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Vaccine of the future: Virus-like particles to trigger body's defence

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Virus-like particles to trigger body's defence



Virus-like particles (VLPs) are among the most exciting emerging vaccine technologies for generating effective and long-lasting protection. It is an advanced technology that has a number of advantages over traditional vaccines. These resemble viruses that are non-infectious as they do not contain any viral genetic material.

A number of companies around the world are working on developing vaccines with these virus-like particles. US-based companies Medicago and Novavax are pursuing clinical trials of VLP-based influenza vaccines. Also, Taiwan-based emerging company, Medigen, has developed VLP for the development of new vaccine candidates against human immunodeficiency virus (HIV), hepatitis B virus (HBV), human papilloma virus (HPV) and influenza virus. (Also read Vaccine delivery technologies of the future)

The particles are made to look like viruses, allowing them to be recognized by the body's immune system. They help in effectively activating key aspects of the immune response to achieve potent immune stimulation and to provide immunological memory. Because VLPs closely match the exact structural components, shape and size of the actual pathogen, they more effectively trigger key parts of the immune system for a longer lasting and more robust immune response.

Medicago has developed VLPExpress, a high throughput platform that rapidly expresses, purifies and tests candidate VLPs. The company is conducting phase I study of its pandemic H5N1 influenza VLP vaccine candidate and has received positive results from an immunogenicity study in mice with this new vaccine candidate for the influenza A virus. Results have

demonstrated that the company's H1 VLP vaccine induced a positive immune response in 100 percent of the mice against the H1N1 influenza.

"There is a unique opportunity in VLPs for vaccine development. It takes 19 days from gene sequencing to incubation, extraction, purification and flu VLP development. The company is conducting phase II trial for H5N1 in Canada and phase I trial in the US for H1N1 using this technology," says Mr Frederic Ors, vice president, Business Development, Medicago.

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Medicago's VLPs mimic the native structure of a virus, allowing them to be recognized readily by the immune system without the core genetic material, making them non-infectious and unable to replicate. The VLPExpress platform identifies the best VLP-based antigen presentations for a disease-causing agent within 10 weeks. Each antigen or antigen variants are rapidly screened for their potential to provide protection. The use of VLPs for antigen surface display allows for the full exploitation of the immunogenic potential of the best antigens. The combination of these technologies in the VLPExpress platform allows researchers to express numerous target proteins of a pathogen to build a library of all possible VLPs in a short time.

Taking the technology to Asia, Medicago has collaborated with Mitsubishi Tanabe Pharma to develop and commercialize at least three new rotavirus VLP vaccine candidates.

US firm Novavax is in the advanced development stage of VLP-based vaccines against both seasonal and pandemic influenza. In a clinical trial of more than 4,000 subjects in Mexico, the H1N1 VLP vaccine was found to be well-tolerated and immunogenic even at the lowest dose of five micrograms tested and after one immunization.

The technology holds huge promise for the future and promises effective alternative to the present set of vaccines available around the world. "VLPs can be exploited as platforms to increase the immunogenicity of poorly immunogenic antigens and this technology is useful for future therapeutic vaccination," says Dr Gerardo Guillen, Biomedical Research Director, Centro de Ingenieria Genetica y Biotecnologia, Cuba.