PRESENTER INFORMATION

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BIOGRAPHICAL SKETCH

Ofer is currently in his last year of Ph.D. studies in the Faculty of Biotechnology and Food Engineering under the supervision of Prof. Ester Segal at the Technion – Israel Institute of Technology. His interdisciplinary research lies at the interface between nanotechnology and microbiology. Ofer utilizes natural nanoclay particles to deliver antimicrobials to target a harmful bacteria strain in a challenging heterogeneous culture. Ofer received his BSc in Biotechnology and Food Engineering (*summa cum laude*) from the Technion – Israel Institute of Technology in 2012. Then he spent five years in the pharmaceutical industry (Teva Pharmaceutical Industries LTD.) coordinating drug product analysis and participating in many successful submissions to the FDA. Ofer is the author of three peer-reviewed journal research articles and two reviews and is currently a fellow of the prestigious Azrieli Foundation. For his planned post-doctoral internship, Ofer is invited to the lab of Prof. Jay Keasling at the University of California, Berkeley.

TITLE

The good china - Intrinsically mesoporous nanoclay for the selective delivery of antimicrobials avoiding dysbiosis

ABSTRACT

How do pottery vases relate to protecting our gut microbiome from non-selective antibiotic disturbance? The very earth we walk upon contains an abundance of low-cost natural clay minerals – some are already FDA-approved – that exhibit intriguing nanomorphologies and high adsorption capacities, ideal for loading antimicrobials and facilitating their controlled release. One of the most prominent clay minerals investigated for that purpose is Halloysite nanotubes (HNTs). These 600-900 nm-long particles consist of alternating layers of silica and alumina, geologically rolled into a tube about 50 nm wide. The mesoporous inner lumen (15 nm inner diameter) enables the loading of guest molecules and their subsequent hindered out-diffusion, while the outer silica surface readily adsorbs active compounds through electrostatic and ion exchange interactions. **Thus, we harness natural clay HNTs for the selective delivery of antimicrobials to target bacteria**. First, the silica surface of HNTs is chemically immobilized with anti-*E. coli* antibodies, which are shown to increase their affinity to target bacteria by 2.5-fold as quantified by high-throughput imaging flow cytometry. Then, the modified clay is loaded with the potent antibiotic ciprofloxacin to be gradually released at the proximity of the target bacteria. The resulting nanoclay-based delivery system selectively inhibits the growth of the target bacteria while maintaining the composition of non-target populations in the gut microbiome, as demonstrated by *in vitro* fermentation of human feces.
We believe our HNTs-based design could serve as a generic cost-effective carrier for a variety of antimicrobials, selectively guided against any chosen microorganism by facilely adjusting the immobilized capture probe.