Proposal P1007 – Primary Production & Processing Requirements for Raw Milk Products.

In response to the questions posed...

Would Australian consumers benefit from a greater range of cheeses and dairy products? Please provide details.

Absolutely we would benefit.

It is without question that enzymes and many nutrients are killed by heat. It is therefore obvious following on from this that if milk is pasteurized, the process kills the enzymes in the milk and cheese and many of the nutrients.

It is obvious that the processing and pasteurisation of milk is denaturing the milk leading something that is a far cry from the nourishing food that our ancestors have thrived on for thousands of years. Many people are becoming intolerant of milk and these numbers are growing. The government should be looking to the cause of this and surprise, surprise the most obvious cause is the quality of the milk that is being consumed. I for one can consume raw milk (which is a much higher quality than the pasteurised milk i.e. it comes from cows breed for quality not quantity, which eat grass and are raised as nature intended unlike a lot of the milk that is pasteurised) and raw milk products but I can no longer tolerate pasteurized milk.

Benefits of raw milk (excerpt from http://www.raw-milk-facts.com/raw-medicine.html)
Immunoglobulins IgG, IgA, IgM, IgE, IgD: Large, complex sugar/protein (glycoprotein) molecules (also known as antibodies) used by the immune system to find and deactivate pathogens such as bacteria and viruses.
Transforming Growth Factor Beta: Stimulates growth and repair of the gastro-intestinal tract.
Epidermal Growth Factor: Biochemically regulates cellular growth, cellular division and cell type. Fosters rapid tissue repair.
Glutathione: Powerful antioxidant that offers protection to cells from free radicals.
Interferons: Specialized proteins that inhibit replication of viruses within cells throughout the body.
Interleukins: A large group of signaling molecules that help regulate the immune system.
Oligosaccharides: Groups of 3-10 sugar molecules that protect against pathogens by competing for binding sites on the intestinal epithelium and provide support to friendly probiotic bacteria.
Proline-rich Polypeptide (PRP) or Colostrinin: Anti-inflammatory hormone that helps regulate immune system activity by stimulating the thymus gland.
Transferrin: Immune system glycoprotein that binds free iron, which, in turn, inhibits bacterial growth.

In cows, newborn calves import up to 90% of their immunity to pathogens and disease from the first 24 hours of suckling. Human newborns get the bulk of their mother's immunity transferred to them prior to birth (across the placenta) but still need that first colostrum to optimize their immune systems. Gentle reminder for all you mothers-to-be out there: whatever you do, make sure your infant gets its fill of your first milk, then continue to breast feed for as long as you can.

Fortunately for calves (and us), their mothers make a surplus of colostrum, roughly 6 gallons (22-24 liters) in the first 24 hours alone. After that, the concentration of antibodies and other factors tapers off quickly to the levels found in regular or 'mature' milk

And raw milk cheeses certainly have a nicer taste and texture

FSANZ has received comments that raw milk cheeses are likely to be gourmet, high-end market products. Costs associated with ensuring the safety of products may also be passed on to the customer - if raw milk cheeses were permitted:

- How much would you be willing to pay for such cheeses?
I currently pay around $65 a kilo

- Are you willing to pay more than the cost of current gourmet cheeses?
Absolutely and I already do. I purchase imported raw cheeses and am certainly paying a premium.

- Are you prepared to pay more if there are added costs in ensuring the safety of raw milk products?
Absolutely. This is the real cost of real food not the poor quality food that is predominately sold in supermarkets and stuffed with cheap nasty fillers and chemicals e.g. why have we got Soy flour in our Bread!

- Would you choose to purchase an Australian raw milk cheese over an imported equivalent?
Yes. I buy local whenever possible and I buy what's in season.

In response to the proposal to exclude acceptance of category three products i.e. raw milk

I am exceedingly disappointed with the narrow view that has been taken by the review board and the refusal to properly consider raw milk. At best, it appears to have been thrown into the too hard basket rather than look at how it can be safely made available and at worst, the obvious bias of the panel with members of the Dairy board who only have reason to suppress raw milk appears to have squashed what has been a nourishing food for thousands of years.

The Proposals exaggerate the risks of raw milk products. Raw milk has a superlative safety record compared to other foods, and even to pasteurized milk.

The proposals do not address changes to Australian microbiological food Standards which are currently out of step with scientific studies and standards applied in overseas countries.

The latest proposals will continue the current BAN on the production and sale of all Category 3 products from raw milk. This will include the sale of raw goats' milk currently allowed in some States and further tighten restrictions on raw drinking milk made from cow's milk. No evidence has been put forward as to a food safety justification of why this should be necessary.

The proposals continue to prohibit farm-consumer sales which are a blatant denial of our rights as consumers.

It is beyond the comprehension of most people that the Food Standards Board allows chemicals in foods that have been shown to cause cancer in animals and / or have been banned in other countries. We can't understand how the board supports many of the foods today and yet wishes to stop people eating unpasteurised milk that we have been consuming for thousands of years.

