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Epizootic measures against infectious and viral animal diseases in Kazakhstan

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ABSTRACT

In the livestock industry, the first principle is animal health. Due to occurrence a disease, an animal imposes more costs and losses on society than the value of the animal itself. Vaccination is one of the effective methods of controlling and preventing animal diseases. Vaccination of animals means giving special vaccines to animals to strengthen their immune system. The present study examines animal vaccination and disease prevention programs using a descriptive research method and collecting library resources. The results of the study showed that vaccination of animals increases their immunity and reduces the transmission of diseases. Animals, especially dairy and beef calves, are susceptible to a variety of common diseases that can sometimes be fatal or cause significant suffering. However, apart from the physical losses of the animal, treating these diseases can be costly and can significantly reduce the productivity and profitability of dairy herds. This measure can help control the spread of diseases in herds and farms. By maintaining livestock's health through vaccination, livestock's productivity and production power increase. Healthy livestock have the ability to grow fast and produce better products. Vaccination also provides the basis for reducing medical costs because disease prevention prevents the costs associated with their treatment. Vaccination should be considered as a basic preventive method in livestock health management. This method maintains livestock health, reduces disease transmission, and also disease treatment costs associated with diseases.

Keywords: Infectious animal disease, Animal virus, Epidemic, Vaccination.
Article type: Review Article.

INTRODUCTION

One of the effective solutions to meet people's food needs is to give importance to the livestock industry and develop industrial and rural livestock as the main source of meat and milk production. The livestock industry in developing countries such as Kazakhstan has always been associated with risks and problems, including the spread and occurrance of livestock diseases, which reduce the efficiency of livestock and their products (Savini *et al.* 2011; Turgenbayev *et al.* 2023). Intensive livestock and poultry farming (due to the increasing need for protein supply) is one factor that spreads various infectious diseases, including bacterial, viral, and parasitic ones. Therefore, awareness of various biosecurity issues, compliance with health regulations and standards, and modern techniques are among the factors that can be used to prevent these diseases. Vaccination is one of the most

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important elements of preventing and controlling infectious diseases in livestock and poultry farming, especially viral and bacterial diseases. For more than 200 years, the role of vaccination as an effective preventive treatment for bacterial and viral diseases has been proven. However, in the fields of livestock and aquaculture, with the increasing global demand for animal and aquatic foods and in line with food security policies and ensuring food safety, using animal vaccines can increase the quantity and quality of products produced from these organisms (Bacenetti & Fiala 2014). All infectious diseases result from the interaction between the animal's ability to resist the disease agent (immunity), the disease agent (bacterial, viral, and parasitic), and the animal's housing environment. Livestock farmers prevent many of these diseases by increasing livestock immunity through vaccination. Livestock farmers can also prevent the occurrence of disease among livestock by preventing the entry of infectious agents into their production units. If an infectious agent is present in the herd, livestock farmers can take action to eradicate or control its spread (Newton *et al.* 2019). Today, health and medical professionals in human society and livestock populations recommend a principle: prevention is better than cure and comes first. Many diseases always threaten livestock. If livestock suffer from any of these diseases, especially infectious ones, the country's livestock farming will suffer great economic losses. As a result, the livestock farmers' efforts and hard work are jeopardized (Murzakaeva *et al.* 2015). Disease prevention in humans is primarily through preventing contact with infected livestock or consumption of contaminated livestock products and, if possible, by preventing the occurrence of livestock diseases, such as by vaccination. Due to illness, livestock imposes more costs and losses on society than the value of the livestock, itself because it is a productive element that has several times the value of its own product production during its life (National Association of State Public Health Veterinarians 2005). The World Health Organization considers livestock vaccination to be the only appropriate method for controlling infections and infectious diseases, which should be the first step towards eliminating the disease. Vaccination is one of the essential components of disease prevention. Designing a good strategic vaccination program is possible by determining the diseases against which vaccination is carried out, considering the benefits of implementing vaccination, and knowing when vaccination provides the most protection. To design the details of a vaccination program, livestock farmers should plan with the help of their unit veterinarians (Kisera *et al.* 2024). Vaccination of livestock means giving specific vaccines to livestock to enhance their immune system. Vaccines usually contain disease antigens that help livestock become immune to various diseases by enhancing an immune response. This process is known as vaccination and is one of the main methods of preventing diseases in livestock (Siembieda *et al.* 2011). The present study discusses vaccination programs and disease prevention in livestock. In a study by Admasu & Wakjira (2021) authors presented the management principles of vaccine administration in veterinary medicine, which states that one of the most important pillars of vaccination in veterinary medicine is the correct way to administer the vaccine because improper administration causes the failure of the vaccination program and the spread of infectious diseases. In this article, an attempt has been made to explain the management principles of vaccine administration in livestock and to state the important and noteworthy points of this field so that by properly educating this subject, the failure of vaccination in controlling infectious diseases can be prevented. In a study conducted by Bagheri Nejad *et al.* (2020) they examined the vaccines produced or under research against some protozoan parasites and worms and the various aspects of their production. The results showed that currently, no vaccine for diseases caused by protozoan parasites has been commercialized for humans, but in line with food security and safety policies and in response to global demand, vaccines with appropriate efficacy have been introduced to the market in the fields of livestock and aquaculture. However, high-throughput technologies, such as next-generation sequencing and omics, have enabled more precise identification of target antigens and prediction of immunological responses, which could lead to the development of more functional vaccines (Bacenetti & Fiala 2014). In their work, Godfroid *et al.* (2013) examined the field of control of various diseases such as brucellosis, bovine tuberculosis, erysipelas, lumpy skin, plague of small ruminants, smallpox, and anthrax; as well as changes in disease control programs and patterns, in addition to updating management protocols by considering epidemiological principles and studying the mode and rate of the disease spread and incidence. In another study, Zinsstag (2023) reviewed leptospirosis, which is a common disease of humans and animals that is highly prevalent in almost all parts of the world, especially in tropical and subtropical regions and also in hot and humid regions. The results of this study showed that prevention of this disease will also be possible by increasing awareness among the public and personnel of regional health and treatment systems, preventing human contact with contaminated materials, and vaccinating livestock and animals. Njeru *et al.* (2016) reported the relationship between vaccination coverage of livestock (lambs, goats, and young

