The importance of maintaining hygiene in the cheese industry

In 2020, approximately 474,000 metric tons of cheese were produced in the UK, an all-time high. According to Provision Trade Federation (PTF), the current UK cheese market is worth over £3 billion with over 98% of households buying into this category. The average Brit is reported to eat 30g of cheese a day and there are over 700 named cheeses produced in the UK, with an export market worth around £675 million.

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Cheese is big business. Across Europe there are many types of cheese which means a variety of production methods, processes, and hygiene related challenges to ensure the safety and quality of the product is not compromised.

Generally, cheeses come in eight varieties including blue, hard, pasta filata, processed, semi-hard, semi-soft, soft, and fresh, and soft-ripened, although regional variations mean that there may be many more to add to this.

Quality and safety

Quality and safety issues are a major cause of concern across all sectors of the cheese industry. Irrespective of the type of cheese being produced, the presence of pathogens can present a hazard to vulnerable consumers, whilst spoilage organisms will reduce the shelf-life and effect the organoleptic qualities of the product. For these reasons, micro-organisms must be eliminated or kept to a minimum level through effective cleaning and disinfection regimes.

In addition, 'wild' strains, or excessive levels of micro-organisms, such as yeasts or moulds, can have a detrimental effect on the starter cultures essential to metabolise lactose in the milk into lactic acid, essential in imparting the characteristic flavours in many varieties of cheese.

Whilst micro-organisms are often introduced to many varieties of cheese in

the form of starter cultures, for example cheddar, or as part of the ripening process, for example Brie, unwanted spoilage micro-organisms will result in reduction in shelf-life or undesirable organoleptic changes. More seriously for the consumer, pathogenic micro-organisms such as Listeria monocytogenes can present a serious health risk in soft cheese varieties, particularly to vulnerable groups.

Pathogenic micro-organisms are described as those that are capable of growing, or surviving in food, and produce illness in the consumer. In cheese one pathogen of particular concern is Listeria monocytogenes and this bacterium is legislated under EU and UK food safety law to be absent at the point at which the product leaves the production site and at less than 100 cfu/g by the end of the product's shelf-life.

Despite this legal control, many recalls of cheese, predominantly soft varieties, have been issued by EFSA through the RASSF alert system in recent years across many countries including the UK, France, Spain and Italy.

Other pathogens that can present a hazard are Staphylococcus aureus, Escherichia coli, Clostridia species and Salmonella enterica although these are less common than Listeria monocytogenes.

Spoilage micro-organisms are able to grow in food products resulting in undesirable changes in their organoleptic properties such as colour, flavour or texture. Consequently, these micro-organisms affect the shelf life of the product and the consistency of the quality and flavour.

Pseudomonas spp. is the most common spoilage micro-organism, whilst moulds such as Mucor and Aspergillus species can also affect many varieties.

Bacteria can divide its cells into two every 20 minutes. For this reason, an initial bacterial concentration of 100 cells can achieve more than three million after five hours of incubation at optimal temperature.

Therefore, all surfaces over which the product passes must be as hygienic as possible to prevent the transfer of micro-organisms.

There are several ways to prevent micro-organism's multiplication, which are effective pasteurisation of milk (unless the cheese is derived from raw milk), cold storage, cleaning and disinfection, personal hygiene, spatial separation of raw and finished product areas and hygiene interventions during the working day.

Biofilm formation also presents a threat to food safety and integrity, particularly as Listeria species are recognised as primary colonisers along with Pseudomonas species. Many foodborne pathogens can develop biofilms in areas that are difficult to properly clean and disinfect.

Their formation depends mainly on the interaction between three components: bacterial cells, adhesion surface and the environment that surrounds the biofilm.

Basic steps of production

Despite the different varieties, all cheese starts from the same raw material – milk – and production follows six basic steps which are:

- Acidification.
- Coagulation.
- Curds and whey.
- Salting.
- Shaping.
- Ripening.

Throughout the production process multiple cleaning and disinfection procedures should be carried out.

Cleaning in Place (CIP) involves circulating detergent, usually alkaline or acid, through pipework and into vats and tanks via spray devices. This often highly automated process requires low-foaming products, specifically formulated to cope with the water chemistry as well as being capable of

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removing the soil from surfaces. Where milk has been heated as part of the process, deposits of calcium phosphate will precipitate from the milk and whey. This will agglomerate with fat and protein resulting in milk stone, which requires removal using acid detergents or formulated caustic.

Ware washing (tunnel/cabinet) items respond well to the use of acid detergents that effectively remove the debris and soiling that may build-up in recesses and corners of the equipment. Often low foaming products are selected, and the use of an acid detergent minimises the chances of subsequent product sticking to the surface of the mould.

The manual application of foam detergents, either alkaline or acidic, to the external surfaces of equipment and the inside of open tanks or vessels ensures the effective removal of cheese residue. Commonly, chlorinate alkaline products are used due to their ability to remove protein and fats.

Dismantled, removed or small parts may be cleaned manually in sinks or other suitable receptacles to remove debris and product build-up. Often a neutral detergent with warm to hot water is used and any brushes or utensils used to achieve the clean should themselves be regularly and thoroughly cleaned to ensure that they do not present a hazard to subsequent cheese products.

It goes without saying that the standard of personal hygiene of employees is, as with all food processing, critical to ensure the safety and quality of the cheese produced. Effective hand washing and disinfection using suitable products is crucial, as is the cleaning of clothing worn in the food production area.

One further method of cleaning is aerial disinfection. Depending on the cheese type, cheese factories are sensitive to fungal yeast and mould contamination and aerial disinfection is an essential step in minimising this risk.

Membrane cleaning is a highly specialised task using specifically formulated products. This process helps turn waste products into high value end products which are much sought after in other food processing industries as ingredients or raw materials.

The most common techniques used for protein standardisation are microfiltration, which removes bacteria from cheese milk and can be used to achieve sanitation of the brine solution; ultrafiltration, which concentrates whey protein that can then be utilised in other products or processes; and reverse osmosis which also concentrates whey proteins.

It is also imperative that the cleaning and disinfection of cheese moulds is effective. Poor cleaning can cause blocked draining pores. This will affect yield and product quality.

In this important sector of food production, the effective application of hygiene controls ensures that the end products can continue to be enjoyed safely. The standard of hygiene and the efficacy of the cleaning and disinfection regime employed however must be monitored, managed, and suitably documented to provide customers and food safety authorities with the confidence that the process is under full control and all risks have been considered.

Part of this management process is to employ suitably trained staff who are equipped with the tools, time and chemical regimes designed to minimise risk and maximise product quality and safety.

Well designed management system

As cheese is a ready-to-eat food, specific hygiene legislation requires the control of pathogenic micro-organisms such as Listeria monocytogenes to avoid food poisoning and product recalls. A well designed, managed, and equipped food safety system will ensure that this aim is met, and that hygiene will be subject to a process of continuous improvement. Christeyns Food Hygiene has over 30 years of experience in the cheese hygiene business and provides both chemicals and equipment for customers on a bespoke basis. ■