

BactoScan™ FC: Beating bacteria in milk



A sample of raw milk today looks exactly as it did 30 or 40 years ago. But if you could analyse the contents, you would find that the one you just took contains far less bacteria. It has been a hard-fought fight, though and it still goes on. Dr Gertraud Suhren from the German Federal Research Centre for Nutrition and Food, in Kiel, talks about the role of rapid analysis in improving milk quality and the long road to approval for new analysis methods.

Bacteriological milk quality is an important parameter for the suitability of raw milk for processing products. It is of vital interest to the dairy industry, for instance, where bacteria levels can affect heat treatment procedures. It provides an indication of shelf life. It is also used to determine how much a dairy pays a farmer for milk. And it helps to determine the quality of end products made from milk. Finally, in an age where consumers are empowered, it provides a reference for the hygienic conditions of milk production.

Happily, average levels of bacteria in raw milk are falling. At least, that is the case if you live in a country like Germany where a combination of regulations, quality-based payment and emerging analysis technology has reduced average bacteria levels in a millilitre of milk from 1 000 000 Colony Forming Units (CFU)

in 1975 to 20 000 CFU today. In Denmark, approximately 93 per cent of milk producers supply raw milk with less than 30 000 CFU per millilitre.

The importance of rapid analysis

On the subject of previous levels of bacteria in milk, Dr Suhren says: “When I started working in the area of milk quality, thirty years ago some milk samples were like a bacteria soup.”

She explains that payment based on quality and government focus on hygiene management have played an important role in improving levels.

For example, according to EU legislation, milk from German dairy farms is tested for bacteria levels at least twice a month. Dr Suhren explains how, when the new rules came into force, they created a huge workload for milk testing laboratories, “It was important to find a way of automating and speeding up the analysis process,” she says.

A number of solutions were available as alternatives to the traditional time-consuming and labour-inten-

sive plate counting method. Among them, BactoScan™ is one that has withstood the test of time. The lower limit of detection of the flow cytometry technology used with BactoScan proved important as increasingly stringent regulations came into force. “Many of the other solutions fell by the wayside because they were not accurate enough to meet the new regulations,” says Dr Suhren.

The ongoing approval process

One would think that something that could speed up analysis of bacteria would be quickly adopted. But acceptance and approval is a complicated process and has been going on for approximately 25 years. Referring to the various industry and government bodies involved, Dr Suhren says: “Many people need to be convinced of the complex nature of the parameter total bacterial count, and it takes a long time.”

In particular, the need to correlate the BactoScan method, based on counting individual bacteria cells, with the traditional method, based on counting colony forming units, has caused much discussion. Dr Suhren has been involved in two main areas of work: providing validation data for the new method; and converting data for comparison with traditional analysis based on CFU. The traditional CFU method gives an indication of quality based on colony forming units. The BactoScan method gives the same indication, but is based on the number of individual bacteria cells and is far quicker, see Figure 1.

Dr Suhren has been instrumental in informing EU lawmakers about the fact that



The BactoScan™ FC.

the two methods can be compared side-by-side rather than one being better than the other. “In effect they are two ways of looking at the same picture,” says Dr Suhren. Her explanation of this to the relevant approval bodies has opened up the road to approval of the BactoScan solution.

The Federal Research Institute installed its first prototype of BactoScan in 1981, and has been involved in discussions about the validity of the method more or less continuously ever since. In 2004 a major milestone was passed with the introduction of the internationally accepted ISO 21187/IDF 196 – the conversion standard. This was an important step forward because the International Dairy Federation represents, according to its website, 74 per cent of total world milk production.

However, it wasn’t long before new requirements in the form of EU and ISO standards for validation of alternative methods appeared on the horizon – an area that Dr Suhren is now actively engaged in. As ever, she is involved in explaining the validity of the method and how it can be incorporated into the approval requirements.