calves) and the human incidence of brucellosis, one of the most important zoonotic (human-animal) diseases which is considered a potential public health threat. Human brucellosis is caused by one of four *Brucella* species: *B. melanosis, B. abortus,B. suis*, and B.*cranes*, whose reservoirs include goats, sheep, cattle, pigs, and dogs, respectively. One of the important policies to reduce the human incidence of brucellosis is the vaccination of young livestock. According to the results obtained in this study, vaccinating young livestock against brucellosis has effectively reduced the human incidence of the disease. The success of this strategy depends on its continuation, increasing the percentage of vaccination coverage, and greater cooperation and coordination between health systems and general veterinary departments. In a study conducted by Molla *et al.* (2017), the cost-effectiveness of livestock vaccination against livestock diseases in Australia was examined, and brucellosis was noted as one of the common diseases between humans and animals that impose significant economic losses on communities. Vaccination of livestock against the disease is one of the control and prevention measures for this disease that is common worldwide. This study showed that immunizing livestock against brucellosis significantly reduces the losses caused by the disease in society. Estimates suggest that this intervention is cost-effective and not out of reach if combined with other control measures and a continuation of the disease eradication program. Studies showed that implementing a livestock vaccination program against brucellosis over several years led to a reduction in the prevalence of the disease in animal reservoirs (Dadar *et al.* 2021). Following the cessation of the vaccination program and the restriction of the policy of "Test-and-slaughter" technique for infected animals, a significant increase in the ratio of livestock prevalence to human incidence of the disease was observed.

MATERIALS AND METHODS

Types of diseases in livestock

In this section, diseases that exist among livestock are introduced, and their nature and causes are examined. Diseases have two main causes, including direct and indirect factors. The former include factors such as bacteria, fungi, parasites, viruses, nutritional deficiencies, chemical toxins, and many small and large factors that cause damage to the livestock's body and cause illness. The latter is more susceptible to disease and, in a way, reduce the resistance and immunity level of the livestock. This factor is more commonly known as stress, including poor ventilation, colds in livestock, insufficient space, excessive drug use, improper transportation, and too much or too little milking, each of which alone causes illness and stress in livestock, which in the long run reduces the level of livestock's resistance.

Infectious livestock diseases

Infectious diseases, just as they are a threat and pain in humans, are also considered a major threat in livestock. These diseases are caused by bacteria, viruses, fungi, and rickettsia in livestock. Most of the diseases seen in livestock are parasitic and infectious, which are not necessarily contagious, but special attention should be paid not to trasmit to other livestock. Also, one of the most important types of infectious diseases is the disease of Malta fever.

Disease among light livestock

Light livestock refers to domestic animals such as chickens, lambs, goats, and sheep. Common diseases among them include abortion, pregnancy toxicity or ketosis, demodicosis, coccidiosis, bacterial pneumonia, ringworm disease, and more.

Disease among heavy livestock

Heavy livestock refers to livestock such as cows and calves, which are commercially important, and their health is given special importance because if the livestock is injured, heavy losses will be incurred by livestock owner. Therefore, the health of these livestock is of utmost importance, and we should become aware of all the diseases in these livestock, so that rapid diagnose and treatment will be established. These diseases include scurvy and calf disease, salmonellosis, pneumonia, congenital heart defects, and diphtheria.

