viously noticed. Further experiments with other ruthenium compounds are being carried on.

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ON THE DETERMINATION OF UNDIGESTED FAT AND CASEIN IN INFANT FECES.[1]

BY HERMAN POOLE.

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LAST summer I had the honor of presenting to the Society a paper on "Methods of Determining Fat and Casein in Feces."[2] In that paper I mentioned the method I had adopted in the investigation I was then engaged in, and stated why the methods previously used did not give me satisfactory results. This paper may be considered as a sequel to that one, or perhaps more correctly, a résumé of the work I have done on the subject to this time. The methods given in the paper cited were used substantially as there given throughout all the cases, no better one having been suggested; in fact, my requests for other methods met with no response at all, showing that but little work had been done directly on this line.

The methods of analysis used may be briefly stated as follows: The feces were carefully removed from the containers as well as possible and thoroughly mixed, if practicable. A portion of this was then weighed out and dried in an air-bath at 90° C. for one hour, and afterwards at 105° to 110° C. for two or three hours or until of constant weight. A portion of this dried residue was then treated with ether in a Soxhlet extraction apparatus to extract the fat and other substances soluble in ether. The extract so obtained was evaporated at 100° till dry and usually weighed. This weighing was not done in every case as it had no important bearing on the aim of the investigation, which concerned the undigested fat and casein only. After drying, the extract was saponified with alcoholic potash, a small portion generally remaining undissolved. Water was then added and the whole boiled till the alcohol had been expelled. Practically this was carried on until the mass was nearly dry, water having

[1] Read at the Boston Meeting of the American Chemical Society, August, 1898.

[2] This Journal, 19, 877.

been added during the boiling. The solution was then diluted with water and filtered.

The cholesterol being soluble in ether was then taken up by agitation in a separatory globe with that solvent. On allowing the mixture to rest the two liquids separated readily, especially after a reagitation. The treatment with ether was generally repeated once, occasionally twice. The second repetition was hardly necessary, as only traces were taken up.

The solution thus freed from cholesterol was evaporated nearly dry, dissolved with water, and the fat acid determined as usual by precipitation with mineral acid, collecting, and weighing. The solution was usually clear enough without filtration.

In many cases the cholesterol solution in ether was evaporated and that body determined. As this was only of minor interest and not germane to the investigation, it was done only when it did not interfere with other work. No regular ratio of the fat and cholesterol could be established.

The solid residue from the ether extraction was treated successively with water and alcohol and then dried at 100° C. This dried residue was afterwards digested in a mixture of equal parts of water and hydrochloric acid for some ten or twelve hours at a temperature of about 60° C. This dissolved the casein and at the same time decomposed the earthy fat acid compounds, and, on cooling, a collection of fat acid was always found. No attention was paid to this fat acid as, being in combination with bases, it was considered to have been digested or changed in the system, and only undigested fat was sought. This fat acid was quite hard and usually, though not always, nearly white in color.

After cooling the solution of casein and filtering, it was evaporated to dryness and the nitrogen determined by the Kjeldahl method. The casein was estimated as being $\frac{100}{15}$ of the nitrogen so determined.

The results obtained are shown in the accompanying table, which contains the results from most of the cases examined :

CASE I.

	Reaction.	Quantity. Grams.	Water. Per cent.	Fat.[1] Per cent.	Cholesterol.[1] Per cent.	Casein.[1] Per cent.
1	Acid.....	28.0	67.7	17.52	11.25	3.28
2	Acid.....	23.0	75.0	18.88	8.40	4.24
3	Acid.....	26.0	73.3	14.23	5.11	4.35
4	Acid.....	30.0	76.1	9.86	6.50	5.02
5	Faint acid	29.0	68.8	7.11	3.68	3.67
6	Nearly neutral..	10.8	69.9	12.65	5.92	3.52
7	Neutral	35.7	65.0	9.26	6.24	...
8	Neutral	38.6	65.0	8.54	7.61	3.11
9	Faint acid.....	62.5	55.0	5.53	5.01	2.87
10	Faint acid.....	42.6	71.5	8.63	5.17	...
11	Faint acid.....	15.8	63.2	8.55	4.99	3.81
12	Very faint acid .	51.8	51.2	...	2.57	3.16
13	Neutral	33.0	61.2	6.44	3.21	4.77
14	Acid.....	21.0	75.0	11.68	7.50	6.00
15	Neutral	18.4	70.6	13.57	4.43	6.00
16	Very faint acid .	29.0	69.3	11.06	5.81	7.97
17	Very faint acid .	23.4	63.0	9.86	8.91	5.19
	Average	27.96	67.2	10.90	6.39	5.03

CASE II.

