Institute of Food Science & Technology

FOOD BITES

Milk and Dairy Products

Welcome to the first Food Bites of the new school year. In this one we learn more about milk and dairy products, and some of the processing technologies associated with these products. We review what's good about milk and why some people can't drink it. In the regulars section we see milk in action through the European Schools Milk Scheme and gain some great insights on careers and courses associated with the dairy area – to hopefully inspire some new young food scientists! "In the news.." captures the melamine contamination scandal of just last year. Finally, this issue also highlights World Schools Milk Day on 30th Sept 2009 - maybe something for your school to get involved in!

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Food Bites is the newsletter produced as part of the Institute of Food Science and Technology's Schools Affiliation Scheme. This newsletter aims to provide information and exchange ideas that can be used to support Food Technology teaching at GCSE and A Level in schools and colleges. The Institute of Food Science and Technology (IFST) is the leading independent qualifying body for food professionals in Europe. The IFST aims to serve the public interest by furthering the application of science and technology to all aspects of the supply of safe, wholesome, nutritious and attractive food, nationally and internationally and to advance the standing of food science and technology, both as a subject and a profession.

Milk in our Everyday Lives

Everyone in the world has drunk milk at some point in his or her life. Indeed milk is the food, which exclusively sustains us for the first few months of life. All mammals produce milk to nurture their young and the composition of different milks (see table 1) reflect the growth and development patterns of the different mammalian species. For almost all people "milk" is synonymous with milk from the cow and that is what is meant here in this newsletter unless stated otherwise.

The yield of milk from the domestic cow, Bos taurus, has increased drastically over the last century due to dairy cattle breeding and production efficiency gains. Most dairies today are high-tech operations. The time delay in leaving the dairy and arriving in the supermarket is generally very short, the same day in many cases. The UK, and Europe on the whole, is a significant milk-producing region of the world, along with the USA, Canada, Australia and New Zealand. This also largely reflects patterns of consumption.

Consumption of milk and dairy products varies from country to country and from person to person. In the UK and northern Europe people tend to consume milk quite regularly, even as adults. Think of the ways we use milk everyday – on breakfast cereals, in desserts like rice pudding or custards, or just as a drink. For most tea drinkers in Britain, a cup of tea is not a cup of tea without milk in it, but in other parts of Europe milk is not generally added to tea. Yet in some parts of Scandinavia milk is a mealtime drink for many adults. But in many parts of the world, consumption of milk is very low.

Different types of dairy products

There are many products made from milk. Even **milk** itself comes in a range of different products on our supermarket shelves. Skimmed, semi-skimmed, whole (or "full-fat"), Jersey, UHT, homogenized, long-life fresh milk, fermented milk, buttermilk, powdered and condensed milk are all examples. And on top of this, there are some fun new products from milk under trial too at the moment (see the "In the news.." section). Although milk is nearly always cows milk in the UK, it is also possible to buy milk from goats and sheep. In other parts of the world, it is normal to obtain milk from other milk animals too (in the Middle East this is from goats and camels; in the Far East, water buffalo are an important source; in Lapland, reindeer milk is consumed).

The fat content of milk when it collected at the dairy is about 3.5%. In Jersey milk it is a little higher, and gives the creamier taste. This is termed "whole" milk. Various processes are then applied to the milk before it reaches consumers, primarily a heat treatment called pasteurisation to remove spoilage microorganisms. (It is possible to find "raw" unpasteurised milk or cheese made from raw milk but not very common). More information on the processes used in the dairy industry is given further on. Many years ago full-fat milk was the normal milk consumed by households. However today this milk accounts for only about 25% of milk sold in the UK. Lower fat milks are the "norm" today. Semi-skimmed milk has a fat content of about 1.5% and skimmed milk has had almost all of the fat removed (down to about 0.1-0.3%). In some places it is also possible to buy milk with fat content between these two levels (about 1%).

There are many other products made from milk including:

- Cream - this separated fat layer of milk is used to make different types of cream. Single cream contains about 18% fat whereas double cream is about 48% fat and whipping cream about 40%. Pasteurisation can still be applied without affecting the ability to form a foam, which is essentially what results when air is whipped into such cream.

- Yogurt is a very popular dairy product made by the fermentation of milk by lactic acid bacteria. Different fat contents reflect the source milk the yogurt is made from. Fruit flavours and cereals can also be added. Yogurts are often used as a delivery vehicle for other ingredients, such as probiotics.

- Butter is a water-in-oil emulsion made from cream by phase inversion (milk as an oil-in-water emulsion, is discussed further on). Butter is about 80% fat. Reduced fat spreads based on dairy or non-dairy components are often more popular today. Spreads are often used to carry "functional" ingredients such as cholesterol-lowering plant derived sterols.

- Cheese is made from curdled milk by removal of the whey part (liquidy part) and then ripening of the curd part (i.e. solids part) using particular microbial cultures. There are a few thousand varieties of cheese in the world. Page 13 (in "Life after school..") shows a hands-on experience of cheese being made by students.

