

Metagenomic analysis of human tongue using phage display

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Microbial infections are dependent on a series of changes in both host and bacterium, in response to bacterial attachment. Commensal bacteria also develop and maintain intimate relationships with mammalian cells, without triggering invasion mechanisms.

In the human mouth, millions of bacteria populate every surface and crevice. Oral mucosal surfaces present micro-organisms with numerous habitats in which to colonize, feed, multiply and interact with other bacteria. The provision of warmth and water, and the ubiquitous presence of nutrient-rich saliva on oral surfaces mean that the mouth is readily colonized by commensals and pathogens which maintain an equilibrium that occasionally favors the progression of disease.

Bacterial cell-surface adhesins enable recognition and binding of specific receptors on human cells (1), and are responsible for the establishment of close relationships between microbe and host. The primary objective of this research project is to locate examples of these bacterial adhesins from micro-organisms previously bound to the human tongue. This has so far required the employment of a metagenomic strategy (2) to process a large volume of DNA, and the investigation of this DNA using a molecular tool called Phage Display.

Phage display is a simple genetic technique for the identification of protein-ligand interactions, such as microbial attachment to mammalian cells, and is currently used successfully in epitope mapping, antibody tailoring and receptor agonist and antagonist screening. It is well established that the adhesion of enteric, oral and respiratory bacteria is required for colonization and, once bound, the bacteria are less likely to succumb to host defences. This study aims to identify bacterial adhesins which are vital for bacterial colonisation of the human tongue, using Phage Display. Screening of the Phage Display library will be carried out using a technique called Bio-panning, against ligands human IgA and fibronectin, and is expected to yield one or more bacterial adhesins.

Results are based on tongue scrapings taken from 9 healthy volunteers, who have no record of antibiotic use for 6 months previous to sampling.

1. Azzazy, H.M. & Highsmith, W.E., Jr. (2002) Phage display technology: clinical applications and recent innovations. *Clin. Biochem.* 35, 425-445.
2. Ward, N. (2006) New directions and interactions in metagenomics research. *FEMS Microbiol. Ecol.* 55, 331-338.