As you well know milk has been used all around the world for centuries. From cows, camel, llama, goat, yak etc. If it were the demon it has been made out to be, we would not have had a human race that kept growing. Raw milk is still being used by peoples all over the world. They are not dying like flies. The healthy Amish are an example.

A Brief History Of Raw Milk's Long Journey...

People have been drinking raw milk from animals for thousands of years. Really, the term "raw" is a misnomer because it implies that all milk should be cooked, but that's a topic for another page! Onward...

Whether it's from cows, goats, sheep, camels, yak, water buffalo, horses, donkeys or even reindeer, unheated, unprocessed milk has been a safe, reliable food source for a good, long time.

Even in the tropics, and centuries before refrigeration had been invented, raw milk was an important food source for many cultures. By exploiting the preservative benefits of fermentation, primitive peoples were able to take a great food and make it even better.

Having access to a nutrient-laden food from their animals gave many cultures a distinct advantage over their hunter-gatherer contemporaries (1).

Rather than having to go from kill to kill, with sometimes days in between, even nomadic tribes like the Maasai nearly always had a protein source at hand, whether it was milk, blood or meat (2).

With a readily available food supply at hand, members of societies were freed up to pursue more productive things like making babies, building permanent communities, conquering their neighbors and everything else that comes with not having to spend energy hunting for food.

Considering raw milk's role throughout history, it's simple to see that it's not a deadly food. If it were, all those dairy-loving primitive cultures would have died out long ago, leaving their vegetarian cousins to mind the store. At the very least, people would have dropped it from their diets entirely. And we haven't even gotten to germ theory yet...

Closer to home, our early American ancestors lived in a farm-based economy. As the Industrial Revolution reached our shores, the cities swelled with job seekers lured from their farms by the factories and mills. By 1810, there were dozens of water-powered operations lining the rivers of southern New England, all staffed by thirsty workers.

With raw milk and whiskey being the main beverages of choice (hopefully not mixed!), demand for both grew along with the cities. When the War of 1812 broke out, the supply of distilled spirits from Europe essentially dried up. Although the conflict only lasted about two years, it's impact on our country was substantial, and strangely enough for milk, particularly nasty.

To meet the soaring demand for spirits, distilleries soon sprang up in most major cities. In one of the most bizarre twists of entrepreneurial insight, some brilliant soul thought it would be fun (and profitable) to confine cows adjacent to the distillery and feed them with the hot, reeking swill left over from the spirit-making process (3).

As you might guess, the effects of distillery dairy milk were abominable, and for many of those drinking it, amounted to a virtual death sentence. Confined to filthy, manure-filled pens, the unfortunate cows gave a pale, bluish milk so poor in quality, it couldn't even be used for making butter or cheese. Add sick workers with dirty hands, diseased animals and any number of contaminants in unsanitary milk pails and you had a recipe for disaster.

Lacking it's usual ability to protect itself, and with a basic understanding of germs or microbes decades away, the easily contaminated "pseudo-milk" was fed to babies by their unwitting mothers. In New York City during 1870 alone, infant mortality rocketed to around 20% and stayed there for many more years (4).

The Distillery Dairy page mentioned above contains links to articles in the New York Times archives which enable you to 'read all about it' in the language of the era.

The situation languished for years until two men stepped up to the plate from different directions, united by a disaster common in the day- the death of a child.

In 1889, two years before the death of his son from contaminated milk, Newark, New Jersey doctor Henry Coit, MD urged the creation of a Medical Milk Commission to oversee or "certify" production of milk for cleanliness, finally getting one formed in 1893 (5).

By joining with select dairy experts, Coit (**above**, treating babies in New Jersey) and his team of physicians (unpaid for this work, by the way) were able to enlist dairy farmers willing to meet their strict standards of hygiene in the production of clean, certified milk.

After years of tireless effort, raw, unpasteurized milk was again safe and available for public consumption, but it cost up to four times the price of uncertified milk.

New York philanthropist Nathan Straus, who lost a child to milk contaminated with diphtheria, felt differently. He believed the only safe milk was that which had been pasteurized.

Straus (**at right**) made a fortune as co-owner of Macy's department stores and spent decades promoting pasteurization across America and Europe.

Using his considerable finances, he set up and subsidized the first of many "milk depots" in New York City to provide low-cost pasteurized milk (6).

While infant mortality did fall dramatically, other technological advances, such as chlorination of water supplies and reduction of previously ever-present horse manure (through the arrival of the automobile) occurred in the same time period making it difficult to say which change was most responsible.

Pasteurized and certified milks managed to peacefully co-exist for a time, but by the mid-1940's, the truce had become decidedly uneasy. In 1944. a concerted media smear campaign was launched with a series of completely bogus magazine articles designed to spark fear at the very thought of consuming raw milk (7).

Government officials and medical professionals, swayed by corporate dollars and lies, have effectively taken this valuable, healing food from the mouths of the people. Only in recent years has the consumer backlash against valueless processed foods grown to the point where access to clean, raw milk is once again being considered a dietary right.

