On the horizon: An acne vaccine

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A new study published in the *Journal of Investigative Dermatology* reports important steps that have been taken towards the development of an acne vaccine. The investigators demonstrated for the first time that antibodies to a toxin secreted from bacteria in acne vulgaris can reduce inflammation in human acne lesions.

"Once validated by a large-scale clinical trial, the potential impact of our findings is huge for the hundreds of millions of individuals suffering from acne vulgaris," explained lead investigator Chun-Ming Huang, Ph.D., Department of Dermatology, University of California, San Diego. La Jolla, CA, USA, and Department of Biomedical Sciences and Engineering, National Central University, Jhongli, Taiwan. "Current treatment options are often not effective or tolerable for many of the 85 percent of adolescents and more than 40 million adults in the United States who suffer from this multi-factorial cutaneous inflammatory condition. New, safe, and efficient therapies are sorely needed."

Even though acne is not a life-threatening disease, its psychological burden is high. It is difficult to conceal and frequently impairs the self-esteem of affected individuals, especially during adolescence—a period of important physical, emotional, and social development. Acne lesions and/or scars may persist in adults. Current medications are often insufficient and can cause difficult-to-tolerate side effects ranging from skin dryness and irritation, to depression, suicidal thoughts, and increased rates of birth defects. An acne vaccination could circumvent potential adverse effects of topical or systemic retinoids and antibiotics, the current treatment options.

This vaccine would be the first to target bacteria already in human skin, instead of invading pathogens. After first demonstrating that Christie-Atkins-Munch-Peterson (CAMP) factor, a toxin secreted from the Propionibacterium acnes (P. acnes) bacteria, can induce inflammatory responses, the investigators explored in mice and ex vivo in human skin cells whether they could inhibit inflammation by employing antibodies to neutralize this virulence factor. Their findings show that the application of monoclonal antibodies to CAMP 2 factor did indeed decrease the inflammatory response.

Both the significance of the findings and the need for continuing

research were expressed in an accompanying commentary. "While addressing an unmet medical need and providing an appealing approach, acne immunotherapies that target P. acnes-derived factors have to be cautiously designed to avoid unwanted disturbance of the microbiome that guarantees skin homeostasis. Whether or not CAMP factor-targeted vaccines will impact multiple P. acnes subtypes and other commensals has to be determined, but acne immunotherapy presents an interesting avenue to explore nonetheless," wrote Emmanuel Contassot, Ph.D., Dermatology Department, University Hospital and Faculty of Medicine of the University of Zürich, Zürich, Switzerland.

The choice of the antigen to be targeted is critical, not only as a determinant of the efficacy of the vaccine, but also to minimize possible unintended effects or cross-reactivity impairing the microbial equilibrium and skin barrier homeostasis. Future studies will address these factors and focus on engineering a non-toxic chemical or targeted vaccine formulation for its human application.

The findings support P. acnes CAMP factor as a promising target for acne immunotherapy. This is an important observation since CAMP factor had not been previously implicated in the pathogenesis of acne vulgaris. The study also provided a human acne model using acne biopsies, as there is not a fully satisfactory animal model for acne studies.

More information: Yanhan Wang et al, The Anti-Inflammatory Activities of Propionibacterium acnes CAMP Factor-Targeted Acne Vaccines, *Journal of Investigative Dermatology* (2018). DOI: 10.1016/j.jid.2018.05.032