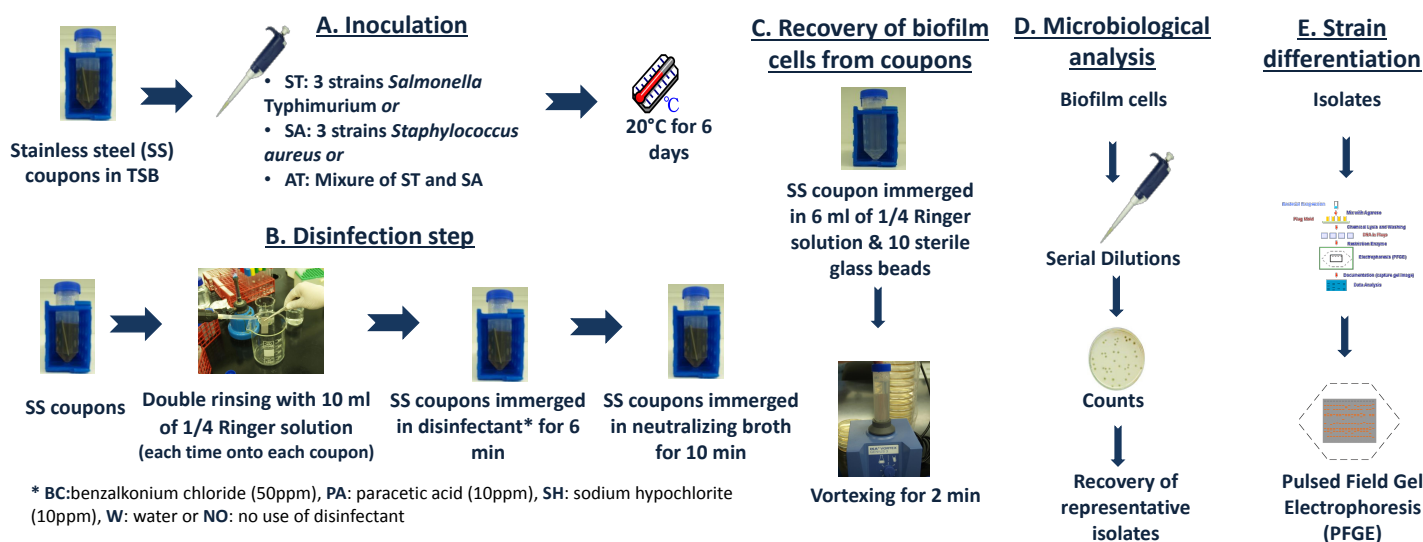


AGRICULTURAL UNIVERSITY  
OF ATHENSDepartment of Food Science  
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and Biotechnology of Foods

## Population and resistance patterns of *Salmonella* Typhimurium and *Staphylococcus aureus* biofilms exposed to sublethal chemical disinfection under mono- and dual-species multi-strain conditions

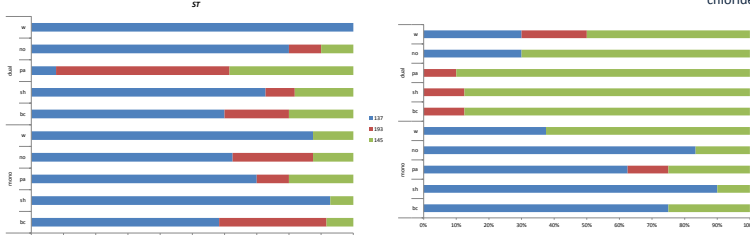
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### Materials & Methods



### Results & Discussion

- Dual-species conditions seem to lead to a reduction in the number of sessile cells (0.6 and 1.1 log cfu/cm<sup>2</sup> for ST and SA, respectively), compared to mono-species conditions
- BC was found to be more effective in both mono- and dual-species biofilm communities compared to the other two disinfectants (PA, SH)



**Figure 2.** *Salmonella* Typhimurium (ST) and *Staphylococcus aureus* (SA) strain distribution on biofilm cells under either mono- or dual-species conditions on SS coupons following disinfection step with BC: benzalkonium chloride (50ppm), PA: paracetic acid (10ppm), SH: sodium hypochlorite (10ppm), W: water or NO: no use of disinfectant

### Conclusion

- ✓ The presence of ST strongly decreased the resistance of SA biofilm to PA, while ST resistance remained stable
- ✓ Different strains here employed behaved differently with regard to both biofilm formation and antimicrobial resistance
- ✓ Such research expands our knowledge on the physiology of multi-species pathogenic bacterial biofilms and may facilitate the development of efficient control methods to be used in the food industry



This work was funded by the action THALIS: "Biological Investigation Of the Forces that Influence the Life of pathogens having as Mission to Survive in various Lifestyles; BIOFILMS", falls under the Operational Programme (OP) "Education and Lifelong Learning (EdLL)" and is co-financed by the European Social Fund (ESF) and National Resources

## **Population and resistance patterns of *Salmonella* Typhimurium and *Staphylococcus aureus* biofilms to sublethal chemical disinfection under mono- and dual-species multi-strain conditions**

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**Introduction:** Following inadequate sanitation, the remaining microflora on food industry surfaces may contain multiple bacterial species which -under permissible surrounding conditions- can eventually grow and form biofilms. Cell-to-cell interactions within such sessile communities may influence both cell physiology and population dynamics.

**Purpose:** To evaluate the possible influence of bacterial interactions encountered in mono- and dual-species multi-strain biofilms of *Salmonella* Typhimurium (ST) and *Staphylococcus aureus* (SA) on: (i) the ability of strains to develop biofilm, and (ii) their subsequent resistance to sublethal chemical disinfection.

**Methods:** 3 strains per species were left to develop biofilms on stainless steel (SS) coupons submerged in TSB for 144 h at 20°C, under either mono- or dual-species conditions. Following biofilm formation and the removal of loosely attached cells, SS coupons were exposed for 6 min to benzalkonium chloride (BC, 50ppm), peracetic acid (PA, 10ppm) and sodium hypochlorite (SH, 10ppm). The dominance of each strain in the sessile communities both before and after disinfection was monitored using a promising PFGE approach.

**Results:** Dual-species conditions led to a reduction in the number of SA sessile cells (1.1 log cfu/cm<sup>2</sup>), compared to mono-species ones, while ST sessile population remained rather unaffected. Regarding disinfection resistance and under both conditions, BC was found to be the most effective disinfectant, while SH was the least effective in all cases studied. Interestingly, the presence of ST strongly decreased the resistance of SA biofilm cells to PA. PFGE analysis revealed that the different strains here employed behaved differently with regard to both biofilm formation and antimicrobial resistance.

**Significance:** Such research expands our knowledge on the physiology of multi-species pathogenic bacterial biofilms and may hopefully facilitate the development of efficient control methods to be used in the food industry.

**Acknowledgments**

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