Crimson Publishers
Wings to the Research

Review Article

Review on Alternative Vaccine of LSD

Tekilegiorgis T[1]* and Tamir D[2]

[1]Department of Quality and Safety Assurance Directorate, Ethiopia.

[2]Department of Veterinary Microbiology, Ethiopia

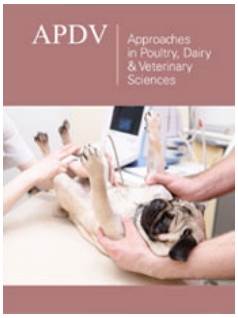
Summary

Lumpy skin disease is of significant economic impact for the cattle industry in Africa. Due to cross protection within the Capri poxvirus genus, sheep poxvirus (SPPV) vaccines have been widely used for cattle against lumpy skin disease virus (LSDV). In the Middle East and the Horn of Africa, these vaccines have been associated with incomplete protection and adverse reactions in cattle post vaccination. The different studies confirm that the real identity of the commonly used Kenyan sheep and goat pox vaccine virus (KSGP) O-240 is not SPPV but is actually LSDV. The low-level attenuation of this virus is likely to be not sufficient for safe use in cattle, causing clinical disease in vaccinated animals. In addition, Isiolo and Kedong goat pox strains, capable of infecting sheep, goats and cattle are identified for potential use as broad-spectrum vaccine candidates against all capripox diseases.

Keywords: Lumpy skin disease; Goat pox; Sheep pox

Abbreviations: LSDV: Lumpy Skin Disease Virus; SPPV: Sheeppox Virus

ISSN: 2576-9162



***Corresponding author:** Tamirat Tekilegiorgis, Department of Quality and safety assurance Directorate, Microbiology Laboratory Team Leader, Ethiopia

Submission: September 12,2019

Published: November 12, 2019

Volume 7 - Issue 2

How to cite this article: Tekilegiorgis T, Tamir D. Review on Alternative Vaccine of LSD. Appro Poult Dairy & Vet Sci 7(2). APDV.000656.2019.
DOI: 10.31031/APDV.2019.07.000656

Introduction

Lumpy skin disease (LSD) is a transboundary high impact cattle pox disease characterized by fever, skin and visceral nodules is caused by lumpy skin disease virus (LSDV) from the family Poxviridae, genus Capri poxvirus. Sheep pox virus and Goat pox virus are the two other virus species in this genus. All the vaccines used to prevent LSD are currently based on live attenuated viruses. These vaccines can be roughly divided into homologous vaccines and heterologous vaccines. The homologous vaccines are based on attenuated LSD viruses (LSDV) whereas the heterologous vaccines are based on attenuated sheep pox or goat pox viruses [1]. Good protection in cattle against highly virulent Ethiopian LSD field strain [2]. Ideal product both LSD and GTP Practically has no side effects in cattle and reduces the price. Sheeppox virus (SPPV) vaccines against has 10 times stronger dose than used for sheep is commonly used for cattle in the Middle East.

Major Vaccines LSD

Neethling strain based vaccines

The Neethling strain based vaccines are cell adapted viruses of the original Neethling LSDV. Two producers currently manufacture these vaccines in South Africa. The Neethling vaccine was four times more effective than the sheep pox vaccine for preventing a laboratory confirmed disease that is, its relative vaccine effectiveness was 77%. Of the cows vaccinated with the attenuated Neethling vaccine, 0.38% developed an adverse effect as a result of the vaccination; this was mostly very mild and was characterized by the appearance of small lumps over the body. In a small scale study in Ethiopia, a Neethling strain vaccine manufactured by the National Ethiopian Veterinary Institute failed to protect calves from challenge by a virulent LSDV strain [3].

Kenyan goat and sheep pox vaccines

The KSGP-180 and KSGP-240 viruses were collected from infected sheep and goats during outbreaks of sheep and goat pox in Kenya in the 1970s. The former was attenuated by 18 passages in bovine foetal muscle cells; the latter was only passaged six times in cell cultures. KS-1 is a virus derived from attenuated KSGP-240; it was also used as a vaccine against LSD, KSGP and hence KS-1 was shown to be a strain of LSDV [1]. Two retrospective studies in Ethiopia report that the KS-1 vaccine was ineffective for protection against LSDV

[4], but there are field reports from Kenya that the KGSP-180 vaccine is safe and protective [5]. A mixture of two recombinant KS-1 vaccines expressing either the haemagglutinin or fusion proteins of Rinderpest virus did not elicit adverse effects and showed protection from challenge with a virulent Neethling strain of LSDV in 5/5 zebu cattle six months after vaccination, in 4/5 after 12 months, in 4/4 after two years and 2/5 after three years [6]. Vaccination of dairy cattle in Israel during 1992 with the KSGP-240 caused a high rate of vaccine associated adverse effects. These were characterized by typical generalized LSD intradermal skin lesions, fever, eye and nose secretions, enlarged lymph nodes, anorexia and a clear decline in milk yield [7].

