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# From cheese to chymosin

**T**he fourth issue of the *International Journal of Dairy Technology*, volume 67, reports on a wide range of topics, cheese and fermented milks being the most popular with researchers. A review of the dairy industry in Saudi Arabia was also included.

An optimisation exercise was carried out with dressings for directly-acidified cottage cheese curd, using a 18-24% fat in the dressing and either single or mixed-strains. The best results were obtained with a dressing containing 22% fat, fermented by a mixed-strain starter.

Ripening temperatures impacting cheese qualities and alternatives to calf chymosin were looked at in the *International Journal of Dairy Technology*, Andrew Wilbey reports

Ripening temperature can affect cheese quality. A study with Reggiano cheese used 12°C for six months as the control and examined the effect of storage at 20°C for two or four weeks then held at 12°C. In all cases there was a decrease in

non-starter lactic acid bacteria on storage, with a significant effect from storage conditions while storage at elevated temperature accelerated the development of the sensory characteristics of this cheese. Antimicrobial agents may extend the



shelf life of cut cheese. Chitosan was the most effective of the naturally occurring substances studied, with little difference between normal- and nano-particulated solutions.

## Alternatives to calves

Enzymic coagulation is a fundamental characteristic of most cheese production and alternatives to calf chymosin are always being sought. A serine protease from *Virgibacillus* sp.SK37 was used to coagulate milk with and without glucono-d-lactone (GDL) as the acidulant, indicating that the enzyme was capable of selective hydrolysis of k-casein, the gel firmness increasing under acid conditions.

Biogenic amines can be formed in mature cheese and have the potential to cause harm. A study of Chilean Gauda cheese indicated that increases in water activity, free amino acid content and *Enterobacteriaceae* favour production of these amines, though the levels found were well below those associated with possible health risk.

Traditional eastern European cheeses are now being characterised. A study of proteolysis in Macedonian 'Beaten' ewes milk cheese reported ranges for groups of breakdown products, including free amino acids and volatile compounds. As with other cheeses, higher salt contents were associated with reduced proteolysis. Traditionally, Turkish 'Civil' cheese may include some whey cheese and has relied on endogenous mould growth to provide the secondary fermentation. Use of a pure culture of *Penicillium roqueforti* gave slow growth, with little proteolysis in the first 90 days but a sharp increase in soluble nitrogen fractions thereafter. Addition of the whey cheese reduced proteolysis.

## Valuable whey

Whey is the major product (by weight) of cheese manufacture and whey proteins an increasingly valuable by-product. The properties of these proteins can vary considerably, depending upon the process conditions and the casein residues. A comparison of products made from milk permeate demonstrated that processing at low temperatures increased the casein content, giving poorer sensory, foaming and storage properties. Whey proteins have also been used to fortify milk for yogurt making. The addition of

whey protein concentrate was shown to improve the textural characteristics of set yogurt, with lower syneresis and better water-holding capacity.

Low viability of probiotic organisms can be a problem in fermented milks. Addition of an extract from shiitake mushrooms was shown to improve viability of selected *Lactobacillus reuteri* and *Bifidobacterium breve*. In a separate exercise with probiotic yogurts, the influence of inulin and of demineralised whey powder was related to both ingredient level and storage time.

## Fortification

Dietary supplementation can affect the lipids in milk fat. The use of extruded linseed increased the levels of unsaturated fats, including omega-3 and conjugated linoleic acid isomers, plus higher levels of long-chain triglycerides. Milk is generally recognised as a good dietary source of calcium but fortification can present technological problems. Fortification of skim milk powder with calcium salts demonstrated that soluble salts had a pronounced destabilising effect, attributed to higher levels of ionic calcium.

Anti-obesity effects are of great interest. Trials on high-fat diet-induced mice with a probiotic dahi showed reduced weight gain and epididymal fat weights.

Freezing is commonly used for pres-

ervation of milk samples prior to enable analysis to be carried out at a later date, the assumption being that any changes in the microstructure would not interfere with subsequent analysis of micronutrients. Storage trials over one year indicated that preservatives were not equally appropriate for all analyses, so any choice of preservatives should be included in the planning of a study.

## Misuse of medicines

The misuse of veterinary medicines such as penicillin and sulphonamides continues to be of concern. The use of monoclonal antibodies immobilised on carboxylic magnetic nanoparticles was reported to provide a 1.5 times more sensitive assay than the random immobilisation method. A survey of 150 samples of raw milk, white cheese from three dairy plants in Ankara indicated high levels of contamination of the raw milk with *Escherichia coli*, *Staphylococcus aureus* and *Bacillus cereus* with reduced levels in the milk products. *E. coli* was recovered from 60% of white cheese and 56% of ice cream samples, while *S. aureus* was recovered from 45% of white cheese and 36% of ice cream.

As might be expected, *B. cereus* was carried over into the cheese and ice cream. Isolates displayed resistance to several antibiotics but not (yet) to cefotaxime. **DT**

