Tailoring Proteins to Fight Against Anthrax

Anthrax is an acute infectious disease that is caused by the bacterium, *Bacillus anthracis*. It occurs naturally in the soil in the form of dormant spores, only becoming active after entering the living host. It could also be used as a bioweapon.

Currently available human anthrax vaccines show an immune response against a Bacillus protein- protective antigen (PA) – a protein that helps in transporting bacterial toxins inside the cells. It means that the immune response is triggered only when spores germinate in the body and start producing bacterial proteins (toxins). Anyone vaccinated with such a vaccine would show no immune response against Bacillus spores and will act only after spores germination and toxin release.

The scientists from the Defence Research and Development Organization, Mysore and Jawaharlal Nehru University, New Delhi have developed a more potent anthrax vaccine by engineering a fusion protein, which is effective not only against bacterial toxins but spores too, thus providing complete protection. The study has been published in the journal, *Frontiers in Immunology* (2019, **10:** 498). This bivalent protein was formed by splicing up moieties of two different proteins: domain IV of PA and a protein from the outer wall layer of spore. The scientists injected the mice with the fusion protein, resulting in higher production of antibodies against the fusion protein. These antibodies depicted a better immune response against anthrax by enhancing the spore killing to 90% and retarding spore germination to 3.3%. The researchers observed that the passive transfer of these antibodies resulted in 100% survival against the anthrax toxin and 83.3% survival against spore challenge. The researchers now plan to investigate the protective efficacy of this vaccine in higher animal models.

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