Docket #: S14-452

Engineering the Gut Microbiome for Imaging and Therapeutic Uses

Researchers in Professor Justin Sonnenburg's laboratory have developed genetic tools for manipulating Bacteroides, a prominent genus of gut bacteria, for imaging, diagnostics, and therapeutic drug delivery. Bacteroides is known to have an important role in digesting dietary fiber, interacting with host mucus, immune development and other host processes. This technology includes a system for predictive, constitutive nucleic acid expression in this gut bacteria. This technology has been applied to perform the first in situ visualization of a fluorescent protein-expressing Bacteroides using confocal imaging.

The inventors were able to distinguish six species of Bacteroides engineered to express distinct fluorescent protein signatures. This novel imaging platform can be applied in microbiota research; microbes may be engineered for use in a diagnostic setting. The inventors have determined that small peptides can be transported to the cell surface as cargo of secreted proteins and can be released extracellularly by naturally occurring mouse gut proteases. This system was used to deliver multiple putative anti-inflammatory peptides to gnotobiotic mice with chemically induced colitis. This technology can act as an in vivo diagnostic and for targeted delivery of therapeutics.

Stage of Development
in vivo proof of concept

Applications

- Imaging
- Diagnostics
- Therapeutics
- Local drug delivery

Advantages

- Tunable and modular
- Predictable function

Publications

- Weston Whitaker, Elizabeth Stanley, and Justin Sonnenburg. "P-191 Genetic Tools for Strong Predictable Expression in the Bacteroides Genus Enable Imaging Species-Specific Difference in Localization in Response to Inflammation." Inflam. Bowel Dis. 22 (2016): S67.

Patents

- Published Application: 20220160791
- Published Application: WO2017184565
- Published Application: 20240016858
- Issued: 11,766,461 (USA)

Innovators

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