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Bacterial Biofilms Targeted with Microbial Drone Therapeutics (20140281, Dr. Christine Salomon)

Technology No. 20140281

IP Status: Issued US Patent; **Application #:** 15/080,254

Microbial Biofilms Destroyed with Engineered Bacterium

Harmless, common bacteria have been engineered to destroy antibiotic-resistant microbial biofilms such as *Pseudomonas aeruginosa* infections (associated with cystic fibrosis, burn wounds, prosthetic implants, pneumonia, cellulitis, and sepsis). This technology uses a strain of *Lactococcus lactis*, a common probiotic bacterium found in many fermented foods as well as the human body. The strain is engineered to specifically target *P. aeruginosa* and acts as a microbial “drone” that binds to the biofilm and secretes enzymes that destroy the biofilm’s structure. The concept, which employs surface display technology that enables the probiotic bacterium to non-covalently bind to biofilm structures of choice, can be adapted to target other biofilm/bacteria and to express different enzymes and/or antimicrobial therapeutics.

More Effective than Antibiotics

While antibiotics are the standard treatment for biofilm-associated infections, they have relatively little effect against such infections. Newer enzymatic and bacteriophage therapies have shown some efficacy, but this new technology is expected to be more effective than existing treatments and with fewer side effects. The microbial “drone” is potentially much more effective than antibiotics and costs substantially less to produce (due in part to requiring less purification, concentration and extraction) than therapies using enzymes and bacteriophage. By providing a localized dose of therapy to a site of interest, the drone can provide a more effective and concentrated dose while minimizing off target effects of systematic treatment (e.g., antibiotic induced *Clostridium difficile* infections). Furthermore, the host bacterium is unique in that it is a probiotic with no known issues of immunogenic responses in humans, and which offers additional immunomodulatory benefits unrelated to the design.

BENEFITS AND FEATURES:

- Effective against antibiotic-resistant biofilms *in vitro*
- May be applicable to *Pseudomonas aeruginosa* infections (e.g., cystic fibrosis, burn wounds, prosthetic implants, pneumonia, cellulitis, and sepsis)
- Localized dose provides a more effective and concentrated dose while minimizing off-target effects of systematic treatment
- Has potential to treat internal and topical biofilm infections
- Can be modified to bind to other biofilm/bacterial components and to express different enzymes and/or antimicrobial therapeutics
- More cost effective than current therapies

APPLICATIONS:

- *Pseudomonas aeruginosa* infections associated with cystic fibrosis, burn wounds, prosthetic implants, pneumonia, cellulitis, and sepsis
- Antibiotic-resistant biofilm infections
- Industrial use: may destroy biofilms associated with surfaces

Phase of Development - Proof of Concept

Researchers

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