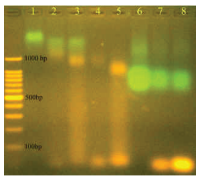
delivering drugs faster

SCOTT BANTA | CHEMICAL ENGINEERING

People suffering from brain diseases and conditions ranging from traumatic brain injuries to brain cancer to progressive brain diseases could be helped if therapeutic drugs could be delivered to the affected area. The blood-brain barrier (BBB), composed of high-density cells, acts as part of the body's defense system to block bacteria and other substances carried in the blood from invading the brain. It is so effective that it makes it all but impossible to deliver important diagnostic and therapeutic agents to the brain also.

Scott Banta has had significant success in solving this problem by using a biochemical approach, creating specific cell penetrating peptides (SCPPs) that can cross the BBB and target specific brain cell populations. Banta, an associate professor of chemical engineering, and his research group are engineering new peptides that are specific for different cell and tissue types. The plasma membrane protects cells by regulating the access of molecules to the cellular cytoplasm. Only compounds within a narrow range of size, charge, and polarity are able to cross the membrane.

Using the process Directed Evolution, the Banta group is creating new SCPPs that are able to both target and penetrate specific cells. These peptide sequences can deliver therapeutic cargos, such as DNA, proteins, drugs, or other exogenous materials, to the targeted cellular cytoplasms.



engineered fluorescent proteins (green) interacting with DNA molecules (orange)

Collaborating with Barclay Morrison of the Department of Biomedical Engineering, Banta is seeking to create SCPPs that are specific for different brain cell types. There is a narrow window of time following a brain injury where the targeted delivery of neurotrophic agents to injured cells could provide a significant benefit to the head-injured patient. In addition, delivery of neurotrophic factors via SCPPs could be beneficial in slowing down the progress of diseases such as Parkinson's, Alzheimer's, and Huntington's.

Before joining Columbia SEAS, Banta, who received his PhD from Rutgers University, was a postdoctoral researcher at Harvard Medical School's Center for Engineering in Medicine, and at Shriners and Massachusetts General Hospitals.