common way that the disease is passed on. In the year 2018, the Integrated Disease Surveillance Programme (IDSP), which is run by the Ministry of Health and Family Welfare, recorded 74 lakh cases of animal bites, which is an increase from the 42 lakh cases reported in the year 2012. In 2017, 30 of the 36 states and territories reported a total of 593 deaths in humans that were suspected to be caused by rabies. The National Action Plan for Rabies Elimination (NAP-RE) (dog mediated) in India provides a broad framework for combating rabies with a vision to reduce human deaths due to dog mediated rabies to zero by the year 2030. This goal was established with the intention of preventing rabies from spreading from dogs to humans. In accordance with NAP-RE, the animal sector plan calls for the vaccination of at least seventy percent of the canine population in a particular geographic area on an annual basis for a period of three years in a row. Clinical and laboratory surveillance are both components of rabies prevention and control in canine populations.

Bovine Viral Diarrhea

It is a viral disease that affects cattle and other domesticated animals. It is caused by the bovine viral diarrhea virus (BVDV) and is primarily transmitted through direct contact with infected animals or their bodily fluids. The disease can cause respiratory and digestive problems, fever, and reduced milk production in infected animals. Vaccination is the most effective way to prevent BVD, and several BVD vaccines are available in India.

Foot-and-Mouth Disease (FMD)

FMD is a highly contagious viral disease that affects cattle, sheep, goats, and pigs in India. It is caused by the FMD virus and is primarily transmitted through direct contact with infected animals or contaminated materials, such as feed or water. Clinical signs include fever, blisters on the mouth and feet, and reduced milk or meat production. Diagnosis is based on the detection of the virus in samples such as saliva or blood. Prevention and control measures include vaccination, quarantine of infected animals, and strict biosecurity measures. Foot and mouth disease is one of the most contagious viral diseases affecting cattle in India. The disease can cause significant economic losses due to reduced milk production, weight loss, and even death in severe cases. Vaccination is the most effective way to prevent FMD, and several FMD vaccines are available in India.

Bovine Herpes Viral Infection

Infectious bovine rhinotracheitis (IBR) is a highly contagious, infectious respiratory disease that is caused by bovine herpesvirus-1 (BHV-1). It can affect young and older cattle. In addition to causing respiratory disease, this virus can cause conjunctivitis, abortions, encephalitis, and generalised systemic infections. IBR is characterized by acute inflammation of the upper respiratory tract. Patel *et al.* (2018) [19] conducted study for detection of Bovine Herpesvirus-1 infection in bovine clinical samples by Direct Fluorescent Antibody Test. They observed that out of a total of 116 clinical samples (44-cattle, 72-buffaloes) tested, fluorescence was observed in 14 (12.09%) samples an found positive for Bovine herpesvirus-1.

Bovine Papillomatosis

Bovine papillomaviruses (BPVs) may generate papillomas (BPV6) or fibropapillomas (BPV1 and BPV5). Although these subtypes reflect the standard etiologic description of teat and udder “warts” in cattle, further strains (BPV 7, 8, 9, and 10, as well as suspected BPV types BAPV4 and BAPV9) have been recently discovered on the teats and udders of dairy calves. The flat "rice-grain" fibropapilloma, which is produced by BPV5, is the most prevalent type of lesion found in dairy cattle. Frond-shaped warts, which have more epithelial projections on the surface of the teat or udder, are frequently caused by types BPV1 (teats) or BPV6 (udder) (udder). The frond-shaped varieties provide the most challenge when they appear on the ends of the teats. The virus that causes warts is infectious and is typically transmitted from person to person through the use of milking machines and the hands of milkers. The virus infects the skin in areas of abrasion. There is emerging evidence that BPV DNA can be

discovered even in normal, healthy cow skin utilizing more sensitive current, molecular techniques. There is still a lack of knowledge concerning the viral and host-specific variables that determine when and to what extent particular cattle develop papillomas. It is similarly unknown how exactly BPV2 contributes to the process of carcinogenesis, for example in the development of bladder wall tumors. Tumlam *et al.* (2022a) [32] reported that BPV1 is the most common in cutaneous form of warts of cattle in Maharashtra.

Equine Infectious Anemia (EIA)

EIA is a viral disease that affects horses and other equids in India. It is caused by the EIA virus and is primarily transmitted through blood-sucking insects, such as horseflies or mosquitoes. Clinical signs include fever, anemia, and weight loss. Diagnosis is based on the detection of antibodies against the virus in blood samples. Prevention and control measures include regular testing of animals, quarantine of infected animals, and strict biosecurity measures. Several epidemiological studies have been conducted to estimate the prevalence and risk factors associated with EIA in India. Equine infectious anemia is a viral disease that affects horses and other equine animals. A study conducted in the state of Punjab found a prevalence of 2.2% in horses, with age and sex being significant risk factors for the disease. Another study in the state of Uttar Pradesh reported a prevalence of 0.74% in horses, with the presence of other infected animals being a significant risk factor. There is currently no effective treatment or vaccine for EIA, and infected animals are often euthanized to prevent the spread of the disease.