I presume the board is not aware of the many uses and benefits of using raw milk. I myself have found that I am now intolerant of pasteurized milk and pasteurised milk products. I come out with terrible itching whenever I eat it and then scratch the heck out of my hands and arms. It is extremely unpleasant. I can however enjoy certified raw milk and products, which taste so much nicer that the pasteurised products. That alone should be reason to look into the matter further.

But I don't just drink raw milk, eat raw cheese, raw cream and raw yoghurt. I Kefir the milk with Kefir grains which increases the nutrients in the milk and beneficial bacterial.

Kefir

Kefir is pronounced **keh f é-er** [as in **keh** in **ke**ttle, and **fear**]. Click here to hear our daughter Shedea pronouncing Kefir at 20 months of age. Alternate spelling and names; **kephir** or **kefyr**, **kewra, talai, mudu kekiya** [Reference: Wikipedia, the free on line encyclopaedia] among other possible names in different

countries. The word **kefir** is said to be derived from the Turkish word **keif**, which loosely translates to **good feeling** or **feel good**. This is quite likely because drinking kefir is renowned to increase a sense of **well-being**.[1]

Kefir is a refreshing cultured-milk **beverage** which originated in the northern slopes of the Caucasus Mountains, believed to date back at least 1,000 years. The tribes-folk of this particular region who possibly developed kefir by shear accident consumed the nutritious beverage in large quantities. These people were renowned for longevity, living long, healthy lives with little to no known disease. An active life span of over one hundred years was common for folks living in the region where kefir was cultured and liberally consumed as part of a staple diet.

Kefir has a uniform, slightly creamy consistency, a sour refreshing flavour, with a slight subtle aroma of fresh yeast [or a very subtle beer-like aroma]. Kefir also has a slightest hint of a natural **effervescent zesty tang**. There is an assortment of some 40 aromatic compounds contributing to the unique flavour and distinctive pleasant aroma of kefir. Rounding this off, kefir contains between 0.08% to 2% alcohol. However, about .08 to .1% alcohol is a realistic figure for 1-day cultured kefir. Whereas kefir stored for a number of days after separating the natural mother-culture, kefir grains [see following], contained up to 2% alcohol, and possibly 3% alcohol, depending on the type of milk and ripening conditions. [Yep-- wow!].

Traditional, authentic kefir can **only** be prepared by culturing fresh milk with **Kefir grains**. Note that **Kefir grains** should not be mistaken for **cereal grains**. The natural mother-culture is referred to as **grains** due to its **granular** structure and appearance. This is to say that the **grain** part of the name can be considered as a **misnomer**. Kefir grains, or **kefir granules** if you wish, are in fact a **natural-starter**. The biological structure or each grain [which I feel can be referred to as a **bio-matrix**] is created through a dynamic association **symbiosis** between a vast mixture of friendly Lactic acid bacteria [LAB], vinegar-producing bacteria and yeasts strains.

A batch of kefir grains consist of many individual white to bone-coloured mostly self-enclosed bodies made up of a soft, gelatinous **biological mass** somewhat resembling cooked cauliflower rosettes. The complexity of the kefir grain is a mixture of protein, amino acids, lipids [fats] and soluble-polysaccharides. Kefiran a unique polysaccharide with many health-promoting virtues, is the major polysaccharide of kefir grains and is also found in kefir. The bacteria and yeasts not only create the bio-matrix structure, or the grains, the organisms are also harboured by the very structure that they create; abiding on the surface, and encapsulated within the grain itself <[**The abode of the friendly microbe**]>

Traditional kefir [real authentic kefir] is easily prepared at home, just as it has been for many centuries by the ancients of the Caucasus Mountains. Fresh, non-pasteurised full-cream, low fat or non-fat milk is put in a clean suitable container with the addition of a smaller portion of kefir grains. The content is left at room temperature for about 24 hours. The resulting developed cultured-milk is strained in order to separate, and retrieve the kefir grains from the liquid-kefir. The grains are added to more fresh milk to repeat the simple process for the next batch. This procedure can be performed on an indefinite basis... for **kefir grains last forever**.

Strained liquid-kefir may either be consumed fresh, refrigerated for later use, or ripened at room temperature over a period of days. The ripening process is not only useful for individuals who wish to reduce lactose in their kefir, it is important to increase some b group vitamins [For details explaining the simple procedure of ripening, please follow this link situated at Dom's kefir making web page]. Ripening improves overall flavour, while increasing vitamins B1, B6 including vitamin B9 or folic acid, and carbon dioxide including alcohol also increase.

Kefir grains increase in overall volume, numbers of, and by weight, as the grains are self-perpetuating when continually cultured in fresh milk to prepare kefir [biomass increase]. Because of this, the need to prevent **overcrowding** of kefir grains, and in order to maintain a reasonable **constant grain-to-milk ratio** it becomes

essential to remove a portion of kefir grains from the batch. Apart from the advantage in preventing overcrowding of grains to avoid over fermentation, the other advantage is to produce a kefir with a reasonable constant character and consistency on an ongoing basis. Traditionally, **excess** or **spare** kefir grains were either eaten [which I highly recommend], dehydrated and stored as a back-up source, shared among family members, or traded among the tribes-folk of Caucasus, in exchange for other basic essentials.

