PHAGE-MEDIATED DELIVERY OF GENES TO GUT MICROBIOME

Tech ID: 32846 / UC Case 2019-196-0

INVENTION NOVELTY

Researchers at UCSF have developed methods to engineer bacteriophage for gene delivery to gut microbiome.

VALUE PROPOSITION

- M13 bacteriophage is well-characterized and infects *E. coli* and related Enterobacteriaceae carrying the F sex factor without causing cell lysis
- M13 phagemid vectors combine the advantages of plasmid DNA manipulation with the ability to easily package recombinant DNA into virions
- Proof-of-concept for extension to other phage-bacterial pairs of interest

TECHNOLOGY DESCRIPTION

There is broad interest in the influence that the gut microbiome has on host health and disease. Mechanistic insights into the role of the human gut microbiome in the predisposition to and treatment of disease are limited by the lack of methods to precisely add or remove microbial strains or genes from complex communities. As such, there is an unmet need for methods to establish a modular toolkit for microbiome editing.

APPLICATION

- Selectively engineer at least one bacterial strain, species, or genus among a mixed population of bacterial strains in the gut of a subject by phage-mediated gene delivery
- Selective engineering can be used to treat a disease, confer antibiotic resistance, modify the genome, increase the growth, or reduce the population of at least one bacterial strain among a mixed population of bacterial strains in the gut of a subject

STAGE OF DEVELOPMENT

The inventors have developed methods for selective *in vivo* engineering of a bacterial strain, species, genus, etc., among a mixed population of bacteria in the gut of a subject. They employ a well-characterized bacteriophage, M13, for selective gene delivery to *Escherichia coli* within the mouse gastrointestinal (GI) tract and confirm that M13 can deliver antibiotic resistance genes to the gut microbiome. Further, M13 phage can deliver a programmable exogenous CRISPR-Cas9 system for both the induction of chromosomal deletions and sequence-specific depletion of *E. coli* within the mouse gut microbiota.

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OTHER INFORMATION

KEYWORDS

Bacterial pathogenesis,

CRISPR, Genome editing

CATEGORIZED AS

- Medical
  - Therapeutics

RELATED CASES

2019-196-0

RELATED MATERIALS

▶ Phage-delivered CRISPR-Cas9 for strain-specific depletion and genomic deletions in the gut microbiome - 11/02/2021

PATENT STATUS

Country	Type	Number	Dated	Case
Patent Cooperation Treaty	Reference for National Filings	WO 2021/231689	11/18/2021	2019-196

Patent Pending

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