Bovine tuberculosis

Bovine tuberculosis is an infectious disease caused by a bacterium, *Mycobacterium bovis*. This bacterium has different species, the bovine and human types, capable of causing disease in cattle and humans. For this reason, tuberculosis is considered a zoonotic disease. The most important way of transmitting this disease is for infected

cattle to enter healthy herds. Another way of transmission is to eat and drink fodder and water contaminated with secretions of an infected animal or inhale particles spread in the air due to the cough of an infected cow. The symptoms of the disease in the affected cow are not noticeable for a long time, but gradually, the animal becomes extremely thin and suffers from severe and repeated coughing. Most affected cows first develop pulmonary tuberculosis. One of the symptoms of this tuberculosis is severe coughing in the animal, which is intensified by irritation of the cow's throat, which is why these coughs are more frequent in the early morning or evening. Cows with pulmonary tuberculosis spread germ-infected secretions in the surrounding area when coughing, infecting other cows. Also, the sick cow may swallow its own phlegm and thus contaminate the pasture or the barn environment through its feces. In the advanced stages of the disease, symptoms of tuberculosis are seen in many organs of the animal, including the udder, uterus, lymph nodes, and kidneys, among which mammary tuberculosis is of particular importance. In addition to endangering public health, mammary tuberculosis also transmits the disease to calves. There is no treatment for cattle infected with tuberculosis; the only way to deal with this disease is to slaughter the infected cattle in authorized slaughterhouses. This is done by conducting the necessary tests and slaughtering the infected cattle. Also, conducting tuberculosis tests in livestock farms every 3 to 6 months by veterinarians of veterinary departments across the country effectively prevents this disease.

Enterotoxemia disease

One of the sheep's acute and fatal diseases is enterotoxemia, which is caused by the increase in the pathogen, *Clostridium perfringens* with types C and D in the intestine and the release of poison. Predisposing factors: (i) Grazing in pastures with high water and rapid growth; (ii) Sudden change of diet; and (iii) Feeding on frozen forage, especially grazing in pastures with ice and dew; (iv) using a large amount of concentrate in the diet, as well as any other factors that slow down the movements of the digestive tract, makes the intestinal environment favorable for the multiplication and toxin production of the pathogen. In goats, the disease period is very short, often less than 2 hours, and it does not exceed 12 hours. For this reason, a large number of them die without showing any previous signs. In the herd, the first signs of this disease are lethargy, depression, yawning, and anorexia. In severe forms of the disease, intermittent convulsions, foaming at the mouth, and finally, death are often seen. Affected sheep survive longer than lambs (up to 24 hours). These sheep lag behind the herd, stagger, and grind their jaws together. They salivate, and bloat may also be seen in the final stages of the disease.

Prevention factors include: Vaccination of livestock; animals that are vaccinated for the first time need two injections two weeks apart; preventing overeating of livestock; changing the diet gradually and very slowly; vaccinating livestock two weeks before changing their diet; and burying the carcasses of animals that died of the disease in a deep pit and covering them with lime.

Anthrax

One of the important diseases shared between humans and livestock, especially cattle and sheep, is anthrax. This disease causes the death of the affected livestock. The agent of this disease, *Bacillus anthracis*, can survive for a long time in pasture land or livestock housing. Anthrax is often observed in pastures after a severe weather change. Infection with this disease often causes sudden death without any specific symptoms. The agent of the disease enters the human body through various routes such as eating contaminated meat, eating raw or undercooked liver of livestock, breathing, and also through unhealthy skin (skin scratches). It should be noted that the agent of this disease can directly enter the animal's body through soil or bone powder with contaminated diet. It occurs in two forms: peracute and acute. In the peracute form of this disease, the affected animal dies within 1 to 2 hours without showing any specific symptoms. In its acute form, symptoms such as high fever, muscle tremors, and abnormal breathing are observed in the animal. This form of the disease has a 48-hour period in which the fever reaches 42 ℃. The mucous membrane of the gums and vagina becomes bloody, and the animal is anorexic. Symptoms of a dead animal include the discharge of unclotted bloody secretions from all-natural body openings such as the animal's mouth, nose, and anus, rapid decomposition and putrefaction of the carcass, and the absence of rigor mortis in the carcass of the affected animal. For control and prevention, the animals should be vaccinated once a year, often in the spring. Burning the patient's carcass or burying it at least 2 m deep in the ground and pouring lime on it can also be effective. Finally, disinfecting the ground around the carcass suspected of having anthrax with a surface area of 3.14 m^2 (R = 1 m).

