General hygiene considerations in the food sector

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It could be assumed that, since HACCP has been in existence for over 40 years, the systems would be well developed, mature and robust. Unfortunately, some recent high profile cases have shown that errors are still being made. What types of hazards typically cause problems for food manufacturers?

An overview of UK food recalls over the past few years shows that allergens are the most common cause of recalls, either due to mislabelling (failure to change labelling rolls between allergen and allergen-free batches of the same product, or incorrect ingredients).

This is followed by physical problems, some chemical issues, and finally microbiological hazards. Although there have been relatively few major recalls or food safety incidents due to microbiological recalls, when problems have arisen, they have often been spectacular in size.

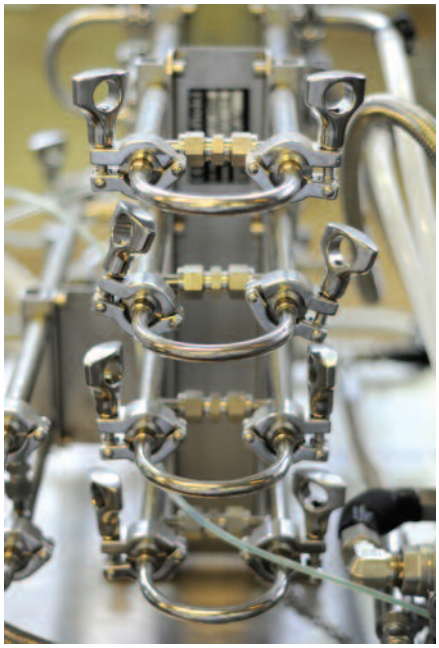
The main microbiological issues include Salmonella spp, Campylobacter, Escherichia coli, particularly E. coli O157, Listeria monocytogenes, Clostridium perfringens and C. botulinum.

Control with HACCP

How can HACCP be used to control these food safety hazards? For the physical and chemical hazards, procedures to minimise raw material contamination, by good farming practices (mainly chemical hazards), or in-factory process hazards (chemical and physical hazards), are required.

For the microbial hazards, procedures need to be in place to minimise the risk of contamination by microbial pathogens, for example, animal welfare and hygiene, transportation and handling up to the abattoir.

Temperature control, including environmental control and cooking and cooling profiles for processed products, are also required. When procedures are not in place or not followed, then the consequences can be disastrous; for example: poor hazard identification, incorrect identification of critical control points (CCPs), inadequate critical limits, monitoring procedures or corrective actions. Finally, poor implementation and maintenance of the completed HACCP plan are serious failings in an otherwise effective system.



Part of Leatherhead's UHT equipment in the pilot plant.

HACCP often fails at the application of pre-requisite programmes (PRPs): poor hygiene and/or cleaning, pest problems, building design or fabric maintenance issues, and poor equipment maintenance, all of which lead to microbial build-up on food contact surfaces.

Staff hygiene

Many problems of hygiene arise from the staff themselves. It is therefore important to ensure that staff are healthy, and that they have a basic understanding of the need for good personal hygiene.

Staff should not be allowed to work in a food processing area whilst suffering with intestinal infections, since these may be transmitted to the food. Open cuts and boils on the hands may harbour pathogenic staphylococci and any staff with such lesions should have them covered with a waterproof dressing. If possible, dressed cuts should also not come into direct contact with food. If this is not possible, then the members of staff affected should be transferred to areas where they do not directly come into contact with the food.

Staff must wash their hands after every visit to the lavatory, but it is often easier to enforce this rule if wash hand-basins are situated at all the entrances to the processing area.

Using this system everyone who enters the food processing area is compelled to wash their hands even if they have not come directly from the lavatories.

This is backed up by effective training and monitoring procedures. Staff should be encouraged to keep fingernails short and clean, since these can be a source of contamination to products.

Staff should not be allowed to wear outdoor clothing within the processing area, since standards of hygiene outside the factory will be invariably lower. This will mean that cloakrooms will need to be provided, where outdoor clothing can be stored during the working day and where staff can change into clean overalls.

Cloakrooms should include lockers in which staff can store valuables such as rings and watches that are not allowed on the factory floor. It should be a function of the factory to provide all workers with clean overalls, hats and, where appropriate, rubber gloves.

It is an unfortunate fact that a considerable proportion (about 20-30%) of staff will be carriers of Staphylococcus aureus and the organism will be found on their hands and in the nose and throat. It is impossible to rid the skin of these organisms by washing, which means that, where there is a great deal of handling of the product, rubber gloves are advisable. Where gloves are provided every effort should be made to ensure that they stay clean.

The wearing of hats in food processing areas is to ensure that there is no fall-out of hair, dead skin scales, or, in some cases, dirt from the hair on to the food. Handkerchiefs are a source of contamination and, because

staphylococci may reside in the nose, they may harbour this organism. Staff should be encouraged to use paper tissues where possible and these should be disposed of hygienically after use.

Critical water supply

Water supply is one of the most critical factors in making products which will be safe to eat and will meet the required microbiological standards. Water from rivers which are also used as lavatories is certain to contaminate the produce with faecal bacteria. Even local authority water supplies may need both filtration and chlorination to suitable levels.

The water supply should be checked for microbial contamination at frequent intervals. The interval varies with conditions found at earlier examinations and may be from once a week to about once a month.

There must be an adequate supply of potable-quality water both for processing and cleaning. This may be from a piped supply or a well/bore hole but, whatever the source, the same criteria should be applied before it is used for food processing. The water should be free of suspended material and chemical pollutants and, above all, free from bacteria which indicate faecal pollution of the supply, i.e., Escherichia coli.