- Ice cream is another universally popular dairy product, made from milk of varying fat contents. Whilst the process used means that this product should not present problems for lactose intolerant people, milk solids are often added back and this reintroduces lactose to the finished product.

- A lactose-free milk is now also available in the UK for people who are intolerant of normal milk. This modified milk is made by taking regular cows milk and filtering it to remove half the lactose. The enzmye lactase is then added to the milk to break down the remaining lactose into simpler forms which the body can absorb.

- Dairy derived food ingredients also feature significantly in the food industry for the functional or nutritional properties they give to the food. See what you can find on ingredients labels - such names as sodium caseinate and whey proteins, amongst others.

Processing technologies associated with milk and dairy products

There are a number of technologies which are important in the production of dairy products. Some of them are outlined here.

Most milk sold in the UK is pasteurised milk. Normal **pasteurisation** extends the shelf-life of milk in the fridge by a few days, a week at most. Pasteurisation is a relatively mild heat treatment, which is sufficient to destroy disease-causing microorganisms and inactivate enzymes. It is usually carried out using continuous flow equipment involving plate heat exchangers. (The opposite of a continuous procedure is a "batch" procedure, where materials are only treated in batches). For the pasteurisation of milk a heat treatment of 72^{o}C for 15 seconds with rapid cooling

to below 10ºC is generally applied and this is referred to as the high-temperature-short-time procedure (HTST). Older methods used a lower temperature, longer time regime, of typically 63ºC for 30 minutes, called the Holder method. Furthermore, even higher temperatures can be used, for example 88ºC for 1s, referred to as flash pasteurisation. You may notice there is a time-temperature relationship exhibited here. You may have come across this before in other areas of science. Such relationships are often relied upon in food processing. Pasteurisation curves are used in the food industry showing the time and temperature relationship for a necessary reduction of microorganisms. An example is shown in the extension section. The destruction of an enzyme present in milk, phosphatase, also follows a similar time-temperature "curve" as for the destruction of the tubercle bacillus. Testing for the presence of the enzyme therefore can be used as an indicator of inadequate heat treatment in milk.

Because pasteurisation is a relatively mild heat treatment, it causes minimal sensory and nutritive changes in the food. Some vitamin levels are reduced, mainly thiamin and vitamin C, but this is an unavoidable compromise of ensuring microbial stability. Any changes to the sensory properties, such as taste and texture, are really inconsequential since very few people today have ever tasted non-pasteurised milk to make a comparison!

To give a longer shelf life to milk or to reduce the need for refrigerated storage then higher heat treatment processes are used. In **ultra high temperature processing (UHT)** a temperature of 130ºC is applied for 1 second. Packaging the treated milk in aseptic packaging, where oxygen is excluded, gives the milk a very long shelf life out of the fridge. In warmer countries or where delivery distances are great UHT milk is often the usual product. UHT milk has a different flavour to pasteurized milk, but some people who are used to consuming this actually prefer the taste. An example of a UHT processing equipment at pilot scale is shown on page 16.

Another technology now used to extend shelf life of milk is a process using a **microbial filtration step**, prior to pasteurisation which removes further microbes and stops later spoilage. Today in the UK it is possible to buy milk with a fridge life of over 3 weeks unopened. The milk, sometimes referred to as extended shelf life (ESL) milk, tastes the same as regular pasteurised milk. Once the milk is opened then it is handled as regular pasteurised milk. As with all food products the choice of packaging is also important. An opaque bottle/carton prevents UV light from spoiling the milk.

Another processing technique of milk, touched upon earlier, is **homogenisation**. Milk is forced through a small opening at high speed, breaking down the fat globules into smaller ones. This results in a physically stable emulsion in which the fat globules no longer coalesce into cream.

Dried milk powders, from either skim milk or whole milk, can also be produced by **spray drying**. In this procedure milk is finely dispersed in a spray tower by centrifugal atomization (spun out into tiny drops) and dried with hot air.

Nutritional issues

Milk is an important source of many nutrients, particularly for the young. In addition to protein, carbohydrate and fat, milk contains significant amounts of calcium, which is essential for developing and maintaining strong bones in children and adults. Calcium intake is an important concern at many stages of life: growth and

development in children and young adults; for women during pregnancy and lactation and also after menopause when osteoporosis can present a risk. Mild calcium deficiency is not automatically diagnosed because the body tends to maintain serum levels at the expense of skeletal reserves, i.e. from our bones. Milk also contains both fat-soluble and water-soluble vitamins, namely vitamin A (fat soluble) and vitamins B12 and B2 (water soluble).

These nutrients are all important for growth and health. The European Schools Milk Scheme discussed on page 10, is founded on the principle of access of highly nutritious, good quality dairy products for children across Europe, in recognition of the nutritional importance.