Brucellosis

Brucellosis caused by bacteria, *Brucella* species, is one of the most dangerous diseases shared between humans and livestock (Zoonotic), causing abortion in cattle and sheep, especially in the last months of pregnancy. This disease can be transmitted to humans in various ways. The most important route of transmission is the consumption of raw milk and its products (ice cream, butter, cheese, and cream), and direct contact with infected cattle can also cause the disease to be transmitted to humans. Contact between an infected and a healthy cow can easily spread the brucellosis infection. The bacterium of this disease can infect healthy cows through the placenta, uterine secretions, aborted fetuses, and milk of infected cattle. Each cow may abort once, twice, or even three times after being infected, and it may be a source of infection for the rest of its life for healthy cows. The most common way this bacterium enters the body is through digestion and eating bacterium-contaminated materials. The *Brucella* can enter the body of an animal or a human by penetrating the mucous membrane of the eye, wounds and even through healthy skin. In female livestock, this disease can cause abortion in the last months of pregnancy, and in male livestock, it sometimes causes swelling of the testicles. Control of this disease is carried out through a long-term program of blood sampling, testing, and slaughtering infected animals. Prevention of the disease is based on vaccination of female calves aged 4 to 6 months with the anti-brucellosis vaccine. Adult cattle can also be vaccinated with another type of anti-brucellosis vaccine (RD). These measures lead to the eradication of the disease when accompanied by strict implementation of hygiene principles, complete disinfection of premises, frequent blood tests, and eradication of infected cattle.

Sheeppox disease

Sheeppox disease, caused by a poxvirus, appears with blisters on the skin and internal injuries. Sheeppox virus, which is pathogenic only in sheep, spreads rapidly due to contact and proximity between sheep. This disease is caused by breathing in virus-infected particles suspended in the air or entering the body through skin abrations. The virus enters the body through the digestive tract, and eating virus-infected materials is ineffective in causing the disease. The course of the disease typically lasts a week; in this case, the body temperature rises to 42 ℃, and the pulse rate and respiratory movements increase. The purulent discharge also flows from the nose and corners of the eyes. Sheeppox disease has been known in Asia and Europe since ancient times and has caused many deaths. In this disease, red spots are seen in areas with little hair on the body, such as the eyelids, nostrils, groin, lips, under the abdomen, and on the breast, and after a while, these spots dry and turn into crusts. Advanced stages of the disease may lead to the death of affected animals. To prevent sheeppox, all sheep should be vaccinated. For this purpose, at the beginning of spring, lambs over three months old should be vaccinated with 1.5 mL smallpox vaccine subcutaneously in the posterior shoulder area. It should be noted that there is no risk in injecting the vaccine into pregnant ewes. The vaccine should be stored at 4 ℃ until injection. Smallpox is a viral disease that has no specific treatment. Visiting a veterinarian and caring for and disinfecting wounds can effectively improve the condition of the affected animal.

Agalactia disease

It is a contagious disease of sheep and goats, caused by *Mycoplasma agalactiae,* the effects of which appear in the udder, eyes, and joints of the affected animals. The cause of this disease is a type of bacteria. Notably, sheep are more susceptible to this disease in Iran than goats, and age does not affect the susceptibility of the animals. Male animals are also susceptible to this disease, as are females. Sheep and goats are the only animals susceptible to this disease. In the acute stage of the disease, the agalactia microbe is abundant in all body secretions, especially in milk, eye secretions, and joint injuries. The number of microbes in milk is very high, and this fluid may excrete the microbes for several months after recovery. Therefore, agalactia disease may be transmitted not only by sick animals but also by recovered ones. This disease is most often transmitted directly from one animal to another, but sometimes, the disease is transmitted by the hands of people during milking. Shepherds and milkers are mechanical carriers of this microbe. Under normal conditions, the agalactia microbe infects livestock mainly through the mouth. However, it may also enter the body through small udder wounds caused by the milkers' contaminated hands and cause the disease. The disease latent period is, on average, 11 to 13 days. Afterward, the symptoms of the disease begin with fever. This fever does not last long and decreases within 2 to 3 days or stops altogether. Also, milk secretion decreases, and after a few days, it completely dries up, and the only fluid that can be milked from the udder is a slimy, gray liquid. Two to fourteen days after milking, lesions of the disease may

appear in one or both eyes and in one or more joints. Eye lesions begin with swelling of the conjunctiva and are accompanied by the loss of mucous secretions, which then spread to the cornea. The eye becomes red at this stage, and its vessels become bloodshot. Joint complications occur mainly in the knee joints, as a result of which the animal moves with deformities and lameness. It should be noted that the mortality rate of this disease is sometimes seen in goats, and in some cases, it reaches 15%. The mortality rate of the disease is also high in lambs aged 1 to 2 months. The vaccine for this disease is usually recommended twice, 20 days apart, and two to three months before calving.

