

CERTIFIED MILK IN RELATION TO THE BACTERIOLOGICAL STANDARD.

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THIS paper contains an analysis of the results of the bacteriological examinations of 184 samples of milk produced by Mr W. G. Symes, Manor Farm, Fordington, Dorset, between April 1st, 1921 and June 6th, 1924.

This farmer holds a licence to produce Certified Milk which is despatched from the farm in sealed glass bottles. The samples were taken at random from the milk as it was bottled and were at once despatched by post to the laboratory, without placing in cold store. The age of the samples varied from 20-24 hours at the time of examination.

Up to August 1922 the milk was cooled with water from a town supply. From April 1921 to August 1922 the average temperature of cooling during the months May to September inclusive was 51° F. and from October to April inclusive was 48° F.

After this date the temperature of cooling seldom exceeded 50° F. and was usually between 40° F. and 50° F. Milking was done in the cowshed which is of the type ordinarily found on farms where clean milking is practised. There is no separate milking shed.

In Table I the samples have been classified according to the temperatures on arrival and the bacterial count. The presence or absence of *B. coli* is considered separately.

It is interesting to note that out of a total of 184 samples 133 or 72 per cent. showed not more than 1000 colonies per 1 c.c. even though the temperature on arrival varied from 40° F. to over 80° F., that 175 or 95 per cent. showed not more than 10,000 colonies per 1 c.c. and that 179 or 97 per cent. conformed to the certified standard of 30,000 per 1 c.c.

Of the 84 samples which arrived at temperatures between 41° F. and 55° F., 66 or 78.5 per cent. showed not more than 1000 colonies per 1 c.c. and 83 or 99 per cent. conformed to the certified standard of 30,000 per 1 c.c.

Forty-three samples arrived at temperatures varying from 56° F.-60° F.; forty-two of these showed not more than 1000 colonies per 1 c.c. and all conformed to the certified standard.

Out of a total of 137 samples which arrived at temperatures not exceeding 60° F., 108 or 78.8 per cent. showed not more than 1000 colonies per 1 c.c. and 136 or 99 per cent. showed not more than 30,000 colonies per 1 c.c.

Twenty-eight samples arrived at temperatures which lay between 61° F.

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and 65° F. Sixteen of these showed not more than 1000 colonies per 1 c.c. and 27 not more than 30,000. Of the 13 samples which arrived at temperatures varying from 66° F.-70° F. eight showed counts of 1000 or less and all were within the certified standard.

Four samples were tested at temperatures varying from 71° F.-75° F. One showed 1000 colonies per 1 c.c. and two were within the certified standard. Of the two samples which arrived at temperatures of over 75° F. one conformed to the certified standard and one showed a count which exceeded 200,000 colonies per 1 c.c. If those samples which arrived at temperatures varying from 61° F. to 75° F. or more are considered, it is seen that of the

Table I.

Temperature of samples on arrival at the laboratory	Total number of samples examined	Number of samples containing not more than					Number of samples containing more than 200,000 colonies per 1 c.c.
		1,000 colonies per 1 c.c.	10,000 colonies per 1 c.c.	30,000 colonies per 1 c.c.	50,000 colonies per 1 c.c.	200,000 colonies per 1 c.c.	
41-50° F.	32	22	32	32	32	32	0
51-55	52	44	51	51	51	52	0
56-60	53	42	53	53	53	53	0
61-65	28	16	26	27	27	27	1
66-70	13	8	12	13	13	13	0
71-75	4	1	1	2	2	2	2
Over 75	2	0	0	1*	1	1	1†
Grand total	184	133	175	179	179	180	4

* (80° F.) † (86° F.)

47 tested, 25 or 53 per cent. gave counts of 1000 or less as compared with 78.8 per cent. when the temperatures on arrival lay between 40° F. and 60° F.

Further, under these conditions 43 or 91.5 per cent. showed not more than 30,000 colonies per 1 c.c. as compared with 99 per cent. when the temperatures did not exceed 60° F.

*Presence or absence of B. coli.*¹

None of the 84 samples examined at temperatures not exceeding 55° F. contained *B. coli* in 1 c.c. or less.

Of the 53 samples which were tested at temperatures varying from 56° F. to 60° F. one contained *B. coli* in 1 c.c. only, and one contained *B. coli* in 1/10 c.c. This organism was also found in 1 c.c. on two occasions out of 28 when the temperatures on testing lay between 61° F. and 65° F.

Of 13 samples examined at temperatures varying from 66° F. to 70° F. none contained *B. coli* in 1 c.c. or less.

Two out of the four samples examined at temperatures between 71° F. and 75° F. showed *B. coli* in 1/10 c.c. only; and one out of the two samples examined at temperatures exceeding 75° F. (80° F. and 86° F.) contained *B. coli* in 1/1000 c.c.

Of a total of 184 samples, 177 or 96 per cent. showed no *B. coli* in 1 c.c.

¹ Measured by the standard adopted by the Ministry of Health.

and 7 or 3·7 per cent. showed *B. coli* in 1 c.c. or less, 3 or 1·6 per cent. showed *B. coli* in 1 c.c. but in no less quantity, 3 or 1·6 per cent. showed *B. coli* in 1/10 c.c. but in no less quantity, and 1 or 0·5 per cent. showed *B. coli* in 1/1000 c.c.

A consideration of the temperatures of the samples on arrival shows that under ordinary conditions of transport some form of artificial cooling is necessary since four (8·7 per cent.) of the 47 samples which reached the laboratory at temperatures exceeding 60° F. failed to maintain the certified standard, whereas there was only one failure (0·7 per cent.) among 137 samples which arrived at temperatures not exceeding 60° F.

The results summarised above are so good that the conclusion that the failures to conform to the certified standard were due solely to adverse temperature effects, appears to be justified.

The figures used in a previous paper¹ which showed the results of the examinations of 82 samples of milk taken between November 1916 and September 1918 may be combined with those analysed in this present paper to extend the number of examinations of certified milk to a period of more than five years. With this addition the total number of samples examined at approximately 24 hours after milking amounts to 266 (184 + 82).

Of the series of 82 samples two or 2·44 per cent. failed to maintain the certified standard and of the present series of 184 samples 5 or 2·7 per cent. gave counts in excess of 30,000 per 1 c.c.

When these two series are combined it is seen that of a total of 266 samples 7 or 2·6 per cent. gave counts in excess of 30,000 per 1 c.c.

When the incidence of *B. coli* is considered it is found that of the first series of 82 samples 7 or 8·5 per cent. showed acid and gas in 1 c.c. or less and that of the series of 184 samples 7 or 3·7 per cent. showed the presence of *B. coli* in 1 c.c. or less. Therefore out of a total of 266 samples 14 or 5·2 per cent. were found to contain *B. coli* in 1 c.c.

This does not mean that on this basis 5·2 per cent. failed to maintain the certified standard of no acid and gas in 1/10 c.c. since seven of the samples showed *B. coli* in 1 c.c. but in no less quantity.

The results of the examinations of Mr Symes' milk serve to emphasise the fact that if delivery can be made within 24 hours there is little danger that the certified standard will not be maintained, provided that the temperature does not exceed 60° F.

Further it is shown that success in clean milk production rests, not so much on the buildings and equipment as upon the skill of the workers and the unflinching interest of the farmer.

¹ Freear, Mattick and Stenhouse Williams (1921). "A Study of the Bacteriological Examination of Grade 'A' (Cert.) Milk." *Journ. of Hyg.* xx. 125.