Diet-depended competition between *Pseudomonas aeruginosa* and *Escherichea coli* in the host intestine

Theodoulakis Christofi, Irini Dieronitou, Christina Michael, **Yiorgos Apidianakis**

Department of Biological Sciences, University of Cyprus

Abstract

Gut microbiota acts as a barrier against intestinal pathogens, but the functions of specific bacterial species in the presence of other microbes and the host intestine remain poorly understood. We assessed thirty-five strains of human intestinal bacteria species in inducing intestinal regeneration and lethality in *Drosophila melanogaster*. Virulence profiles of single bacterial strains in flies significantly match the anticipated pathogenicity of the corresponding species in humans. Furthermore, among all possible one-to-one bacterial combinations we identified *Pseudomonas aeruginosa* and *Escherichia coli* antagonizing each other in eliciting midgut regeneration and fly lethality. Oral antibiotic-induced dysbiosis and associated elimination of commensal *E. coli* in mice, favours intestinal *P. aeruginosa* colonization and concomitant mouse mortality. This effect can be explained by the glycolytic fermentation of sugars in *E. coli* and the production of lactic acid, which inhibits *P. aeruginosa* growth. Nevertheless, in the absence of high levels of sugars *P. aeruginosa* is capable of producing the quorum sensing regulated virulence factor pycyanin, which can inhibit *E. coli* growth. Assessing three extreme and a conventional diet in mice we find that, in addition to sugar fermentation to lactic acid, a fat-based diet can also induce *E. coli* to inhibit *P. aeruginosa* colonization in the mouse gut. These results aim to explain why although *P. aeruginosa* infection is a formidable clinical problem in sever wounds and predisposed human lungs, it doesn't commonly affect the human gut. We propose that dysbiosis induced by antibiotics and unbalanced diet eliminate lactic acid producing bacteria imposing an environment conducive to *P. aeruginosa* infection.