Most food pyramids recommend 2-3 servings of dairy products a day. The contribution of fat - and particularly saturated fat - from dairy products to the diet is also recognised today and accordingly lower-fat options, are often advised. For example it is now recommended that school children (older than 5 years) drink semi-skimmed milk rather than whole milk.

The main constituents of milk are shown below in Table 1.

Constituent	Cow milk	Goat milk	Sheep milk	(Human milk)
Energy (kcal)	66	60	95	69
Protein (g)	3.2	3.1	5.4	1.3
Fat (g)	3.9	3.5	6.0	4.1
Lactose (g)	4.6	4.4	5.1	7.2
Calcium (mg)	115	100	170	34
Water (g)	87.8	88.9	83.0	88.2

The chemistry of milk

The major protein in milk, accounting for about 80% of the total protein, is called casein. The other protein fraction is the whey proteins (lactalbumin, lactoglobulin and immunoglobulin). The casein is arranged in super-structures called micelles, which consist of protein together with phosphate, citrate and calcium. The micelle is itself an aggregate of sub-micelles. The milk proteins are of high biological value which means they are readily used by the body.

The fat in milk occurs in the form of droplets or globules, surrounded by a membrane and emulsified in the milk serum part (the whey part) or the watery part. Milk is a so-called colloidal system, an oil-in-water emulsion. This emulsion is not naturally physically stable which is why creaming occurs if it is left to stand. The lighter fat globules rise to the top through the denser water phase and can be seen as a creamy, yellow coloured portion of the milk, above the whiter, more watery part. This colouration is due to the scattering and absorption of light on the fat globules. However this phase separation is not seen if the milk has been homogenized, and the fat droplets reduced to a size which does not cause coalescence (creaming).

Furthermore, to see creaming at the top requires clear packaging. Unless you receive doorstep delivery of full-cream, non-homogenized milk in glass bottles then you may not have seen this. Phase separation can be speeded up through centrifugation. (Skimmed milk is so called because the fat portion separating out is then "skimmed off").

The sugar in milk is called lactose and this is a disaccharide (two smaller units joined together). The chemical name for lactose is actually β–D-galactopyranosyl-(1→4)-α-D-glucopyranose. Lactose is less sweet than sucrose, the sugar we find in the kitchen. If sucrose is 1.0 on the sweetness scale then lactose is only 0.16 units. In heated milk products, there is also lactulose which is a little sweeter, for example in condensed milk.

CONSUMER ISSUES

Lactose intolerance

In some parts of the world people consume very little or no milk at all. This is partly due to a natural intolerance to lactose - sugar in milk - that many people around the world exhibit. Normally lactose is broken down, or digested, by an enzyme called lactase. As we get older the amount of the enzyme in our body decreases. Lactase declines rapidly after weaning in all mammals including humans. (It is very, very rare to be born without the enzyme lactase). In some people, particularly in certain parts of the world, the amount of this enzyme in the body is very low. If the body is unable to digest this sugar then symptoms such as bloating and diarrhea can result. Lactose intolerance is relatively low in northern Europe, estimated at around 5-15% of the population, but in parts of Africa and Asia it is found in 50-90% of people. People with lactose intolerance can sometimes take small amounts of milk without being too ill. Lactose intolerant people can however usually drink fermented milk products, since the biochemistry is changed during the fermentation process. Low lactose milks have also been developed today. Milk products such as cheese and ice-cream should not in themselves present problems to lactose intolerant consumers but the practice of adding back milk solids reintroduces lactose. Reading ingredients labels in important for people with intolerances and allergies. Some lactose intolerance is not due to low lactase levels but to other things such as Crohn's disease or Coeliac's disease or acute gastroenteritis. But lactose intolerance should not be confused with milk allergy, a rarer situation, where consequences of consuming milk are more severe.

Milk Allergy

Some people have an allergy to the protein in milk, causing an immune-system response in the body. Anybody diagnosed with an allergy to milk needs to totally eliminate milk, dairy products and any foods containing milk ingredients from their diet. For such people, reading labels on food packaging is especially important. Today there is a good selection of dairy alternatives, such as milk from soya and cereals, available to allergy sufferers. These products are popular with many other people too, who chose not to eat dairy products for one reason or another, or who just enjoy the taste of these alternatives.

Organic dairy products

Organically produced milk and dairy products represent a growing segment of the food industry in the UK and Europe in general. Most supermarkets now sell organic

dairy products alongside their regular non-organic produce, giving consumers greater choice. Sometimes organic milk does not cost any more to buy than conventional milk. Reasons for opting for organic products vary between people – the main drivers can be related to human health, animal welfare, environmental or societal issues. Organically produced milk comes under standards controlling production and handling. Generally, organic production falls under regulations concerned with chemicals and pesticide use, grazing access for cows, GMOs, antibiotics and hormones, where this is of relevance. For example, in the USA a hormone called bovine somatatrophin (BST, or bST) which is used to increase milk yields, is not allowed in organic milk, but in Europe this hormone is not allowed in any milk production, organic or conventional. It is also banned in Australia, New Zealand and Canada. In addition to chemicals, some argue that certain processes should not be accepted under organic criteria, for example homogenisation. (There are some reported consumer concerns about the effect of size-reduced fat globules and enzymes on the body, in particular with cholesterol and satiation response). Many organic milk products are homogenised but non-homogenised (usually organic) milk can be found in some supermarkets.

