Molecular interactions between plant-associated *Salmonella enterica* serovars and their plant hosts

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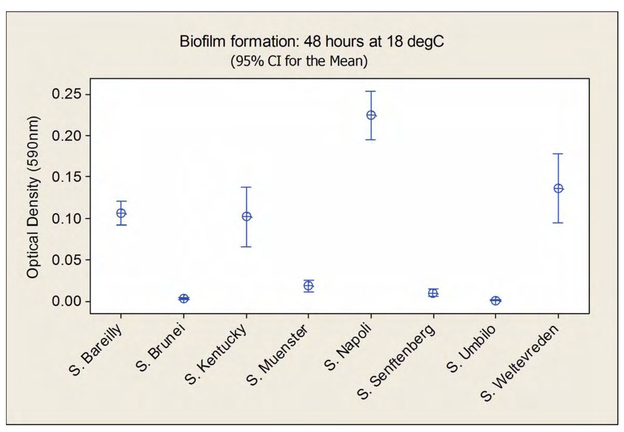
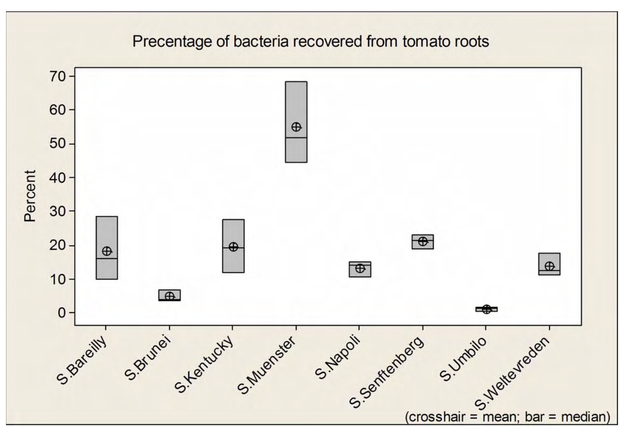
Background

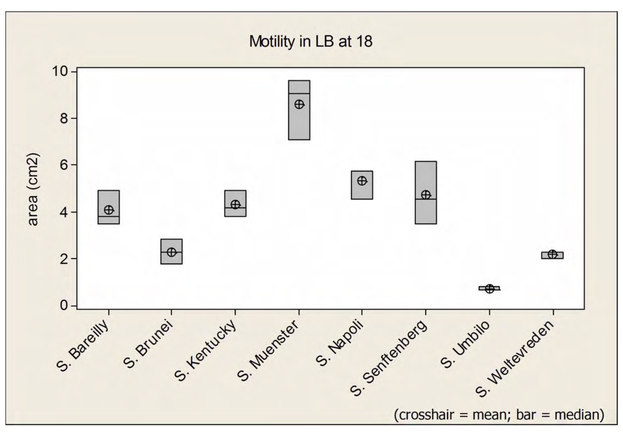
The incidence of food-borne illness from contaminated fresh produce (fruit and vegetables) has increased over recent time. One of the main causative organisms is non-typhoidal *Salmonella enterica*, of which there are a large number of different serovars. Several studies have shown that the bacteria are not simply transmitted by plants into the food chain, but they are able to interact with plants and colonise them as alternative hosts [1]. The aim of our work is to investigate the molecular basis to the plant-microbe interactions, making use of a small collection of *S. enterica* serovars with a known heritage with plants, either from disease outbreaks or product re-calls (Salmonella and Shigella reference laboratory, Scotland).

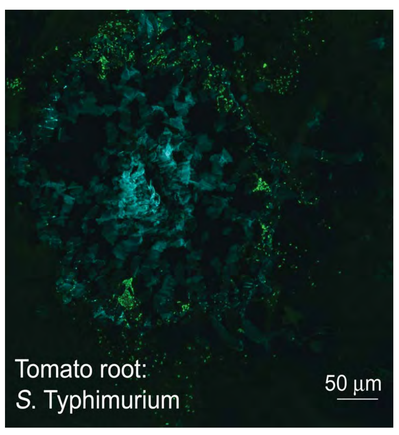
Results

Adherence is a pre-requisite for host colonisation by microbes and differences normally relate to bacterial surface factors and/or host ligands [2]. We found a large variation in adherence ability between the *S. enterica* serovars on the roots of 4-week-old tomatoes, which appeared to correlate with motility at 18°C, but not with biofilm formation. Longer colonisation times result in internalisation of bacteria into root tissue.

