XIII.—*Milk of Abnormal Quality.*

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PERHAPS some apology is needed for bringing these notes before the Chemical Society, which is mainly concerned with the recondite investigations of those who are extending the boundaries of chemical science. My apology is, that the following facts not only materially affect views at present universally accepted as to the limits in the composition of genuine milk, but are also interesting physiologically.

On the 13th of November last, among some samples of milk forwarded for analysis, were two marked No. 40, which gave the results shown in the accompanying table. On the 19th, further samples were received from the same source, with a message that the former samples came from the sender's own cows, as also the samples then forwarded. Two of these, marked No. 41, gave the results shown in the table. I then visited the sheds, saw these cows, Nos. 40 and 41, obtained full particulars as to their feeding, and requested further samples, which reached me on the 22nd November. The analyses of these confirmed the previous results. Periodical analyses have since been made of the milk from these cows, with the following results (see table, p. 202).

The fat estimations have, in several cases, been made in more than one way, whilst all have been calculated by Fleischmann's formula from the total solids and specific gravity. The results have varied not more than 0.15 per cent., and seldom so much as that. Some of the milks were passed through a separator to determine if the fat, as estimated, could be removed as cream. This was so. The separated milks, upon analysis, confirmed the analyses of the whole milk as to the percentage of solids other than fat. The ash has been estimated on nine occasions, and gave 0.70, 0.76, 0.78, 0.78, 0.78, 0.80, 0.80, 0.84, 0.86. The utmost precaution was taken to ensure perfect combustion of the carbon.

Some complete analyses of the milk were made to discover whether the loss fell on any special constituent or on all alike.

The following are the results obtained :—

Composition of the Milk.

Yield of milk.		Date.	No. 40.						No. 41.					
			Morning.			Evening.			Morning.			Evening.		
40	41		Fat.	Other solids.	Total solids.	Fat.	Other solids.	Total solids.	Fat.	Other solids.	Total solids.	Fat.	Other solids.	Total solids.
38 lbs.	37 lbs.	13th Nov.	3.41	8.47	11.88	5.71	8.63	14.34	—	—	—	—	—	—
—	—	19th "	—	—	—	—	—	—	3.80	8.24	12.04	4.54	8.10	12.64
—	—	22nd "	3.39	8.39	11.78	4.50	8.38	12.88	3.80	8.38	12.18	4.61	8.41	13.02
22 "	25 "	5th Dec.	3.44	8.28	11.72	5.12	8.48	13.60	3.07	8.21	11.28	4.50	8.52	13.02
—	—	10th "	2.17	7.87	10.04	4.68	8.30	12.98	3.13	8.19	11.32	5.13	8.25	13.38
15 "	22 "	17th "	2.98	7.58	10.56	3.86	8.14	12.00	3.27	8.27	11.54	4.26	8.26	12.52
8 "	18 "	7th Jan.	2.70	7.50	10.20	3.64	7.68	11.32	3.93	8.13	12.06	4.95	8.19	13.14

Complete Analyses.

	No. 40. 25th Nov. Morn.	No. 40. 25th Nov. Even.	No. 40. 5th Dec. Even.	No. 41. 25th Nov. Morn.	No. 41. 25th Nov. Even.	No. 41. 5th Dec. Even.	Average.
Fat	3·39	4·50	5·12	3·80	4·61	4·50	4·32
Casein	2·54	2·78	2·64	2·75	2·69	2·76	2·69
Albumin ...	0·39	0·29	0·24	0·45	0·45	0·26	0·35
Other N constituents*	—	—	0·44	—	—	0·42	0·43
Sugar	4·76	4·55	4·36	5·11	4·43	4·30	4·19
Ash	0·70	0·76	0·80	—	0·84	0·78	0·78
	11·78	12·88	13·60	12·18	13·02	13·02	12·76
Solids other than fat..	8·39	8·38	8·48	8·38	8·41	8·52	8·44

* Nitrogen determined $\times 6\cdot25$.

The composition of the solids other than fat of good milk, judging from the preliminary results of experiments still in progress, may be taken to be as under. By deducting one-twelfth (the amount of solids other than fat, lacking in the milks under consideration), the remainder would have the composition also here shown.

	Normal composition of solids other than fat.	11/12th thereof.
Casein	3·00	2·75
Albumin	0·38	0·35
Other nitrogenous bodies	0·36	0·33
Sugar	4·56	4·16
Ash	0·70	0·64
	9·00	8·23

Upon comparing these last figures with those of the complete milk analyses, it will be seen that they agree closely; hence the falling off has been equally distributed over both the casein, sugar, and other constituents, except the ash.

Some of the worst of these milks were drawn in my presence, by one milker, and the samples taken by me then. When not present myself, the owner of the cows supervised the milking and sample-taking, being deeply interested in the results of the inquiry. Hence the purity of the samples cannot be doubted.

What then is the cause of the abnormal results? Three causes appear probable. 1st, that the cows were suffering from a disease which, though at first unnoticeable, would, in time, become manifest.

But the cows have, as yet, shown no sign of disease. 2nd. That the food they received was either insufficient or ill-apportioned in its constituents. This, however, was not the case; the food was ample, and had been most carefully apportioned. As all the cows in the shed were receiving the same food, on each occasion of taking samples other cows were milked, and their milk analysed. But in no single instance has any other cow in the shed given milk which differed in any way from rich normal milk. To make more certain, the milk of the whole shed was mixed, and a sample of the mixed milk analysed. The solids other than fat have only once (6th January) fallen below 9 per cent. Hence, the food was not at fault, even assuming, which is doubtful, that the food could affect the milk to such an extent. The third and last explanation, and the conclusion to which we are forced, is that owing to some inherent quality of these animals, the normal composition of their milk is such as has never before been recorded. They are cross-bred shorthorns, and No. 41 appears to have Dutch blood in her. But No. 40 has no appearance of foreign blood, and is to all intents and purposes a shorthorn. The animals are the property of Mr. A. Tisdall, of Holland Park Dairy, Kensington, who has retained them mainly for the purpose of this investigation.

The quantity of milk they yield has not been large, and is decreasing rapidly.