

ACM/499

ADVISORY COMMITTEE ON THE MICROBIOLOGICAL SAFETY OF FOOD

**SUMMARY OF MICROBIOLOGICAL RESULTS FROM THE NATIONAL
STUDY OF THE MICROBIOLOGICAL QUALITY AND HEAT PROCESSING OF
COWS' MILK**

1. Members will recall that at the 38th meeting they received the interim MAP results from the above survey (ACM/485). This paper summarises the remaining results.
2. The paper will be introduced by Dr Jonathan Back and Ms Geraldine Hoad from the FSA.

**Secretariat
November 2000**

SUMMARY OF MICROBIOLOGICAL RESULTS FROM THE NATIONAL STUDY ON THE MICROBIOLOGICAL QUALITY AND HEAT PROCESSING OF COWS' MILK

Background

1. The National Study on the Microbiological Quality and Heat Processing of Cows' Milk ran for 18 months, from March 1999 to August 2000. It surveyed a representative sample of approved dairy establishments throughout the UK, which heat treat milk (both drinking milk and milk for the manufacture of milk products). In addition to microbiological examination of samples of milk before and after heat processing, details of the quality management systems and process controls were collected.

2. The objectives of the study were:

- To obtain data on the microbiological quality of cows' milk in the UK, before and after heat processing.
- To obtain and analyse details of the production process by which the milk was heat-treated.

Study Design

3. All 755 approved dairy establishments in the UK who heat treat milk were invited to take part in the study and 258 dairies agreed to participate. Although participation was voluntary, every effort was made to ensure that the dairies sampled were as representative as possible of those in the UK as a whole in terms of size, location, etc.

4. Each dairy was asked to complete a form providing details about throughput, staffing levels, training, quality management and process controls, prior to the first sampling visit. At each sampling visit, samplers were also asked to complete a sampling form in consultation with the dairy. This recorded details

of the samples taken and the order of the processes which they have gone through e.g. separation, homogenisation.

5. The number of sampling visits a dairy received was determined by its throughput in litres of milk processed per annum (see Table 1). At each sampling visit, one raw and a number of heat-treated milk samples (pasteurised whole/semi-skimmed/skimmed or UHT) were collected. Wherever possible, the raw and pasteurised milk samples originated from the same batch of milk.

Table 1: Number of sampling visits based on dairy size

Dairy Size (litres/annum)	Number of Visits
<100,000	1
100,000 - 500,000	2
500,000 - 1 million	2
1 million - 25 million	3
25 million - 50 million	3
50 million - 100 million	3
> 100 million	4

6. A range of microbiological tests were carried out on each milk sample examined as part of the survey (see Table 2). In addition, samples were also tested for the presence of phosphatase and antibiotic residues.

Table 2: Microbiological examinations carried out on milk samples

	Enumeration	Detection
Total Viable Count	✓	
Coliforms	✓	
Coagulase positive staphylococci	✓	
<i>E. coli</i>	✓	
<i>Listeria</i> spp.	✓	✓

<i>Listeria monocytogenes</i>	✓	✓
<i>Salmonella</i> spp.		✓
<i>Campylobacter</i> spp.		✓
<i>E. coli</i> O157		✓
<i>Mycobacterium avium</i> subspecies <i>paratuberculosis</i> (MAP)*		✓
<i>Mycobacterium bovis</i> *		✓

* Only one set of samples (i.e. all the samples from a single visit) collected from each dairy participating in the survey were examined for the presence of *M. bovis* and MAP.

