

Vaccinating against psoriasis, allergies and Alzheimer's a possibility, research shows



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Research from the Universities of Dundee and Oxford has shown how combining the tetanus vaccine with a viral particle that normally affects cucumbers can be used to treat psoriasis and allergies, and may even protect against Alzheimer's disease.

Scientists led by Dundee's Dr John Foerster and Oxford's Professor Martin Bachmann, were able to take the protein coat of cucumber mosaic virus and incorporate a tetanus vaccine-derived protein structure known to stimulate the immune system in order to create vaccines to treat multiple chronic diseases.

The vaccine showed positive results in models of psoriasis and cat allergy and was shown to raise antibody levels thought to be beneficial in Alzheimer's disease. These vaccines can be either preventative, which is the hope for Alzheimer's but also therapeutic, meaning they can cure a disease like psoriasis after it has already been established.

More research is required to test the efficacy of the therapeutic in a clinical setting, but the Dundee-Oxford study raises the possibility of hundreds of thousands of people being spared the ravages of chronic diseases.

Dr Foerster said, "As an academic dermatologist with special interest in the immune system, my specific attention is on vaccines to be developed against chronic skin diseases. The idea is pretty simple – for diseases such as psoriasis or eczema, the newest and most effective medicines on the market are so-called 'antibodies', which are what you and I produce against bugs in a common cold.

"For chronic diseases, these antibodies are specially made against one of the body's own proteins. By blocking that single protein, the disease gets better. To use the example of psoriasis, a protein called Interleukin 17 needs to be active for the disease to progress. By creating a vaccine that stimulates the body to make antibodies against Interleukin 17 itself we can replace the need for frequent and expensive injections and make this type of treatment much more affordable and accessible to patients who could otherwise not afford specially made antibodies.

"Our research shows that this technique works in mice and, importantly, our new vaccine technology shows that it is likely to be a more effective type of vaccine than existing ones in older people. Since many patients with chronic conditions like psoriasis are elderly this technology may work much better to obtain effective vaccines."

The paper is published today in the journal *npj Vaccines*. The researchers are now looking to begin clinical testing of the vaccine and have already received regulatory approval to initiate testing in humans. Present antibodies for psoriasis treatment typically need to be injected at least once a month to keep working, and cost around £10,000 per patient annually. A vaccine would offer much more affordable treatment.

In Alzheimer's, it is known that a protein called beta amyloid can cause brain damage resulting in inhibited function. Previous unsuccessful trials saw patients injected directly with antibodies against the same target but the new research suggests that starting the treatment – in the form of prophylactic vaccines – could provide a way of offering treatment even before the disease becomes clinically apparent. It is possible such prophylactic approach may work better and this could not be done using frequent antibody injections.

Professor Bachmann, Professor of Vaccinology at the Jenner Institute in Oxford, said, "Alzheimer's disease usually develops in elderly people. The fact that the vaccine described here is optimised for old individuals seems therefore particularly helpful. An additional important aspect of the current work is that we developed a platform technology and are currently broadening our preclinical studies to vaccines against Parkinson's disease as well as chronic pain."

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More information:

Andris Zeltins et al. Incorporation of tetanus-epitope into virus-like particles achieves vaccine responses even in older recipients in models of psoriasis, Alzheimer's and cat allergy, *npj Vaccines* (2017). DOI: 10.1038/s41541-017-0030-8

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University of Dundee