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Peste Des petits ruminants: A devastating viral disease in small ruminants

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ABSTRACT

Peste des petits ruminants is a highly lethal viral disease that affects small non-domesticated ruminants (including sheep and goats). The pathogen that causes this disease is Small Ruminant Morbillivirus (SRM), which belongs to the genus *Morbillivirus* and is included in the family *Paramyxoviridae*. The transmission rate of this virus is very high, as one animal can transmit it to another animal in a very short period. This disease is of high concern for the farmer because it has a high impact on livestock and causes many economic losses in many countries around the world. This disease is difficult to treat due to its short life cycle. Still, we use preventive measures like maintaining strict biosecurity and following proper diagnostic techniques for the early detection of the virus. Efficiently available modern vaccines are the most effective tools for prevention of animals from this lethal disease.

Keywords: Peste des petits, Small Ruminant, Small Ruminant Morbillivirus (SRM), Economic losses, Vaccination

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Introduction

Peste Des petits ruminants is a highly lethal disease that primarily affects the small ruminants (sheep and goats). This disease is present in almost the whole world, and many deaths occur due to this disease [1]. The other names of this disease include "plaque of small ruminants, contagious pustular stomatitis, ovine rinderpest, goat plaque," and many more [2, 3]. This viral disease belongs to the genus *Morbillivirus* and is included in the family *Paramyxoviridae* [1, 4]. In the beginning, it was thought that this virus was quite similar to canine distemper virus and measles virus, but recent research has shown that this virus is different from other viruses both antigenically and genetically [2]. PPR transmits very quickly from one animal to another, from one country to another, and for this reason, the WHO has classified this disease as a notifiable terrestrial animal disease [3, 5]. It causes major losses in livestock and dairy husbandry and affects almost the whole population of sheep, goats, and it causes trade restrictions, losses due to controlling this disease, drops in production values, and abortion [7, 8]. It is very difficult to treat because no treatment has been able to kill and eradicate the virus, so we use preventive measures, proper diagnostic techniques, and the use of vaccines to make animals immune to this disease, so they can tackle this disease in the future [2]. This article provides a synopsis on the causative agent, transmission, pathogenesis, economic losses, prevention, and treatment of Peste Des petits ruminants.

Causative agent

This virus is categorized into four lineages according to their genetics, three genes N gene, the H gene, and the F gene. The Lineage type with the most important gene that controls the Lineage is the N-gene. Lineage 1 is usually found in central Africa and western Africa, Lineage 2 is found in western Africa, Lineage 3 is found in the Middle East and eastern Africa, and Lineage 4 is present in South Asia and the Middle East [2, 3]. This virus contains a hemagglutinin (H), which is a coded transmembrane protein present in the viral envelope and plays an important role in the entry of the virus into the cell by attaching the virus to the surface of the cell. Secondary structure is dominant in this protein [9, 11]. The inner surface of the virus envelope consists of another protein called Matrix (M) protein [3]. This virus occurs in many forms in nature and has a capsid as well, and its genome consists of a single strand of RNA (negative-sense RNA) [12, 13]. PPRV is not host-specific, for example, it can cause the death of lions, tigers, polar bears, camels, goats, and sheep [3]. It has been confirmed by recent studies that due to its structural composition, the virus's genetic material remains intact and allows it to carry on its activity [1, 3].

Transmission

This virus transmits from one animal to another very quickly. The virus mainly transmits through three ways: direct contact between animals, via the respiratory route, via contaminated fomites (like water, bedding, feeding, and water troughs), with the respiratory route being the main route [14, 15]. The virus is found in different body secretions like nasal discharge, ocular discharge, and in the milk, urine, and feces of animals suffering from PPR small ruminants can transmit this disease to large ruminants [2, 16]. The virus has not existed for a long period in the environment, and its transmission through aerosols is not known. [3, 16]. This virus could affect camels, pigs, and large ruminants (buffalo and cattle), but we do not have any proof that the disease is related to the illness of these animals. In the latest research, it is found that pigs are involved in the spread of this disease to other animals [19].

Pathogenesis and economic losses

The pathogenesis of the virus depends upon many factors, like the immune status, breed type, and nutritional status of animals. The virus affects females more commonly in comparison to males [3]. After the entry of the virus into the host body, the virus is engulfed by antigen-presenting cells presented in the mucosal membrane of the respiratory tract. Replication of the virus occurs in lymphoid tissues and causes necrosis of these tissues. After replication, the virus is dispersed to other organs of the body [2, 3]. Small age animals are at high risk of developing this disease, with more chances in animals of 5-6 months of age [3]. The Observable signs include diarrhea, pneumonia, pyrexia, emission from the nose and eyes, but there are three forms of disease in small ruminants: per-acute form, acute form, and sub-acute form [3]. Mortality could be 100% in animals suffering from other diseases, but almost 20% to 90% animals died due to PPR [3, 7]. This disease is of prime importance in livestock and can cause significant losses by increasing the mortality rate of animals, decreasing production rate, restricting the import and export of animals, and reducing the quality of meat [3, 8]. As small ruminants play an important role in meeting the food shortage and decreasing poverty, as poor farmers use them as a source of income, so with the death of these animals the society faces a food shortage and farmers face financial losses [2,7].

Prevention and treatment

Preventive measures include maintaining strict biosecurity, using disinfectant to kill the virus, limiting the movement of suffering animals, and separating the suffering animal from the flock, slaughtering the infected animals [10]. Proper diagnostic techniques should be adopted, and diagnosis can be made grossly, i.e., seeing the lesions, but this method is not a reliable method as lesions can be similar or could match with other viral diseases like foot and mouth disease, blue tongue, and contagious ecthyma [13, 18]. Other preventive measures include vaccinating the flock. Various kinds of vaccines are present in the market, out of which following are mentioned in this article: Tissue culture rinderpest vaccine is used against this disease, and recombinant subunit vaccine has shown good results against this disease [10, 13]. Tissue culture rinderpest vaccine is a heterologous vaccine, which have shown good results against this disease and protect the vaccinated animal up to 12 months, it is called heterologous vaccine. Because it acts against both PPR virus and rinderpest virus due to their antigenic resemblance, but now countries have started making vaccines that are homologous to this virus and particularly kill this virus [3,13]. However, this disease is difficult to treat because there is no direct treatment related to this disease [3]. Antibiotics are used to prevent the secondary infection, but antibiotics are not recommended in the treatment of PPR because bacteria can develop resistance to the drugs [3, 17]. Fluid therapy and hyperactive immune serum are also used to cure this disease, but they are effective in the early stages of the disease [3]. Antivirals are also used for the treatment of this disease, but before administering an antiviral, you should know the dose rate, pharmacokinetics and pharmacodynamics of the drug [2, 3]

Conclusion

Peste Des petits ruminants is rising at a rapid speed in the whole world, causing major issues for the farmer and has a harmful impact on the economy by reducing production rate, increasing the death rate of animals, and causing restrictions in the trade. Spreading of PPR can be controlled by making a proper control program like vaccination, educating the farmer and animal handlers, surveillance of animals, separating the infected animals from the flock, and making public awareness about this disease to report to your local veterinarian if you find any kind of signs and symptoms related to this disease. Early and correct diagnosis is very important for the treatment and prevention of other animals in the flock. With the help of unceasing efforts, PPR can become the second animal disease to be eradicated from the world after rinderpest.

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