International research in dairy science

They are many studies that have been undertaken in the dairy area - from the cow right through to new product innovation and development. A couple of examples are given below but you can find many others for certain. Just browse the internet!

✯ Researchers at a biotechnology firm in New Zealand discovered a few years ago that some cows naturally carried a gene, giving them the ability to make milk of a reduced fat content, like skimmed milk. The research team screened thousands of cows. They found one cow in particular (which they named Marge!) which produced milk of a very low saturated fat content, and higher polyunsaturates, and with higher omega-3 oils. The key to the research was the discovery that this special Friesian cow with this random genetic mutation, could pass her genes onto her calves and ultimately allow the production of low fat milk from a herd of cows. Skim milk straight from the cow!

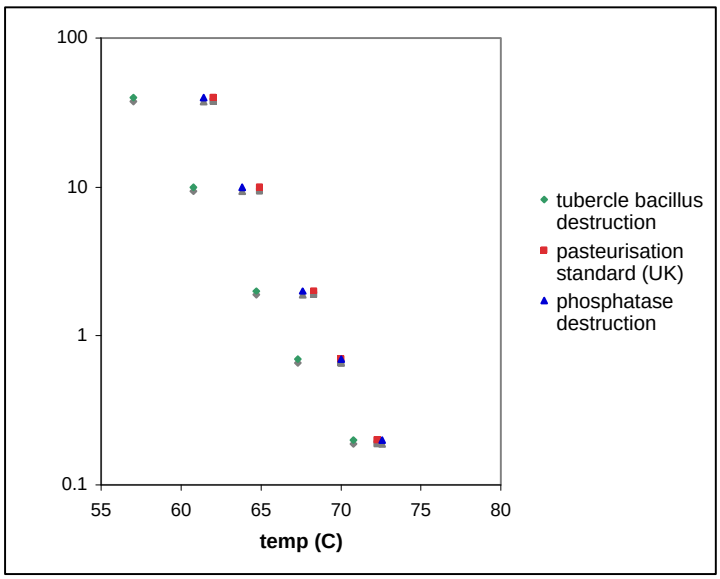
(see SCI 28/05/07 or for example BBC News at http://news.bbc.co.uk/2/hi/science/nature/6700129.stm)

✯ Going to the other end of the supply chain now… R&D scientists at an international food company have discovered new ways to deliver probiotics in an ice cream product. The ice cream, called Milk Time, contains the probiotic BB12 *Bifidobacterium lactis* which is used commonly in dairy products, where they are most usually found in drinking yogurts. However yogurts, as chilled products, are susceptible to temperature fluctuations on transport and storage and, as a result, the probiotic levels in the yogurt can be a lot lower by the time it reaches the supermarket shelf. However in this new ice- cream product, the bacteria are frozen alive in the ice cream and remain in a state of suspended animation, and in constant numbers, until they are reanimated at the time when the product is eaten. *Chemistry & Industry, 07/07/2008*

Extension – pasteurization curves

The time-temperature relationship for the pasteurization of food materials can be represented by time-temperature curves. The time-temperature curve for the inactivation of the Mycobacterium tuberculosis bacillus in milk is shown below in Fig.

1. You will see that plotted as such, with the logarithmic y-axis time the curves are actually straight lines. Can you place on the graph where the HTST method conditions lie, as discussed earlier?



The time-temperature relationship needed for the sufficient pasteurisation of different food materials is dependant upon the viscosity ("thickness") and pH (acidity/alkalinity) of the food. In low acid foods (pH > 4.5) the main purpose is destruction of pathogenic bacteria. Below pH < 4.5 the primary destruction is of spoilage micro-organisms or enzyme inactivation. Milk is approximately neutral in its pH, but pasteurisation is also used for acidic foods like fruit juices.

The rheology of the product must also be considered in determining its time-temperature profile. (Rheology was discussed in an earlier Food Bites on Food Texture - Jan 2009). Heat transfer into a material is dependant upon how viscous the material is, i.e. is the fluid very thick or more watery? The viscosity of milk is about twice that of water and like water, milk is a Newtonian fluid, which means its viscosity is constant under a range of shear rates. Skim milk is slightly less viscous than whole milk.

Another type of new pasteurisation process, called infusion pasteurization, is currently under development. Very rapid heating to relatively high temperatures (ca. 80-100C) combined with very short times (0.1-0-9s) have been shown to alter physical properties of the milk at the level of the casein micelle.

