MODULAR SURFACE DISPLAY SYSTEMS FOR MICROBIAL SELECTION AND TARGETING

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OTHER INFORMATION

CATEGORIZED AS

- **Agriculture & Animal Science**
  - Animal Science
  - Nutraceuticals
- **Biotechnology**
  - Food
  - Health
- **Research Tools**
  - Nucleic Acids/DNA/RNA
  - Reagents
- **Veterinary**
  - Other

RELATED CASES

2025-097-0

PATENT STATUS

Patent Pending

BRIEF DESCRIPTION

Achieving durable engraftment and spatial localization of engineered microbes in complex environments, such as the gut microbiome, has been a persistent challenge. Current methods to select and isolate engineered microbes in the lab rely on antibiotic-based selection systems, which are unsuitable for in vivo applications due to safety concerns, environmental risks, and regulatory hurdles. Moreover, these methods lack the precision needed for selective recovery and targeting within diverse microbial communities.

UC Berkeley researchers have developed an innovative framework that integrates plasmid-based systems and CRISPR-associated transposase systems (CASTs) to enable precise delivery of genetic cargoes encoding surface display systems. These systems, when expressed, allow engineered microbes to display modular binding domains capable of interacting with a range of targets, including but not limited to host associated mucus and magnetic particles. This modularity expands the toolkit for selective enrichment, spatial targeting, and functionalization of engineered microbes in diverse contexts. For example, modified microbes can be magnetized for recovery through magnetic separation or equipped with binding domains to interact with other substrates or biomolecules, unlocking targeted applications in microbiome engineering, therapeutic delivery, and biomanufacturing. This approach not only enables the enrichment and spatial targeting of engineered microbes within complex communities, such as those in the gut, but also provides a versatile method for isolating bacterial strains or directing microbes to specific niches without relying on antibiotics. By combining plasmid modularity with the precision and stability of CASTs, the platform establishes a robust and adaptable solution for microbiome modulation.

SUGGESTED USES

- » Engineering gut microbiota to deliver targeted therapies or beneficial metabolites
- » Enhancing the precision of therapeutic interventions for gastrointestinal disorders
- » Enriching and targeting engineered microbes in complex environments like soil and water
- » Bioremediation through selective localization and activation of microbial strains
- » Engineering microbes for ecological restoration by selectively binding them to host environments
- » Improving yields and efficiency in industrial fermentation processes
- » Streamlining microbiome studies by enabling targeted manipulation and recovery of engineered strains
- » Facilitating research on host-microbiome interactions through modular display systems
- » Engineering microbes to improve gut health in livestock
- » Precision delivery of therapeutic bacteria to specific tissues or organs

ADVANTAGES

- » antibiotic-free selection (reducing environmental and safety concerns)
- » modular design (flexibility to target different molecules or particles, such as magnetic nanoparticles or other substrates),
- » precision (e.g., targeted chromosomal integration, ensuring stability),

- versatility (e.g., compatible with many microbial species and applications)
- scalability (e.g., suitable for high-throughput applications and in vivo applications).

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