Pollen Grains for Oral Vaccine Delivery

This oral vaccine delivery system uses pollen grains or plant spores as the vehicle for vaccine delivery. Oral vaccines have the advantage of being painless, easy to self-administer, and less expensive to produce and disseminate. Pollen grains are an excellent vehicle for oral vaccine delivery because their strong outer shell doesn't dissolve in stomach acid, allowing the vaccine to be absorbed intact through a patient's intestinal walls. Pollen grains are less potentially dangerous than the attenuated viruses and bacteria used to deliver some injected vaccines, which can become virulent and have the potential to trigger cancer-causing oncogenes. Pollen grains are a low cost, effective vaccine delivery vehicle that could revolutionize oral vaccine delivery and allow for the creation of new vaccines.

Oral Vaccines Cheaper to Produce, Deliver, More Effective

Oral vaccines offer advantages over injected vaccines because they are needle-free, child-friendly, convenient, painless, and amenable to self-administration. Because oral vaccination doesn't require needles, it eliminates needle stick injuries and sharp medical waste, and is less expensive to deliver. The cost to produce oral vaccines is expected to be lower because they require a less stringent degree of sterilization than injectable vaccines.

Oral vaccines can confer better mucosal immunity than injected vaccines because they enter the body through a patient's stomach and intestines. This mucosal immunity could be more effective against pathogens that enter the body through mucosa in the stomach, lungs, or nasal passages.

Pollen Grains Produce Immune Response in Mice

In tests on mice, a formulation of lycopodim clavatum (as the vaccine delivery vehicle) and ovalbumin (as the vaccine antigen), consistently produced a very strong immune response. The immune response achieved with the lycopodium clavatum spores was far stronger than that achieved with a cholera toxin/ovalbumin formulation. Cholera toxin is currently used to test a vaccine's effectiveness, but, because of its toxicity to humans, isn't an option for vaccine administration. These tests show that pollen grains (including plant, moss, fern, algae, and bacterial spores) are superior to vaccine testing mechanisms currently in use and present a viable option for oral vaccination.
Applications

- Oral vaccine antigen delivery, immunomodulators for infectious disease, toxins, allergies, cancer, and various auto-immune diseases
- Oral delivery of many vaccines that are currently injected
- Development of new vaccines that are only delivered orally (e.g., new anthrax vaccine)
- Self-administered vaccines to allow mass inoculation without the need for medical professionals (excellent for soldiers in war zones with the potential of exposure to disease or pathogens)

Advantages

- Can enable oral vaccines to become a reality
- Painless and child-friendly, which may increase compliance with vaccination schedules
- Self-administrated, requiring no trained personnel, improving the ability to vaccinate large numbers of people in the event of a pandemic
- No needles or sharp medical waste
- Less costly to produce and distribute
- Effectively delivery oral vaccines confer mucosal immunity

Inventors

Gill Harvinder

Dr. Harvinder is an assistant professor of chemical engineering. He received his Ph.D from Georgia Institute of Technology and post doctoral training in microbiology and immunology at Emory University. His areas of study include drug delivery, vaccines, immunology, and nanomedicine. Dr. Gill received an R21 award from the National Institute of Allergy and Infectious Diseases to develop gold nanoparticles as a platform for flu vaccine design and delivery.

Gill Laboratory