

Filtration & Separation: Contamination

Banishing the bugs

Both dairy processing and product development depend on filtration and separation technologies for survival

When outbreaks of foodborne illnesses occur, the culprit is pathogenic microorganisms. One of the most dangerous, *Listeria monocytogenes* bacterium, is at the root of listeriosis, a severe infection that can sometimes turn deadly.

Pathogens have been an especially serious problem for the dairy industry, since contaminated cheese and milk have been the cause of many of the listeriosis outbreaks over the years. Statistics for 2003 from the USA, Germany, and France indicate that between one and eight per cent of foodborne illnesses come from dairy products. Ten per cent of these are from milk and 87 per cent from cheese.

The dairy industry has responded by instituting practices based on Hazard Analysis Critical Control Point (HACCP) guidelines and by diligently pursuing improved contamination control equipment and processes for its plants. Detection and elimination of microbial contaminants have been improved using membrane filtration and total fluid management programmes to identify and address potential sources of contamination throughout the production process.

Unsuccessfully controlled contamination takes its toll in many ways. With the many sources of contamination present in dairy plants, risk is high for product recall and its profit-reducing consequences of lost sales, product and brand equity. Above all, industries must continually grow and reinvent themselves to survive, and a constant battle with seemingly omnipresent contaminants drains energy and resources from the development of new products and markets.

Listeria monocytogenes bacteria are abundant in the natural environment. Unpasteurised milk has a natural microbial flora containing up to 10 cfu/ml of the bacteria. Listerias show a regular rod form (0.5 μ m-2 μ m length/0.4 μ m-0.5 μ m diameter), with a lag phase of between 24 and 48 hours and a regeneration time of 20 hours.

In a dairy plant, controlling *Listeria* bacteria is challenging because of their ubiquity and unique characteristics. These include:

- the ability to grow at refrigeration temperature (down to 0-1°C);
- a higher thermal resistance than other pathogens;
- a tolerance towards low pH (down to 4.4); and
- sodium chloride levels (up to 12 per cent).

When final dairy product becomes contaminated, the production process is usually to blame. Bacteria are easily spread by contact with wet surfaces and with process fluids, such as water that is used for curd and butter washing, lactose removal, and pasta filata cheese stretching. Contamination can result from poor plant or equipment design, improper identification of contamination sources, lack of appropriate process controls, and inefficient sanitation.

The dairy industry is not one to stand idly by in the face of difficult challenges, and it has become aggressive in instituting measures to prevent contamination in plants, processes, and products. Nowhere has this commitment been felt more strongly than at the 2004 International Dairy Federation symposium held in South Africa in March, where dairy producers from all over the globe pledged to increase their decontamination efforts in the interest of the health and welfare of their customers.



Pall Membralox ceramic membranes successfully remove microbials from milk and whey, while achieving a high protein transfer rate

Total fluid management

Dairy plants have been applying HACCP guidelines to reduce contamination risk with positive results. More drastic reductions are possible when membrane filtration solutions and total fluid management programmes, offered by companies such as Pall Corporation, are used to supplement guideline enforcement. The total fluid management programme helps dairy plants identify and address potential sources of contamination at each critical point in their production process. It uses the customised selection and integration of quality products and services to provide highly effective filtration of pathogenic bacteria. This allows the dairy plant to operate at the highest possible efficiency and lowest cost without compromising the product's quality and taste.

Some dairy applications for total fluid management are:

- removal of bacteria from skim milk for the production of extended-shelf-life milk, raw milk cheeses, and whey protein concentrates (using ceramic membrane systems);
- protection of bulk water in the cheese making process (using microfiltration systems); and
- sterilisation of food-grade process water at points where a high risk of contamination has been identified (using sterilising filters). **dii**

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