While culturing is normally regarded as the gold standard for enumeration of bacteria, the difficulties and long incubation times lead to underestimates while PCR methodology included non-viable cells though the emerging phage-based assay should overcome these concerns. These difficulties have led to a broad variation in the D- and z-values for thermal death of *Mycobacterium avium subsp. paratuberculosis* (MAP), possibly aggravated by issues of clumping and inclusion in somatic cells as well as the possibility of more heat-resistant sub-populations. These factors make the modelling of thermal death rates very difficult, even assuming that accurate time-temperature profiles of plate pasteurisers are known. Reports of original research contribute a further 18 papers.

**Analysis**

Fourier transform infrared spectroscopy has been adopted widely for routine milk analysis and offers the potential to detect some adulterants. The use of targeted and untargeted models to detect potential milk adulterants was reported, together with expected limits of detection.

Immunoglobulin G (IgG) is a major immune component of colostrum and is of interest as a functional food. Passive micro-rheology was used to investigate the correlation between IgG and rheological characteristics, finding a correlation between the elasticity index and IgG concentration.

**Diary microbiology**

*Mycoplasma bovis* is a major causative organism for mastitis in cattle. A study of the status of *M. bovis* over eight years in paired samples of serum and milk in China plus similar numbers from the Inner Mongolia autonomous region showed unexplained fluctuations but averaging just over half and a third of respective samples. There was no direct relationship to heat stress but a possible inverse relationship to air temperature was noted.

Bioethanol and beta-galactosidase production by *Kluyveromyces marxianus* and *Saccharomyces fragilis* were compared using cheese whey media in stirred reactors at 30–40°C. *S. fragilis* gave the highest ethanol production at 40°C and 8.8% initial lactose level while a strain of *K. marxianus* demonstrated the highest beta-galactosidase activity with 8.8% lactose in the fermentation medium at 30°C.

The formation and dispersal of biofilms on stainless steel surfaces at 25°C was investigated using incubation with three strains of each of *Enterococcus faecalis*, *Listeria monocytogenes*, *Staphylococcus aureus* and *Bacillus cereus* in mono- and multi-species systems. *E. faecalis* exhibited dominant behaviour in most systems, while the other pathogens did not form biofilms in mixed, whey protein based systems. Greater biofilm dispersion was observed in skimmed milk.

**Milk processing**

Microfluidisation and ultrasonication were investigated as adjuncts to pasteurisation. Microfluidisation was found to be more effective in modifying the physicochemical properties, giving smaller monodispersed particles and greater inactivation of protease activity without changes in pH, lipid oxidation or thermal denaturation of proteins during subsequent storage.

Heat stability of bovine milk to indirect UHT and in-container sterilisation was compared. Slightly more sediment was produced following UHT treatment but adding stabilising salts at 6.4 mM reduced sediment formation in the UHT milk. Addition of excessive (12.8 mM) levels increased sediment with both processes.

**Fermented milks**

A study of Georgian yogurt-like Matsoni recovered about 300 strains of lactic acid bacteria. The species most represented were *Lactobacillus delbrueckii*, *Streptococcus thermophilus* and *Lactobacillus rhamnosus*, indicating a high degree of biodiversity. The...
bulgaricus was more commonly isolated than the lactis subspecies of L. delbrueckii, while the less commonly found strains of L. rhamnosus were recovered from fewer areas.

A comparison between skim milk yogurts with and without the use of transglutaminase (TG) indicated significant differences between the TG yogurt and the control. The TG yogurt was firmer but less creamy than the control, the latter having a higher acceptance index.

Some consumers seek high protein products to increase muscle bulk. A series of high-protein set yogurts were prepared, based on 12% reconstituted skim milk powder fortified with up to 8% whey protein, provided from either whey protein concentrate (WPC80) or whey protein isolate (WPI) powders. The rheological properties of the yogurts were measured and those produced using the WPI displayed accelerated gel formation.

Dried products
An optimisation study of foam-mat drying of yogurt compared the effects of different levels of lecithin on foam density and foam expansion on dehydration at 58-63°C. No significant effects of lecithin concentrations of up to 1% on bulk properties were noted, but the treatments significantly affected functional and surface properties of the powders.

Cheese
The activities of a strain each of Penicillium camemberti and roqueforti were compared using culture on whey solids based and simulated cheese media. Growth on the whey-based medium resulted in greater lipolytic activity, while the culture medium had less effect on proteolytic activity. The effect of pH varied with both the culture medium and the organism.

Enzyme-modified cheeses (EMC) are used as commercial flavour enhancers. A comparison was made between eight different EMC types, finding free fatty acid levels at 10-100 times that in the natural types. Goat EMC was characterised by furan compounds and 2-acetyl-pyrrole while blue EMC had the highest levels of methyl ketones.

Ovine ricotta cheese can be produced as a by-product from whey drained off during production of Pecorino and similar cheeses. The acid and heat coagulation process will trap fat from the whey. Ewes were randomly allocated to three groups, either given daily access to pasture, zero grazed with typical winter rations or zero grazed with winter rations plus extruded linseed. Each of the milks were used to produce Pecorino cheese and each of the subsequent wheys then used to make ricotta. The fat content of the linseed ricotta was significantly higher than in the other two, while the linseed and pasture-based ricotta had lower levels of saturated fatty acids and higher levels of conjugated linoleic acid. The ricotta from linseed fortification scored highest for sensory acceptability.

A comparison between pasture, grass plus clover and indoor feeding with a total mixed ration (TMR) was also reported in Maasdam cheese production. The pasture-derived cheeses were less white and more yellow than that produced from the TMR milk. Acetate levels were lower in cheeses produced from the clover-fed milk, while butyrate levels were higher for cheeses from TMR milk. Cheese from grass-fed milk scored higher than that from TMR milk for smoothness of texture, ivory colour and shiny appearance, but there were minimal differences in cheese yield, composition and ripening.

Experiments with a Pasta Filata approach to making artisanal kaskaval cheese curds used both raw and pasteurised ovine milks and a starter culture. Heating the curds to 55-58°C in the water reduced levels of coagulase-positive staphylococci and coliforms but favoured enterococci in raw milk curds. Pasteurisation of the milk aided prevalence of Streptococcus thermophilus and Lactococcus lactis from the starter and generally improved microbial quality.

Ice cream
Polyols may be added to ice cream where attempts are made to reduce sugars while retaining sweetness and consistency. A series of ice creams were produced using five polyols as alternatives to sucrose, together with the addition of Bifidobacterium animalis subsp. lactis BB-12. The viable bifidobacteria counts remained above 108 cfu/g in all samples over a 28-day storage period. The experimental design highlighted differences in sweetness and in hardness related to the molecular weights of the polyols.

Butter
A survey of 147 artisanal butter producers in the Wallonia region of Belgium demonstrated the variability in methodology and scale of production. Average quantities varied from 19g from small herds of fewer than 20 cows to 67kg with herds of more than 60 cows in production.