Bi-Directional Hygiene: Using the Microbiome to Combat Nosocomial Infection

Shaquib, Rishit (School: Vanguard High School)

Overuse of chemical sterilization has applied selective pressure to the bacteria that colonize our surfaces, increasing their pathogenicity and resistance to treatment. A possible solution to this problem lies in the same system that our skin utilizes to stay "clean": a microbiome. The purpose of this experiment was to test the effectiveness of specific commensal strains in the conditions of an artificial microbiome on a variety of surfaces common in healthcare environments. Two forms of inhibition tests were conducted with each commensal strain against E. coli, a common source of nosocomial infection. Furthermore, a series of cultures tested the efficacy of inhibition on a variety of material samples that are common in hospitals. All of the commensal strains demonstrated inhibitive effects against E. coli. However, each strain demonstrated unique strengths and weaknesses in the varying tests primarily due to differences in inhibitive mechanisms. Strains such as L. acidophilus ,which utilize a wide range of bacteriocins, were more effective in live inhibition. However, strains which primarily relied on lactic acid production such as L. delbrueckii, were much more effective in a solution. These differences accounted for differences in inhibitive efficacy on material samples; commensals such as L. delbrueckii took longer to completely inhibit E. coli, while strains such as L. acidophilus had a dramatic initial inhibition which did not increase significantly over time. These results prove the viability of the concept of an artificial microbiome, and provide data about the most effective applications of these commensal strains to surfaces.

Awards Won: