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UHT milk : expanding the market

Caroline Love
Ian Bell
Martin Robertson

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An increase in the export of UHT (Ultra Heat Treated) milk to Asian markets is potentially worth millions of dollars to the dairy industry. This increase however, relies on the shelf life of UHT products being extended to nine months. Spoilage of UHT milk can be caused by bacterial spores which originate on-farm and are resistant to processing. Expansion in the UHT market therefore relies on a continued reduction in the number of these spores getting into raw milk. **Caroline Love, Ian Bell and Martin Robertson** report on the sources of spores entering milk on-farm and the control methods available.

**Background**

Many markets require milk products with an extensive shelf life. This shelf life requirement for UHT in some Asian markets is up to nine months, as compared with six months in the United States of America and only one month in Europe.

The shelf life of milk products is greatly extended by low microbial contamination in raw milk and by pasteurisation. But *Bacillus* species bacteria produce spores which are very heat resistant, surviving pasteurisation and even UHT processing. These spores then grow in processed milk, causing spoilage. The number of surviving spores is directly related to the number of spores in raw milk. It is possible to only have one spore per litre survive to give spoilage of UHT milk.

These microbes are widespread and are generally found in environments such as faeces, soil, pasture, silage, concentrates, dust and water. Previous investigations have found that the majority of spores enter the milk on-farm. It is essential that the number of these spores entering raw milk is kept low because of their resistance to the available methods of processing. This makes finding the on-farm solution to the problem particularly important.

A research project funded by the Dairy Research and Development Corporation (DRDC) and Agriculture Western Australia in collaboration with the Peters and Brownes group, is investigating the major on-farm sources of spores under pasture grazing conditions. The aims of this project are to:

- measure the incidence and distribution of spores in milk;
- identify the major routes of entry of the spores during milking;
- devise a control strategy to guarantee low levels of spore contamination.
The project

The research team is sampling all the potential routes of bacterial spore entry into raw milk. This includes the teat, mammary gland, air and water in the dairy, milking machine equipment and the milk vat.

Initially, vat milk samples from 50 herds were monitored weekly for spore counts. This was to establish the changes in spore numbers over 12 months, and to find those herds with consistently high and low spore counts. Weekly monitoring is continuing.

A few months into this monitoring, intensive on-farm studies started on farms with high spore count herds. We knew that most spores entered the raw milk on-farm, but there were many potential sources that we needed to assess.

A number of specific samples were taken. Milking machines were rinsed and sampled. Air, water, milk vat samples and milk samples from individual cows were taken during milking. Teat skin samples were taken by swabbing the teats before and after milking.

Our results showed the majority of spores entered raw milk during the milking process. Only low numbers entered the milk from the air, milk vat, water and milking machine. Another separate trial concluded that the milk from the cow itself was unlikely to be contaminated inside the udder; again, the milking process was adding the spores.

The next stage of the project was to take sterile samples of milk from the known high spore count herds. This was done using specially designed clusters and test buckets that prevented spores entering the milk through air admission. A large number of cows in each herd were sampled. These test bucket results showed that during winter and spring teat skin was a major source of spores in raw milk.

We then needed to verify that the major source of spores, teat skin, was correlated with vat milk spore counts and that other sources, for example, water, milking machine contamination, were not correlated with vat milk spore counts.

Seven high and seven low spore count farms were tested. We found that the level of spores in the test bucket was very close to vat milk spore counts, particularly for the low spore count herds. Few spores were entering from other sources. The results confirmed that teat skin was the major source of spores (50 to 80 per cent) in raw milk during the winter and spring period.

In the final stage of the project a control program will be developed to enable farmers to minimise the numbers of spores present in raw milk.

Acknowledgments

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For more information contact Laurie De Piazzi on (097) 806 100