REGULARS

Editorial/Notes to teachers

This newsletter on dairy foods comes just in time for Schools Milk Day on September 30th. Check out more information on the web (see below) and see how your school could get involved. Milk consumption in schools – for senior pupils too - is back on the agenda with a new EU initiative to give all schools access to subsidised dairy products (more on p10). In the "Life after school.." section (p 11) we learn more about studying food subjects in higher education and in particular in this issue, courses within dairy science. These courses offer multi-level entry possibilities, including post-GCSE, which means greater flexibility for obtaining professional qualifications and an exciting career in the food industry. In the "careers spotlight" section we again hear about a fulfilling career in the food industry, and within the dairy foods areas too. "In the news.." on page 19 reminds us of the importance of rigorous food safety control, with the contaminated milk scandal of last year.

Comments and feedback on anything in Food Bites are always welcome to the Editor, Dr. Rachel Kelly at rachel.j.kelly@gmail.com

Remember to check out more on World School Milk Day 30th Sept. For example: http://www.dairyco.org.uk/news/news-articles/august-2009/celebrate-world-school-milk-day.aspx

Links to the D&T curriculum

There are a number of areas of relevance to the D&T Food curriculum, such as:

- Principles of preservation – pasteurisation, UHT treatment, homogenisation
- Functions of ingredients – dairy products
- Nutrition – sources of protein
- Dairy products – milk and secondary processed products
- Processing technology – continuous vs. batch processing

Furthermore, some of the DMAs (design and make assignments) described in the QCA Schemes of Work include product innovation involving dairy products, for example a chocolate bar inspired milk/ice cream product.

REAL INSIGHTS

MILK IN ACTION – THE EUROPEAN SCHOOL MILK SCHEME

Whilst it has been traditional for younger children in schools to receive milk, it is now possible for older school students to also receive milk as a drink, through a subsidised plan, called the European School Milk Scheme. Perhaps your school is already doing this? If not, it might be something you want to enquire further about? Many school children across the UK and Europe are now drinking milk at school as part of this Scheme.

It has long been recognised that milk is an excellent calcium source for school age children. It also contains a range of vitamins important for healthy growth. Furthermore, exchanging milk as a drink for fizzy, sugary drinks can help promote an overall healthier diet.

Food Bites contacted the Dairy Team at the Department of Environment, Food and Rural Affairs (DEFRA) to find out more about how this Scheme operates in the UK and the motivation behind the scheme. Many thanks there to Matt there for contributing some useful insights.

Through the European School Milk Scheme, the European Union (EU) provides subsidies to schools and other educational establishments so that they can provide their students with milk and other milk products. The School Milk Scheme encourages children to consume dairy products and maintain a balanced diet. As well as the obvious nutritional dimension, the scheme also provides an educational element, by supporting the development of good eating and nutritional habits that will hopefully last a lifetime. Such an initiative could ultimately help in the fight against the growing problem of obesity amongst children.

Just last year the scheme was reviewed and opened up to secondary school age children. A bigger range of dairy products was also made available so schools can chose from a list which ones they want to offer students (for example flavoured milks and fermented milks are popular in some countries). In the UK it tends to be just regular whole or semi-skimmed milk and yogurt which is offered by schools but this reflects the most usual preferences.

Semi-skimmed milk constitutes 78% of all milk consumed nationally. Semi-skimmed milk has been introduced in response to DfES legislation, which recommends milk in schools be semi-skimmed. Why is this?

The Food Standards Agency (FSA) healthy eating advice recommends reduced fat versions of milk products for children, such as semi-skimmed and skimmed milk. This recommendation does not apply to younger children, who should drink whole milk from one year of age until at least two years at which point semi-skimmed milk can be introduced if they are eating well. Skimmed or 1% milk should not be introduced to children until they are at least five years old because it is too low in calories. Also skimmed milk only contains very small amounts of vitamin A, which children need. For this reason in the UK children participating in the Nursery Milk Scheme drink whole milk, and primary and secondary school children participating in the School Milk Scheme drink semi-skimmed milk.

The financial support – or the subsidy, the EU gives to schools is the same for full-fat, medium-fat or low-fat products. The member states, or the individual countries of the EU, can choose the products they want to distribute to schools from the list of eligible

products. The individual countries are also free to apply stricter standards if they wish to than those set out in the EU list. The subsidy as of September 2009, on whole and semi-skimmed milk, stood at just under 16.5p per litre from the EU with a further “top-up” subsidy of almost 4p from the UK government.

According to official figures from the EU for the 2006/2007 school year (for example look at the website http://ec.europa.eu/agriculture/markets/milk/schoolmilk/index_en.htm) the equivalence of 305 000 tonnes of milk was distributed in schools in 22 Member States with EU expenditure of more than 50 million Euros.

The picture for England, Scotland and Wales shows that in the school year up to 2007, almost 47000 tonnes of milk and yogurt had aid paid on it in. This figure compares to the amount for Germany but is far greater tonnage than other countries in the EU.

Of the 27 member states of the EU only 3 do not participate in the milk scheme. And of the 24 countries participating in the scheme, 13 also provide a top-up from national funds (like the UK does). The UK is second in the amount of subsidised milk it provides to its children.

