RESEARCH

Working with GM vaccines: engaging the public

The UK Veterinary Vaccinology Network was among the sponsors of this year's Cheltenham Science Festival, which took place from June 7 to 12. During the festival, Adrian Hill and Andrew Pollard, of the Jenner Institute, and Bryan Charleston, of the Pirbright Institute, represented the network and discussed the development of genetically modified vaccines and the issues surrounding them in animal and human health. Madeleine Clark sums up their presentation

GENETICALLY modified (GM) vaccines are rationally created by either expressing a subset of the genes that are not pathogenic or by modifying the pathogenic genes from the target pathogen. In the latter case, proteins from the pathogen are precisely manipulated, deleted or added by what is termed reverse genetics. Alternatively, safe viruses are used as vectors to deliver these proteins. These vaccines can be used as robust control measures against high impact diseases in both animals and people.

There have been great successes for viral-vectored vaccines in the veterinary field with more than 12 such vaccines currently licensed for use. However, these vaccines are more restricted for human use although they can be developed rapidly in emergencies, as noted in the recent Ebola outbreak. The GM connotation causes a perceived fear that these vaccines may be unsafe to the user and to the environment.

Historically, vaccines were created by passaging the disease-causing agent through transformed cell lines or in atypical hosts. This traditional development technique has produced successful vaccines, including the Jenner vaccine used to eradicate smallpox and the Plowright vaccine used against rinderpest in cattle. A powerful argument in support of the development of GM vaccines is that these traditional vaccines were accepted without having complete scientific understanding of the mechanisms involved. With newer GM vaccine technology and a rational approach, genetic modifications can be carefully and intentionally introduced, making the vaccines intrinsically safer. There is a much better scientific understanding of why these vaccines work effectively and safely.

Complementary scientific developments have been used to aid in vaccine design and analysis of pathogen evolution. Sequencing of the rinderpest vaccine virus approximately 80 years after its introduction showed that were very few changes in the viral genome. Although the vaccine proved to be safe, current technologies could be used to introduce more significant changes in the genome.

Photograph: Teresa Maughan/ Pirbright Institute

(from left) Adrian Hill, Andrew Pollard and Bryan Charleston at the Cheltenham Science Festival

Concerns

There are stringent regulations on the release of GM vaccines and careful risk assessments are performed to ensure the environment, animals and people are protected from any adverse effects. There are, however, worries that GM vaccines could recombine and evolve to cause an infectious pathogen. This would be unlikely as the pathogenic genes have been manipulated/altered/removed. Furthermore, there would be very little risk of the attenuated viruses or viral vector recombining, causing adverse effects or reverting to virulence, especially as replication-defective viral vectors have been developed. The viral-vectored oral bait vaccines against rabies for wild foxes were cited as a very successful and safe product which has had a huge public health benefit.

Regulated approaches, coupled with the use of rational vaccine design, sequencing technologies, rigorous analysis of side effects and surveillance after vaccine implementation, will provide a holistic approach to GM vaccine development, retaining the importance of safety and effectiveness of the vaccine to protect healthy animals and humans from the impact of pathogenic disease.

About the Veterinary Vaccinology Network

The Veterinary Vaccinology Network is a five-year initiative funded by the Biotechnology and Biological Sciences Research Council. Its vision is to foster a multidisciplinary community that aims to address the unmet needs in veterinary vaccinology, continuing in the fight against animal diseases and consequently those that have the potential to spread to humans. The network aims to enhance collaborations between scientific researchers, industry, policymakers and regulators to design, develop and deliver safe and effective next-generation vaccines. This is supported by the development and uptake of novel tools and technologies as well as addressing the 'unmet' needs in protective immunity in the field of veterinary vaccinology. More information can be found at www.vetvaccnet.ac.uk

A survey carried out among the public at the Cheltenham Science Festival found that 88.3 per cent were in favour of GM vaccines. When asked what the public thought was the most important criterion of a vaccine, 49.2 per cent said safety, with 27.9 per cent saying effectiveness.

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