Foot and Mouth vaccine

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Technology description

Vaccine technology for the prevention of Foot and Mouth disease virus.

Description

Researchers at NML have developed a vaccine creation technology that produces vaccine free of live virus and makes differentiation between vaccinated animals and diseased animals possible. The technology involves genetic alteration of a portion of the foot and mouth disease virus (FMDV) genome and introduction of that recombinant genetic material into a cell or cell line that subsequently generates non-virulent copies of the outer coating of theFMDV. These custom capsids, which do not contain any virulent genetic material, are administered to an animal and prompt the immune system to create an immune response triggered if the animal is later exposed to live, virulentFMDV.
DuringFMDVreplication, a polyprotein is split into the four structural proteins (1A, 1B, 1C, and 1D) that form the cell capsid by a protease that splits the polyprotein at specific cleavage sites.
In the NML vaccine creation technology, the sections of theFMDVgenome that create the cleavage sites between the structural proteins are replaced with genetic material that creates non-FMDVcleavage sites, preferably made of a cell protease such as furin. These sites are cleaved by protease produced by the cell or cell line chosen to generate the particles used in the vaccine.
The introduction of this recombinant genetic material into the chosen cell or cell line results in the production of empty, non-virulent copies of theFMDVcapsids. The capsids can be designed to incorporate structural proteins from a number of strains or subtypes ofFMDVif desired, thereby providing immunity to multiple strains or subtypes.
If desired, a marker can be incorporated into the capsid that indicates an animal has been immunized. Or, a vaccine that only includes capsid, but no polymerase proteins can be used, with the result that vaccinated animals will only have anti-capsid antibodies and no anti-polymerase antibodies, which allows the differentiation of vaccinated and diseased animals.

Investment Opportunities

The NML Foot and Mouth vaccine technology will be a powerful method of preventing Foot and Mouth disease. Its characteristics and capabilities make it a great stride forward in the battle against this economically devastating disease. The market for this technology is a worldwide.

The Challenge

FMD outbreaks can cause loss of animals and animal products as well as export markets. There is no effective antiviral treatment for FMD.
Though there are safe and effective vaccines for FMD, they use live virus and require complex production processes in high biocontainment conditions. Massive culling, a controversial practice that causes animal suffering, human suffering, and economic devastation, is often used to try to control outbreaks.
There are seven serotypes of FMDV and dozens of subtypes. Immunity to one serotype or subtype acquired through vaccination does not necessarily mean immunity to other serotypes or subtypes. Vaccination of an animal after exposure to FMDV may prevent disease, but it may not necessarily prevent infection, and a vaccinated animal may become a disease carrier and disease spreader. Because current vaccines contain live virus, it is difficult to tell the difference between a vaccinated animal and an infected animal.
Due to these and other drawbacks, vaccines presently used against FMD have not been systematically employed on a worldwide basis to eradicate FMD.
An effective, easy to produce vaccine that may be produced in low biocontainment conditions and allows post vaccination differentiation between vaccinated and infected animals is needed to lessen the suffering and economic devastation caused by Foot and Mouth disease.

Institution

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