Equine Influenza (EI)

EI is another important respiratory disease that affects horses in India. It is caused by the influenza virus and is primarily transmitted through direct contact with infected animals or contaminated materials, such as feed or water. A study conducted in the state of Maharashtra found a prevalence of 7.3% in horses, with age and vaccination status being significant risk factors for the disease. Another study in the state of Tamil Nadu reported a prevalence of 4.4% in horses, with the presence of other infected animals and the use of shared water sources being associated with an increased risk of transmission. Clinical signs include fever, coughing, and nasal discharge. Diagnosis is based on the detection of the virus in samples such as nasal swabs or blood. Prevention and control measures include vaccination, quarantine of infected animals, and strict biosecurity measures.

Equine Herpesvirus (EHV)

Equine herpesvirus is a viral disease that affects horses and other equine animals. It is caused by several different herpesviruses, including equine herpesvirus-1 (EHV-1) and equine herpesvirus-4 (EHV-4). The disease can cause respiratory and neurological symptoms, as well as reproductive problems in pregnant mares. Vaccination is the most effective way to prevent EHV, and several EHV vaccines are available in India. Vala *et al.* (2020) [35] 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.

Equine Piroplasmosis

Babesia caballi and *Theileria equi*, two apicomplexan protozoan parasites, are the culprits behind the tick-borne disease known as Equine piroplasmosis (EP). The sickness has caused the equine industry to suffer significant financial losses. Donkeys, horses, mules, and zebras are the main species affected, however DNA of the parasites has also been found in dogs and camels, casting doubt on the host-specificity of the disease. In temperate and tropical areas of the world where the capable tick vectors are common, the disease is endemic. Whereas *B. caballi* infection clears itself within a few years, *T. equi* infection causes infected equids to remain carriers for life. Equine piroplasmosis (EP), also known as piroplasmosis of equids, is a protozoan parasite illness that affects equids (horses, donkeys, mules, and zebras) and is spread by ticks. *Theileria equi* and *Babesia caballi* are the two species that cause EP (Formerly *Babesia equi*). Both of them are spread by tick species from a variety of genera, including Hyalomma, Rhipicephalus, and Dermacentor. Long-lasting carriers of these infections, infected animals act as a source of infection for ticks, which in turn spread the parasites to equine hosts. There are three different manifestations of the condition, which might be acute, subacute, or chronic. Although there are differences between theileriosis and equine babesiosis, their common clinical symptoms include fever, anemia, inappetence, oedema, icterus, hepatomegaly, and, in some cases, mortality. The equine sector suffers considerable financial losses as a result of EP. Treatment costs, abortions, lost productivity, and mortality are all examples of economic losses. EP is known by a number of other names, including equine malaria, horse tick fever, anthrax fever, equine biliary fever, equine babesiosis, and equine theileriosis (Onyiche *et al*., 2019). Thakre *et al.* (2016) reported *Babesia equi* infection in 14 out of 190 horses presented at TVCC at Junagadh, Gujarat. Mavadiya *et al.* (2021) [17] 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.

Challenges and Opportunities

There are many diseases are prevalent in India and endemically or epidemically, diseases are prevalent across the India. Despite the significant progress made in the diagnosis, surveillance, and control of bovine and equine diseases in India, several challenges remain. One of the main challenges is the lack of adequate infrastructure and resources for disease surveillance, diagnosis, and reporting. This is particularly true in remote and rural areas where access to veterinary services and diagnostic facilities is limited. Another challenge is the limited awareness and knowledge among farmers and other stakeholders about the importance of disease prevention and control measures, as well as the potential risks of zoonotic diseases. Bovine and equine are two of the most important domesticated animals in India. They are used for various

purposes such as agriculture, transportation, and sports. However, these animals are prone to a number of diseases that can cause significant economic losses to their owners. 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) [7, 8]. 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) [13]. 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) [27].

Conclusion

Livestock diseases are the major challenges for livestock industries in Gujarat. The government of Gujarat has implemented various programs to control the prevalence of livestock diseases. Vaccination, testing, and culling of infected animals are some of the effective ways to control these diseases. It is essential to create awareness among livestock owners and farmers about the importance of disease control programs and the benefits of vaccination. By implementing these programs, Gujarat can become a disease-free state and contribute significantly to the country's livestock and dairy industry.

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