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ON THE TREATMENT OF SOUR MILK INTENDED FOR ANALYSIS.

By MATTHEW A. ADAMS, F.R.C.S., F.C.S.

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I IMAGINE all will agree that the curdled condition of sour milk, presents a mechanical difficulty by no means trifling, to the food analyst, whatever be the method of analysis employed, which adds not a little to the uncertainty of the results, because of the

impossibility to obtain an uniform distribution of the milk constituents throughout the sample, and this condition obviously becomes an obstacle amounting to an absolute barrier to the paper method of analysis, which I have lately brought to your notice. It was, in these circumstances, essential to discover some innocent expedient, whereby curdled milk might be restored to its natural limped emulsified condition. In as much as coagulation has often set in before the sample intended for analysis reaches the hands of the analyst, it is out of the question attempting anything of the nature of an antiseptic treatment to anticipate or arrest the changes which fermentation brings about; there is no help for us, unless we can restore the already curdled milk, to a fluid condition, and this is what we set ourselves to do.

Of course it is well known that precipitated casein is soluble in potash or soda, but it does not appear to have been remarked that ammonia added to sour milk, not only re-emulsifies the coagulum, but also maintains it in the re-emulsified state for a considerable time, apparently arresting fermentive change, and so preserving the milk in a physical condition suitable for our purposes of analysis, and so far as I can find, in no way interfering with the analysis. In proof of which I beg to offer for your consideration the following experiments.

I first set myself to ascertain what, if any effect, ammonia had in the ordinary course of analysis of a sample of fresh milk; for this purpose I divided a specimen of fresh milk into two portions, to one of which I added ammonium, and examined the two by the paper, and also the usual methods, with the following results per cent.

			Average.	
Solids-not-fat	8.31	8.38	8.345	} Without Ammonia.
Fat	4.50	4.44	4.47	
Total solids	12.81	12.82	12.815	
			Average.	
Solids-not-fat	8.16	8.26	8.210	} With 9 per cent. of Ammonia.
Fat	4.41	4.44	4.425	
Total solids	12.57	12.70	12.635	

From which it appears that there is a certain small loss on the total solids, caused by the ammonia treatment, which loss is chiefly borne by the solids-not-fat, the difference being

Solids-not-fat	0.135
Fat	0.045
Total solids	0.18

with the same sample, on drying 5c.c. in platinum capsules, the difference on the total solids was 0.31 per cent.

In another sample of fresh milk, treated with 7.1 per cent. of ammonia we got

			Average.	
Solids-not-fat	8.76	8.62	8.69	} Without Ammonia
Fat	2.76	2.77	2.765	
Total solids	11.52	11.39	11.455	
			Average.	
Solids-not-fat	8.47	8.46	8.465	} With 7.1 per cent. of Ammonia
Fat	lost			

The loss on the solids-not-fat being 0.225 per cent., and the same dried in platinum gave a loss on the total solids = 0.33 per cent.

It was noticed that the dried residues of the ammoniated samples were much darker than the others; they had become brown like partially caramelized sugar, and the thought struck me at once that perhaps the ammonia has the effect of causing the milk-sugar to give up more readily its water of crystalization, and with this idea I next experimented with a simple solution of milk-sugar, with the following results:—

	Average.	
Sugar Solution only	3.74 p.c.	3.68 p.c. = 3.71
Ditto + $4\frac{1}{2}$ p.c. of Ammonia	3.49	3.47 = 3.48
Ditto + 12 p.c. of Ammonia	3.54	3.45 = 3.49

This was with paper coils, and there is again a loss = 0.23 % on the ammoniated sample. The same thing done in porcelain dishes gave:—

	Average.	
Sugar Solution only	3.50	3.50 = 3.50
Ditto	3.53	3.53 = 3.53
Ditto with Ammonia	3.44	3.41 = 3.425
Ditto	3.42	3.35 = 3.385

Difference 0.11 per cent.

