

Docket #: S24-010

Mucin-Binding Protein Shuttles for the Delivery of Brain-Targeted Therapeutics

The blood-brain barrier (BBB) remains a major obstacle to developing effective therapies for neurological and neurodegenerative disease, because most drugs and biologics do not efficiently reach brain tissue. Researchers at Stanford have identified mucin-domain glycoproteins as a new target class for BBB uptake and have developed mucin-binding protein "shuttles" designed to transport attached cargo into the central nervous system.

The lead shuttle is based on a catalytically inactive form of the bacterial mucinase StcE (StcE-E447D), used here as a selective mucin binder. In preclinical studies, these shuttles show rapid uptake at the brain vasculature and deliver a model protein cargo into the brain parenchyma, with uptake observed across multiple key CNS cell types, including neurons, astrocytes, and microglia.

The platform is modular and engineerable, with domain variants (including smaller constructs) that retain brain delivery. This mucin-targeting approach provides an alternative to widely used receptor-based BBB shuttles and may enable differentiated delivery strategies across a range of CNS therapeutic modalities.

Stage of Development: Preclinical - *in vivo* proof of concept (mouse)

Applications

- **Enabling brain delivery of biologics** (proteins, antibodies, enzymes)
- **Delivery of nucleic acid therapeutics** (e.g., ASOs and conjugates)
- **Improving CNS exposure for small molecules**
- **CNS delivery of imaging agents or research tools**

Advantages

- Distinct from common receptor-based shuttles, supporting differentiated positioning and use cases
- Fast uptake kinetics into the brain in preclinical studies
- Broad brain cell-type access including neurons, astrocytes, microglia, enabling multiple CNS indications
- Modular and engineerable formats including smaller variants that retain delivery capability

Innovators

- Sophia Shi
- Anton Wyss-Coray
- Carolyn Bertozzi

Licensing Contact

Mona Wan

Senior Licensing Manager for Special Projects

[Email](#)