Results

7. A total of 2008 samples of milk were examined in the study, 602 raw, 1393 pasteurised and 13 UHT. The results of the microbiological examinations were as follows:

Table 3: Summary of Total Viable Count results

TVC Log ₁₀ count/ml	Number of milk samples						Total
	Raw	Pasteurised Whole	Pasteurised Semi-Skimmed	Pasteurised Skimmed	Total Pasteurised	UHT	
<1.00	1	5	5	2	12	13	26
1.00 – 1.99	3	24	15	14	53	0	56
2.00 – 2.99	23	245	188	199	632	0	655
3.00 – 3.99	233	230	190	169	589	0	822
4.00 – 4.99	240	37	25	20	82	0	322
5.00 – 5.99	81	9	8	8	25	0	106

>6.00	21	0	0	0	0	0	21
Total	602	550	431	412	1393	13	2008

Table 4: Summary of Coliform results

Coliforms Log ₁₀ count/ml	Number of milk samples						Total
	Raw	Pasteurise d Whole	Pasteurise d Semi- Skimmed	Pasteurise d Skimmed	Total Pasteurise d	UHT	
<1.00	81	504	401	359	1264	13	1358
1.00 – 1.99	181	34	22	37	93	0	274
2.00 – 2.99	229	11	8	13	32	0	261
3.00 – 3.99	85	1	0	3	4	0	89
4.00 – 4.99	21	0	0	0	0	0	21
5.00 – 5.99	5	0	0	0	0	0	5
Total	602	550	431	412	1393	13	2008

Table 5: Summary of *Escherichia coli* results

<i>E.coli</i> Log ₁₀ count/ml	Number of milk samples						Total
	Raw	Pasteurise d Whole	Pasteurise d Semi- Skimmed	Pasteurise d Skimmed	Total Pasteurise d	UHT	

<1.00	288	550	431	410	1391	13	1692
1.00 - 1.99	206	0	0	2	2	0	208
2.00 - 2.99	92	0	0	0	0	0	92
3.00 - 3.99	13	0	0	0	0	0	13
4.00 - 4.99	3	0	0	0	0	0	3
Total	602	550	431	412	1393	13	2008

Table 6: Summary of Coagulase Positive Staphylococci Results

Coagulase Positive Staphylococci	Number of milk samples						Total
	Raw	Pasteurised Whole	Pasteurised Semi-Skimmed	Pasteurised Skimmed	Total Pasteurised	UHT	
<1.00	489	548	431	412	1391	13	1893
1.00 - 1.99	49*	2	0	0	2	0	51
2.00 - 2.99	45	0	0	0	0	0	45
3.00 - 3.99	18	0	0	0	0	0	18
4.00 - 4.99	1	0	0	0	0	0	1
Total	602	550	431	412	1393	13	2008

* Includes 2 raw samples that were recorded as being >100

Listeria spp. and L. monocytogenes

Listeria spp. was detected in 222 (37%) of the raw milk samples and 5 (0.4%) of the pasteurised milk samples.

Listeria monocytogenes was detected in 101 (17%) of the raw milk samples.

In addition to the presence/absence tests for *Listeria* spp. and *L. monocytogenes* a quantitative analysis was also carried out. No counts were found greater than Log₁₀ 2.00 per ml.

Salmonella

Salmonella spp. was detected in two (0.3%) of the raw milk samples.

Campylobacter spp.

Campylobacter spp. was detected in five (0.8%) of the raw milk samples.

E.coli O157

E. coli O157 was detected in one (0.2%) of the raw milk samples.

Mycobacterium bovis

A total of 765 samples of raw or pasteurised milk were examined for the presence of *M. bovis* and 763 gave a negative result.

Two samples of pasteurised milk were found to contain *M. bovis*. However, when assessing the need for action to protect public health it was concluded that the evidence pointed towards laboratory contamination. Further investigation tended to confirm this (see Annex).

December 2000

Microbiological Safety Division

ANNEX

The following gave rise to the conclusion that the presence of *M. bovis* in the samples arose from cross contamination in the laboratory.

- Work on heat resistance has shown that pasteurisation effectively inactivates *M. bovis*.
- Corresponding raw milk samples from the same batch of milk were negative.
- There was no evidence from either the microbiological or phosphatase results that the samples had been inadequately pasteurised or post pasteurisation contamination had occurred.
- Molecular typing (spoligotyping, variable number of tandem repeat (VNTR) and RFLP) was not able to distinguish the isolates from the laboratory control strain.
- The samples were analysed on the same day when separate work on *M. bovis* was also being carried out in the laboratory. The same equipment was probably used for both this work and testing of the survey samples, although precautions would have been taken to avoid cross contamination.