

Next-generation vaccines—eliminating the use of needles

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Lead scientist Professor Simon Cutting, from the School of Biological Sciences at Royal Holloway, has developed the jabs through the use of probiotic spores. He carried out fundamental studies into the biology of the bacterium *Bacillus subtilis* which attracted the attention of microbiologists due to its ability to form spores that can last millions of years before germinating under the appropriate environmental conditions.

Professor Cutting says: "The mechanisms by which this process occurs have fascinated microbiologists for decades making it one of the most intensively studied bacteria. Its simple life cycle and ease of use make it an ideal laboratory subject."

Professor Cutting discovered that the *Bacillus* spores act as ideal vehicles to carry antigens and promote an immune response. He explains: "Rather than requiring needle delivery, vaccines based on *Bacillus* spores can be delivered via a [nasal spray](#), or as an oral liquid or capsule. Alternatively they can be administered via a small soluble film placed under the tongue, in a similar way to modern breath fresheners. As spores are exceptionally stable, vaccines based on *Bacillus* do not require cold-chain storage alleviating a further issue with current vaccine approaches."

As well as eliminating the pain associated with needles, oral vaccines provide greater benefits including being safer to administer, especially in developing countries where HIV is rife, being inexpensive to produce and easier to store and reducing concerns of adverse reactions.

Professor Cutting has carried out pre-[clinical evaluation](#) of *Bacillus*-based vaccines for a number of diseases including Tuberculosis, influenza and tetanus but most recently he has been investigating the potential for use of the vaccines against a disease of particular relevance to the West - [Clostridium](#) difficile

"*C. difficile*, is a gastrointestinal infection that is commonly picked up following hospital stays and causes around 50,000 infections and 4,000 deaths per year in the UK, mostly in elderly patients. Currently, there is no vaccine against the disease, and although several approaches are currently undergoing clinical trials, none are expected to provide full protection, and new solutions are urgently needed," says Professor Cutting.

He adds: "*Bacillus* based vaccines offer distinct advantages as unlike other approaches, oral delivery can cause a more specific [immune response](#) in the gastrointestinal tract to fully eliminate *C.difficile*."

Professor Cutting has recently received private seed investment to form a company, Holloway Immunology, to develop the *bacillus* vaccine technology and concentrate on three lead vaccines for Tuberculosis, *C. difficile* infection and influenza (flu). The company is currently looking for investors to help fast track the implementation of these jabs and contribute to the transformation of vaccine delivery around the globe.

Provided by Royal Holloway, University of London

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