

# Persistence of *Mycobacterium bovis* and Verocytotoxin-producing *Escherichia coli* (VTEC) in UK-made raw milk cheeses

Area of research interest: [Foodborne pathogens](#)

Study duration: 2007-09-01

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Conducted by: Campden BRI, Queens University Belfast and AFBI

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## Background

Research has shown that there is a potential for *Mycobacterium bovis* (M.bovis) to survive in cheeses made from unpasteurised milk. A great deal is known about the survival of Verocytotoxin-producing *E.coli* (VTEC) O157:H7 in some foods. However, not a lot is known about it in fermented dairy foods such as cheese, where starter cultures and naturally occurring microorganisms may compete with this pathogen.

This project investigated the survivability of M.bovis and relevant VTEC serotypes, such as O157:H7, through the manufacture of raw milk cheeses which are made in the UK. Benchmark cheeses were identified for use in the project. These were then inoculated with these key pathogens. Outcomes from the project enabled the safety of raw milk cheeses to be assessed.

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## Research Approach

Different types of cheese made from unpasteurised milk were taken to be representative of, for example, a hard and a soft cheese. These products differed in their characteristics with respect to the environment they present to M.bovis or any other microorganism found to be present (e.g VTEC). Information on values for characteristics such as salt and pH came from the expertise in the team carrying out the study, but measurements were also made.

Methods for detecting, isolating and calculating both M.bovis and VTEC O157:H7 from milk and cheeses were developed and evaluated in this study. The ability to detect and isolate non-O157 VTEC (e.g. O26, etc.) from cheeses was also investigated.

Cheeses were manufactured in the laboratory and inoculated separately with both species of bacteria. The microflora and characteristics of the cheeses were monitored throughout the life of the cheeses, so that the impact on the growth and survivability of M.bovis and VTEC could be evaluated effectively. This enabled the safety of raw milk cheeses to be assessed more precisely.

The project team consisted of experts in the areas of M.bovis, VTEC and cheese and were supported by a steering group comprising cheese manufacturers and other experts in cheese production.

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## Results

### Work on VTEC

An increase in VTEC concentration was seen during cheese manufacture and then a slow decline in count during the maturation of the Caerphilly cheese. This would suggest that there is a potential for VTEC to cause food safety issues in Caerphilly cheese made from raw milk (especially if the cheese is eaten in the first week or so after production).

However, the accepted characteristics of Caerphilly cheese, such as pH, salt and moisture content appear to be variable and the moisture content of the cheese made in the laboratory was higher than that which would be expected for a Caerphilly cheese. Due to the higher moisture content because the cheese was made in the laboratory, it is not possible to say for sure that the results reflect what would happen in industry-made Caerphilly cheese.

### Work on M.bovis

Results showed that the manufacturing process for Cheddar or Caerphilly would not be sufficient to ensure M.bovis present in the raw milk was destroyed. However, the decline in the numbers of M.bovis seen during maturation shows that the length of this stage is likely to have an impact on the contamination level of the organism in the final product eaten by the consumer.

Cheese was produced with milk containing both high and low levels of M.bovis. At the high inoculum level, average D values (the decimal reduction time, i.e. the time required to kill 90% of the microorganisms in a sample at a specific temperature), were 50.75 and 57.59 days for the Cheddar and Caerphilly respectively. At the low inoculum level, the D values were 30.49 and 21.48 respectively.

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## Published Papers

1. Mycobacterium bovis: the importance of milk and dairy products as a cause of human tuberculosis in the UK. A review of taxonomy and culture methods, with particular reference to artisanal cheeses Michael T Rowe, John Donaghy International Journal of Dairy Technology, 2008, 61(4):317-326
2. Review: raw milk and raw milk cheeses as vehicles for infection by Verocytotoxin-producing Escherichia coli., Baylis, C. L. (2009), International Journal of Dairy Technology 62, 3, 293-307

Research report

**England, Northern Ireland and Wales**

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