Amongst other method validation studies, Dr Suhren has also conducted three extensive ring trials in Germany that have been of enormous importance in gaining acceptance of the BactoScan as a reliable analysis method.

While official approval work goes on, today BactoScan can be said to be broadly

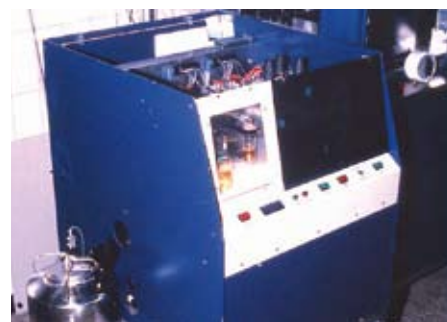
accepted. “In the industry, BactoScan is no longer controversial, but there is always the need for an independent reference for proprietary methods,” says Dr Suhren. “Now I think BactoScan is the most widespread rapid method for payment analysis and quality control, and makes milk the best examined foodstuff. Furthermore, Bactoscan has become the pacemaker for automated rapid analyses in quantitative food microbiology.”

The same combination of compulsory measures, in the form of payment according to quality and government focus, has led to similar progress in reducing raw milk bacteria levels in other countries, for instance in the USA. New and aspiring EU member states are catching up fast, and the phase that Germany has already been through is applicable globally. “The same pressures to reduce levels of bacteria apply worldwide,” says Dr Suhren. “We can look forward to further improvements in countries with developing milk production.”

Such attention may be primarily driven by issues such as public health, but is also increasingly important in a global economy where milk quality is vital for processing, export and shelf life prediction.

More information on the Federal Research Institute in Kiel can be found at www.bafm.de

by Richard Mills, FOSS



A Prototype instrument from 1981 in use at the Federal Research Institute in Kiel.

BactoScan™ today

- More than 90 per cent of all milk within the EU is paid for according to BactoScan results
- In use in over 50 countries
- Has become the industrial standard for counting raw milk bacteria in many countries worldwide
- Accords with numerous internationally accepted standards e.g. of the International Dairy Federation (IDF), and is approved by the Interstate Milk Shippers Association (IMS)
- Flow cytometry technology currently used in the BactoScan FC is a widely accepted analysis method that delivers results in less than nine minutes
- Recent updates include a semi-automatic version for laboratories with only a low throughput of samples.

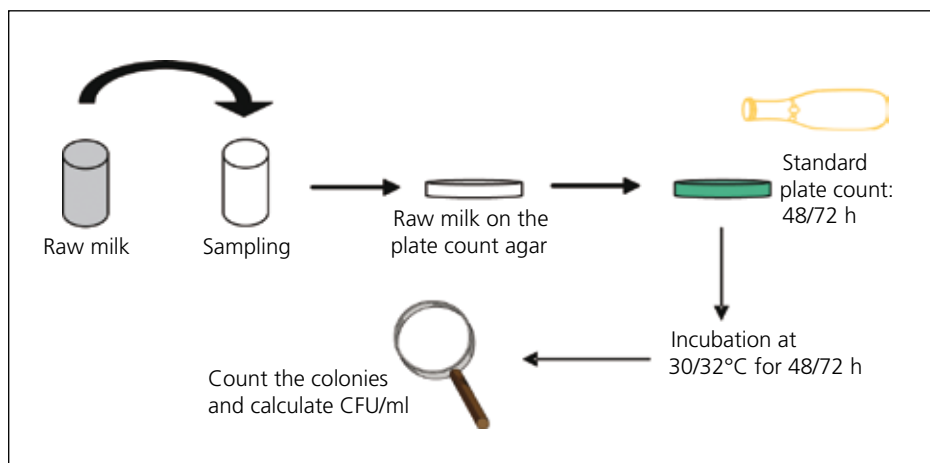


Fig. 1: Reducing Bacteria levels worldwide.



BactoScan™ FC: Less than nine min