Except for refrigeration, the culture-art of kefir has been practiced for many centuries by the tribes-folk of Caucasus. In fact, this is the very reason why kefir came about, for the preservation of milk over extensive periods, without refrigeration, for there were no means for refrigeration back then.

This is why folks of yesteryear cultured a wide range of fresh food produce, to extend the keeping quality of food grown in larger quantity. It is only in recent time that we learned the fuller extent regarding how such culture food-products give the consumer extra health benefit such as protection against disease, other than good nutrition. For this reason, most if not all naturally cultured foods can be classified as **functional-food**.

Each and every batch of kefir grains in existence today, trace back to a region of the Caucasus Mountains--all kefir grains found anywhere today, originate from that place and are the children of the very first natural mother-culture that mysteriously developed in a particular region of the Caucasus Mountains.

So by restricting my access to raw milk you are also removing my access to Kefirred milk as well, which is a highly nutritious yoghurt type drink that I have on a regular basis. I can't buy anything close to it in taste and there is nothing available to match the nutrition in it. It is a unique culture that works with raw milk. You have no idea how upsetting it is to think that I may not be able to have this.

Then there is the fermentation and culturing of products and the soaking of grains. I separate the Kefirred milk into curds (soft cheese) and whey. I use the whey to soak oats in before making porridge as this neutralizes the phytic acid in the grain which binds nutrients (so you don't receive them) and is destructive to the digestion system. Oats should always be soaked in an acidic medium and boxes of oats did use to contain instructions to soak them before faster food methods influenced this and the instructions have been removed.

I also use it to soak other grains such as lentils and beans.

I use whey when culturing vegetables. I make Kimchi and Sauerkraut in particular and although whey is not absolutely necessarily it reduces the amount of salt required (which is great because otherwise these foods can taste quite salty) and it increases the amount of beneficial bacteria in the culture and its ability to properly culture.

I use it to make Beet Kvass, a traditional drink made from beetroot, salt and whey that it a tonic and extremely healthy.

So by removing raw milk from my diet you are now affecting many of the foods I and my family eat.

And for what, to replace them with foods that have been pasteurised and chemicalised and heavily processed, that are missing many nutrients and are likely to lead to poor health.

If you take raw milk away from my family we will be left without an alternative as we do not wish to consume pasteurised milk.

Another reason to support certified raw milk is that it comes from traditional breads of cows bred for the quality of their milk not the quantity. These breeds are slowly dying out having been replaced by industries desire of quantity over quality. By supporting certified raw milk you will be supporting our smaller farmers

and very important breeds of cows. People are saving seeds all over the world because of the incredible damage being wrought on our environment by industrial farming. The same thing needs to happen in the dairy industry so that our Jersey and other traditional breeds of cows are maintained.

Pasteurisation allows the Dairy industry to get away with feeding cows appalling rubbish that they would never be allowed to in nature. Why are our cows fed grains! And what about cheap fillers such as soy which is known to disrupt endocrine systems and GM foods – it makes one shudder.

http://www.raw-milk-facts.com/about_cows.html

Excerpt

Cows are in the class of animals known as ruminants. Ruminants are hoofed animals with an even number of toes and complicated four-chambered stomachs designed to break down difficult to digest plant matter (such as fibrous grasses).

All ruminants regurgitate and re-chew their food or 'cud' in a process called, appropriately enough, rumination. For 6-8 hours a day, they'll chew their cud to make up for not chewing much while actually eating the grass. This breaks up the plant fibers into smaller and smaller chunks and pumps fresh saliva into the mix.

Speaking of which, depending on the moisture content of their food, cows can make an astounding amount of saliva every day. Although 15-20 gallons is probably closer to the norm and amazing enough, at the extreme, one study calculated up to 66 gallons/day! Nearly 280 liters!

Why so much slobber? A big reason is that plant-digesting microbes work best breaking down tough cell walls in a nearly neutral pH environment, 6.2-6.8, preferably (pH is a way of measuring acidity and alkalinity: 7 is neutral, less than 7 is acidic, greater than is alkaline).

The problem is, waste products from fermentation are acidic, so Nature, in its infinite wisdom, endowed cows with alkaline substances in their saliva (bicarbonate and phosphates) to give it a pH of about 8.2 and help maintain the favorable conditions in the rumen. Amazing!

This is a good place to point out that feeding cows too much grain can drop, or acidify, the pH of the rumen and so affect digestion and milk composition. How much starchy grain is too much? Probably whatever quantity it takes to drop the pH of the rumen below 6.0, when cellulose-digesting bacteria can no longer do their job.