Rabies

Rabies is among the most important and dangerous diseases, caused by rabies virus, shared between humans and animals. Almost all domestic and wild mammals are susceptible to this disease. It should be noted that rabies has no cure, and all rabies patients, whether humans or animals, will die. Therefore, knowing how to transmit and prevent this disease is very important and necessary. As mentioned, all mammals (dogs, cows, goats, bats, sheep, rabbits, etc.) can be infected with this disease, but in our country, dogs, cats, wolves, foxes, jackals, weasels, etc. are considered the most important reservoirs of the disease. Since the disease virus is present in the saliva of rabid animals, the most important way of transmitting the disease to humans and animals is through being bitten by a rabid animal. It should be noted that scratching a cat can also transmit the disease. The disease can also be transmitted through wounds and skin scratches. The disease is often seen in two forms: furious rabies (severe) and mild rabies (silent). The symptoms of the disease in different animals sometimes vary, which are briefly mentioned in three cases.

Prevention methods include:

1. Vaccination: A: Humans: Especially people who deal with animals including veterinarians, livestock; keepers, etc.; B: Animals: Herding and domestic dogs and cats should be vaccinated;
2. Preventing domestic dogs and cats from leaving their enclosures;
3. Quarantining animals suspected of having rabies for at least ten days;
4. Rapidly transferring bitten individuals to medical centers.

Foot-and-mouth disease

The causative agent of foot-and-mouth disease is a type of virus (foot-and-mouth disease virus; FMDV). Foot-and-mouth disease causes blisters in the mouth, hooves, and sometimes the animal's udder. These blisters rupture after a short time and turn into sores. This disease causes heavy damage to the livestock industry worldwide and sometimes causes livestock deaths, especially calves and lambs. Sometimes, the disease is mild and reduces livestock growth and milk production. Therefore, the economic losses of this disease are significant. Foot-and-mouth disease is specific to cloven-hoofed animals such as cows, sheep, goats, buffaloes, and pigs, while horses and donkeys resist the disease. An animal infected with foot-and-mouth disease excretes a large amount of virus through its respiratory vapor. This contaminated respiratory vapor can cause infection of other animals over a long distance. The virus is excreted through saliva, milk, urine, feces, as well as nasal and eye secretions. This virus can infect previously unvaccinated animals. The virus enters a healthy animal's body through respiratory air, mouth, as well as skin, and eye scratches. Another way of transmitting the disease is indirect. For instance, if a person goes to an infected farm and enters another farm with the same shoes, clothes, or car, he transmits the virus and causes the disease to spread. Moving livestock without observing health rules is important in transmitting the disease. The virus causes the disease 5 to 7 days after entering a cow's body. High fever, reduced milk production, shiny discharge, sores and blisters on the tongue and mucous membranes of the mouth and hooves, as well as severe lameness are some of the symptoms of the disease. Sometimes, the death of young calves and lambs is also observed.

The following can be used to prevent and manage this disease:

1.Vaccination: Although vaccination alone is not effective in preventing the disease, it plays a significant role.
2.Infected animals play a very important role in transmitting the disease. Therefore, the purchase and sale of animals should be approved by veterinary departments.
3.Vehicles should be disinfected when entering and leaving the farm.
4. Movement between other farms should be avoided.
5. Manure should be emptied, and the farm disinfected regularly.
6. Newly imported animals should be quarantined for at least 3 weeks.

Crimean-Congo hemorrhagic fever (CCHF)

CCHF is a viral disease caused by CCHF virus, shared between humans and animals that causes bleeding under the skin or blood leakage from the body's natural pores in humans and, in some cases, causes human death. Since there is no vaccine for this disease in humans and animals, knowing how to prevent and transmit it is essential. The causative virus (CCHF) can infect a large number of animals. The most important way of transmission in animals is through ticks. When a tick attaches to an infected animal's body, the virus enters the tick's body along with the blood and is transmitted to other animals. The infected tick transmits the virus to its offspring, and in this way, many infected ticks enter the environment. The most important way of infection for humans is through the slaughter of infected animals. If an infected animal is slaughtered, the blood contains the virus, and if it comes into contact with the human body or is dispersed in the air, it can enter the body with dust, infecting human. The virus can survive in the carcass of an infected animal for up to 24 hours, and the disease may be transmitted if it comes into contact with a wound or scratch. Therefore, in some parts of the world, livestock carcasses are kept in slaughterhouse cold storage for 24 hours and then enter the market for consumption. Crimean-Congo hemorrhagic fever does not cause any specific symptoms in livestock, so the livestock farmer is not aware of the presence of the disease in the livestock.

