Generalizable and Non-genetic Approach to Create Metabolically-active-but-non-replicating Bacteria

Tech ID: 32948 / UC Case 2021-646-0

ABSTRACT

Researchers at the University of California, Davis have developed a method to stop bacterial growth while maintaining desirable metabolic functions for therapeutic and biotechnological applications.

FULL DESCRIPTION

Recent understanding of the human microbiome has ushered in the interest in engineering bacteria or probiotics for therapeutic applications. Yet, few if any engineered bacteria have been approved by FDA for therapeutic applications. For many target applications, it is difficult to maintain the desirable characteristics and metabolic processes of bacteria while simultaneously restricting their replication in non-targeted parts of a patient and the human population at large. The existing approach to limit cellular division often involves genetically modifying bacteria, but this is a technically challenging process and does not usually generalize to non-standard bacteria. Furthermore, such genetic modification tends to induce stress on the bacteria, resulting in poor therapeutic performance. In addition, bacteria can mutate the genetic control elements, resulting in biocontainment issues. A generalizable method of limiting bacterial growth while keeping their metabolic functions is needed to translate bacterial vaccines and probiotics in clinical applications.

Researchers at the University of California Davis have developed a non-genetic method to selectively limit cellular division. This process causes an irreversible stop of bacterial growth but still allows for the typical metabolic activity, nutrient import, protein synthesis, and motility that are desired for therapeutic applications. Additionally, the process results in cells that are robust to certain external stress factors. The novel approach allows for the generation of broad metabolically-active-but-non-replicating bacterial classes, including Staphylococcus, Pseudomonas, Klebsiella, Escherichia, Lactobacillus, etc. The metabolically-active-but-non-replicating bacteria can be used for vaccine, anti-cancer, and gastro-intestinal applications.

APPLICATIONS

- Living therapeutics
- Gene delivery vectors
- Live attenuated vaccines
- Biosensors
- Probiotics

FEATURES/BENEFITS

- Improved stability and cellular functions compared to genetic modifications
- Generalizable for many different bacterial strains

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Published Application	20250034519	01/30/2025	2021-646

CONTACT

Pooja N. Bhayani
pnbhayani@ucdavis.edu
tel: .



INVENTORS

- Contreras Llano, Luis Eduardo
- Tan, Cheemeng

OTHER INFORMATION

KEYWORDS

live bacterial therapeutics, bacterial therapy, gene delivery vectors, biotherapeutics, engineered bacteria, probiotics

CATEGORIZED AS

- **Biotechnology**
  - Genomics
  - Health
- **Medical**
  - Gene Therapy
  - New Chemical Entities, Drug Leads
  - Research Tools
  - Therapeutics
  - Vaccines
- **Nanotechnology**
  - NanoBio
- **Research Tools**
  - Other
  - Screening Assays
  - Vectors

RELATED CASES

2021-646-0

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- A New Cell-free Protein Expression System with three-fold higher protein yield in batch and continuous mode than existing systems
- Protein Translation Machinery One Shot (TraMOS) Tool
- Hydrogelated Bacteria as Antibacterial Vaccines
- Hydrogelated Cells for Regenerative Medicine Applications

University of California, Davis
Technology Transfer Office
1 Shields Avenue, Mrak Hall 4th Floor,
Davis,CA 95616

Tel: 530.754.8649
techtransfer@ucdavis.edu
https://research.ucdavis.edu/technology-transfer/
Fax: 530.754.7620

© 2022 - 2025, The Regents of the University of California
Terms of use
Privacy Notice