How does Listeria develop antimicrobial resistance in food products?

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A research project by Surrey's BioProChem group reveals crucial

evidence about the way Listeria grows in foods – particularly when novel, milder processing techniques are applied – which could have implications for the food processing industry.

The research, led by the BioProChem group within the Department of Chemical and Process Engineering, was published in the *International Journal of Food Microbiology* in July 2018. The research was conducted in collaboration with Surrey's School of Biosciences and Medicine and KU Leuven in Belgium.

In the project, researchers have remodelled food products to enable them to thoroughly examine how bacteria develop antimicrobial resistance in a highly controlled chemical and structural environment – and in particular how Listeria responds to nisin (a natural antimicrobial produced by lactic acid bacteria present in dairy products) and to heat in such a controlled environment. They found that in food models containing both proteins and polysaccharides (a type of carbohydrate), the bacteria grow exclusively on the protein, suggesting that Listeria has a mechanism which decides on where growth will take place.

The research could provide useful information for food processors as antimicrobial resistance becomes an ever increasing challenge. When cells are exposed to environments that are mildly stressful – such as a gradual increase in temperature – they develop resistance not only to this particular factor but to others as well, via a mechanism called 'cross protection'. As a result, by 2050 it is estimated that more people will die from bacterial infections than cancer.

However, at the same time, conventional sterilisation techniques are being abandoned because consumers demand foods that undergo minimal processing and have high nutritional value and sensory characteristics, which are lost during sterilisation. Food manufacturers are therefore looking at alternatives such as processing with natural

antimicrobial compounds, ultrasonic treatment, hydrostatic pressure or milder heat treatment.

Dr. Eirini Velliou, who has led the recent project at Surrey, explains: "Our research could enable manufacturers to tailor products and processing techniques more effectively. The long term aim is to ensure safety from 'farm to fork' and to find out how bacteria can develop resistance throughout the food chain as a result of a food's specific chemical and structural properties."

The research paper, 'Modelling the microbial dynamics and antimicrobial resistance development of Listeria in viscoelastic food model systems of various structural complexities', was published in the *International Journal of Food Microbiology* in July 2018.

More information: Katherine M. Costello et al. Modelling the microbial dynamics and antimicrobial resistance development of Listeria in viscoelastic food model systems of various structural complexities, *International Journal of Food Microbiology* (2018). DOI: 10.1016/j.ijfoodmicro.2018.07.011

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