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Contributors

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183 Euston Road
London NW1 2BE UK
T +44 (0)20 7611 8722
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INGESTION AND EXCRETION OF IRON IN HEALTH¹.

BY RALPH STOCKMAN, M.D., F.R.C.P.E., AND E. D. W. GREIG, M.B. (*Edin.*).

(*From the Laboratory of the Royal College of Physicians of Edinburgh.*)

IN a previous paper² one of us showed that the quantity of metallic iron in ordinary dietaries seldom exceeded 10 milligrams per day, and might be as low as 6 milligrams in people of ordinary appetite and digestion. It was inferred from these results that the iron-metabolism of the body must be very small, and that while the pigment of disintegrated red blood corpuscles is excreted, in part at least, as the colouring matter of bile and urine, their iron is carefully retained in the body for future use. A more systematic series of observations has now enabled us to confirm these opinions and to obtain an accurate record of the amounts of iron taken in the food and excreted in the urine and fæces from day to day.

Four series of observations have been made on three persons with healthy digestions and enjoying fair average health. In order to have the intake of iron as unvarying as possible, they were put on a fixed diet for eight or ten days, and on the last three days the total urine and fæces were kept, and the amount of iron present in them determined. The diets and excreta were first thoroughly dried, and then carefully ashed, the iron of the ash being extracted and estimated as in the previous research already referred to. The food used in each observation was all bought at one time and the perishable articles kept in a refrigerator, so that each day's diet might be as uniform as possible. The articles composing the diet were selected largely on account of their comparatively unvarying composition, but these diets were found to contain less iron than an ordinary full mixed dietary does.

¹ Towards the expenses of this research a grant was made by the British Medical Association on the recommendation of the Scientific Grants Committee of the Association.

² This *Journal*, xviii. 484. 1895.

OBSERVATION I. Man, 20 years old.

Dietary.

Minced collops	240 g.	Sugar	40 g.
Biscuits (sweet & plain)	200 „	Sat. Salt solution	20 c.c.
Oatmeal	80 „	Milk	1000 „
Rice	30 „	Water	1500 „
Butter	30 „	Tea tabloids	6
The mince contained	3.4 milligms. Fe.		
Rest of diet „	2.8 „		
Total Fe in diet	6.2 „		

Day of Diet	Mgms. Fe in Fæces	Mgms. Fe in Urine
6	3.5	1.0
7	6.6	1.2
8	5.1	1.6
Average per day	5.06	1.26

OBSERVATION II. Man, 35. On same diet.

Day of Diet	Mgms. Fe in Fæces	Mgms. Fe in Urine
6	8.8	1.1
7	10.0	1.4
8	5.5	1.2
Average per day	7.7	1.23

OBSERVATION III. This was made on same man as Obs. I. The diet was the same, but consisted of different samples.

The mince contained	3.8 milligms. Fe.		
Rest of diet „	1.8 „		
Total Fe in diet	5.6 „		

Although he was on the same diet as before, the bulk of the fæces was about double what it had been on the three corresponding days of the preceding experiment. The iron excreted by the bowel was also very much greater, that of the urine was less.

Day of Diet	Mgms. Fe in Fæces	Mgms. Fe in Urine
6	13.7	0.7
7	9.1	0.7
8	9.8	0.6
Average per day	10.8	0.66

OBSERVATION IV. Woman, 23 years old. She ate very much less than the men, and her bowels moved only every second day.

The dietary consisted of

Minced collops	90 g.	Sugar	30 g.
Biscuits	130 "	Milk	850 c.c.
Oatmeal	40 "	Water	1200 "
Butter	40 "	Salt solution	10 "
Rice	23 "	Tea tabloids	6 "

Total Fe in this diet = 3.5 milligrams.

Day of Diet	Mgms. Fe in Fæces	Mgms. Fe in Urine
6	6.1	0.7
8	7.5	0.7
10	4.7	0.8
Average per day	3.0	0.73

In Obs. I. the intake and output of iron almost exactly coincide, the former being 6.2 milligrams and the latter averaging 6.3 milligrams per day, while in Obs. IV. they are 3.5 and 3.7 milligrams respectively. In the others the amount of iron excreted on the three days of the analysis was considerably greater than the amount ingested, but at other times the balance must be reversed, or the equilibrium of health would not be maintained.

It is now known definitely that iron is excreted from the blood chiefly by the intestinal mucous membrane, only minimal amounts being present in the bile and urine, but our present methods of investigation do not permit us to say how much of the iron of the fæces has been excreted in this way, and how much of it, after having been taken in our food, has never left the alimentary canal. That the absorption and excretion must undergo considerable variations is shown by comparing the results of Obs. I. and III., which were made on the same man on practically the same diet, but we are quite unable to determine how much of the excreted iron had been actually in combination with the body tissues. We may claim, however, to have demonstrated that the iron-metabolism of the human body is extremely small, so far as concerns the intake and output. Of what may be called the internal iron-metabolism, namely, the interchange between the blood corpuscles, bone-marrow, liver, spleen and other iron-containing tissues, we know almost nothing. If the red corpuscles are broken down in such large numbers as is commonly supposed, the interchange of iron between them and the hæmatopoietic organs must be considerable, but we have no exact data to guide us in forming an estimate of this. Very little of this iron, however, seems to be excreted, the greater part being retained in the liver, where it is stored and may thus be used over again as occasion requires.





