Salad contamination with Listeria – improving food safety through understanding plant-bacterial interactions and development of novel detection methods

Supervisory team:
Main supervisor: Dr Carsten Muller (Cardiff University)
Second supervisor: Dr Cedric Berger (Cardiff University)
Prof Hilary Rogers (Cardiff University)

Host institution: Cardiff University

Project description:
Consumption of fresh produce such as salads is an important component of the human diet, protecting against a range of cancers and cardiovascular disease. Unfortunately, disease outbreaks linked to contaminated vegetables, especially in ready-to-eat pre-packed salads, have increased sharply over the last decade. Major bacterial contaminants are Salmonella, E. coli and Listeria. Listeriosis, caused by the bacterial pathogen Listeria monocytogenes is specifically dangerous for pregnant women and elderly people. Unlike other foodborne pathogens, Listeria can multiply at cold temperatures (4 °C) increasing the risk of human infection. There is a lack of understanding of how Listeria attaches to salad leaves in the first place and how it manages to multiply to dangerous levels. Salads have also a short shelf-life and, therefore, the time between harvest and reaching the consumer is very short. Current detection methods for Listeria require several days of culturing and risk contaminated products reaching the consumers before any contamination can be confirmed. Consequently, a better understanding of the factors regulating how Listeria attaches and multiplies on salad leaves, and faster method of detection of contamination of fresh produce by Listeria. would make an important contribution to food safety. Food aroma is composed of a bouquet of volatile organic compounds (VOCs) whose composition is affected by food storage conditions and colonisation of food by microorganisms. The VOCs bouquet of a food, therefore, contains information about storage conditions and contamination and can be measured using gas chromatography mass spectrometry (GC-MS) within a matter of hours. We recently showed that realistic levels of contamination with Listeria could be detected on fresh cut melon through the analysis of VOC profiles, and preliminary results indicate that we can also detect contamination with Listeria on rocket leaves. Further data from our group show that, in the case of contamination with Salmonella and E. coli, attachment of the pathogen to the salad and its multiplication is affected by the strain of the pathogen, and the salad species and age of the salad leaf. The student will (1) Investigate the effects of strain, salad species, and leaf age on Listeria attachment and multiplication (2) use our preliminary results to develop a VOC based detection method for contamination of fresh salads with Listeria.

Hear more about the project from Dr Carsten Muller directly >>