Prevention and control methods:

1. Spraying livestock housing to combat ticks;
2. Avoidance of touching or picking ticks from livestock;
3. Slaughtering livestock in authorized slaughterhouses and preventing unauthorized slaughter;
4. Using masks, gloves, and goggles when working in livestock centers, butchers, slaughterhouses, and when handling animal carcasses;
5. Store carcasses in a cold storage at 4 ℃ for 24 hours after slaughter

Peste des petits ruminants (PPR)

This is an acute viral disease of sheep and goats, caused by a morbillivirus closely related to rinderpest virus, characterized by high fever and superficial ulcers in the oral cavity. The main transmission route is direct contact between healthy and infected animals. The disease is also transmitted through drinking contaminated water and fodder. The latent period of this disease is 4 to 7 days, characterized by symptoms of high fever, loss of appetite, severe weakness, lethargy, disheveled hair, and clear discharge from the nose and eyes. In the advanced stages of the disease, these discharges become thick and purulent, which causes nasal obstruction, and as a result, the breathing sounds of infected animals can be heard from a distance. Other symptoms of this disease include severe ulcers in the oral cavity, especially the palate and tongue, and severe and foul-smelling diarrhea. This disease can infect 100% of the animals in a herd, with the mortality rate of infected animals at this stage reaching 20-90%.

Given that this disease is viral and that treatment of infected animals does not have satisfactory results, carrying out preventive programs for this disease is the only way to deal with this disease. To prevent and care for livestock from contracting PPR, it is of particular importance to observe the following points:

1. Vaccination of susceptible livestock (lambs and goats aged 3 to 12 months);
2. Vaccination of susceptible livestock one week before transporting livestock from one region to another;
3. Purchasing livestock from disease-free areas and paying attention to the complete health of the livestock before purchasing;
4. Observing health and quarantine precautions during transportation and also at the beginning of the livestock breeding period;
5. Quarantining infected units and control traffic in these units;
6. Disinfect infected units with caustic soda or 1% formalin;
7. Quickly reporting the occurrence of the disease to the nearest veterinary unit;
8. Following the health and treatment recommendations of veterinarians regarding sick livestock;
9. Observe health principles and legal distances in the construction of livestock farms.

Hydatid cyst disease or hydatidosis

A species of tapeworm causes hydatidosis. The adult worm of this parasite, a tapeworm of the genus *Echinococcus*, lives in the intestines of dogs or wild carnivores. These worms have a tapeworm body, and the terminal segments of the body are mature and contain sexual organs. However, the segments near the serra are immature. The terminal segments of the worm's body, which contain the parasite's eggs, are excreted with the

feces of the host animal. The eggs come from tapeworms and contaminate fodder, vegetables, or water in the external environment. The condition for the continuation of this parasite's life is that its eggs enter the body of an intermediate host. This intermediate host, which may be sheep, cattle, or humans, provides the conditions for the continuation of the parasite's life cycle by feeding on fodder or vegetables and water contaminated with parasite eggs. The parasite's eggs hatch in the intestine of the intermediate host and are released. Then, they are transported to different body parts through the blood and form cysts. These cysts are primarily formed in the liver and lungs, but other organs, such as the heart, brain, etc., may also be the site of cyst formation. The parasite's intermediate host, infected with hydatid cyst disease, dies, and the definitive host carnivorous animals have access to its carcass. In that case, the immature larvae enter its intestine and mature there. Due to the importance of this disease in terms of its potential for transmission to humans, a serious combat against it is necessary. Eliminating stray dogs, preventing unauthorized slaughter, and careful and regular inspection of carcasses in slaughterhouses, eliminating slaughterhouse waste so that it is not accessible to carnivorous animals, and treating domestic dogs with appropriate medications can be useful in preventing the spread of the disease.

Treatment and prevention methods

Methods of treating livestock diseases

Livestock farmers should be responsible for examining the health of their livestock and recognizing the signs of livestock health problems so that if any signs are observed, they can try to treat them as a first step. These signs include the following:

Changes in the animal's nutritional status; the way the animal walks and stands; the color and condition of the eyes and ears; changes in the color and condition of the skin; digestive problems; lack of regular breathing; increase or decrease in the animal's body temperature; the presence of specific abnormal symptoms.

General measures for the control and prevention of livestock diseases

These measures include: prevention of environmental contamination; controlling internal parasites, arthropod pests and reduction of infection upon outbreak; isolation of sick animals; quarantining for newly acquired animals; vaccination of farm animals; deworming of animals; elimination of carriers; tuberculosis testing; Janine test; agglutination test for brucellosis; mastitis test-Cup strip test; mastitis test-California mastitis test (CMT); carcass disposal; carcass burial; carcass burning; disinfection of animal housing; disinfection of pastures; using common disinfectants (such as Damocib) and their use; preventive measures for common diseases.