To say that raw milk is not safe enough to consume is incredible considering how safe it is. A careful study of the research on the matter and the experiences of millions of people attest to this.

http://www.realmilk.com/does-raw-milk-kill-pathogens.html

Excerpt

In another cited paper, researchers Massa, Goffredo, Altieri and Natola inoculated seven different strains of *E. coli* O157:H7 into fresh unprocessed whole milk to determine their fate after days of storage (*Letters in Applied Microbiology* 28(1):89-92). Like Doyle and Roman, they spiked the milk with extraordinarily high numbers of each pathogen (1,000,000 per ml—Doyle and Roman used 10,000,000 per ml). Even with these huge numbers of pathogens, the *E. coli* O157:H7 strains failed to grow and died off gradually. Actually, the purpose of this research was not to determine whether the pathogens were being killed, but whether it was acceptable to store milk at 8°C (46°F)

rather than the standard 5° C (41° F). The authors conclude that the colder temperature should be used as the standard.

In the third paper, researchers Pitt, Harden and Hull used lower amounts of inocula of a different pathogen, *Listeria monocytogenes*, introduced into raw milk, but unlike the others they kept the milk at temperatures that optimize the growth of these bacteria (98.6° F) (*Australian Journal of Dairy Technology* 54(2):90-93). After fifty-six hours, no viable cells of L. mono were detectable. In a paper not cited by Rose, these same authors looked at other pathogens and concluded, “The growth of *Staph. aureus*, *S. enteritidis*, and *L. monocytogenes* in raw milk at 37° C was reduced markedly compared to the growth of these organisms in pasteurized milk” (*Milchwissenschaft* 2000 55(5):249-252).

A Special Report from
The Association of Unpasteurised
Milk Producers & Consumers

Originally Published by The Soil Association.

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Introduction

It is already illegal to sell unpasteurised milk through shops, catering establishments, hotels, hospitals and schools in England and Wales. In 1989, for political and financial reasons, the government went for a total ban to fall in line with Scotland. The attempt failed, owing mainly to consumer pressure. However, on November 4th of this year (1997) the government announced its renewed intention to ban unpasteurised milk on the grounds that it presents a health hazard. There is no evidence for this. As this article explains, unpasteurised milk has special qualities that are destroyed by pasteurisation. The fight to save 'Green Top' is symbolic. It is a whole, living food whose demise would signal a new level of impoverishment for all of us who treasure real food with real flavour. It would also sound the death knell for the five hundred or so small farmers who still produce Real Milk. The last of their number has already been killed off by corporate interests in the USA and Canada. Do not let it happen here.

The supposed aim of pasteurisation of milk is to prevent risks to public health. Yet this ignores the many benefits of untreated milk and the damaging effects of heat treatment; these are outlined below.

The question is whether these effects are outweighed by the one advantage of pasteurisation, the destruction of disease bacteria. An evaluation of the infections caused by milk is presented here, in an attempt to show that pasteurisation is not the universal solution that it may first appear to be.

The Detrimental Effects of Heat Treatment

Many years ago when pasteurisation was a relatively new phenomenon, dire warnings were made of its harmful effects on the health-giving properties of untreated milk. Pottenger completed his famous cat experiments [(1)] and concluded that unpasteurised milk was better for health than pasteurised. Studies on rats over several generations showed that haemoglobin counts were higher in the untreated milk-fed rats compared to the pasteurised fed group; hair loss occurred in the pasteurised milk group and after four generations those on pasteurised milk failed to lactate and could be bred no further [(2)]. Even sanatoria made a point of obtaining specially tuberculin-tested untreated milk for their patients.

These early experiments were too unsophisticated to withstand modern statistical analysis but this does not deny their historical value. Reference can, however, be made to more recent and precise experiments which have compared untreated with heat-treated milk.

The Effect on Flavour

This effect is obvious to the consumer and has been noted by researchers [(3,4)] - "Fresh milk has a delicate flavour contributed by compounds of low molecular weight in trace amounts. Heat treatment affects the flavour of milk and produces detectable off-flavours" [(3)].

The Effect on Nutritional Value

The components thought to be most affected here are the water soluble vitamins and the proteins.

There is approximately a 10% loss of vitamins BI, B6, B12 and folate and a 25% loss of vitamin C [(5,6)] although some workers have noted higher losses of vitamin C. Greater losses of vitamins occur with more severe heat treatment [(5,7)].

The proteins in milk are of two kinds - casein and whey. Caseins are remarkably heat stable but the whey proteins, which are of much higher nutritional value, are denatured by heat treatment [(5,8)]. The degree of denaturation varies depending on the temperature and time of heat exposure - 10% during pasteurisation, 70% during ultra heat treatment. Homogenisation has a further destabilising effect [(9)].

Several experiments have reported adverse effects of heat treated whey proteins on baby pigs and calves. Although no such effects have been reported for humans and it is generally assumed that such denaturation is of no practical significance [(5,10)], some workers argue that the effects of the cross-linking of whey proteins caused by heating may be detrimental to the consumer, possibly via an effect on nutritional value and also perhaps by the increased potential to trigger some form of allergic reaction [(8)].

Vitamins and minerals can be bound to proteins and this binding can facilitate their absorption from the digestive system. Pasteurisation destroys the ability of certain proteins in milk to bind the important vitamin folate and hence help its absorption [(11,12)]. Heat treatment might also cause a similar inactivation of other protein carriers, for example those for zinc and vitamin B12.

