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Adenovirus vector-induced innate-adaptive protective immunity duo against viral and bacterial infections

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Abstract

We report that intranasal administration of an E1/E3-defective (ΔE1E3) adenovirus serotype 5 (Ad5)-vectored influenza vaccine could induce seroconversion in human volunteers without appreciable adverse effects, even in subjects with pre-existing Ad5 immunity. Mice and ferrets were well protected against challenge by a lethal dose of an H5N1 avian influenza virus following intranasal instillation of an Ad5 vector encoding hemagglutinin (HA) in a single-dose regimen. Moreover, the ΔE1E3 Ad5 particle itself without transgene could confer rapid prolonged-broad protection against a variety of influenza virus strains by inducing an anti-influenza state in a drug-like manner, conceivably by activating a specific arm of innate immunity. An Ad5 vector encoding HA consolidates drug and vaccine into a single package, which allows the Ad5 backbone to confer nearly immediate and prolonged (*e.g.*, 5 hours to 47 days) protection against influenza; followed by HA-mediated adaptive immunity before the ΔE1E3 Ad5 backbone-induced anti-influenza state declines away. In addition to ΔE1E3 Ad5's capacity to rapidly induce an anti-influenza state, an Ad5 vector encoding a bioengineered *Bacillus anthracis* protective antigen (PA) could also confer rapid (*e.g.*, 1-2 days) prophylactic or post-exposure anthrax therapy with synergy to antibiotic treatment in a murine model. Both rabbits and macaques were well protected by an Ad5-PA-vectored nasal anthrax vaccine in a single-dose regimen against inhalational anthrax following challenge with a lethal dose of *Bacillus anthracis* Ames spores

Biography

Dr. De-chu C. Tang is a Korean Brain Pool Program Scientist and the Scientific Founder of Vaxin Inc. He obtained his PhD in Microbiology from Indiana University in 1989. He carried out his postdoctoral work at Baylor College of Medicine, Duke University, and the University of Texas Southwestern Medical Center. He joined the faculty at the University of Alabama at Birmingham in 1994; subsequently founded Vaxin Inc. on UAB campus in 1997; and was responsible for Vaxin's daily operation as the Chief Scientific Officer until 2012. Dr. Tang was one of the pioneers during the development of DNA vaccines, noninvasive skin patch vaccines, adenovirus-vectored influenza and anthrax vaccines, adenovirus-vectored poultry vaccines, as well as the drug-vaccine duo platform technology. He received the Wallace H. Coulter Award for innovation and entrepreneurship in 2000; Vaxin Inc. was selected as a Tech Museum Awards Laureate in 2007; Dr. Tang was selected as a distinguished overseas scientist by the Korean Brain Pool Program in 2012 and subsequently recruited to Chung-Ang University and International Vaccine Institute in Seoul as a Scientist.