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Editorial

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Cell Derived Virus-Like Particles (VLP) in Future Vaccine Development

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Traditionally, viral vaccines have been based on inactivated or live attenuated viruses. While in general, they are highly effective, in some cases they fail to provide adequate immunogenicity, safety or can even cause adverse events. In the case of live attenuated vaccines, achieving a stable optimally attenuated virus is often difficult and there is the potential for reversion. Transmission to the immunocompromised individuals is an additional concern. Inactivated vaccines run the risk of inducing enhanced disease. Single proteins, including single protein nano-particle vaccine attempts have not been successful to date for human use. Various other ways of making vaccines have also been attempted by engineering the virus.

Virus-like particles (VLP) show much promise as future vaccines. VLP vaccines such as HPV are already available commercially. These VLPs are safe because they are devoid of any viral genetic material and therefore not infectious.

The VLP technology using the expression of one or more viral structural proteins in cells from cDNA results in spontaneous assembly of particles that resembles the real virus morphologically and immunologically. Larger the number of viral protein particles better the immune response expected to be. However, for the vaccines to be cost-effective, the number of proteins have to be limited; here the improved immune response has to be taken care of by adjuvants.

We used a mammalian cell-derived VLP technology to generate VLPs in a short time and to develop vaccines on the fast tract. Fundamentally, the technology can be used to generate VLPs for any virus. We have produced Nipah virus VLPs (NiV VLPs) and shown that the adjuvanted NiV VLPs protects in the hamster model with single inoculation. We have produced respiratory syncytial virus (RSV) VLPs and shown that the adjuvanted RSV VLPs protects in both cotton rat and mice models the lower and upper respiratory tracts. Adjuvanted RSV fVLPs showed potent neutralizing antibody response and protection in mice. We have shown that we can develop VLPs in a short time. Zika VLP proteins were assembled together and VLPs were made in less than 2 months. The technology has the potential to handle unexpected, uncontrolled outbreaks quickly.