THE CASE FOR UNTREATED MILK

A SPECIAL REPORT

FROM
THE ASSOCIATION OF UNPASTEURISED
MILK PRODUCERS & CONSUMERS

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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 our booklet 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 i) anaphylactic allergy ii) 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 (see diagram).

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.

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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.

Incidents of food poisoning reported by laboratories, medical officers of environmental health and environmental health officers in 1992-4 (from Communicable Disease Surveillance Centre, December 1997).

CLICK HERE FOR FOOD POISONING GRAPH

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