Preventing contamination

Smaller cheese makers and hygienic construction were some of the topics at the Society of Dairy Technology's annual general meeting and autumn symposium. Andrew Wilbey reports

The UK's Society of Dairy Technology held its annual general meeting and autumn symposium on the topic of preventing contamination at Harper Adams University. The six papers presented ran the gamut from Hazard Analysis and Critical Control Points (HACCP) to surface contamination and the small dairy.

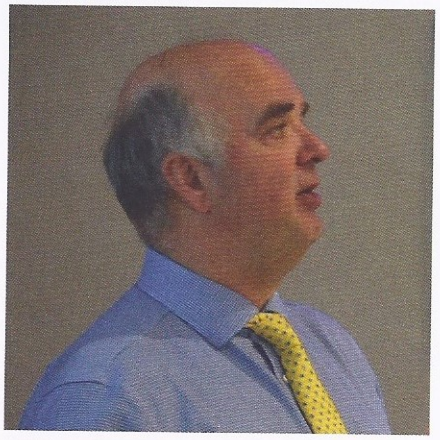
A five-point plan

The first paper was presented by Dr John Holah, technical director at Holchem. The plan was developed through cooperation between Campden BRI, Land O'Lakes, Pepsico and Holchem, following greater awareness of the potential for survival of salmonella in low moisture foods, and focussed on prerequisites since HACCP was of less use in avoiding contamination after heat treatment.

The control cycle was described as preventing entry, restricting harbourage and growth, reducing cross contamination vectors and killing or removing the pathogen. Control of the environment was considered as important as control of the process and it was acknowledged that 10 per cent of workers carry pathogens.

Salmonella in low moisture foods was associated with condensation and in many cases with leakage of seagull faeces from roofs – hence valleys in roofs should be avoided. Listeria infections are less common but more lethal: factory contamination is more likely to come via floors and aggravated by free moisture. Plinths can prevent pallets being brought in from outside by vehicles and footwear changing is essential for all workers and visitors.

Factories should be built on the box within a box principle, with the most critical processes in the innermost box at a higher floor level and operating at a higher air pressure so that air only escapes outwards. Internal dividing walls should be built upon a plinth so that moisture cannot be retained within the wall and each production line should be in its own



Dr John Holah of Holchem discussed controlling salmonella in low moisture foods and how thoughtful building construction can help

room to minimise cross-contamination. Floors should be kept dry, except during cleaning, though drains must not be allowed to dry out and include an airlock to prevent sewer gas emerging. Damaged floors can be sources of contamination.

Cross-contamination can be reduced by good equipment design, avoiding crevice formation, water residues and splashing. Wipeable switch panel membranes should replace push buttons. Product routing should be designed to avoid contamination, and rework can be an issue.

It is best to clean drains first, then the floor and then equipment, avoiding high-pressure jets that can spread aerosols over several metres. An additional, different, cleaning system may be needed periodically to overcome accumulations.

There are no pathogens that are resistant to disinfectants under correct use conditions. An investigative sampling plan is better than a random one and the aim should be to move to predictive control, Dr Holah says.

Hygiene and the small dairy

Dairy consultant Paul Thomas presented the second paper, dealing with some of the problems that small scale cheese makers encounter, since EU regulations are not always interpreted as flexibly as they could be and issues may occur over the interpretation of HACCP.

This year, an *European Guide to Good Hygiene Practice in the Production of Artisanal Cheese and Dairy Products (GGHP)* has been published on the EC Europa website. The guide gives plenty of useful practical guidance but one of the problems arising is how to deal with process hygiene nonconformity where, for instance, there is no harmonised guidance on the interpretation of quantitative polymerase chain reaction (PCR) data for the

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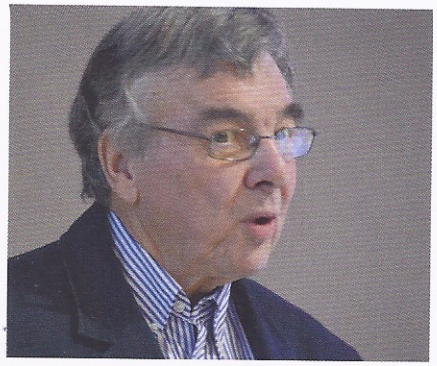
and wear-resistance, useful for knives and shafts, while increased chromium improves bendability but increases cost.

