

FUNCTIONALIZED NANOPARTICLES FOR VIRAL CLEARANCE

Keywords: nanoparticles, viral clearance, phagocytosis, virus-binding peptides, high-affinity binding, antiviral therapy

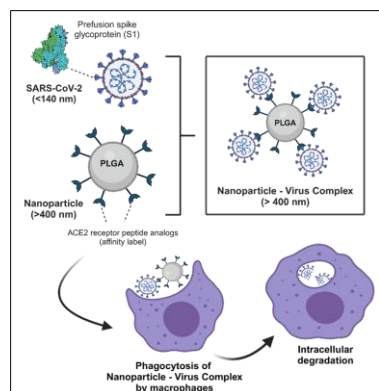
INVENTION NOVELTY

Nanoparticles equipped with high affinity virus-binding peptides for virus encapsulation to induce virus phagocytosis before cell infection.

VALUE PROPOSITION

- **New MoA:** by forming aggregates with the viruses, these nanoparticles facilitate the clearance of viral particles through phagocytosis
- **Target engagement:** initially developed for SARS-CoV-2, the nanoparticles show ~ 5 pM K_d towards the spike protein and low-nM range with Omicron strains
- **In vitro efficacy:** Single dose (10 $\mu\text{g/mL}$) reduces wt and Delta strains titers to detection limits, and reduces viral activity even when dosed up to 24 h post-infection, and macrophage imaging shows internalization of virus-nanoparticles complex into vesicles
- **Specificity & safety:** Inactive against other virus (spike-specific mechanism), no cytotoxicity in Calu-3 assay

These nanoparticles offer a mechanism-anchored, resistance-agnostic adjunct or monotherapy to neutralize and clear viruses, with an inhalation-amenable format under development.



MoA of functionalized particles (modified from Hortschansky et. al., Unpublished).

TECHNOLOGY DESCRIPTION

- **Modality:** PLGA/PLGA-PEG nanoparticles (≈ 360 – 600 nm) functionalized via maleimide/DBCO to show spike-protein minibinders
- **Dose benchmark:** free LCB1 $\text{IC}_{90} \approx 11.4$ nM, $\text{IC}_{50} \approx 4.86$ $\mu\text{g/mL}$ (pseudovirus); $\text{IC}_{90} \approx 3.7$ $\mu\text{g/mL}$ (wt SARS-CoV-2)
- **Safety/TD:** no membrane damage or metabolic impairment in Calu-3 at tested ranges; specificity confirmed by lack of effect on MERS-CoV
- **Therapy type:** effective means of viral neutralization and clearance without acting at the cell level

COMMERCIAL OPPORTUNITY

The technology is available for co-development and in-licensing partnerships.

DEVELOPMENT STATUS

Current work is optimizing production and scale-up of functionalized nanoparticles, advancing in vivo validation, and refining target-specific designs toward standardized diagnostic and therapeutic kits.

PATENT SITUATION

A European patent was filed in November 2023 (EP23209601) followed by a PCT application (WO2025104091) in 2024.

FURTHER READING

Original publication – Unpublished.