THE ANALYST.

AUGUST, 1885.

REMARKS ON SEWAGE-FARM MILK AND BUTTER.

BY ALFRED HILL, M.D., F.I.C., F.C.S.

President of the Society of Public Analysts.

(Read at the Meeting, 10th June, 1885.)

THE products in question have frequently been the objects of suspicion and attack by persons who knew, or thought they knew, something about the subject.

With regard to the milk, it has been said to be poor and watery, to possess, when 24 hours old, a rancid odour, and to produce typhoid fever.

The butter made from the milk of cows fed on a *small proportion* of sewage-grass has also been stated to be so offensive, that it could not be borne upon the table. Such statements as these seeming to me *primâ facie* incredible, I determined, as far as Birmingham is concerned, to test their accuracy; for it seemed, and still seems to me a matter of the greatest importance that the truth upon this question should be known, especially at a time when the disposal of the sewage of towns upon land is on

the increase, and considering that it is likely to be more and more adopted to the exclusion of artificial methods, for the reason that it is the most satisfactory of all systems.

I obtained, therefore, samples of milk direct from the Birmingham Sewage-Farm, and submitted them to both organoleptic examination and chemical analysis, the result being that the milk proved to be of as good a quality as, if not better than, ordinary milk, and that its *keeping* properties were in no way inferior, although fresh sewage-grown grass formed a large part of the cows' food.

In order to test the quality of the butter made from it, I requested the wife of the farm manager, who thoroughly understands butter making (although no butter is ordinarily made on the sewage-farm) to make a churning for me, which she was kind enough to do.

The resulting butter was excellent in quality, and retained its sweetness and other properties as well as other fresh butter, although the weather at the time was excessively hot; so that the conditions of the experiment were as unfavourable as possible.

Subsequently, I had 48 cows at the sewage-farm milked, in the presence of one of our Assistant Inspectors, and I analysed the samples by the ordinary (Bell's) method. *The results are given below in Table A.*

As, however, the samples above were yielded by cows at a time when they were eating certain sewage-grown products, but were not eating sewage-grown grass, I have thought it desirable to submit to analysis another series of milks from cows of whose fodder sewage-grown grass formed a considerable part, in order to see whether the constitution of the milk became thereby changed. *The results are given below in Table B.*

The ages of the cows vary from three to nine years. The time since calving ranged from three weeks to eleven months. Altogether there are 144 milking cows on the farm, and they yield 400 gallons of milk daily, which gives an average to each cow per diem of a little over $2\frac{3}{4}$ gallons. The breed of cows is the "Cross Short-horn,"

Besides sewage-grown grass, part long and part cut, the food of the cows includes sewage-grown cabbage, ensilage, brewers' grains, some cake, and a little mixed flour, which latter is given with the cut grass.

Some years ago, viz, in 1872, 1875, 1876, I examined the milks of a number of cows in different dairies, as well as some purchased by the Inspector, the results of which are recorded at page 44 of the first volume of THE ANALYST. None of these cows were fed on sewage-grown products, and it is interesting to observe how little are the differences in the three series of analyses, as seen below:—

	Average of Milks from 46 Cows in ordinary Dairies in 1872, 5, & 6.		Average of 48 samples of Sewage-Farm Milk, 1882.		Average of 48 samples of Sewage-Farm Milk, 1885.	
Fat	..	3·22	..	3·69	..	3·95
S. N. F.	..	9·74	..	9·45	..	9·14
Total Solids	..	12·98	..	13·11	..	13·10
Ash	..	·73	..	·77	..	·77

An inspection of the tables will show that the average quality of the milk is decidedly high, that the Specific Gravity is indicative of good quality, and varies very equally with the fluctuation of chemical composition, that in nearly all the few samples in which the fat is low the solids-not-fat are higher than usual, and *vice versa*, but that in many instances the quantities of both fat and solids-not-fat, *i.e.*, total solids, are high. Thus the average figures of the different results are as follows:—

Specific gravity		1031.9	Max.	1036.0	Min.	1027.5
Percentage measures of cream		12.1	Max.	20.5	Min.	5.0
Fat		3.69	Max.	7.59	Min.	2.1
Solids-not-Fat		9.45	Max.	10.64	Min.	8.40
Total Solids		13.11	Max.	17.01	Min.	11.38
Ash		0.77	Max.	0.84	Min.	0.70

From No. 1 to No. 40, inclusive, the food of the cows consisted of cut hay, turnips, mangel-roots, with some brewer's grains and flour.

From No. 40 to 45, inclusive, the food was cut hay, rabi roots, some linseed and a little bean flour.