Where better corrosion and stress resistance is needed, AISI 316 with added molybdenum is better than AISI 304 alloy. Poor designs with sharp corners can cause stress concentration and, while the resulting stress fatigue may not result in mechanical failure, the cracks may provide sites for bacteria to colonise.

Most process plant also includes components made from polymers, plus elastomers for seals. These must also be appropriate for the foodstuff, processing and cleaning conditions. A well designed plant with smooth surfaces and free of crevices can reduce cleaning time by up to 75 per cent and save on detergent, water and effluent costs.

Fermented products protection

Michael Pinches, commercial manager at DuPont Nutrition & Health, discussed the limits to shelf life of non-sterilised foods and how they might be made both safer and to last longer. While elimination and



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avoidance of recontamination by pathogens is accepted, other microbial interactions can have both preservation and spoilage implications, depending upon the food being addressed and the way in which it is handled.

For many short shelf life foods, good manufacturing practice is critical and the inherent stability of the product will depend on the introduction of hurdles including fat and sugar content, pH, fermentation processes, storage conditions and water activity.

The initial contamination level is important and the more hurdles that can be introduced, then the greater chance of restricting growth. With some products, growth can also be restricted by the use of protective cultures, fermentates or purified antimicrobials.

In using protective cultures, the first step is to find the spoilage organism in the foodstuff and then screen for potential protective cultures. These can be very effective against low-level fungal contamination and some gram-positive bacteria and may be included in a starter system as well. The shelf life of yogurt containing such cultures can be increased from three to five weeks against mould.

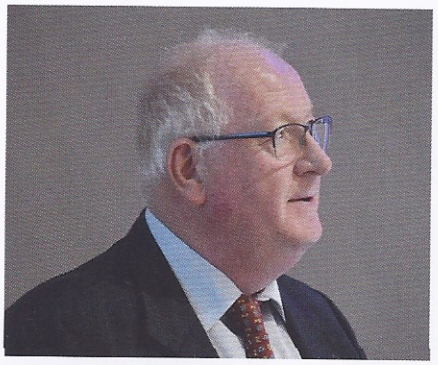
Non-viable byproducts of protective culture fermentation may be concentrated to produce fermentates, which are ingredients with protective properties that might work against yeasts, moulds or gram-positive bacteria. Fermentates may also be used to improve mouthfeel in end products.

Purified antimicrobials are classed as additives and comprise nisin that acts against gram-positive bacteria, along with natamycin that acts against fungi and is commonly used in the red wax coating of Edam cheese. These systems complement but cannot replace good manufacturing practices.

Rapid surface testing

The final paper of the symposium was presented by Dr Martin Easter, chief scientific officer at Hygienia International. Cleanliness of surfaces is of vital importance to the food industry, but cleanliness is not easy to measure.

Traditional plating methods make estimates of the viable biomass, expressed as colony-forming units (cfu), often expressed in log10 format, as numbers can vary greatly. At best, variations less than ±0.3 log10 cfu are not significant,



Dr Martin Easter of Hygienia International examined rapid testing methods

Soeren Vonsild, president of the Society of Dairy Technology, emceed the symposium

but in practice ±0.5 log10 cfu (three-fold) is realistic for limited sample numbers. The ability of bacteria to mutate and grow rapidly adds to the problems of obtaining representative samples using a repeatable swabbing technique, where recovery rates are known to vary widely, from one to 25 per cent.

These systematic problems, plus the time needed for incubation, have led to the use of indirect tests requiring less skill, for instance in cleaning verification where product residues are measured. In the case of milk, tests for protein residues are not very sensitive, but a test for glucose and lactose residues can give a result in one minute with a change from colourless to green.

Pathogen screening tests using chromogenic agar have been developed for salmonella and for listeria; the latter also provides for a fluorescence-based verification of listeria monocytogenes.

The adenosine triphosphate (ATP) bioluminescence methodology for the non-specific surface hygiene post cleaning verification is very sensitive and has stood the test of time. The methodology can also be applied to sterility testing.

More specific second-generation ATP systems are now available, which are capable of measuring specific enzymes that are characteristic of the foodstuff being examined, such as alkaline phosphatase in milk. The technology has also been adapted to provide specific and general microbiological tests that can be completed within eight hours and which have good correlation with traditional methods taking 72 hours or longer. DI

The full presentations are available on the SDT website to members. See www.sdt.org for further information.