1	Acid.....	9.8	77.95	24.14	22.76	8.24
2	Faint acid.....	5.2	60.00	12.98	7.69	7.65
3	Faint acid.....	7.7	72.83	14.76	15.31	7.54
4	Faint acid.....	33.44	65.14	8.84	8.11	5.81
5	Faint acid.....	19.36	70.20	10.57	6.63	3.68
6	Neutral	6.6	65.66	8.74	10.11	4.48
7	Acid.....	12.6	69.18	10.67	9.14	6.04
8	Faint acid.....	8.76	74.86	11.27	20.11	4.97
9	Acid.....	10.56	75.18	13.09	20.85	7.21
10	Faint acid.....	9.32	76.14	14.44	....	8.95
11	Faint acid.....	3.12	79.69	22.11	....	...
12	Faint acid.....	17.13	71.84	12.18	15.10	8.59
	Average	11.92	71.57	14.47	13.58	6.65

VARIOUS SAMPLES.

1	Faint acid.....	about five grams	78.40	9.17	12.80	16.39
2	Faint acid.....		75.45	19.81	10.91	12.22
3	Acid.....		53.25	8.98	16.15	5.68
4	Faint acid.....		46.55	9.57	4.85	6.31
5	Faint acid.....	20.0	73.00	22.60	8.25	13.15

[1] These are calculated on the dry material.

The reaction with litmus was almost uniformly acid, although seldom strong enough to admit of determination. In a few cases no action was noticed and in a very few a slightly alkaline reaction was observed. It is possible that these alkaline cases may have been due to decomposed urine, all the samples being old (*i. e.*, more than one day).

The quantity excreted varied considerably, but the quantity as given in the table does not show the actual quantity voided. It simply shows the amount available for analysis, and in many instances this was only a small percentage of the entire amount, but from physical reasons it was impossible to obtain any more in a clean condition, free from extraneous substances. The quantity column of Case I fairly represents the actual amounts per day.

The amount of moisture varied considerably and its determination was generally of no use except as a means of reducing the subsequent results to a dry basis. Many of the samples were fairly fresh and in such cases a percentage of about seventy was attained. Departures far from this amount occurred only in old and partially dried samples.

The quantity of fat, casein, and cholesterol varied considerably. Not only is a large variation noticeable between the different individuals but also in the same case from day to day. There seems to be no relation existing between the proportions of these three, except that generally a large amount of fat is accompanied by a correspondingly large amount of casein. This could be expected, as the presence of an increase in one would be caused by a derangement of the intestinal canal and should have an effect on the other also. This is quite evident in the latter part of the data from Case I. In this instance the removal of the child to the country had a marked and unmistakable effect on the feces; still, the child was reported in good health.

Incidentally, it may be mentioned that the characteristic odor of adult feces was entirely wanting. It showed itself in one instance only, and this case was dismissed for that reason. Subsequent investigation showed that the child had been fed on a mixed diet. Indol and skatol were looked for but not formed except in the case just mentioned.

All the children were fed on the same kind of milk, and given approximately the same quantities per day. This milk was not a single cow's milk but a milk prepared by the "Gaertner Mother Milk" method from the average milk of a large number of cows, and care was taken to have the milk as near as possible of the same composition. The analysis of the milk was approximately

	Per cent.
Fat	3.05
Casein	2.09
Lactose	6.00

Specific gravity, 1.0275.
Reaction, faintly alkaline.

The milk was sterilized perfectly and did not become sour after standing exposed for three days.

Each child consumed from one to one and one-third liters daily and hence ingested

	Grams.
Fat	30.5 to 40.67
Casein	20.9 to 27.87
Lactose	60.0 to 80.0

Cases I and II were well cared for throughout the investigation and the results obtained may be considered as reliable as possible from such cases. The others are given to show the range of results obtained, but from reasons beyond the control of the investigation, modifying influences were present; and, while the analytical results are individually correct, the connection between the food ingested and the excreta cannot be traced.

ELECTRIC FURNACES FOR THE 110-VOLT CIRCUIT.[1]

By Nevil Monroe Hopkins.

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IT occurred to the writer in wiring a couple of experimental arc lamps across the feeders of an incandescent lighting system, that a laboratory electric furnace could be operated on a series carbon plan, without disturbing the protecting fuses of the circuit. The idea of focusing a pair of arcs within a small crucible, or furnace, using only the amount of resistance located in the tops of typical series lamps, proved, however, to be unsatis-

[1] Read at the Boston meeting of the American Chemical Society, August, 1898.