American Rescue Plan

DEVELOPING MORE EFFICIENT PURIFICATION OF VIRUS-LIKE PARTICLES (VLPS) FOR VACCINES

AFFINITY PRECIPITATION PURIFICATION OF VIRUS-LIKE PARTICLES

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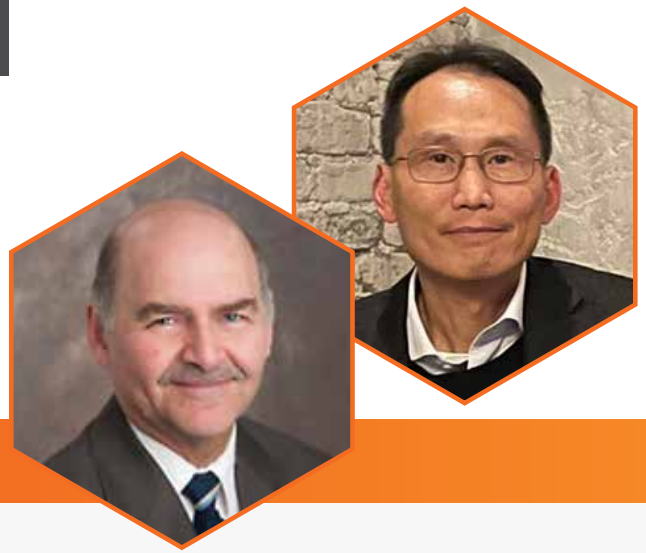

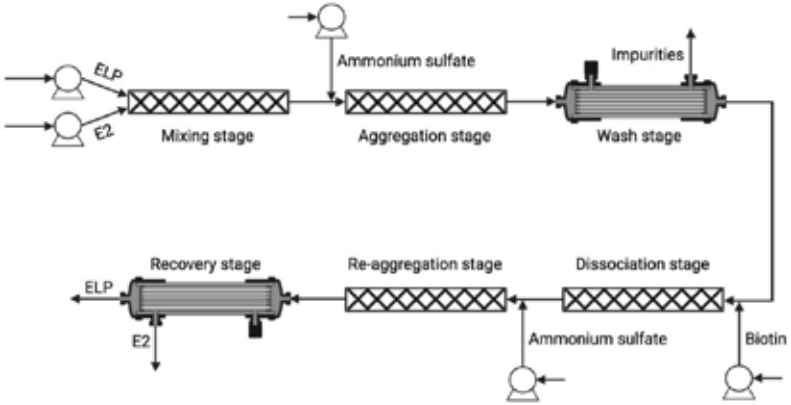

University of Delaware, Newark, DE

Type:
Academic Research Organization

» Abraham Lenhoff and Wilfred Chen,
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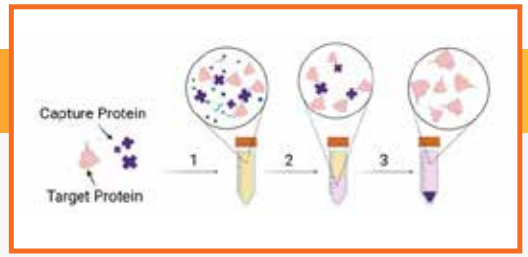

INDUSTRY NEED

Virus-like Particles (VLPs) are widely used as vaccines for a wide range of diseases, including COVID-19 and vectors to deliver therapeutic genes in gene therapy. As especially big and complex moieties, their manufacture can be expensive (>$1million for 100-liter fermentation) and inefficient (yields below 50%), requiring significant scale-up to produce enough VLP suitable for patients. Chromotography does not work as well for purification with these virus or virus-like particles, because their large size prevents them from integrating the particle, thus limiting surface area. Alternatives are needed to find cost-effective means for manufacturing VLPs in order to harness their potential for life-advancing therapeutic treatments.

SOLUTION

In this project, the University of Delaware team developed a spontaneous precipitation process for selective, non-chromatographic separation of viruses and VLPs. Through affinity precipitation, the product is driven to associate with itself in the liquid through a ligand that binds to the target rather than to solid particles, thus forming large clusters that are insoluble and allowing the impurities to be removed with the solvent. The insoluble clusters are then broken up with the addition of a reagent and the target is recovered so the ligand can be reused.

OUTCOME

Through the design and synthesis of the whole molecular machinery for this affinity precipitation on virus like particles, the team has demonstrated the full capture and recovery cycle. This non-chromatographic alternative combines the high selectivity of a chromatography-like affinity system with the operational benefits of working entirely within liquids. Purification is simplified and the capture ligand can be reused for additional VLP purification. Achieving 90% plus recovery of the VLP produced in the original cell culture, this method provides a twofold improvement in yields. The team then developed a proof of principle for using this method as a continuous process for potential use in actual manufacturing and eventual large scale up.

> *“We experienced first-hand the difficulty of making these virus-like particles, but fortunately, by working on this project and with NIST, we were able to demonstrate this new more efficient concept.”*
>
> **Abraham Lenhoff,**
> University of Delaware

This work was performed under a Project Award Agreement from the National Institute for Innovation in Manufacturing Biopharmaceuticals (NIIMBL) and financial assistance award 70NANB21H085 from the U.S. Department of Commerce, National Institute of Standards and Technology.