Vaccination

Vaccines are a way to prevent disease and are administered according to a specific schedule that depends on the livestock production schedule, the cattle's history, the cattle's general health, and the cattle's general condition. Vaccines protect the cattle's immune system against various organisms, and if the cattle get sick, this organism will protect the cattle; if the disease is very strong, the cattle will receive it in a limited amount. Most cattle vaccines are injectable but are also used in other ways, such as nasally and orally. Depending on the livestock production plan, cattle history, current situation, and overall health of the herd, along with various other factors, vaccination programs can be modified and designed to meet the needs of each producer. A herd health program is of utmost importance. The following vaccination programs address different approaches to cattle vaccination that can be tailored to cattle production plans and prevent cattle diseases. Cattle herd vaccination programs are designed to protect animals against diseases caused by infectious organisms such as viruses, bacteria, and protozoa. Vaccines stimulate the animal’s immune system to mount a protective response against an organism. The immune system then remembers how to respond if exposed to that organism. Vaccines cannot prevent exposure to infectious organisms, but they do increase the animal’s ability to combat infection or reduce the severity of the disease if it does occur. Also, as shown in Fig. 1, the effect of vaccination on livestock health is quite clear. Fig. 1 compares livestock health in three cases: no vaccination, vaccine with 40% coverage, and vaccine with 80% coverage. By performing vaccination to 80%, the number of healthy livestock increases by 40% compared to the unvaccinated state, indicating the vaccination effect on livestock health and preventing the spread of diseases. Most cattle vaccines are injectable, although some may be administered by other routes, such as intranasal or oral. Although antibiotics are also often administered by injection, treating an animal with one of these drugs is not a vaccination but rather a treatment after the infection has occurred. Vaccines are generally classified into viral vaccines and bacterial vaccines. In general, vaccinations are administered to livestock in several time intervals.

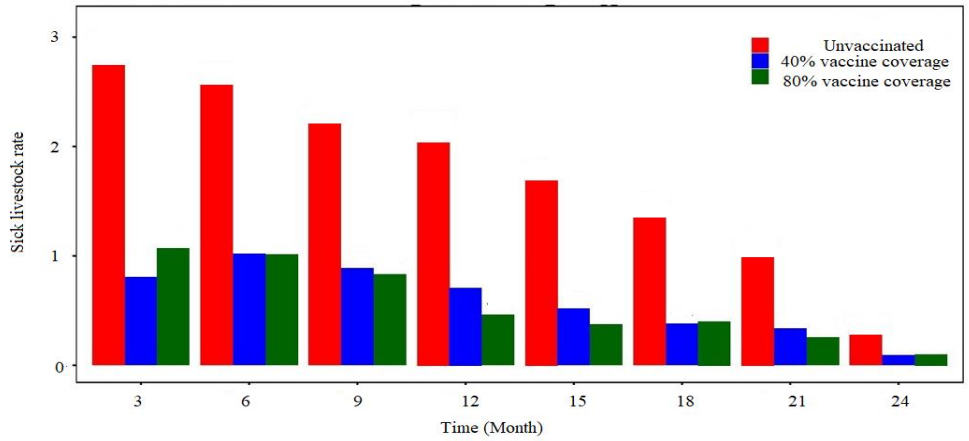

Fig. 1. Effect of vaccine on diseased livestock rate.

Calf immunization vaccines

To control and prevent calf diseases, the following vaccines should be administered to calves to increase their immunity levels: BRD 4-Vaccine, *Pasteurella* Bacterin & Leukotoxoid, *Haemophilus* Bacterin, Leptobacterin 5-Vaccine, Blackleg Bacterin, Vaccine or 8-Vaccine, Scor Vaccine, *Vibrio* Bacterin, Trich Vaccine [5].

To control and prevent cattle diseases, vaccination is carried out 3 to 6 weeks before mating: BRD 4-Vaccine, *Pasteurella* Bacterin & Leukotoxoid, *Haemophilus* Bacterin, Leptobacterin, 5-Vaccine, Blackleg Bacterin 7-Vaccine or 8-Vaccine, *Vibrio* Bacterin, Trich Vaccine (heifer).

Anaplasmosis vaccine

To prevent calf diseases, the vaccination schedule for lactating calves after calving (2 to 3 months of age) is as follows:

Vaccinations for lactating calves after calving: Viral 4-Stroke BRD, Pasteurella Bacterin & Leukotoxoid, *Haemophilus* Bacterin, Leptobacterin 5-Stroke, Blackleg Bacterin 7-Stroke or 8-Stroke.

Pre-weaning vaccination of dairy calves, this vaccination is done 3 weeks before weaning: BRD 4-way vaccine, *Pasteurella* Bacterin & Leukotoxoid, *Haemophilus* Bacterin, Leptobacterin 5-way, Blackleg Bacterin 7-way or 8-way, Bang vaccine (heifer).

Vaccines for lactating calves: Clostridial 7-sided (blackleg), IBR/BVD/PI3/BRSV, IBR = Infectious bovine rhinotracheitis, BVD = Bovine viral diarrhea, PI3 = Parainfluenza3, BRSV = Bovine respiratory syncytial virus

Vaccines for feeder calves: IBR/BVD/PI3/BRSV, Clostridial 7 (blackleg), *Mannheimia haemolytica, Pasteurella multocida.*

Vaccines related to livestock reproduction

Heifers, cows, and replacement cows should generally be vaccinated at least 6 to 8 weeks before the breeding season to ensure high immunity during the breeding season and to prevent livestock diseases: IBR/BVD/PI3/BRSV, *Leptospirosis quinque,* Vibriosis (*Campylobacter fetus*).