The Effect on Allergic Reactions

Milk allergy has a relatively low incidence in this country (approx. 1% of the adult population [(13)]). Although it is widely believed that heat treatment will reduce milk's ability to provoke an allergic reaction in sensitive individuals, this may not be so in all cases.
Milk allergy can be divided into two types

1. anaphylactic allergy

2. atopic allergy [16].

In the first instance, heat treatment does diminish, but does not completely destroy, the allergenic properties of milk [9, 16]. In the second type of allergy, atopic, it was found by one researcher that heat processing may render milk more harmful to atopic individuals. The B-lactoglobulin from fresh raw cow's milk had a lower allergy-causing reactivity than that from pasteurised or otherwise heat-processed milk [16].

One doctor has even gone so far as to suggest that the response of the body to heat-denatured milk protein may contribute to the development of atherosclerosis [15]. He has produced evidence linking the introduction of the Holder pasteurisation technique and its geographical distribution to the incidence of heart disease. Such results, though interesting, should be treated cautiously, since they are statistical associations and not evidence of cause and effect. Whilst others have not found supporting evidence for this theory [16], it is clear that more critical research is necessary before heat treatment is universally enforced.

The Effect on 'Anti-Infective' Agents

Untreated milk contains varying amounts of anti-microbial proteins and other anti-infective agents which are designed to protect the young animal from infectious disease [17]. This can happen even if the milk is contaminated - for example, investigators reported a "low incidence of enteric infections in suckled infants under appalling hygenic conditions amongst South American Indians, although the milk was frequently harbouring bacteria" [17]. In an experiment involving newborn guinea pigs, untreated fresh cow's milk was found to be the most effective in decreasing colonisation by Escherichia coli, followed by pasteurised milk, then boiled milk, frozen milk was the worst. In this experiment the animals fed untreated milk also showed striking differences in the skin and coat compared to those fed pasteurised or boiled milk [18].

It is not only newborn animals which may benefit from this protection. Studies have shown that consumption of untreated milk by various tribes favoured the suppression of infection [19]. Animal experiments have demonstrated a suppressing effect of milk, although this remained to some extent even after pasteurisation [20,21].

In addition to the fact that untreated milk contains anti-microbial agents which function after its ingestion, it also has components which inhibit the proliferation of bacteria before it is consumed [22,23]. In one sampling study, bacterial counts were measured in 48 samples, the bacterial counts did not increase significantly over the two-day period and in 5 of these the count actually fell [22]. Rigorous testing by the Milk Marketing Board's Central Testing Laboratories make it unlikely that antibiotics contaminating the milk might have contributed to the decline in bacterial count. Whilst some organisms may have continued to grow, the number dying was greater, resulting in an overall decline. In another experiment, in milk held at 4C the bacterium Campylobacter jejuni (a potential cause of acute gastro-entritis) "died most rapidly in unpasteurised milk and was inactivated at an intermediate rate in sterile milk" [23]. If untreated milk is of high microbiological quality, it is obviously not the breeding ground for bacteria that many people would have us believe.

Once milk has been pasteurised or otherwise heat-treated, the ability to restrict bacterial growth is lost or severely curtailed [17,23]. The enzymes and other infective agents are destroyed to varying degrees. This means that bacteria contaminating milk after pasteurisation (e.g. from filling machines, from the air, or even entering under the bottle cap) can grow more rapidly than they would in untreated milk. Pasteurisation of human milk for hospital milk banks has been reported in some instances to contribute to outbreaks of digestive upsets in infants [24,25]. The doctors writing this report concluded that "the evidence suggests that pasteurisation not only eliminates pathogenic

bacteria but also damages bacteriostatic mechanisms, so making the milk more susceptible to later contamination" [24]. They concluded that "pasteurisation of donated breast milk is unnecessary and it is not recommended" and that "untreated breast milk can be safely stored at 4 - 6 C for 72 hours".

Conditions of hygiene in many of the larger dairies are fortunately extremely good but nevertheless post-pasteurisation contamination remains a problem [26,27] and some of the contaminating micro-organisms can grow quite well at refrigeration temperatures. In a recent report from the National Institute for Research in Dairying, 146 out of 158 samples of pasteurised milk from 50 dairies were contaminated with these kinds of bacteria. Although not pathogenic they do contribute to spoilage [26]. In most cases, the bacteria were present at a very low and insignificant level so that the keeping quality of the milk was still very good. Some, however, had bacterial counts sufficiently high that the effective shelf-life was very much shorter.

Yet another group of bacteria, the so-called thermodurics, can survive pasteurisation. The numbers present in bottled milk can vary quite widely and the presence of those which grow well at low temperatures affects the shelf-life of the pasteurised product [28]. In addition, laboratory studies have shown that when cow's milk is pasteurised, a germinant for certain bacterial spores can be produced [29].

The Effects of Heat Treatment on Disease Bacteria

The major advantage of pasteurisation, if not the only one, is its ability to destroy pathogenic bacteria. There are, however, two fundamental questions to be asked: Does all pasteurised milk offer absolute protection from infection? Does the consumption of all untreated milk post a significant health risk?

