LXXVI. THE INFLUENCE OF THE ANTENATAL FEEDING OF PARENT RATS UPON THE NUMBER, WEIGHT AND COMPOSITION OF THE YOUNG AT BIRTH.

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IN our previous experiments [1923, 2], as well as in the experiments of Korenchevsky [1921, 1922], we came to the conclusion that, as the result of a properly constituted diet taken by the mother during pregnancy or lactation, rickets and general disorders of nutrition in the offspring can be mitigated or even prevented for a considerable time; or *vice versa*, a diet, improperly constituted, may cause or aggravate serious nutritional diseases in her young. These facts were proved by experiments on young rats immediately after weaning and also when about 2-3 months old.

In the present investigation we studied the following questions:

1. Has the mother's diet before and during pregnancy any influence on the weight and number of the young, as well as on their chemical composition, at the time of birth?

2. Has the father's diet before conception any influence upon the same factors?

3. To what cause were due the striking differences found after weaning [Korenchevsky, 1921, 1922; Korenchevsky and Carr, 1923, 2] in the composition of the skeleton of the young born of mothers on normal diets. For instance, is the storage of calcium and phosphorus in the foetuses increased when the mother is on a diet rich in these elements and in cod-liver oil?

The experiments were conducted on 30 litters of rats. The technique of the experiments and the diets used were described in Korenchevsky's previous papers [1921, 1923]. The mother rats were fed on the following basal diets [for details see Korenchevsky, 1922, 3, p. 7]:

D 1 consisting of milk, cabbage, oats, bran and white bread.

N 2, containing a liberal amount of fat-soluble factor in the form of butter and cod-liver oil, 0.52 % Ca and 0.5 % P (in fresh diet).

— *A*, a diet similar to *N* 2, but deficient in fat-soluble factor, the only source of fat being cotton seed oil, and containing only 0.25 % Ca in the fresh diet.

In each series of experiments the mother rats were taken from the same litter and the father rats from another litter. After weaning, the young rats were put on special diets: some were put on *N* 2 diet and were kept on this the whole time. Rats are usually sterile on *-A* diet, therefore, before conception the mother rats in this group received *D* 1 diet and only from the day of conception or about one week before this, were put on *-A* diet on which they were kept during the whole pregnancy. The father rats in this group were also kept on *D* 1 diet and about a fortnight before conception were put on *-A* diet.

The experiments were so arranged that the mothers and fathers in each series were approximately of the same age at the day of conception. The pregnant rats were carefully watched during the last period of pregnancy and immediately after birth, or in some cases 1-2 hours later, the young were killed by breaking their necks. After the stomachs and intestines had been removed the young were weighed and used for estimation of water, calcium (McCrudden's method), phosphorus (Neumann's method) and nitrogen (Kjeldahl's method).

The results of our experiments are seen from Tables I and II. The different diets of father and mother rats are clear from Table II. The number, weight and water content of the young were estimated in all 30 litters, but only in 13 of these were the total calcium, phosphorus and nitrogen determined.

Table I. *Average Weights of Mothers.*

Diets of mothers		Weight of mothers	
Before conception	During pregnancy	Four weeks before birth	After birth
<i>N</i> 2	<i>N</i> 2	179	212
<i>D</i> 1	<i>-A</i> or <i>D</i> 1	149	171

Table II. *Average Number, Weight and Composition of the Young at Birth.*

No. of group	Diets				Average number of young in each litter†	Average weight*			In young							
	Of father	Of mother		Number of litters		Of the whole litter	Of one fresh young	Of one dry young	Ca %		P %		N %			
		Before conception	During pregnancy						H ₂ O %	Fresh	Dry	Fresh	Dry	Fresh	Dry	
I	N 2	N 2	N 2	10	10	47.00	4.71	0.64	86.31	0.31	2.26	0.30	2.12	1.60	11.70	
II	D 1 or -A	N 2	N 2	4	11	47.92	4.90	0.68	86.32	0.30	2.19	0.32	2.34	1.65	12.06	
III	D 1 or -A	D 1	-A	12	8	35.06	4.64	0.66	85.97	0.35	2.49	0.35	2.49	1.73	12.33	
IV	N 2	D 1	D 1 or -A	4	8	37.82	4.70	0.66	86.24	0.31	2.25	0.30	2.18	1.65	11.99	

* The figures in these three columns represent the weights of the young after removal of stomach and intestines.

† The figures in this column are given to the nearest whole number.

The results of our experiments can be summarised as follows (see also Tables I and II):

1. The diet of the father before conception had no influence whatever over the young, either on their number, weight or composition, at birth.

2. The diet of the mother before conception and during pregnancy has influenced the litter in some respects: the mothers kept on normal diet containing an excess of fat-soluble factor and calcium bore litters larger in number

and total weight than those born of mothers fed on usual or fat-soluble-deficient diets.

3. The larger total weight of the litters was due to the greater number of the offspring in each litter and not to the increased weight of each individual.

4. A large number of young were born dead in those litters, whose mothers were fed on deficient diets: in 4 litters from well-fed mothers only in one litter was one young rat found dead; in 16 litters from the mothers kept on a deficient diet, 1, 3, 5 and 7 dead young respectively were found in 4 litters.

5. At the day of birth the H_2O , Ca, P and N content in the young was nearly the same irrespective of the mothers' previous diet. A slightly better composition of young was found in some of those (see Group III in Table II) from parents on the deficient diets.

6. The striking influence previously shown by Korenchevsky [1921, 1922], Korenchevsky and Carr [1923] of different diets of mother rats shown in the skeleton of their young 24–85 days after birth cannot therefore be due to a variation in the reserve of P and Ca in the foetuses and is probably due to the different degree of storage of fat-soluble factor in the foetuses.

7. The normal chemical composition shown to exist in foetuses born of mothers kept on a diet deficient in fat-soluble factor is in accord with the accepted belief that the maternal organism will as far as possible yield all the necessary substances to her offspring even by the sacrifice of her own tissues. However, in our experiments, the storage of these substances, though being sufficient at birth, did not suffice in the post-natal life of the offspring.

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