SDSU | Division of Research and Innovation

Engineered wild bacteria for drug cell delivery

Molecular Syringes

Contractile Injection Systems (CIS) are nanometric syringe-like structures that target eukaryotic cells. CIS are evolutionarily related to bacterial viruses (phage) and deliver large protein peptides (>100 kDa) selectively to mammalian cells. CIS can be purified from producing cells and do not replicate. These syringes possess a receptor binding used for target cell recognition and possess a hollow needle for target cell protein payload injection.

Peptide Therapeutic Delivery

Peptide therapeutics have the potential for higher potency with fewer side effects than traditional small molecule drugs. Hundreds of peptide therapeutics are currently in clinical and pre-clinical trials to treat diseases such as cancer and diabetes. Current major obstacles in the use of peptide therapeutics are the need for subcutaneous injection and systemic administration that releases therapeutics throughout the body, resulting in unwanted side effects. As a result, hundreds of promising peptide therapeutics stall in clinical trials because of side effects (safety) or target tissue delivery issues (efficacy). CIS selectively target eukaryotic cell surface markers and hold great potential as a protein delivery device, including use for protein payload delivery, pest management and genetic modification.

'Wild' Bacteria

Environmental 'wild' bacteria are a deep source of natural products such as antibiotics and biotechnologies (e.g. Taq polymerase, CRISPR, molecular syringes). However, the full potential of most wild bacteria is limited by an inability to genetically engineer their DNA. There is a current need for engineered wild bacteria in both academic and industrial markets. While there are a handful of companies that specialize in the genetic manipulation of classic bacteria (e.g. *E. coli*), there are presently no known companies that offer genetic engineering services for 'wild' bacteria, likely due to the challenge of overcoming natural antibiotic resistances and specific genetic engineering method requirements. This technology addresses those challenges and fills this gap in available wild bacteria genetic engineering to provide a solution for this unmet problem.

Patent Applications

US Patent Application No. 17/294,656 entitled "PROTEIN AND PEPTIDE DELIVERY SYSTEMS AND METHODS FOR MAKING AND USING THEM"

PCT Application No. PCT/US2023/024108 entitled "Protein and Peptide Delivery Systems and Methods for Making and Using Them" filed 6/1/2023

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