Types of Infection Carried in Milk

Fears about the risk of many diseases once associated with milk are now largely unfounded. "By the end of the 1960's tuberculosis (TB), typhoid fever, paratyphoid fever, bacillary dysentry, scarlet fever and staphylococcal intoxication conveyed by milk had disappeared, brucellosis had declined" [30]. From 1951 -1960 there were 3 cases of TB (no deaths) attributed to untreated milk and in the subsequent 20 years (1961 - 1980) no cases at all [31]. In contrast, deaths from tuberculosis from other causes number 7752 over the period 1972 - 1981 [32]. In 1961 - 1980 there were only 10 cases of brucellosis attributed to untreated milk, although as acknowledged in one report "most cases of brucellosis are occupationally associated with cattle, and it is difficult to prove that milk was the primary source of infection" [31]. "For the 5 years 1978 - 1982, only 4 of 99 cases of brucellosis were probably caused by milk" [30].

The majority of infections attributed to milk during this period were outbreaks of salmonella food poisoning and campylobacter infection, with a few isolated cases of other infections. For the decade 1971 - 1980, there were 86 outbreaks of infection attributed to untreated cow's milk with 1096 people affected [31].

In 1981, 21 outbreaks from consumption of unpasteurised milk were reported with 294 people affected [33] and in 1982, 18 outbreaks with approximately 612 people suffering [34]. The question is whether these figures represent a true increase in the numbers of people infected by consuming unpasteurised milk, and if so, why, or whether they are the result of increased reporting of this type of infection, with possibly undue blame put on milk.

The Reporting of Food Poisoning

Reporting of food poisoning can be influenced by fashion, which in recent years appears to have become anti-Green Top. The assignment of blame to untreated milk is often based on circumstantial evidence and other potential sources of infection are not always investigated. "Trends in reporting (food borne disease) may reflect changes in investigative personnel and public awareness of food borne disease as much as actual numbers of people ill" [35]. Those purveyors of cooked meats or chickens who in the past may have received their undue share of attention may sigh with relief whilst the focus is on milk. Sadly the reputation of all Green Top producers, not just that of those implicated in outbreaks of infection, has suffered as a result.

Furthermore, "in the incidents reported to the Communicable Disease Surveillance Centre, the food vehicle of infection is only infrequently confirmed epidemiologically or microbiologically. Therefore food items reported to be vehicles of infection should be viewed cautiously" [36]. For example, in one report from this Centre, unpasteurised milk was the "suggested" vehicle in 21 outbreaks of salmonellosis in 1982 [36] whereas in another report published two weeks later, the figure given was 15 and it was admitted that the causative organism was isolated from milk, milk stocks, or both in only 10 of these outbreaks [34].

The General Increase in Food Poisoning

The apparent increase in salmonella infections is by no means confined to those contracted from milk - there has been a great increase from all causes [36, 30]. "Part of this increase is almost certainly spurious due to more interest in the disease, better and more available laboratory facilities and more improved reporting but there has also been a real increase related to changing patterns of food production, processing, distribution and consumption" [30]. Salmonellosis does not appear to have been a common disease in England and Wales in the 1930's - when much more unpasteurised milk was consumed than is now. Only 38 incidents were reported from all causes between 1936 and 1940 compared to 9461 in 1982 [30].

In the period 1950 - 1982 there were 172 outbreaks attributed to untreated milk and 6 deaths [31, 33, 34], which is only a small proportion of the total numbers over that period. In 1982 salmonellosis attributed to untreated milk affected 412 people [34], only 3.2% of the total number of 12,684 who were affected [36] from all causes. During the period 1950 - 1980 this figure was only approximately 1% [30]. When considered in terms of 'incidents' of food poisoning, less than 3% of the total for 1982 were conclusively linked to untreated milk .

Over the 31 years from 1951 - 1982 only 6 deaths were attributed to infections from untreated milk [31, 33, 34]. Yet in one year alone, 1982, there were 67 deaths from other types of bacterial food poisoning [31].

Infection from Pasteurised Milk

Contrary to popular belief, contamination with pathogens can occur in pasteurised milk. For example, 3,350 people were affected in two outbreaks of Campylobacter infection [31], and salmonella outbreaks attributed to pasteurised milk, dried and tinned milks, have also occurred [31, 30, 37]. Other types of infection have been linked with pasteurised milk [38, 39]. For example, in 1982 in the United States there was a multi-state outbreak of a gastrointestinal infection (Yersinia enterocolictica) transmitted by pasteurised milk [38]. Reported cases number 172 but estimates suggested approximately 800 individuals may have been ill. This was despite the fact that "standards for adequate pasteurisation had been met or exceeded throughout the period when contamination had occurred" [38].

Who is to Blame?

It must be accepted that illness derived from food may not necessarily be the fault of the primary producer. Mishandling in the home can lead to bacterial growth significant enough to cause infection [(35)], as can dumping of contaminated sewage on the land. What too of the reduced capacity to resist disease which can be engendered by an unhealthy lifestyle and reliance on heavily processed, nutritionally inferior foods?

