

## Biofilm formation of mono and dual Bacterial Species (*Escherichia coli* and *Salmonella*) on different food contact surfaces

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### Abstract

Biofilms are microbial associations as communities on a biotic or abiotic surface by secretion of matrix where they thrive in stressful environments. These communities can be formed by single species or by multiple species that is differing from their planktonic state and are capable of surviving on food contact surfaces. This process creates huge problems in food industry by causing higher contamination, antibiotic resistance and food spoilage. In addition, these biofilms have higher resistance to disinfectants and sanitizers too. The present study was carried out to evaluate the biofilm formation ability of mono-species (*E. coli* and *Salmonella spp.*) and multispecies (*E.coli+Salmonella spp.*) on different contact surfaces (Stainless steel, glass and tile) which are used in food processing plants. *E. coli* and *Salmonella spp.* used for the study were isolated in a previous study from broiler chicken meat. Biofilm formation by *E coli*, *Salmonella spp.* and *E coli + Salmonella spp.* on glass, tile and stainless steel surfaces were measured at ambient temperature in Luria Bertani Broth medium for 24, 48, 72, 96, 120, and 144 h of incubation time. The quantification of biofilm formation was performed by enumeration of viable biofilm cell count using the spread plate method. The results revealed that biofilm formation by *Salmonella spp.* was significantly high ( $p<0.05$ ) on glass ( $8.0\pm 0.21$  Log CFU/cm<sup>2</sup>). On stainless steel and tile surfaces the highest biofilm formation was by combination of both *Salmonella* and *E. coli* (i.e multiple spp.) ( $8.0\pm 0.06$  Log CFU/cm<sup>2</sup>,  $7.3\pm 0.04$  Log CFU/cm<sup>2</sup>) respectively on stainless steel and tile. Biofilm formation by *E. coli* was significantly ( $p<0.05$ ) high on stainless steel and low on tile ( $7.0\pm 0.02$  Log CFU/cm<sup>2</sup>,  $6.7\pm 0.44$  Log CFU/cm<sup>2</sup>) and this is the least biofilm former. Biofilm formation by *Salmonella spp.* was significantly ( $p<0.05$ ) low on tile ( $7.0\pm 0.09$  Log CFU/cm<sup>2</sup>) whereas high in glass. Lower biofilm formation by dual species (*E coli + Salmonella spp*) was on tile ( $7.3\pm 0.04$  Log CFU/cm<sup>2</sup>) compared to other two surfaces. The ability of biofilm formation by multi-species bacteria on stainless steel and tile surfaces studied was higher than the single spp. The study concluded that the biofilm formation ability is depend on surface and the type of bacteria. Also multi species bacteria have higher biofilm formation ability on some surfaces than the biofilm formation by single bacterial species.

**Keywords:** Antibiotic resistant, Biofilms, Food contact Surfaces, Mono-species, Multispecies

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