In England the School Milk Scheme is administered by the RPA, (Rural Payments Agency). There are currently 171 active claimants in Britain (claimants who have claimed recently), of which the vast majority are LEAs (local education authorities). In Wales all KS1 pupils receive free milk. Under the scheme, schools can claim up to 250ml portion per child per day (but most cartons in England are 189ml). Schools can also organize their own supplier of milk and can buy in bulk.

By opening up the scheme to older children, and increasing the flexibility on product choice it is hoped that even more schools will participate in the scheme in the future, giving more children access to high quality dairy products.

A school milk information campaign was launched last year by the EU called “Milk - drink it up” (http://drinkitup.europa.eu/) to raise awareness of the benefits of drinking milk and how the EU is supporting this promotion through funding. A dedicated school web site was launched at the same time giving information about the scheme from the EU to all school children in Europe. Just to better appreciate how wide the coverage of this scheme is in Europe, take a look at the selection of languages the site can be read in (23 European languages!). As part of this campaign, young people were invited to take part in a photo competition on the theme "Milk power" – maybe someone at your school took part in this?

DairyCo, the dairy levy board in the UK, have their own school milk project and their schools web site gives even more useful information about school milk. (http://www.dairyco.org.uk/school-milk/for-schools/milk-scheme-options.aspx).

The European Schools Milk Scheme is the only subsidised milk scheme currently in operation. You can tell easily which schools are participating in the scheme because they will be displaying a poster in the school entrance, as required by the scheme.

CAREERS SPOTLIGHT – by Helen Mottram (BSc Hons)

It's a small world in the food industry and it's certainly one of the most exciting and fast paced environments to work in. This I have learned quickly throughout my exciting career, predominately in chilled foods.

It all started back at Harper Adams University College, where the warmth of the food technology labs was much more appealing than the wet and muddy farm! We had a great lecturer in Food, Dr Ralph Early, whose passion for the industry was very infectious and I knew that the food industry was where I wanted my career to develop.
Experience, experience and more experience were the words that rang in my ears after graduation, so there was only one thing for it and that was to get on the job ladder.

My first job was in a small frozen poultry factory in Norwich as a Quality Assurance (QA) Technologist. I was thrown in at the deep end as they were building a new extension to their factory to produce frozen ready meals for Discounters and that was my project for next 12 months.

After just over a year on a very steep learning curve, I wanted a return to the bright lights and headed to Nottingham as a Process Technologist for Northern Foods. A great place to work, with some fantastic people and I moved through various positions as my career progressed. I think I learned that determination and the will to ensure I completed my projects helped me get on at Northern Foods. You have to be ready to roll your sleeves up and get in the factory to make things happen and by doing this, you truly know your products and processes inside out, a key to successful process and product development. There is also nothing more rewarding than finally seeing your products on the supermarket shelf, knowing how you helped ensure it launched on time.

After working in factories, I had the opportunity to switch to the other side of the fence and work for Tesco as a Technical Manager. In this role you manage a group of suppliers that produce similar products for Tesco. You work with suppliers to ensure customers get the very best products, to the quality they would expect and that the Tesco brand is protected, by managing risk. My roles at Tesco took me far and wide across Europe, South America and finally to the USA to help establish a team of technical people to run Tesco American business – Fresh and Easy.

It's a non-stop world in the food industry, where no two days are the same and you have to be quick-thinking, determined and passionate, as well as being level-headed in a sometimes chaotic world. I have loved all of my jobs and think the food industry offers a fantastic opportunity for a great and exciting career!

LIFE AFTER SCHOOL – STUDYING FOOD AT REASEHEATH COLLEGE

The following feature has been contributed by Reaseheath College. Many thanks to Sharon Hopkinson, Curriculum Leader in Food at Reaseheath.

Reaseheath College is the leading land-based College in the UK. Based in Cheshire, the College is set amongst 500 acres of farms, parklands, lake, woodland and sports facilities. It offers excellent teaching and learning facilities for food technology, particularly dairy studies.

Reaseheath's Food Technology department runs a range of qualifications for people looking to take advantage of the many careers available in the food and dairy industries. Reaseheath has a licensed food production factory, where students learn to make a range of dairy foods such as butter, cheese and ice-cream, which they then test for safety and quality before it is sold in local shops. The National Diploma in Food Technology is a qualification equivalent to three 'A' levels and covers a whole range of topics of use to young people looking to make a start on a career in the food industry. As well as essential topics such as food safety, food chemistry and microbiology, students also take part in a wide range of practicals. Students make products such as butter, ice-cream and cider, learning about the changes that take place in the raw materials as they turn them into finished products. Students regularly win awards in the Nantwich International Cheese festival! A winning cheese with its developer is shown below.

As well as producing the finished product, students get to see precisely where the raw materials come from too – the Agriculture department at Reaseheath has a very special herd of cows – the Genus MOET herd. The food students get to help with the

milking to experience food production ‘from farm to fork’.

