Cell engineered vehicles for drug delivery to SARS-CoV2 infected cells

Shekoofeh Yaghmaei

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Many synthetic drug delivery methods have been developed and released to the market during the last few decades. However, the applicability of such systems is limited due to their inefficiency, cytotoxicity, or immunogenicity. Simultaneously, the field of natural drug carrier systems has exploded. One of the most well-known natural carriers is extracellular vesicles (EVs). EVs are membranous Particles produced by cells that play a crucial role in intercellular communication. In addition, EVs have a variety of properties that make them attractive medication delivery vehicles.

More than 6 million people have died from COVID-19, and infection fatality rates in unvaccinated populations are around 1%. Indeed, infection with SARS-CoV-2 is silent in about 40% of cases, underlies a benign upper respiratory tract disease in another 40%, and causes pneumonia in approximately 20% of cases. A coronavirus's envelope is typically made up of three proteins, including a membrane protein, an envelope protein, and a spike protein (S), which is used by the virus to bind to its receptor on human cells (ACE-2).

This project aimed to conduct research into a potential drug delivery system against COVID-19 using EVs as a vehicle. For that, two cloning strategies were chosen to fuse the spike protein to another protein that will be expressed in the end on the surface of RBCs: GYPA and stomatin. Moreover, K562 cells were used to generate RBCs needed for EV generation. GYPA and stomatin were cloned and then used to create lentiviral vectors and later for the infection of HEK 293 cells. Analysis of infected cells via quantitative PCR showed the expression of proteins in the cells. Hence it can be concluded that, while EVs are an excellent alternative to standard drug delivery systems, using EVs has a lot of different potential. However, it still requires a lot of work to optimize fully.

Director: Dr. Pierre-Yves Mantel