

Precision Food Safety - Using DNA Sequences to Inform Risk Assessment

Séamus Fanning

UCD-Centre for Food Safety, School of Public Health, Physiotherapy & Sports Science, University College Dublin, Belfield, Dublin, Ireland

Abstract

Foodborne disease surveillance is now at a critical juncture. Whilst remaining firmly embedded in the principles of risk analysis; including assessment; management and communication, technological developments have opened up new opportunities for food safety, in its pursuit of the protection of public health and brand reputation.

Microbiological food safety has traditionally been monitored using culture-based protocols designed to detect; characterise and identify the target foodborne pathogen. Bacterial pathogens have been mainly studied at the species level without any consideration being given to the microbiological context, from which the bacterium was originally recovered. Technological advances in high-throughput DNA sequencing in the early 2000's have made available accurate sub-typing protocols that can be deployed to track foodborne pathogens across the food chain whilst describing the associated microbial communities, from which they have arisen. These advances have rapidly changed the approach to foodborne disease surveillance and the assessment of risk to human health. This paradigm shift heralds the era of precision food safety.

In this presentation, examples demonstrating the application of DNA sequencing in the context of microbiological food safety will be presented. These will describe strategies used to accurately identify bacteria and genotypes of importance to human health during an outbreak along with a study to describe the resistome contained in metagenomic data of relevance to food safety.

PRESENTER BIOGRAPHY: SÉAMUS FANNING

Séamus Fanning graduated with a BSc degree in Biochemistry from University College Cork in 1983. He subsequently obtained his PhD (from UCC) in molecular microbiology in 1990. In 2002 Professor Fanning was appointed to the Chair of Food Safety & Zoonoses at University College Dublin and is the Director of the UCD-Centre for Food Safety. Current research themes of the Centre include studies related to antimicrobial resistance; bacterial transmission across the food chain and these are focused at extending our understanding of those mechanisms, that enable bacteria to adapt to food production environments. This research work is underpinned using molecular methods, including next generation sequencing (NGS), among others. Professor Fanning's research group has an interest in Salmonella and Cronobacter, related to low-moisture conditions and associated food matrices, such as powdered infant formula (PIF). Professor Fanning has published more than 356 original experimental papers, along with 32 review papers, 28 book chapters and two textbooks. He is a member of the editorial boards of international journals including, Foodborne Pathogens & Disease; Journal of Food Protection; Microbial Drug Resistance; One Health Advances; and an Editor of a further two journals Research in Microbiology & FEMS Microbiology Letters. In 2019, he was elected as a Fellow of the American Academy of Microbiology. Professor will be conferred with his DSc degree in June 2023.