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Department of Food Science  
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## Metabolomic Analysis of *Salmonella enterica* cells *in vitro* and *in situ*

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### AIM

#### *Salmonella enterica*

- ❖ Important human pathogen
- ❖ Ability to form biofilm
- ❖ Persistent in the plant environment



#### Raw plant tissues

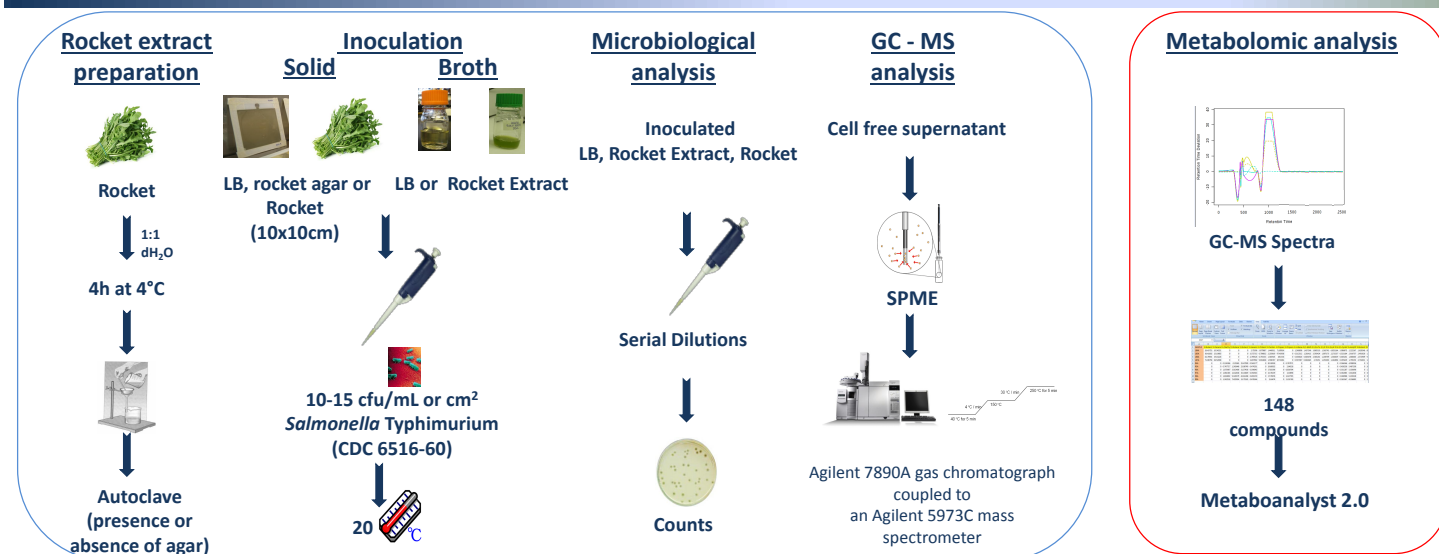
- ❖ Consumption has been associated with the risk of foodborne diseases
- ❖ cross contamination



#### Study

The different metabolic compounds of *Salmonella* during the growth on either abiotic or plant surfaces needs to be further studied

### MATERIALS and METHODS

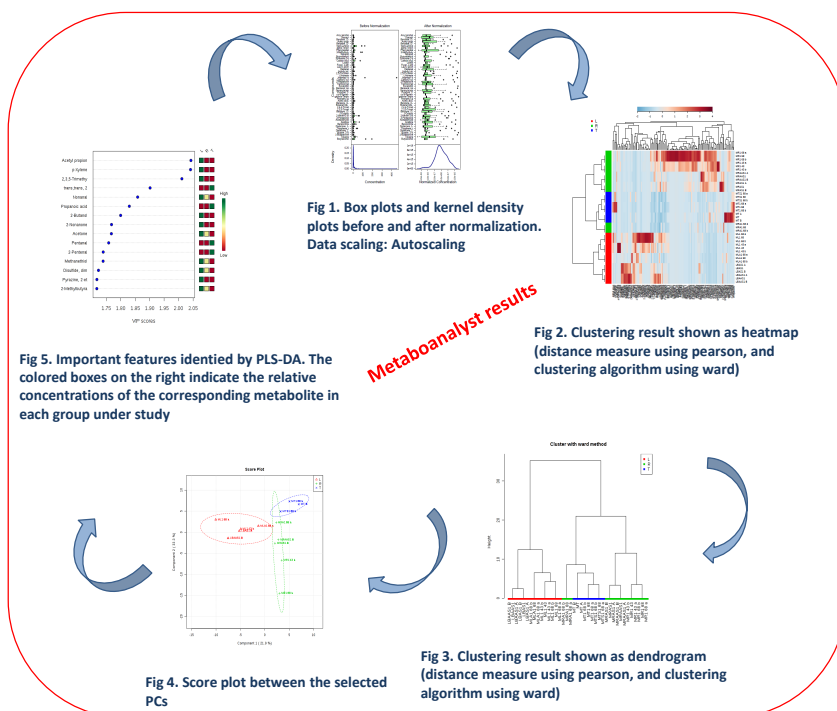


### RESULTS

- ❖ Final population of *S. Typhimurium* was
  - ca. 8 log cfu/mL on rocket extract
  - ca. 5 log cfu/cm<sup>2</sup> on tissue
  - ca. 9 log cfu/mL on LB
- ❖ Heat sterile rocket extract was sub-cluster in the same branch with rocket tissue, while rocket extract agar was more related
- ❖ The different metabolic compounds were associated with
  - The growth on the different media
  - Sampling points
  - The inoculation on the surface or stomata of tissue

### CONCLUSION

The correlation of these metabolites with the different growth conditions of the microorganism could be fundamental for understanding the possible actions to be taken for controlling the probability of survival on food chain or food processing environments



## **METABOLOMIC ANALYSIS OF *SALMONELLA ENTERICA* CELLS IN VITRO AND IN SITU**

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Current trends indicate an increase in produce-based outbreaks caused by e.g., *Salmonella* spp., while their persistence in the plant environment is due to biofilm formation either on or within the plants. In the present study a comparison of metabolomics, on laboratory medium, on rocket extract, of *S. Typhimurium* (ST) CDC 6516-60, as well as on the developed biofilm on rocket tissue was investigated. This pathogen grew on Luria – Bertani (LB) growth media and extract from rocket, and the samples were incubated at 20°C. The metabolomic analyses with GC-MS resulted in a great number of compounds for LB, rocket extract either with or no biofilm formation. The compounds 2-butanediol, 2,3,5-trimethylpyrazine, pyrazine, 2-ethyl-5-methyl-, acetyl propionyl were high associated with LB, while amyl alcohol, 2-Hexen-1-ol(trans), butanamide, N-methyl-4-(methylthio)-2-(2,2-dimethylpropylidene)amino-, Pyrazine,2,5-dimethyl- and 2-Penten-1-ol,(Z) were associated with rocket extract without biofilm formation. In the case where biofilm has been developed the following compounds were evident Sulfide, dimethyl, Toluene, Isobutylaldehyde, 2 Hexen-1-ol (trans) and Heptyl alcohol. An open sources platform (the web server Metaboanalyst 2.0) was used to analyze the data derived from these analyses. The knowledge of the different metabolic compounds and the correlation with the different growth conditions of the microorganism could be fundamental for understanding of its growth and the possible actions to be taken for controlling the probability of survival on food chain or food processing environments.

### **Acknowledgments**

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