Where the supply is contaminated with such faecal indicator bacteria, then chlorination will effectively get rid of this but, in any case, it is a good practice to chlorinate the supply since this will help to maintain standards of hygiene in the factory.

All water used on the process line or for cleaning down should be chlorinated. This is not a substitute for clean working but it will reduce both the number of micro-organisms and prevent or reduce odours.

When chlorine or a chlorine salt is added to water, chlorine molecules are released. If the water contains protein particles or bacteria, molecules of chlorine attach to these, so some chlorine is used up i.e. is no longer free to do its work.

Only water containing free chlorine has any value as a bactericide and this is why the level of free chlorine must be checked at frequent intervals using a disc comparator or other device/kit.

In-line chlorination system

An in-line chlorination system is best; this should be a type in which the level of chlorine can be varied as and when necessary. Ultra violet sterilisation of water is another possible treatment. UV treatment does not provide residual bactericidal activity and is therefore not as good as chlorination as a way of maintaining water sterility.

Whatever method is used, a disc comparator or test device/kit should be available to check the level of free chlorine.

A maximum of 5ppm of free chlorine should be present in water which comes into contact with the product; 50ppm should be used for cleaning down the premises, where a two or three stage cleaning process is employed; where a one step clean down is used 200-400ppm is used.

Keep equipment clean

Where it is necessary to hold water in storage tanks, great care must be exercised to ensure that the tanks are kept clean and that they are designed to prevent the ingress of birds and rodents. Tanks should be regularly inspected and cleaned.

All equipment must have smooth, easily cleaned surfaces. Plastic cutting boards should be used. Plastic, fibre-reinforced plastic, aluminium, and stainless steel are all suitable materials for containers. Sinks and other facilities for cleaning equipment should be in a separate room from the process area. Large pieces of equipment that cannot be moved should be positioned to allow easy cleaning; and equipment should be able to be easily dismantled for cleaning.

There should be sufficient access to clean under and around equipment, between the base, floor and walls. To help efficient cleaning, any joints between permanent equipment and floors should be covered.

Equipment should be washed with detergent, preferably in hot water, scrubbed with a plastic-handled nylon bush and then rinsed in water chlorinated to 50ppm. Containers should be left upside down to dry.

At the end of the day's work, the production area will be littered with particles of food, water, and general dust and dirt. If the quality of the product is not to fall, it is essential that the whole area is adequately cleaned and disinfected. If processing operations are continuous then a certain amount of time must be allocated in the schedule for cleaning.

Five stage process

Cleaning is essentially a five stage process, dependent on whether a detergent/disinfectant or sanitiser is used:

- All large debris must be removed with a brush or scraper, whichever is most appropriate. Follow up with hosing down using cold, clean water. This removes visible food soil, and associated with the food, large numbers of micro-organisms.
- Wash the whole area with warm water and detergent. Scrub tables and utensils with warm water and detergent, using a plastic scrubbing brush. Make sure the compound used is especially formulated for the purpose. Many household detergents contain perfumes and these may taint the product if used in the factory. Do not mix sanitisers and detergents as this can produce noxious fumes. This second phase removes invisible food soil and most of the remaining micro-organisms.
- Rinse with cold water. This removes detergent, food soil and micro-organisms.
- Disinfect the whole area by drenching or fogging with bleach (50ppm free chlorine), or other types of product. Bleach may react with certain metals so check before using. Do not rinse the bleach away immediately but leave it to act. Wash down with fresh water at an appropriate interval. The purpose of disinfection is the destruction of residual micro-organisms.
- Rinse. Removes disinfectant.

Difficult cleaning jobs may warrant the purchase of a high-pressure cleaning machine. These machines deliver a jet of water at approximately 500psi and most have facilities for mixing detergent or disinfectant with the stream of water. These machines are particularly good for cleaning items of equipment which, due to their intricate design, are difficult to clean with a brush.

They are also very good for cleaning rubber conveyor belts such as those found on automatic prawn grading machines. Due to the very high pressures generated by these machines, care must be exercised in their use since they may inflict considerable damage to badly maintained cement floors and walls; they may also cause injury if directed at other personnel.

The aerosols generated can also cause cross-contamination, if high pressure equipment is not used with care. It is usually found that although these machines are good at removing deposits on machinery, walls, floors and drains, they do not carry away the loosened dirt because of the low volumes of water involved. It is therefore necessary to hose down items which have been cleaned by machine with a low pressure hose and large volumes of water.

Cleaning is often seen as the 'Cinderella' operation in food manufacturing; often being conducted at night when other staff are not working.

The key considerations of effective cleaning are to maintain a balance between the four components of cleaning: chemical, mechanical, thermal energy, and time. Essentially, the amount of energy to clean a piece of equipment or area remains constant, for a given level of soiling.

If cost considerations lead to a reduction in thermal energy, for example, then the other components must be increased to compensate. For example, increased chemical concentration, using a more powerful cleaner, increased mechanical rigour, or increased time.

Time is the component most likely to be under pressure in any manufacturing operation; care must be taken to ensure that it does not get cut. Most spoilage problems in food manufacturing occur because a shortcut has been taken somewhere with cleaning. It is vital to make sure that general hygiene considerations and cleaning are fully integrated into HACCP via an effective set of PRPs. Any changes to equipment or operations should always lead to a review of the cleaning schedules. ■