New method makes vaccines stable at tropical temperatures

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A cheap and simple way of making vaccines stable -- even at tropical temperatures -- has been proven to work by scientists at Oxford University. Credit: Nova Bio-Pharma Technologies

A simple and cheap way of making vaccines stable - even at tropical temperatures - has been developed by scientists at Oxford University and Nova Bio-Pharma Technologies.

The British technology has the potential to revolutionise vaccination efforts, particularly in the developing world where infectious diseases kill millions of people every year, by removing the need for fridges, freezers and associated health infrastructure.

The work, funded by the Grand Challenges in Global Health partnership with other funds from the Wellcome Trust, is published in the journal

Science Translational Medicine.

Preparing vaccines that do not need refrigeration has been identified as one of the major unsolved problems in global health.

'Currently vaccines need to be stored in a fridge or freezer,' explains lead author Dr Matt Cottingham of the Jenner Institute at the University of Oxford. 'That means you need a clinic with a nurse, a fridge and an electricity supply, and refrigeration lorries for distribution.

'If you could ship vaccines at normal temperatures, you would greatly reduce cost and hugely improve access to vaccines,' he says. 'You could even picture someone with a backpack taking vaccine doses on a bike into remote villages.'

In the proof-of-concept study, the team showed it was possible to store two different virus-based vaccines on sugar-stabilised membranes for 4 months at 45°C without any degradation. The vaccines could be kept for a year and more at 37°C with only tiny losses in the amount of viral vaccine re-obtained from the membrane.

'We've developed a very simple way of heat-stabilising vaccines and shown it works for two viruses that are being used as the basis for novel vaccines in development,' says principal investigator Professor Adrian Hill of Oxford University. 'This is so exciting scientifically because these viruses are fragile. If we are able to stabilise these, other vaccines are likely to be easier.'

The team's method involves mixing the vaccine with the sugars trehalose and sucrose. The mixture is then left to slowly dry out on a simple filter or membrane. As it dries and the water evaporates the vaccine mixture turns into a syrup and then fully solidifies on the membrane.

The thin sugary film that forms on the membrane preserves the active part of the vaccine in a kind of suspended animation, protected from degradation even at high temperature. Flushing the membrane with water rehydrates the vaccine from the membrane in an instant.

'The beauty of this approach is that a simple plastic cartridge, containing the membrane with vaccine dried on, can be placed on the end of a syringe,' explains Dr Cottingham. 'Pushing a liquid solution from the syringe over the membrane would then release the vaccine and inject it into the patient.'

The process is general and could be used for many types of vaccines and sensitive biological agents.

Professor Hill adds: 'The World Health Organisation's immunisation program vaccinates nearly 80% of the children born today against six killer diseases: polio, diphtheria, tuberculosis, whooping cough, measles and tetanus. One of the biggest costs is maintaining what's called the cold chain - making sure vaccines are refrigerated all the way from the manufacturer to the child, whether they are in the Western world or the remotest village in Africa. If most or all of the vaccines could be stabilised at high temperatures, it would not only remove cost, more children would be vaccinated.'

Provided by Wellcome Trust

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