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Veterinary vaccines: Current status

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CURRENT STATUS

The major goals of veterinary vaccines are to enhance the health and welfare of companion animals, increase production of livestock during a cost-effective manner, and stop animal-to-human transmission from both domestic animals and wildlife. These diverse aims have led to different approaches to the event of veterinary vaccines from crude but effective whole-pathogen preparations to molecularly defined subunit vaccines, genetically engineered organisms or chimeras, vectored antigen formulations, and naked DNA injections. The final successful outcome of vaccine research and development is that the generation of a product which will be available within the marketplace or which will be utilized in the field to achieve desired outcomes. Successful veterinary vaccines are produced against viral, bacterial, protozoal, and multicellular pathogens, which in some ways have led the sector within the application and adaptation of novel technologies. These veterinary vaccines have had, and still have, a serious impact not only on animal health and production but also on human health through increasing safe food supplies and preventing animal-to-human transmission of infectious diseases. The continued interaction between animals and human researchers and health professionals are going to be of major importance for adapting new technologies, providing animal models of disease, and confronting new and emerging infectious diseases.

Vaccination aims to mimic the development of naturally acquired immunity by inoculation of nonpathogenic but still immunogenic components of the pathogen in question, or closely related organisms. The term "vaccine" was first coined by Edward Jenner to describe the inoculation of humans with the cowpox virus to confer protection against the related human smallpox virus and illustrates the close relationship between human and animal communicable disease sciences. The criteria for successful animal or veterinary vaccines are often very different from those for human vaccines counting on the animal groups into account. For example, criteria for companion animal vaccines are almost like those for human vaccines therein the health and welfare of the individual animal are primary concerns. The main objective of livestock vaccines, on the opposite hand, is to enhance overall production for the first producers, and therefore the cost-benefit resulting from vaccination is that the bottom line for this industry. Vaccination against zoonotic or food-borne infections is aimed toward reducing or eliminating the danger for the buyer and in some cases to enhance the productivity of the individual animal. Vaccination of wildlife is generally considered only with respect to infections that are transmittable to humans, although welfare concerns are of increasing importance.

While veterinary vaccines comprise only approximately 23% of the worldwide marketplace for animal health products, the world has grown consistently due mainly to new technological advances in vaccine development, the continuous development of drug resistance by pathogens, and therefore the emergence of latest diseases. Apart from improving animal health and productivity, veterinary vaccines have a big impact on public health through reductions within the use of veterinary pharmaceuticals and hormones and their residues in the human food chain. This will be an increasing impetus for activity with the more stringent requirements of regulatory agencies and consumer groups, particularly in the major markets of Europe and the United States. For example, the utilization of antibiotics in animal production has already been severely restricted, and therefore the European Union has recently banned the utilization of coccidiostats for poultry.

In addition, vaccines contribute to the well-being of livestock and companion animals, and their use is favored by the growing animal welfare lobby. The process of developing veterinary vaccines has both advantages and drawbacks over human vaccine development. On the one hand, the potential returns for animal vaccine producers are much but those for human vaccines, with lower sales prices and smaller market sizes, leading to a much lower investment in research and development within the animal vaccine area than within the human vaccine area, although the complexity and range of hosts and pathogens are greater. For example, the market size for the recently launched human vaccine (Gardasil) against papillomavirus and cervical cancer is estimated to be greater than 1 billion U.S. dollars, while the most successful animal health vaccines enjoy a combined market size that is 10 to 20% of this figure. On the opposite hand, veterinary vaccine development generally has less stringent regulatory and preclinical test requirements, which may structure the most important cost in human vaccine development, and a shorter time to plug launch and return on investment in research and development. In contrast to human vaccine development, veterinary scientists also are ready to immediately perform research within the relevant target species. This is a clear advantage over human vaccine development, as experimental infections, dose-response studies, and challenge inoculations needn't be administered in less relevant rodent models.