I cannot believe that in this later case the drying in the porcelain dishes can have been complete, it being so very difficult to get rid of the last trace of moisture from the sticky residue when in mass in the dishes, though it is accomplished easily enough on the paper coil, and I beg to be allowed to remark that incidentally this is a corroboration in part of my contention in regard to the paper method. But to return to our present subject, there was again observed the same darkening effect produced by the ammonia, although the experiments were done side by side under precisely the same conditions. Those that had the ammonia became sooner and more dark than those that had not, and, as you will have observed, the loss on the paper coils viz., 0.23 % is practically the same loss as we find in the milk.

So far then as these few experiments go, it appears that the addition of ammonia has no great effect upon the milk, and such as it has is confined to its action on the sugar, and further, I think we may safely conclude that it only causes the sugar to give up its molecule of water more readily than it otherwise would do.

We now pass to the consideration of the details of two sets of experiments on very old and decomposed milks. The first relates to a sample received from Dr. Vieth, January 7th, and examined jointly with him and Mr. Baynes (No. 5, page 52 in the March ANALYST). The other sample is one received from Dr. Vieth, December 19th, 1884 (No. 1, page 51). On the first milk by the paper process, my results were as follows:—

	Average.			
Solids-not-Fat	9.05	9.01	8.91	8.89 = 8.96
Fat	0.52	0.48	0.54	0.55 = 0.52
Total Solids	9.57	9.49	9.45	9.44 = 9.48

On March 26th, when 78 days old, this milk was decomposed, having a thick felted growth of fungus on its surface, the addition of 11.3 per cent. of ammonia, with a

vigorous shake broke up the clot and brought the whole into a limpid condition, except for a few flakes of the mycelium of the fungus, and on analysis we got :

Solids-not-fat	8.76	8.58	=	Average. 8.67
Fat	0.42	0.51	=	0.46
Total solids	9.18	9.09	=	9.13

Showing a loss on the original analysis when in the fresh state of

Solids-not-fat	0.29
Fat	0.06
Total solids	0.35

and with the second, originally when fresh, the following results were obtained :—

Solids-not-fat	8.97	8.88	8.91	9.07	=	Average. 8.96
Fat	0.70	0.68	0.78	0.68	=	0.71
Total solids	9.67	9.56	9.69	9.75	=	9.67

On March 26th, when 98 days old, and very much decomposed, it was treated with 12.3 per cent. of ammonia with the following results :—

Solids-not-fat	6.09	6.12	=	Average. 6.105
Fat	0.67	0.64	=	0.655
Total solids	6.76	6.76	=	6.76

Showing a difference of

Solids-not-fat	2.86
Fat	0.06
Total	2.92

To these I add particulars respecting a sample only a week old—which, when in the fresh state, gave

Solids-not-fat	8.89	8.87	Average. 8.88
Fat	3.64	3.72	3.68
Total Solids	12.53	12.59	12.56

And with 8.1 per cent. of ammonia when a week old—

Solids-not-fat	8.77	— 0.11
Fat	3.77	Difference + 0.09
Total solids	12.54	— 0.02

In the first of the two very old samples you observe the loss is only 0.35 per cent., whereas in the second the loss is 2.91 per cent.

I can't pretend to explain this irregular difference of loss, the sample 98 days old, certainly in outward appearance alone, was even to the unassisted senses much more decomposed than the one 78 days old. So far as they go, the facts only confirm the opinion of those who hold that no regular time allowance can be made in calculating the effect of changes which occur during the decomposition of milk.

As regards the last experiment, the results are anomalous, and for the want of time I could not repeat the experiment—indeed, the experiments altogether are neither so numerous or elaborate as I could wish, they were conducted under the pressure of other important engagements, and would not have been brought forward at the present time, except that it appeared very desirable to show with as little delay as possible that

the mere coagulation of milk is no barrier to the adoption of the paper method of milk analysis, and the only object sought for, so far as the present communication is concerned, is to point out a simple and innocent way whereby the restoration of coagulated milk to a condition suitable for analysis can be accomplished, and I submit that the addition of ammonia answers this purpose very satisfactorily.