Salmonella survival in different host plants, be careful with what you eat

Azhar Zarkani and Adam Schikora
Julius Kühn-Institut, Institute for Epidemiology and Pathogen Diagnostics, Braunschweig
E-mail of corresponding author: azhar.zarkani@julius-kuehn.de

The Gram-negative *Salmonella* genus can cause diseases ranging from enteritis to typhoid fever. The variety of *Salmonella* serotypes reflects the adaptation to diverse hosts. Ubiquitous serotypes, such as *Salmonella enterica* serotype Enteritidis or Typhimurium, generally cause gastrointestinal infections in humans but can induce other diseases in animals. For example, they can cause typhoid-like infections in mice but an asymptomatic intestinal colonization in chickens and pigs. In order to provoke a disease in mammals, *Salmonella* must survive the harsh conditions of the gastric tract after being ingested with the contaminated food or water. The two Type III Secretion Systems (T3SS) encoded within the Salmonella Pathogenicity Islands 1 and 2 (SPI-1 and SPI-2) are essential for *Salmonella enterica* virulence. T3SS-1 and T3SS-2 are responsible for the secretion and translocation of a set of bacterial proteins into the host cells, those proteins are named effectors. The aim of effectors is to alter the host cell physiology, preparing host cell for bacterial entry. Emerging evidence indicates that these effectors modulate immune-related proteins and are utilized by bacteria to de-activate intracellular signalling pathways, not only in animals or humans but also in plants.

Salmonella usually enters agricultural environments, in which it may colonize plants, *via* animal faeces. Animal faeces can directly contaminate plants or surface water used for irrigation or during processing. Recently, an increasing number of reports linked *Salmonella* contaminated raw vegetables and fruits with food poisoning. *Salmonella* is able to adjust to different external conditions such as low pH or high temperature, permitting its survival outside the animal organism. Before active colonization of the interior of different plants and suppression of their immune systems, *Salmonella* needs to attach and adhere to plant surfaces. Additionally, *Salmonella* originating from plants maintains its virulence in animals. Hence, plants might be an alternative host for *Salmonella* and can play a role in its transmission towards animals. Nevertheless, the targets of effector proteins in plant cells are not well characterized. Therefore, the aim of our work was to investigate the impact of chosen effectors on the plant immune system, as well as their role in *Salmonella* survival inside the different plant hosts.

We found that *Salmonella* can survive until 14 days post inoculation inside the plant without a significant change in the plant phenotype. Our results give also rise to a hypothesis suggesting the presence of redundant effectors. *Salmonella* might use them to compensate the deficiency of particular (other) effectors. However, this hypothesis requires further experimental tests. In addition, in this work we developed tools, which will be useful to investigate further effectors.