Attenuated goat pox vaccines

Several studies have shown the efficacy of goat-pox strains for protecting cattle from challenge by LSDV. The Kedong and Isiolo strains were isolated from sheep in Kenya during the 1950s, and were later shown to be goat pox viruses [8]. Both were shown to protect cattle from LSDV challenge. In a recent study a commercial vaccine based on an attenuated Gorgon strain of goat pox virus isolated in Iran was administered at two doses to ten calves, five in each dose group. All calves were completely protected from challenge by a wild Ethiopian strain of LSDV. No adverse effects were observed in the vaccinated calves [2].

Sheep pox vaccines

Currently there is not enough evidence confirming efficacy of for sheep pox based vaccines, though until recently it was believed that vaccination by sheep pox vaccines could provide protection from infection by LSDV. This probably wrong concept was based on the genetic similarity between the different capripox viruses. Earlier studies using thought to be sheep pox strains provided protection from challenge by LSDV, increased the confidence that such cross protection in fact exists. However, these were later shown as actually LSDV or goat pox strains [1]. To date, the sheep pox strains that have been used most to vaccinate against LSDV include the Romanian strain, the Yugoslavian RM-65 strain and the Bakirkoy strain used in Turkey. The Romanian sheep pox virus strain was also used in Egypt [1] and although it was claimed that it immunized cattle [9] and that it provided protection from challenge. The vaccine was shown to be ineffective in controlling the outbreak of LSD. The dose was therefore increased by a factor of ten. At this dose, however, the vaccine was demonstrated to be still significantly inferior to a Neethling vaccine used at the same dose [10].

Conclusion

The Neethling strain based vaccines are cell-adapted viruses of the original Neethling LSDV. These vaccines are currently manufactured in South Africa. The Neethling vaccine was four times more effective than the sheep pox vaccine for preventing a laboratory confirmed disease that is, its relative vaccine effectiveness was 77% Full protection is provided by this vaccine about one month after vaccination, though there is evidence that it is effective in certain individuals at two weeks as well. This vaccine might cause a mild adverse effect characterized by multiple small lumps on the skin, similar to the lesions formed during LSD. Sheep pox and Goat pox vaccine has cross protection and so used for immunization of cattle against LSD.

References

1. Tuppurainen E, Oura C (2014) Lumpy skin disease: An African cattle disease getting closer to the EU. Vet Rec 175(12): 300-301.
2. Gari G, Abie G, Gizaw D, Wubete A, Kidane M, et al. (2015) Evaluation of the safety, immunogenicity and efficacy of three capripoxvirus vaccine strains against lumpy skin disease virus. Vaccine 33(28): 3256-3261.
3. Buller RM, Arif BM, Black DN, Dumbell KR, Esposito JJ, et al. (2005) In virus taxonomy: Eight report of the international committee on the taxonomy of viruses. In: Fauquet CM, Mayo MA, Maniloff J, Desselberger U, Ball LA (Eds.), Elsevier Academic Press, Oxford, UK, pp. 117-133.
4. Ayelet G, Abate Y, Sisay T, Nigussie H, Gelaye E, et al. (2013) Lumpy skin disease: Preliminary vaccine efficacy assessment and overview on outbreak impact in dairy cattle at Debre Zeit, central Ethiopia. Antiviral Res 98(2): 261-265.
5. Davis FG, Mbugwa G (1985) The alterations in pathogencity and immunogenicity of akenya sheep and goat pox virus on serial passage in bovine foetal cell culture. J cop pathol 95(4): 565-572.
6. Ngichabe CK, Wamwayi HM, Ndungu EK, Mirangi PK, Bostock CJ, et al. (2002) Long term immunity in African cattle vaccinated with a recombinant capripox-rinderpest virus vaccine. Epidemiol Infect 128(2): 343-349.
7. Yeruham I, Perl S, Nyska A, Abraham A, Davidson M, et al. (1994) Adverse reactions in cattle to a capripox vaccine. Vet Rec 135(14): 330-332.
8. Abutarbush SM (2014) Efficacy of vaccination against lumpy skin disease in Jordanian cattle. Vet Rec 175(12): 302.
9. Davies FG (1991) Lumpy skin disease of cattle: A growing problem in Africa and the Near East. World Anim Rev 68: 37-42.
10. Ben Gera J, Klement E, Khinich E, Stram Y, Shpigel NY (2015) Comparison of the efficacy of Neethling lumpy skin disease virus and x10RM65 sheep-pox live attenuated vaccines for the prevention of lumpy skin disease-The results of a randomized controlled field study. Vaccine 33(38): 4837-4842.