Entry requirements for the National Diploma are 4 GCSEs at Grade C or above.

For students looking for real opportunities in the food and dairy industry, Higher Education courses such as the Foundation Degree in Food Industry with Management will give a real practical and theoretical grounding in the food industry. Here students learn work skills such as planning and managing the running of a production line for, for example, flavoured milks, organising their fellow students in order to meet all the targets set by the tutors – just like working in the food industry! They also learn about food chemistry and microbiology in the very well equipped laboratories.

Students testing raw milk before accepting the delivery.

The food industry demands graduates who have knowledge of how a company works, so the course also covers topics such as business organisation, human resources and marketing. One popular module is New Product Development, where students come up with a concept for a new product, develop it through trials and then scale up production using the pilot scale facilities. Food company managers come to judge the new products, with prizes given to the most innovative and professional products. Last year, the winning product was on orange yogurt with a gingerbread teddy bear safely packaged on top of the yogurt, to stop it from going soggy. The product was designed for younger children to dip the teddy into the yogurt. It was quite popular with the adults, too!

Students Sarah (left) and Peter (right) developed Orange Yogurt with Gingerbread Teddy Dippers, with industry judge in the centre.

One great opportunity for students on the Foundation Degree is the 12-month work placement where students work for a food company, learning about all the different areas within that company. Entry requirements for the Foundation Degree in Food Industry with Management are a minimum of one ‘A’ level or a merit grade profile for BTEC National Diplomas. There are also more mature students who join the course, who have had experience in the food industry but do not necessarily have formal qualifications.

Reaseheath Food and Dairy Department work closely with the food industry with trials and development of new products. When a food company wants to make a trial run of a new product, they do not want to stop production in their factories as it costs

time and money, so they may use the facilities at Reaseheath to make small-scale samples. Several new products have been launched after being trialed at Reaseheath, including a cheese which can be easily piped into pizza crusts, and cartons of microwaveable coffee for Marks and Spencer. Some of the Foundation Degree students have helped with trial work as part of their technical projects, giving them a chance to experience real research and development work.

Checking pasteurisation temperature

Controlling milk flow using computer controlled systems

The food and dairy department likes to work closely with schools to raise the profile of careers in the food industry. For example, 'taster days' are held for school pupils, where the pupils design a product such as an ice-cream flavour or a new type of sausage, manufacture the product and then get to eat it!

Taster day school pupils getting ready to pot their ice-cream

The college can also support more specific areas of the school curriculum with specialist equipment, such as for butter-making, milk pasteurisation and cheese-making.

So that the department can rightly claim world-class status, a £2.5 million refurbishment of the dairy and production facilities is about to begin. Reaseheath is also starting a new course, developed with the dairy industry – the Foundation Degree in Dairy Technology. Companies such as Arla Foods, Robert Wiseman Dairies, Dairy Crest and Muller will be employing young people straight after A levels as trainee dairy technologists on what is called the EDEN course. These young people will come to Reaseheath to learn about dairy technology for 12-18 weeks a year, with the rest of their time actually working with the companies, learning every

aspect of the dairy industry, ready for their career start.

Most of the National Diploma (16 to 18 year old) students go on to higher education either with Reaseheath or other universities, as having a degree really opens up doors in the food industry. Graduates typically move into a wide range of jobs. Several have gone into new product development, working with dairies and with ready meal manufacturers to come up with new ideas and take them through to the supermarket shelves. Other ex-students have gone on to manage production in factories, responsible for ensuring that orders are met. Others have gone on into auditing roles, ensuring that producers are working hygienically. This role can involve a lot of overseas travel as many raw materials come from all over the world today.

A student adjusting settings on the new £250,000 UHT equipment

The College has accommodation on site for students from the age of 16. Students on the National Diploma course from all over the UK stay in the halls of residence and can really enjoy life at Reaseheath.

HEALTHY LIVING

There are many ways of including dairy products in a healthy diet. Dairy products are a good source of protein and calcium which is particularly important for children and young adults. Some ideas for healthy living with dairy foods are given below. Some of these are fairly obvious but it might help start the milk ideas flowing! The class could brainstorm many other ideas for sure.

- ✓ We all know the saying that "breakfast is the most important meal of the day" but many people, including teenagers, skimp on breakfast or skip it all together. Breakfast is an obvious time to use milk – on cereals or in porridge – but also try energy smoothies (with milk, bananas and honey), or cheese with fresh bread (continental style!)

- ✓ Yogurt as a snack – natural or fruit. Also try blending your own natural yogurt with fresh fruit. Sprinkle the top with muesli or chop bananas into it. A really healthy, satisfying filler! You can also buy ready-made yogurt mixer snacks.

- ✓ Try making your own rice pudding – its surprisingly easy! The recipe is sometimes found on the rice packet. Add cinnamon for a cosy winter dessert. Or of course you can always buy it ready made. Rice pudding has a high milk content.