From No. 46 to No. 48 it was hay, turnips, mangels, with brewers' grains and a little flour.

Everything was grown upon the Sewage-Farm except the linseed cake, flour, and brewers' grains.

These facts clearly disprove the allegation that sewage-farm milk is of poor quality, and that it acquires a rancid odour in 24 hours, and, even if it did, this would be no proof of the other contention that its consumption produces typhoid fever. There are sewage-farms in considerable number in the country, notably at Edinburgh, where the Craigintinny meadows, irrigated with sewage, have been used for growing grass for feeding cattle, for two hundred years, and where, as I can testify from my own observation, the sewage is applied in excessive quantities; at Croydon, Warwick, Rugby, Merthyr Tydfil, and other places, but in no case has it ever been proved that disease was propagated by the milk produced on such farms, on account of its origin.

Such an assumption appears to be about on a par with another made some years ago, on the strength of a suggestion by Dr. Cobbold, that sewage-grown grass was calculated to introduce parasites into the system of the cow, and to prove injurious to it and to the consumers of its milk and flesh.

In order to test this assumption a special and crucial experiment was made; a cow was reared and fattened exclusively on the agricultural products of sewage irrigation at Breton's farm, under the superintendence of Mr. W. Hope, V.C. On being killed and thoroughly examined by Dr. Corfield it was found "that the animal in question was entirely free from parasites of any kind."

The practical verdict of the retail vendors of milk in Birmingham confirms the analytical results, for that produced on our sewage-farm always commands a higher price by a half-penny per gallon than milk produced by private farmers and cow-keepers.

TABLE A.
Mils from the Sewage Farm at Saltley (Birmingham).

No. of Sample.	Date. 1882.	Sp. Gr.	Percentage Volumes of Cream.	T. S. M.	S. N. F.	Fat.	Ash.
1	Jan. 23rd	1033·5	15·0	13·84	9·86	3·96	·84
2	"	1030·5	16·0	14·55	9·53	5·07	·77
3	"	1032·0	7·0	12·25	9·21	3·00	·75
4	"	1027·5	7·5	15·45	8·40	7·02	·71
5	"	1033·0	11·0	11·87	9·58	2·37	·78
6	"	1029·0	16·0	17·01	9·42	7·59	·78
7	"	1031·5	13·0	13·66	9·54	4·11	·82
8	"	1034·0	13·0	13·50	10·01	3·57	·77
9	Jan. 25th.	1032·0	14·0	13·58	9·68	3·98	·82
10	"	1030·0	12·5	11·58	8·63	2·98	·80
11	"	1031·0	13·0	12·93	9·03	3·97	·70
12	"	1033·5	11·0	13·45	9·93	3·57	·80
13	"	1034·5	10·5	13·39	10·11	3·28	·81
14	"	1033·0	12·0	13·50	9·59	3·94	·76
15	"	1032·5	7·5	13·19	9·34	3·89	·76
16	"	1032·0	9·0	13·38	9·37	3·94	·74
17	Jan. 30th	1028·0	15·5	12·72	8·96	3·83	·71
18	"	1032·0	14·5	13·35	9·65	3·71	·73
19	"	1033·0	16·0	13·82	9·71	4·15	·77
20	"	1031·0	14·0	13·09	9·16	3·89	·78
21	"	1033·0	18·0	13·38	9·50	3·89	·76
22	"	1032·0	12·0	13·22	9·50	3·80	·81
23	"	1032·5	6·0	12·34	9·52	2·88	·74
24	"	1030·0	11·5	12·78	9·06	3·74	·77
25	Feb. 1st	1030·0	15·0	11·87	8·87	3·07	·70
26	"	1031·0	11·0	11·52	8·76	2·83	·72
27	"	1032·0	14·0	12·65	9·42	3·32	·72
28	"	1036·0	12·5	12·80	10·24	2·53	·78
29	"	1034·0	13·0	11·97	9·82	2·10	·76
30	"	1033·0	9·0	12·16	9·87	2·37	·84
31	"	1031·0	13·0	13·15	9·14	4·06	·75
32	"	1034·0	8·5	12·13	9·94	2·17	·80
33	Feb. 6th	1030·5	9·5	11·93	8·53	3·42	·81
34	"	1032·0	15·0	12·21	9·17	3·12	·81
35	"	1031·5	20·5	13·71	9·17	4·53	·81
36	"	1031·5	5·0	13·46	9·32	4·13	·75
37	"	1030·5	15·5	12·61	9·34	3·33	·76
38	"	1031·0	8·0	11·38	9·00	2·44	·73
39	"	1030·5	10·5	14·17	9·73	4·49	·79
40	"	1033·5	9·0	14·52	10·64	3·92	·81
41	Feb. 8th	1029·0	12·0	11·76	8·49	3·36	·72
42	"	1032·5	10·0	13·18	9·71	3·44	·80
43	"	1031·0	12·5	12·58	9·27	3·30	·76
44	"	1032·0	16·5	13·36	9·60	3·82	·80
45	"	1031·5	15·0	13·38	9·34	4·12	·77
46	"	1033·5	8·5	12·46	10·17	2·30	·82
47	"	1034·0	10·5	14·74	10·04	4·78	·83
48	"	1033·0	13·5	13·70	9·56	4·19	·80
Average - -		1031·9	12·1	13·11	9·45	3·69	·77

