Bug barcode readers hold out promise of universal vaccines

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Veterinary scientists have made a discovery that promises to deliver a new approach to fast development of cheap vaccines that are effective in all mammals - not just humans or another particular species. They propose that by harnessing the system that reads the biological 'barcodes' of infectious microbes such as food poisoning bacteria, flu viruses and protozoa that cause malaria, one vaccine could be made to prevent a particular disease in all mammals. The research is discussed in the new Autumn edition of Business, the quarterly magazine of the Biotechnology and Biological Sciences Research Council.

The scientists, led by Professor David Haig, University of Nottingham, Dr Tracey Coffey and Dr Jayne Hope, Institute for Animal Health, Compton, Professor Dirk Werling, Royal Veterinary College London and Dr Elizabeth Glass and Dr Oliver Jann, The Roslin Institute, have used a 'one medicine' approach, which recognises that many diseases and immune system response are common across different species and removes the largely artificial distinction between humans and other animals. This approach can be particularly powerful when investigating zoonoses - diseases that jump the species barrier.

Researcher Professor Dirk Werling from the Royal Veterinary College, said: "Vaccines that are effective in several species are entirely feasible and could potentially be cost effective. Since any vaccine can be difficult and expensive to develop and manufacture, it would be desirable to really hone the effectiveness of a single vaccine so that it can be used in a variety of circumstances. What we have found is

something that could be used to adapt one vaccine to many mammals.

"There are very subtle differences according to species, or even geographical location, in the system that alerts the immune system of a mammal to harmful bacteria, viruses and other threats. This is down to tiny variations in how animals have evolved alongside these threats and manifests as slightly different forms of a type of molecule called a toll-like receptor or TLR. TLR's work like a barcode reader to identify a particular threat to the health of an animal and give the immune system the information it needs to respond and in this way are very important to determining the success of vaccination. Local differences in this system in humans might partly explain the variable success rate of Tuberculosis vaccination programmes around the world."

One way to make a good vaccine even more effective is to accompany it with a "helper substance", known as an adjuvant.

Professor Werling continued: "We already know that molecules that interact with TLRs make very good vaccine adjuvants and with the knowledge we have gained about species and geographical variations, we have the ability to use these strategically."

Professor Janet Allen, BBSRC Director of Research said: "When we embark on research to understand the fundamental workings of something as complicated as the immune system of mammals, we really don't know what gems we might discover. To be able to maintain the health of people and animals using one single vaccine would be a great development and shows that there is value in understanding the basic biology of how things work.

"There are infections by microbes such as Salmonella, E.coli and Campylobacter that can occur in many species and cause a significant risk to health and having a 'one medicine' approach to preventing and

treating these can really only be a good thing."

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