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Viral Attachment Blocking Chimera for Antiviral Therapeutics

Of the emerging pathogens, the most concerning seem to be pathogenic viruses. Antiviral therapeutics are integral in instances where vaccines are not effective (e.g. HIV or Herpes infections). Despite the recent SARS-CoV2 pandemic and other viral outbreaks, antivirals have been clinically approved to treat only 10 out of the greater than 200 known pathogenic human viruses. Further, because of evolution to evade antivirals, and virus functions that are often intimately coupled with host cellular processes, developing new antivirals is challenging.

Researchers at Arizona State University have developed a generalizable methodology, termed Viral Attachment Blocking Chimera (VirABloC), for developing antivirals with limited structural or biological insight of a viral pathogen. What makes VirABloC so successful is that a non-inhibitory nanobody is functionalized with DNA origami to become a potent inhibitor of viral attachment to host cells by targeting a non-essential viral epitope. These antivirals would be administered post-symptom development to limit viral entry and reduce infection. When tested with pseudorabies virus (PRV), antivirals developed with this platform reduced viral infectivity, in vitro, by 51% compared to the no inhibitor group. Further, it demonstrated a dose-dependent inhibition of PRV, in vitro, with IC50 value of 4.2±0.9 nM, highlighting how the non-covalent attachment of the DNA scaffold to the virus particle obstructs its attachment onto host cells.

This modular and target-agnostic methodology helps lower the barriers to developing rapid and effective antivirals in a scalable and cost-effective manner.

Potential Applications

- Development of antiviral therapeutics
  - Human and animal antiviral therapeutics

Benefits and Advantages

- Modularity – the antivirals can be designed to have between 1 and 60 conjugation sites
- Can be used even with limited structural or biological insight of the viral pathogen
- Biocompatibility – cytotoxicity assays show no obvious cytotoxicity towards cells – almost 100% cell viability after 24-hour incubation with antiviral
- Scalability
- Multivalent – offsets weak interactions and enhances virus neutralization
- Can be used for humans and other animals
- Stability – when incubated for up to 8 hours in cell culture medium, the antivirals showed minimal degradation
- VirABloC is robust to changes in temperature and chemical adjuvants enabling multiple strategies for storage, dosage and delivery

For more information about this opportunity, please see

Pradhan et al - bioRxiv - 2023 (Manuscript under review)

For more information about the inventor(s) and their research, please see

Dr. Hariadi's departmental webpage

Dr. Hariadi’s laboratory webpage