

Control of pasteurised milk

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I wonder what our ancestors would have thought about current press reports on diet/health issues. To them there were no doubts - beef was safe and wholesome. Dairy products were never doubted but to be other than essential part of their diets. Now, quite correctly, with increased knowledge and awareness of food safety, consumers are much more questioning.

Recently at a meeting entitled "Milk - From Production to Consumption", organised by the Royal Society of Medicine", shadows of doubt were cast over pasteurisation - the very backbone of milk safety. Concern was raised about failures of the statutory test for pasteurisation of on-farm pasteurised skimmed milk. The issue was even the subject of national press and radio cover following statements made by the Public Health Service Laboratory.

The test to establish that milk has been correctly pasteurised is the Alkaline Phosphatase, or "ALP" test. Its origin dates back to the 1930's when scientists found that the enzyme alkaline phosphatase, (present in all milks) was inactivated at slightly higher time temperature conditions (71.7°C for at least 15 seconds) than those required to kill *Mycobacterium tuberculosis* (the organism responsible for TB). This heat treatment also killed most other milk born pathogens.

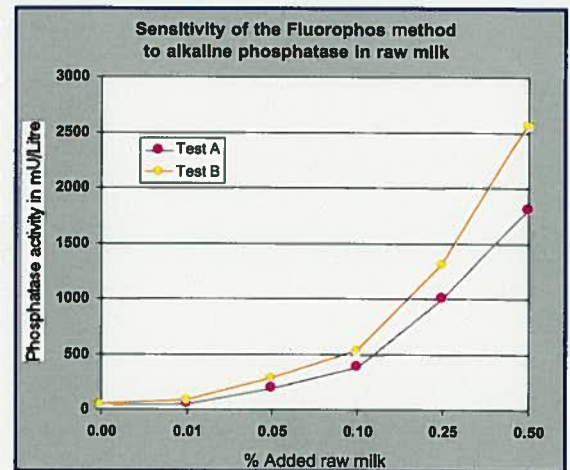
The test involves measurement of the amount of ALP remaining "undenatured" after pasteurisation. Reaction with a substrate is then used to facilitate ALP measurement. The chemistry is common to all the ALP tests. Residual ALP breaks the bond between a phosphate group and the remainder of the molecule in a phosphate mono-ester. A number of phosphate mono-esters have been investigated all liberating different compounds for subsequent measurement. Two have been standardised internationally to form statutory approved tests for

pasteurisation. One, used in the USA (Scharer test) is based on the liberation and measurement of phenol and a second, used in the UK (Aschaffenberg & Mullen) is based on the liberation and measurement of p-nitrophenol. The tests use colour measurement since this was the best technology available in the 1930's. The lowest level of sensitivity was (and still is) 10µg of p-nitrophenol. Since raw cow's milk contains about 10,000µg p-nitrophenol units of ALP (1) the best these methods were able to measure was about 0.1 per cent raw milk in the pasteurised product. Therefore, pasteurised cow's milk passing the statutory test can contain up to 0.1 per cent raw milk.

We know however that raw milk can contain pathogens. A recent paper by Karl Eckner (2) questions whether, in the current climate of food safety concerns, it is right to accept up to 0.1 per cent raw milk in pasteurised milk. This is supported in a paper by Langridge (3) who in addition showed that pasteurised milk can pass the UK statutory colourimetric test even when it contains greater than 0.1 per cent raw milk.

These recent findings show that colourimetric methods, used for over 70 years, are no longer sufficiently discriminating to meet modern consumer demands for food safety.

What is the answer? It is now time to rethink the current legislative limit for ALP. More sensitive tests are available. The Fluorophos (*below*) for example is based on the same chemistry as historic colourimetric tests yet, because it involves liberation of a chemical measured by fluorescence rather than colour, it is more sensitive, more rapid and more reproducible than older test methods. The Fluorophos, which has been extensively tested and internationally approved (ISO, IDF, AOAC), is capable of measuring down to 0.003 per cent raw milk (30 times lower than historic tests -see graph above). The pool of ALP in raw cow's milk is about 500,000 mu/L (Flourophos units). Sheep and goat supplies differ in ALP levels and may require a different interpretation (1). The legal upper limit for pasteurised milk in UK is 500mu/L i.e. 0.1 per cent raw milk even though much lower values can be measured. This statutory value was set to keep Fluorophos "in line" with historic qualitative colourimetric tests.



The Fluorophos, unlike colourimetric tests which merely provide a 'pass or fail', is a quantitative test. Correctly pasteurised milk in practice yields values of 20-50 mu/L. As it is quantitative the Fluorophos enables processors to check pasteurisers on a regular basis. Fluorophos values rising above 50mu/L should initiate an investigation into the reason for the rise. Recognising the importance of the Fluorophos to food safety, and the benefits it offers to the dairy industry, one major retailer has incorporated it into a "Code of Practice" for its dairy suppliers.

Recent research questions whether *Mycobacterium para tuberculosis* (possibly implicated in Chrons disease) might survive pasteurisation or might be carried over into pasteurised milk by raw milk. This is a further potential threat to the image of pasteurised milk.

The technology for regular monitoring of all pasteurised milk for very low levels of raw milk and for improper heat treatment exists, it is fully proven and internationally approved. Recognising this, the regulatory bodies concerned have already instituted a national programme, incorporating the Fluorophos, to monitor the performance of pasteuriser plants.

The Fluorophos offers a practical quality control for exposing milk-processing irregularities. It would be prudent for the dairy industry and legislators to use this more sensitive method to ensure current consumer confidence in milk products is maintained.

1) Harding, F, 1995, "Milk Quality", published by Blackie Academic & Professional (pp 119 - 123).
2) Karl F Eckner, 1992, *J of Food Protection*, Vol. 55, No 12 pp 960-963 (December)
3). Langridge, E, 2000
Dairy Industries International April, pp 30-31.
The Fluorophos is manufactured by Advanced Instruments USA and distributed in UK by QCL Ltd, Riverside, Forest Row, East Sussex RH18 5DW

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