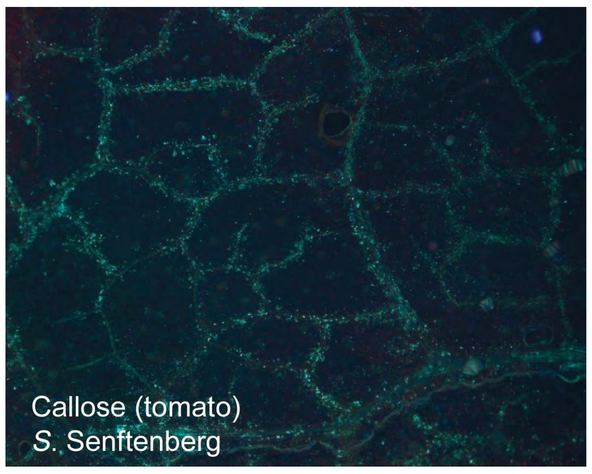


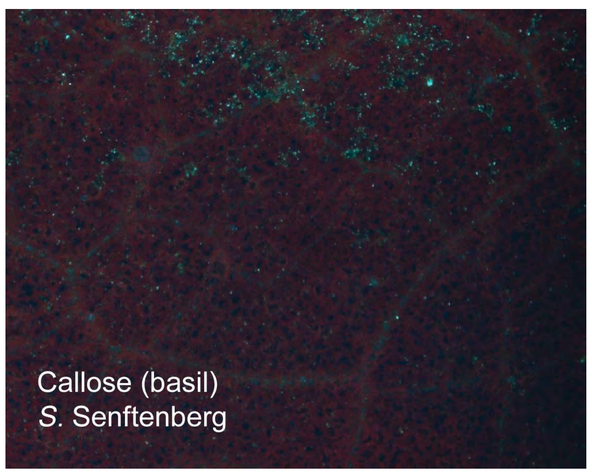






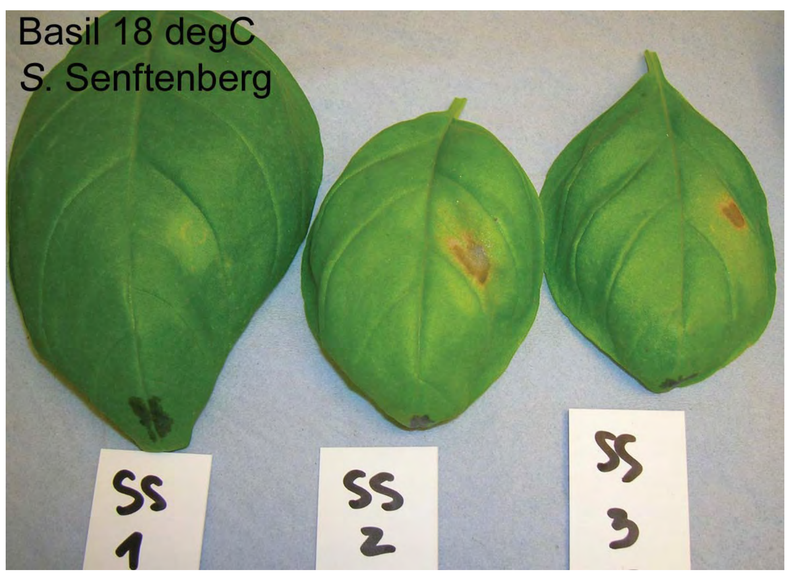
Inflitration of the bacteria into tomato and basil leaves resulted in a PAMP-triggered host defence, as determined from callose deposition and induction of ROS. For example, we found high levels of callose deposition in both basil and tomato following infiltration with *S*. Senftenberg.





Our on-going studies are investigating whether the plants induce additional arms of the defence response using qRT-PCR. Initial indications suggest PTI genes are induced in tomato 6 hours after infiltration with *S*.Senftenberg.

Finally, we have evidence of symptomatic disease development following infiltration, in a temperature dependent manner. Lesions are evident at 18°C, but not at 25°C in basil infiltrated with *S*. Senftenberg, which suggests that the plants are able to detect the bacteria and induce an HR-like response at lower temperatures.



References:

1 Holden, N., Pritchard, L. & Toth, I. Colonization outwith the colon: plants as an alternative environmental reservoir for human pathogenic enterobacteria. *FEMS Microbiol Rev* **33**, 689-703 (2009).

2 Cooley, M. B., Miller, W. G. & Mandrell, R. E. Colonization of *Arabidopsis thaliana* with *Salmonella enterica* and enterohemorrhagic *Escherichia coli* O157:H7 and competition by *Enterobacter asburiae*. Appl Environ Microbiol **69**, 4915-4926 (2003).

Conclusions

- Some isolates (e.g. *S*. Muenster) show particularly high levels of adherence.
- Adherence potential may correlate with motility, but not biofilm formation.
- Infiltration of some isolates triggers a PAMP response in both tomato and basil.
- Development of symptomatic disease in basil appears to be temperature dependent.