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Perspective

Vol. 10 (2), pp.05-06 , September, 2022

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Proper vaccination for diseases in animals health care: A perspective

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Received: 05-Aug-2022, Manuscript No. AASTGB-22-77755; **Editor assigned:** 09-Aug-2022, Pre QC No. AASTGB-22-77755 (PQ); **Reviewed:** 23-Aug-2022, QC No. AASTGB-22-77755; **Revised:** 30-Aug-2022, Manuscript No. AASTGB-22-77755 (R); **Published:** 09-Sep-2022, DOI: 10.51268/2736-1810.22.10.061.

DESCRIPTION

All people who care for animals, including pet owners and farmers, have a duty to protect the health and welfare of the animals in their care. Prevention of disease or minimization of clinical signs of disease should be a priority to protect the health and welfare of animals.

In the UK, veterinary vaccines can be categorized based on their approved delivery route, POM-V (Prescription - Veterinary) or POM-VPS (Medical Prescription only - Veterinary vaccines by a Doctor, Pharmacist, Qualified person).

This allows us to continuously monitor the safety of these medicines and further improve them if necessary.

So, knowing that most infectious diseases originate in animals, what we do to prevent transmission to humans, and what we do to prevent animal diseases in the first place?

For example, Foot-and-Mouth Disease (FMD) alone is estimated to cost up to $21 billion annually in countries where the disease is endemic, despite effective vaccines. Also, while Foot-and-Mouth Disease has little impact on public health, the economic consequences of ignoring it and the widespread culling of animals during the 2001 Foot-and-Mouth Disease outbreak, when more than 6 million animals were culled cannot be forgotten.

It is estimated that there are approximately 1 billion cases of disease and millions of deaths from zoonotic diseases worldwide each year. The most common zoonotic diseases include Rabies, Avian Influenza (H5N1, H7N9), SARS (Severe Acute Respiratory Syndrome), MERS (Middle East Respiratory Syndrome Coronavirus), and now COVID-19.

Types of animal vaccines

Vaccines can contain live or killed bacteria, or antigens purified from these bacteria. Vaccines containing live organisms tend to elicit the best protective responses. Dead organisms or purified antigens may be less immunogenic than living organisms because they are unable to grow and spread within the host. Therefore they are less likely to optimally stimulate the immune system. On the one hand, they are often cheaper and safer.

Subunit vaccine: Vaccines containing whole dead organisms can be produced economically, but contain many components that do not contribute to protective immunity. They may also contain toxic components such as Endotoxin. Therefore, depending on the cost, it may be advantageous to identify, isolate and purify important protective antigens. These can be used in vaccines. For example, purified tetanus toxin (tetanus toxoid) inactivated by formalin treatment is used for active immunization against tetanus. Similarly, the attached fimbriae of entero pathogenic *E. coli* can be purified and incorporated into vaccines. Anti-pilus antibodies protect animals by preventing bacteria from adhering to the intestinal wall.

Antigen by gene cloning: The cost of physically purifying a particular antigen can be prohibitive. In such cases, it may be more appropriate to clone the gene encoding the

protective antigen into a vector such as Bacteria, Yeast, Baculovirus or Plants. The protective antigen is expressed when the DNA encoding the antigen of interest is inserted into the vector. The recombinant vector is propagated and the antigen encoded by the inserted gene is recovered, purified and administered as a vaccine.

DNA plasmid vaccine: Animals can also be immunized by injection with DNA encoding viral antigens. This DNA is inserted into a bacterial plasmid, a circular piece of DNA that functions as a vector. Once injected, the engineered plasmid is taken up by the host cell. Then the DNA is transcribed and the mRNA is translated to produce the vaccine protein. Thus, transfected host cells express vaccine proteins in association with major histocompatibility complex class I molecules. It not only produces neutralizing antibodies, but also cytotoxic T cells.

Alpha virus replicon: RNA vaccines also effectively induce the production of endogenous antigens. They are more stable than DNA plasmids and are more efficient as they only need to reach the cytoplasm of the cell and not the nucleus.

Attenuated vaccine: Using live organisms in vaccines has many advantages. For example, they are usually more effective than inactivated vaccines in inducing cell-mediated immune responses.

CONCLUSION

Many diseases can be successfully combated by vaccination, but despite our best efforts, developing an effective vaccine can be technically very difficult. This is due to the complex nature of vaccine development and the unique characteristics of some pathogens. Our continued investment in research and development aims to address these challenges and make more vaccines available to maintain the welfare of animals.