- ✓ Warming autumn beverages like hot chocolate or chai latte. (Indian-inspired spiced tea made with lots of hot milk). Can be made with skimmed milk if preferred. You can buy the powders to make it yourself at home, and they often taste just like the café product!

IN THE NEWS

This time last year a story hit the news about babies getting sick in China from the formula milk they were drinking. At least six babies eventually died and the punishment delivered on found guilty was the death penalty. After investigations it was revealed that the milk product had been intentionally contaminated with a chemical normally used in the plastics industry, called melamine. This chemical has no approval for use in any food products. Why would someone want to add this substance to milk?

A number of companies, and one in particular, was found to be diluting its milk or watering it down, to make it go further and increase profits. But diluting the milk dilutes all the components including protein, which forms the basis of the analysis made to check the quality. Melamine, however, looks like protein when it is analysed because of its nitrogen content. Adding melamine to milk could “compensate” for the protein loss through dilution. However the subsequent poisoning of thousands of babies and deaths of at least six babies soon followed and since then charges have been brought to those found guilty. According to recent news reports, tests have now been developed for detecting tiny traces of melamine.

When stories like this appear, it makes us realize how important it is to have careful control and inspection of our foods and the need for scientifically based legislation for approval of food ingredients.

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source: http://news.bbc.co.uk/2/hi/asia-pacific/7614083.stm

BBC News 13 Sept 2008

Chinese baby milk scare 'severe'

The number of Chinese babies known to have fallen ill with kidney stones as a result of contaminated milk powder has risen to 432, officials have announced.

"This is a severe food safety accident," health ministry official Gao Qiang, said. Those responsible would be "severely" punished, he added.

Later, it was announced that 19 people had been arrested.

Tests showed the milk powder contained the industrial chemical melamine. One infant has died.

The new scare revived memories of a fake baby milk formula scandal four years ago in which at least 13 babies died.

Vow to punish

"As of 12 September, there are 432 cases of kidney stones in the urinary systems of infants according to reports from health departments nationwide," Gao Qiang said.

"None of the milk powder was exported to other countries or

regions," Mr. Gao said.
"Only a fraction of the milk powder was sold to Taiwan for food processing," he added.
Gao Qiang said the Sanlu Group had been ordered to halt production after its products were found to be responsible.
"We will severely punish and discipline those people and workers who have acted illegally," Mr. Gao said.
Melamine is a toxic chemical used in plastics, fertilisers and cleaning products.

New Zealand-based dairy product company Fonterra Cooperative Group Ltd, a part-owner of Sanlu, ordered a recall of about 700 tonnes of powder contaminated with melamine believed to be in circulation.

Melamine has been used by Chinese suppliers of animal feed components to make them appear to have more protein.
It was linked to the formation of kidney stones and kidney failure in pets in the United States last year, leading to thousands of deaths and illnesses.

A fake milk powder scandal in 2004 killed at least 13 babies in the eastern province of Anhui. Investigators found that the milk given to these babies had no nutritional value, and the resulting scandal triggered widespread investigations into food safety.

On a more “bubbly” note have you heard about the newest milk product being developed? Fizzy milk!! Read on…

From The Sunday Times, Maurice Chittenden - July 26, 2009

It’s the new real thing from Coke – fizzy milk

COWS may not think it is the real thing but Coca-Cola is set to launch fizzy milk on the world.

The drink contains skimmed milk mixed with sparking water, flavoured with fruit and sweetened with cane sugar.

Scientists have developed the drink at the firm's laboratories in Atlanta, Georgia, ensuring it will not curdle in its 8oz aluminium bottle.

Going under the name Vio, Coca-Cola has begun test-marketing the carbonated drink at natural food stores and delis in New York It sells for about £1.50 a bottle, no chilling required. One of Coke's copywriters claims it tastes "like a birthday party for a polar bear".

It comes in four "natural" flavours — peach mango, berry, citrus and tropical colada — and could even be marketed as a healthy nutritional drink. But it has 26g of sugar a bottle, on a par with other non-diet Coca-Cola products, and 1.5g of fat.

A flavour tester for BevNET.com, a drink industry research site, who tasted the citrus version, said: "It's big on milk flavour and, as a result, has a somewhat creamy body. It didn't seem sweet until you consumed almost a whole bottle."

The drink is part of a wider Coke initiative called Project Life to develop milk-based products. If it is a success in the United States it could be launched globally.

Coca-Cola GB said there were no plans for a British version but added: "We are constantly listening to consumers."

David Jago, director of insight and innovation at Mintel, the consumer research firm, said: "I suspect it is a bit of a novelty. British people will expect a milk drink to be chilled and will be suspicious if they see it on the shelves."

Dairy farmers hope the drink could boost milk consumption.

David Cotton, vice-chairman of the Royal Association of British Dairy Farmers, said: "Anything that helps to sell milk is great. If Coca-Cola want to market fizzy milk and give us the odd shilling, we would be very happy."

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