Current tactics in food safety

Food safety was explored at a recent SDT meeting. Andrew Wilbey reports

Rapid testing
Dr Cath Rees, associate professor in microbiology, on the faculty of science at the University of Nottingham, presented the first paper, with a review of the uses and potential of bacteriophage as a food safety tool. First reported 100 years ago following unexplained recovery of infected wounds, these viruses are highly specific in their attack on host bacteria and in the dairy industry are commonly thought of as hazards in the production of cheese and other fermented products, where a phage-infected bacterial cell will release about 50 new phage particles on lysis, leading to an extremely rapid increase in the phage population. While this property can have a catastrophic effect on acid development in cheese production, it also creates opportunities in other areas.

Phage may be used in biocontrol, both for the disinfection of surfaces and potentially for eradication of target pathogens from foods. Long-term use on surfaces could run the risk of resistance to that phage evolving, though that might be reduced by co-evolution.

This risk is less likely if the treatment was applied to the surface of foods, as the food would be removed immediately and products are available for this approach. Dosage rate is critical as there must be sufficient phage particles to infect all the target bacteria, since unaffected bacteria could grow and recolonise the foodstuff.

Culture methods are the gold standard in microbiology but can be slow and some organisms are not easily culturable. Many of the rapid tests cannot easily differentiate between viable and dead organisms. Since bacteriophage are highly specific to their host organism and replicate rapidly, then phage-based plaque counts can give rapid quantitative enumeration of the live target bacteria and the method is especially useful for those species that are very slow growing, such as the mycobacteria. Application of this approach to Mycobacterium avium subsp. paratuberculosis (MAP) has suggested that traditional culturing methods have underestimated the numbers present in milk. There is now the potential to test batches of raw milk before artisanal cheese making, with results being available in eight hours instead of 18 weeks for culturing MAP.

An even more rapid test using a genetically modified bacteriophage has been developed, but there may be problems in using it within the EU.

Challenges
Dr Ken Burgess, technical management consultant at Ken Burgess Associates, took a radically different approach to food safety, talking about the psychological aspects of the problem. The former president of the Society started with a discussion of the challenges to implementing food safety (speed, cost, dependability, flexibility, quality), the defenses that should be implemented and the need to balance systems and people.

He differentiated between human error where there are unintentional actions or decisions, and intentional violations. Mistakes can arise from misjudging risk, a common problem that is often the result of taking mental short cuts rather than reflective thinking.

Violations resulting from the culture within an organisation can be very difficult to eradicate and the problems can be found at a number of levels, which may be described as a triangle with environment at the base and rising through behaviour, capabilities, beliefs and values, to identity at the apex. Each has an increasing impact on the levels below it and identity is the most difficult to change. Culture has been compared to an iceberg, where most of the mass is hidden below the surface. Both fundamental assumptions and stated values might need to be changed before any modification of typical behaviour can be expected. Changes need to be directed from the top in an incremental progression to change the culture of the organisation.

Product recall
Dr Ruth Price, the UK/EU harmonised regulatory affairs manager at Campden BRI described a product recall as the last thing to be done when all else has failed. Article 19 of Regulation (EC) No 178/2002 places responsibility on a food
business operator to withdraw or recall any food that is not compliant with food safety regulations where that food has left the control of that operator and also to inform the relevant authorities. There is also a requirement to inform consumers of the reason. Of the 49 food recall notices issued in the first three months of 2016, 24 were allergy alerts, 12 were linked to food poisoning and nine were to physical contamination.

Regulation (EC) No 2073/2005 includes food safety and process hygiene criteria. If a food safety criterion is exceeded then the food must be withdrawn from the market, whereas process criteria are indicative of process safety and remediation is required. Recall must be rapid and targeted.

Traceability is essential to achieve efficient recall. This is easier to manage with batch than continuous processes. Article 18 of the General Food Law (Regulation (EC) No 178/2002) requires traceability at all stages of production, processing and distribution. This in turn requires the keeping of appropriate records.

**Critical control**

Dr Richard Leathers, quality management systems specialist at Campden BRI, concluded the meeting with a discussion of threat assessment and critical control points. He pointed out that, qualitatively, little had changed from Frederick Accoum’s 1820 treatise on adulteration of foods. Adulteration is a form of fraud and can be divided between potentially harmful and deliberate misdescription.

One harmful example is the addition of melamine to milk in China to falsely raise apparent protein results. This toxic compound was thus introduced into dried milk powder for the domestic and export markets. Pet deaths were noted in the US as melamine accumulated in kidneys, then the injury and death of maybe a quarter of a million babies and infants in China was reported. Threats can also be external, for instance seeking a ransom payment.

‘Horsegate’, the deliberate substitution of cheaper horse-meat for beef and other more expensive meats, is another good example of deliberate misdescription causing commercial rather than physical harm. This led to the Elliot Review in the UK.

The defense of authenticity can be improved by mapping the supply chain, identifying impacts, risks and opportunities. The undeclared addition of bovine milk to sheep and goat products is a long-standing problem in the dairy industry that may also physically harm some consumers.

Sometimes contamination can be the result of boredom rather than organised criminal intent and a US study found that the offender was more likely to be male, 31-45 years old and on the permanent staff for less than five years. Codes of practice for dealing with these risks were revised following the melamine and ‘Horsegate’ incidents, and work on version 8 of the TACCP PAS will start in February 2017.