The effects of plant phenolics on *Escherichia coli* and *Pseudomonas aeruginosa* biofilm formation at the air-liquid interface on solid surfaces

By: Marnie Hustins

VIU Faculty Advisor: Dr. John Amaral

Plant source phenolic compounds have been suggested as potential non-antibiotic controls of bacterial growth and biofilm formation. This study evaluated the effect of the phenolics gallic acid (500 and 2,000μg/mL), ellagic acid (5 and 10μg/mL), and catechin (500 and 1,000μg/mL), at the given final concentrations, on biofilm formation by strains of the Gram-negative bacteria *Escherichia coli* (ATCC 25922) and *Pseudomonas aeruginosa* (ATCC 25922). Biofilm formation was measured using a recently-described procedure for quantifying air-liquid interface biofilms on solid surfaces (e.g. glass slides) at two time points, 24 and 48 hours. The antibiotic ciprofloxacin (0.625 and 1.25μg/mL) was used for comparison against the plant phenolics tested. After 48 hours of incubation, *E.coli* biofilm formation was significantly reduced in the presence of gallic acid (~30%), and catechin (~30), as compared to formation in controls unammended with phenolics ($p \leq 0.01$). Ellagic acid showed only minor inhibition at the concentration used (< 10%). Ciprofloxacin completely inhibited biofilm production by *E.coli*. *P.aeruginosa* biofilm production was unaffected by both phenolic compounds tested (gallic and ellagic acids). Of the phenolic compounds tested, gallic acid showed the greatest inhibitory activity against *E.coli* biofilm formation. These results support the idea that plant source phenolics may be useful, non-antibiotic interventions against biofilm formation or biofouling of surfaces by bacteria.