

## ON THE PRODUCING OF MILK HAVING A LOW BACTERIAL CONTENT.

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### ABSTRACT<sup>1</sup>.

ABOUT a year ago the specific opportunity which our laboratories had been seeking presented itself. We were brought into touch with a farm on the outskirts of Vancouver engaged in the production of milk and the distributing of the same in the city. The proprietors of the farm, with at that time a herd of twenty-five grade cows, were endeavouring to supply a high grade milk, a milk having a low bacterial content, and secured from cattle giving a negative reaction to the tuberculin test. We approached the proprietors, Mr and Mrs Alexander Hill, and found that they were desirous of co-operating with us. At the same time their milk was obtaining a premium over the usual price obtained for market milk sold in the city. We made it clear that we were anxious to secure data which would be of use to milk producing farmers generally with respect to the possibility of producing a high quality milk; and they—Mr and Mrs Hill—assured us that they desired to have advice and help if the same could be forthcoming. Finally we made the following arrangement: (a) we were to be permitted to obtain samples of milk at any time deemed most suitable to ourselves, (b) these samples were to be examined for bacterial flora to the end that we might secure the data we needed, (c) no report on the examinations was to be sent from our laboratories until it became possible for us to publish the data as a whole, (d) the proprietors of the dairy were to be given any information that was available from the laboratory data, but, under no circumstances, was the same to be used for publicity purposes, (e) we were to check up any of the procedures in vogue on the farm and dairy as far as proved to be possible without unduly interfering with the progress of our main project. The arrangement was agreed to mutually, and it is a matter of gratification to us that throughout the entire investigation the conditions detailed above were subscribed to loyally.

We conducted preliminary work in February and March, 1923, and the investigation proper commenced on April 10th, 1923, and continued until July 24th, 1923<sup>2</sup>.

<sup>1</sup> Sadler, Wilfrid, Kelly, C. D. and Martin, G. R. (1923). On the Producing of Milk having a Low Bacterial Content. *Scientific Agriculture*, Ottawa (in Press).

<sup>2</sup> During the past summer, the senior worker was absent from the University, and the laboratory work was done by Mr C. D. Kelly and Mr G. R. Martin. Mr Martin is conducting a detailed study of certain of the organisms isolated and retained during the work. W. S.

The farm premises would be held to be well below the average of what are usually considered to be suitable holdings for the production of milk. In the paper (*loc. cit.*) a description of the premises, of the methods and procedures followed by the proprietors and of the system adopted by them in the cleansing and sterilization of utensils, are given in detail. A milking machine was used throughout. A small quantity of the first milk was drawn into a separate pail and in all cases this was used for the feeding of certain livestock. The milking as such was done with the machine. Stripping was done by hand and the strippings were mixed with the milk supply.

Throughout the period during which the work was carried on, 90 samples of milk were examined, three samples being taken on each of the 30 days when determinations were made. At each sampling, two pint bottles of milk, intact, as bottled by the dairy, were taken by us on the premises. One bottle was of evening's milk—designated I in Table, and one was of morning's milk—designated II in Table. The bottles were chosen at random, and usually were obtained by us at 8.30 a.m. In addition, a sample of morning's milk after cooling and prior to bottling and representative of the entire supply, was taken—designated III in Table. The media employed for the plate counts was the Bacto-purple-lactose-agar (dehydrated) of the Digestive Ferments Company. For detecting lactose-fermenting (gas-producing) types we employed MacConkey's neutral-red-bile-salt-broth. All determinations were done in triplicate. Triplicate plates were incubated at 37° C. and at 22° C. respectively. The former were counted after 48 hours' incubation and the latter after 5 days' incubation. For the fermentation tests, triplicate tubes containing 20 c.c. of milk in each case were submitted to the fermentation test at 37° C. and at 22° C. respectively. For the reductase test triplicate tubes containing 20 c.c. of milk and 0.5 c.c. methylene-blue in each case were submitted to the methylene-blue-reductase-test at a temperature of 37° C.

#### DATA OBTAINED.

Of the 90 samples examined, 7 samples gave a count of 8150, 7800, 5050, 5260, 5800, 5800, and 5400 colonies per c.c. respectively; 83 of the 90 samples gave a count of less than 5000 colonies per c.c. The counts are recorded as for the plates incubated for 48 hours at 37° C. The appended Table summarizes the averages of the counts for each set of samples for the period April 11th to June 6th and June 6th to July 24th respectively. When average counts are considered, it is seen that the highest average for any one period is 3680 colonies per c.c. and that throughout the work in all instances for any period considered, the count was below 5000 colonies per c.c. We failed to find organisms of the lactose-fermenting (gas-producing) types in 1/10 c.c. of any sample of milk examined. In only 5 of the 90 samples did we find gas-producing types in 1 c.c. of the milk. The results from the fermentation tests and from the reductase test agreed in the main with the findings from the plate counts. Our results as a whole, considering the data available from all our determina-

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Table.

Samples	Dates of sampling 1923	No. of samples examined	Treatment of utensils	PLATE COUNTS.		PRE-SUMPTIVE TEST. Gas-producing types in 1/10 c.c. milk	RE-DUCTASE TEST. Hours required to reduce meth. blue 37° C.	FERMENTATION TEST. No. of hours.			
				No. of colonies per c.c. Average for no. of samples specified in column 3				Before milk clotted		Before peptonization observed	
				Incubated at 37° C.	Incubated at 22° C.			37° C.	22° C.	37° C.	22° C.
I. Bottle of evening's milk	Apr. 11 to June 6	14	Utensils sterilized once a day	2000	2130	0	23	43	86	27	59
	June 6 to July 24	16	Utensils sterilized twice a day	3040	3460	0	24	35	101	23	61
II. Bottle of morning's milk	Apr. 11 to June 6	14	Utensils sterilized once a day	2920	3650	0	24	43	101	24	63
	June 6 to July 24	16	Utensils sterilized twice a day	2740	2660	0	23	38	105	22	62
III. Sample of morning's milk	Apr. 11 to June 6	14	Utensils sterilized once a day	3120	3680	0	23	42	104	25	63
	June 6 to July 24	16	Utensils sterilized twice a day	2470	2660	0	23	37	101	22	61

tions, indicate that the milk produced on the farm under consideration is of excellent quality bacteriologically. It is our conviction, based on the work recorded, that the results are indicative of the paramount importance which is to be attached to the quality of the personnel, and to the effective cleansing and sterilization of utensils as factors influencing the bacterial quality of milk. The results of our work appear to harmonize with those recorded by North, Delépine, Ayers, Cook and Clemmer, Stenhouse Williams and others.

It remains to be said, that the milk produced and distributed by the farm dairy under consideration commands an enhanced price in the City of Vancouver.

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