It has become evident that the risk of infection from untreated milk is very small for most of the traditionally associated diseases. The apparent increased danger from food poisoning is part of a general increase, which has been exaggerated by a greater awareness of the problem, and against which pasteurisation is not a complete safeguard.

The Way Ahead

Universal pasteurisation of milk would not of itself quell the increasing incidence of salmonella infections in this country as has become apparent from recent outbreaks which were not attributed to milk. More attention should be paid to the primary sources of this disease in cattle - the increased movement and mixing of calves to auctions, intensive methods of calf husbandry, contamination due to imported concentrates and other feedstuffs, increased production of slurry - as well as the contamination of streams and watercourses with town and agricultural effluents and wider areas of milk distribution which may well all have contributed to the increased incidence of salmonellosis [(40)]. For example, increased sewage pollution increases the chances of viral contamination of fruit and vegetables, which can then act as transmitters of viral disease [(41)]. Until these fundamental issues are addressed, together with more education in the handling of food, salmonella will continue to increase.

Progress lies not in banning unpasteurised milk but in trying to ensure that the milk's total bacterial count is always less than 10,000 per ml, when it is highly unlikely that pathogenic organisms even if present, could represent a significant hazard to health under normal conditions. Pasteurisation is, and will continue to be, of great value for lower quality milks but there is no reason to deny the consumer the enjoyment of high quality unpasteurised milk. As pointed out in 1965 in an authorative book on cheese "when milk can be produced generally with a low bacterial count and with no fault-producing or pathogenic micro-organisms pasteurisation can be abandoned" [(42)].

That it is possible for farmers to produce clean milk has been amply demonstrated recently. The introduction of the bonus incentive scheme for milk of low bacterial counts produced an unprecedented response from dairy farmers. The majority of dairy farmers are now producing clean milk. Many of the larger dairies have also achieved excellent systems of hygiene.

The mere installation of pasteurisation equipment is not necessarily a guarantee of immediate success in terms of microbiological quality. One notable example was on the farm of an ex-minister with special responsibility for Scottish agriculture, when 12 of 22 samples of pasteurised milk were unsatisfactory [(43)]. When the Agricultural Development and Advisory Service (ADAS) sampled pasteurised milk from 53 producer processors in Northern England, 10% had a total bacterial count of more than 100,000 per ml (unsatisfactory) and 26% were in the range 10,000 to 100,000 (Also classed as unsatisfactory) [(44)].

However, the majority of producer/processors (64%) produced bottled pasteurised milk with total bacterial counts of less than 10,000 per ml (32% were less than 2,000 per ml). Such results can also be achieved with untreated milk: in a small study of bottled untreated milk, 42% of the samples were below 10,000 per ml, with 6% less than 2,000 [(45)].

If some farmers and dairies can consistently produce and market milk with a very low bacterial count, then all should be able to do so. This will happen if the financial incentives and the penalties for failure are sufficient.

Already, because of the problems of post-pasteurisation contamination and/or inadequate pasteurisation, some producer/processors have conducted their own regular quality control tests and have been able to effect a marked improvement (only 15% with counts of more than 10,000 per ml) [(44)]. Improved methods of quality control for Green Top producers should also be seen as a progressive rather than a restrictive step.

It is within the scope of microbiological advances and electronic technology to develop further the already sophisticated testing systems which operate within the Milk Marketing Board's central laboratories. Within the immediate future, there is an urgent need to improve upon the currently available microbiological tests for Green Top milk, to increase the frequency of testing and to stiffen the penalties for dirty milk. In the not-too-distant future, we should look to the possibility that milk samples could be screened before distribution for total bacterial counts and even for specific pathogens.

Conclusion

There is no doubt that heat-treatment is detrimental to milk. Evidence shows that untreated milk has a higher nutritional value providing more available vitamins and minerals than pasteurised milk. It contains anti-infective agents which can both restrict the growth of contaminating bacteria in the milk and give the consumer protection. Not at least, it has a better flavour, with none of the deterioration in quality caused by heat treatment.

Whilst it is eminently reasonable to stamp out any significant cause of disease and to penalise those whose conditions of hygiene are poor, it is unjust to suggest that all untreated milk should be pasteurised, because of isolated outbreaks of infection, whether or not they have been conclusively linked to untreated milk consumption.

A rational approach to hygiene is obviously necessary but it is nonsensical to hope for a situation in which our food is sterile. It makes more sense to opt for the institution of a reasonable degree of hygiene combined with the promotion of vigorous good health and the associated resistance to disease which comes from eating natural wholesome foods which have not been unnecessarily processed.

There is an increasing desire from the consumer for 'natural' untreated products. Demand for all untreated dairy products is being dramatically revived. It is possible that the housewife of the future could enjoy the benefits of untreated milk, whether supplied by the smaller producer or by the larger dairy, and at the same time she could rest assured that sophisticated modern technology could guarantee that the product was clean and pathogen-free.

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Notes

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I request that you reconsider the option to exclude raw milk consumption and instead pave the way forward for this to be looked at thoroughly and to be made available to the general public with appropriate safeguards.

Yours sincerely
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