TABLE B.
Milks from the Sewage Farm at Saltley (Birmingham).

No. of Sample.	Date. 1885.	Sp. Gr.	Percentage Volumes of Cream.	T. S. M.	S. N. F.	Fat.	Ash.
49	May 27th	1031·0	12·0	12·57	9·51	3·11	·78
50	"	1030·5	7·0	13·38	9·34	4·07	·79
51	"	1032·0	17·0	12·59	9·51	3·11	·79
52	"	1030·0	12·0	12·87	9·26	3·65	·78
53	"	1031·5	8·0	12·28	9·43	2·92	·76
54	"	1032·0	9·0	13·68	9·55	4·19	·81
55	"	1031·5	11·0	12·14	9·11	3·07	·75
56	"	1032·0	11·0	13·32	9·70	3·65	·79
57	May 29th	1029·0	36·0	13·57	8·90	4·73	·78
58	"	1031·5	11·0	13·36	9·39	4·02	·79
59	"	1032·0	11·0	12·02	9·30	2·79	·81
60	"	1033·0	8·0	11·38	9·70	1·74	·75
61	"	1030·5	10·0	12·24	9·02	3·28	·77
62	"	1032·0	11·0	12·75	9·95	2·86	·80
63	"	1031·5	14·0	13·63	9·99	3·67	·79
64	"	1029·5	13·0	12·64	8·88	3·79	·75
65	May 30th	1029·5	13·0	12·63	8·96	3·62	·78
66	"	1031·5	12·0	12·34	9·28	3·01	·77
67	"	1031·0	9·0	12·50	9·38	3·07	·77
68	"	1031·5	10·0	12·80	9·50	3·21	·79
69	"	1031·0	12·0	11·91	9·01	2·98	·74
70	"	1031·5	14·0	13·29	9·46	2·80	·81
71	"	1030·5	16·0	12·78	9·01	3·71	·80
72	"	1031·0	12·0	12·81	9·28	3·48	·79
73	June 3rd	1029·5	13·0	12·84	9·10	3·80	·74
74	"	1031·5	12·0	13·81	9·70	4·01	·80
75	"	1031·0	9·0	14·06	9·65	4·36	·81
76	"	1031·5	10·0	14·66	9·68	4·90	·79
77	"	1031·0	12·0	13·12	9·30	3·80	·77
78	"	1031·5	14·0	13·48	9·45	3·98	·77
79	"	1030·5	16·0	12·96	9·28	3·59	·78
80	"	1031·0	12·0	13·32	9·51	3·74	·79
81	June 4th	1030·5	10·0	13·58	9·37	4·15	·79
82	"	1025·0	15·0	14·94	8·10	6·76	·77
83	"	1024·0	18·0	16·28	8·16	8·10	·77
84	"	1029·0	10·0	12·54	8·95	3·54	·79
85	"	1028·0	9·0	12·53	8·67	3·80	·75
86	"	1025·5	12·0	14·15	8·29	5·88	·76
87	"	1025·0	15·0	13·61	8·18	5·38	·79
88	"	1027·5	16·0	14·79	8·71	6·00	·79
89	June 5th	Curdled	Curdled	12·49	9·01	3·42	·75
90	"	"	"	14·91	8·97	6·01	·73
91	"	"	"	13·75	9·11	4·56	·75
92	"	1027·0	11·0	11·55	8·11	3·40	·72
93	"	Curdled	Curdled	11·52	8·29	3·20	·71
94	"	1031·0	24·0	12·95	8·91	3·99	·78
95	"	1030·0	12·0	12·88	9·00	3·81	·76
96	"	Curdled	Curdled	12·78	8·91	3·83	·76
Average - -		1030·2	12·8	13·10	9·14	3·95	·77