Recommendations for livestock vaccination

1. Most diseases occur at specific ages, conditions, and seasons, so it is essential to be familiar with them and choose the right time for administering the vaccine, booster doses, and the sequence between the two vaccines. The right time to vaccinate sheep is usually after the sheep have sheared.

2. Inform the livestock farmers in the area one or two days before the vaccination and coordinate the necessary actions.

3. Prepare clean clothes, shoes, and sterile equipment (syringes and needles) required for vaccine injection in advance.

4. Obtain the vaccine only from reputable sources and store it away from sunlight and in a cold chain according to the vaccine manufacturer's brochure until use.

5. Avoid using expired vaccines.

6. Before vaccination, evaluate the appropriate conditions for administering the vaccine and make an appropriate decision by controlling the following: animal health (no disease or weight loss), age, number and variety of animal

species, pregnancy status of the animals, presence of stress, density, and separation of animals in terms of sex, age, pregnancy and compliance with quarantine requirements, presence of appropriate facilities for restraining animals/transmissibility, history of hypersensitivity in previous vaccinations, sharpness and straightness of needles and caliber of automatic syringes, using antibiotics or drugs that weaken the immune system, and absence of wetness of the animals' bodies.

7. Store and transport vaccines in appropriate conditions. For example, to prevent mixing and errors in selection, different vaccines should be arranged and stored separately. Never place other substances and drugs in the vaccine storage cold room or store them wholly separate and distinct. The arrangement of vaccines in the cold storage should be such that new vaccines (with an extended expiration date) are placed behind old vaccines (with a short expiration date).

8. Upon delivery of the vaccine and before injection, all technical specifications of the vaccine, such as the type of vaccine, batch number, expiration date, vaccine form, and the name of the manufacturing company, should be checked and recorded in the vaccination center and pharmacy offices.

CONCLUSION

The present study examined important livestock diseases and their vaccination programs. In general, the results of the study showed that despite the aforementioned information limitations, it can be said with great confidence that the effectiveness of vaccination is significant, and for more effective control of diseases and achieving eradication (which is an achievable goal), other complementary control measures such as restricting livestock movement (especially from neighboring countries) and a slaughter test program are recommended. To prevent cattle and calf diseases, in addition to vaccination and regular check-ups of livestock by a veterinarian, another method is to observe cleanliness and hygiene in the living environment of livestock and livestock farms. The disinfectant should have a spectrum covering these three types of pathogens. Therefore, pre-treatment control is one of the most important preventive measures against livestock diseases. To prevent cattle and calf diseases, in addition to vaccination and regular check-ups of livestock by a veterinarian, another method is to observe cleanliness and hygiene in the living environment of livestock and livestock farms. Washing and disinfecting various parts of livestock farming, disposing of waste, and disinfecting bedding, drinking troughs, dining rooms, animal washrooms, etc., are all important measures to prevent livestock diseases. Vaccines are considered a way to prevent diseases. They are planned according to a specific program, which depends on the livestock production plan, the cattle's history, the livestock's general health, and general situation. Vaccines protect the livestock's immune system against various organisms. If the livestock gets sick, this organism protects the livestock, and if the disease is very severe, the livestock receives it in a limited way. Vaccination is one of the best and easiest ways to prevent livestock diseases. Vaccination is carried out on all types of livestock, such as cows, buffaloes, camels, sheep, and goats, from birth until the end of production. Vaccination protects livestock from getting infrcted by various diseases. It also prepares livestock for greater and better growth and production. A review of the past decades shows that livestock farmers have suffered great losses due to the lack of vaccination and the spread of dangerous diseases. These diseases include plague, anthrax, foot-and-mouth disease, brucellosis, tuberculosis, smallpox, enterotoxemia, gangrene, and agalactia, some of which we have described and explained in this article. Fortunately, timely livestock vaccination has greatly reduced these losses and prevented diseases that were very common in the past. Vaccination of livestock increases their immunity and reduces the transmission of diseases. This measure can help control the spread of diseases in herds and farms. By maintaining livestock's health through vaccination, livestock's productivity and production power increase. Healthy livestock can grow better and produce better products. Vaccination also provides the basis for reducing medical costs because preventing diseases prevents the costs associated with their treatment. Vaccination in livestock not only helps maintain the health of livestock but can also prevent the transmission of diseases to humans and enhance the general health of society. Therefore, vaccination should be considered a basic preventive method in livestock health management. As a result, this method maintains livestock health, reduces disease transmission, and disease treatment costs.

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