XXXVIII. THE EFFECTS OF AN UNBALANCED DIET IN THE PRODUCTION OF GUINEA-PIG SCURVY.

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It has long been recognised that when pigeons are fed on polished rice the addition of an excess of carbohydrates to the diet leads to a more rapid onset of the symptoms of beriberi. According to Funk [1914] the addition of an excess of any of the basal foodstuffs has some effect in hastening the appearance of beriberi, the effect being most marked with polysaccharides and disaccharides, least marked with fats, while proteins occupy an intermediate position. In the following experiments an attempt has been made to ascertain whether the same conditions hold good when guinea-pigs are deprived of vitamin C.

Twenty-four guinea-pigs were divided into four equal groups, each group consisting of three males and three females. Group A received a basal diet of oats and bran *ad libitum* with the addition of 60 cc. of autoclaved milk per diem—Table I. Group B received the same diet with the addition of 10 grams of caseinogen, the caseinogen before administration being autoclaved at 120° for two hours to destroy any trace of the anti-scorbutic factor—Table II. Group C received the same basal diet as group A with the addition of 10 grams of cane sugar a day—Table III—while in group D the cane sugar was replaced by a daily ration of 10 cc. of cod-liver oil—Table IV.

In avian beriberi the onset of symptoms is, as a rule, well marked, but in guinea-pig scurvy it is much more gradual. By feeding the animals oneself and by carefully handling them, it is however quite possible to ascertain with considerable accuracy the date at which haemorrhages first occur in the region of the joints. The date at which the first symptoms appear is not materially affected by an excess of protein, carbohydrate or fat in the diet. The date of death is, however, slightly accelerated by an excess of protein and carbohydrate in the diet, the acceleration being less marked when fats are in excess. The most striking feature revealed was the considerable loss of body weight in the guinea-pigs fed with excess of carbohydrate, this loss being equivalent to a loss of 7.26 grams per day per guinea-pig, whereas animals fed on the oats, bran, milk diet only lost 2.64 grams per day.

TABLE OF RESULTS.

I.

Number	Weight at beginning of experiment g.	Weight at end of experiment g.	Percentage loss in weight	Day of first symptoms	Day of death
Guinea-pigs on a basal diet of oats and bran <i>ad libitum</i> and 60 cc. of autoclaved milk per diem.					
1	252	218	13.5	16	27
2	374	268	28.3	13	33
3	468	401	14.3	15	41
4	250	210	16.0	14	25
5	440	257	41.5	13	27
6	282	239	15.2	15	26
Average	344.3	265.5	21.5	14.3	29.8

II.

Guinea-pigs on a basal diet of oats and bran *ad libitum* and 60 cc. of autoclaved milk per diem plus 10 g. of caseinogen.

7	302	255	15.5	13	27
8	310	262	15.5	12	14
9	248	205	17.3	15	21
10	340	275	19.1	15	25
11	262	196	29.0	14	26
12	273	224	17.9	13	27
Average	289.2	236.2	19.5	13.6	23.3

III.

Guinea-pigs on a basal diet of oats and bran *ad libitum* and 60 cc. of autoclaved milk per diem plus 10 g. of cane sugar.

13	465	298	35.9	16	29
14	466	304	34.8	13	24
15	498	320	35.7	12	22
16	428	318	25.7	15	23
17	470	295	37.3	14	20
18	520	284	45.3	13	23
Average	474.5	303.2	35.8	13.8	23.5

IV.

Guinea-pigs on a basal diet of oats and bran *ad libitum* and 60 cc. of autoclaved milk per diem plus 10 cc. of cod-liver oil.

19	298	250	16.2	14	21
20	230	191	17.1	13	19
21	263	224	15.0	13	22
22	228	178	22.1	15	32
23	319	253	20.8	14	31
24	350	281	19.6	16	27
Average	281.3	229.5	18.5	14.2	25.3

It is of some interest to note that the histological appearances found in the bones and joints of the animals which were given cod-liver oil were identical with those met with in other cases of acute guinea-pig scurvy, thus showing once again that the lack of vitamin A is in no way responsible for the lesions that occur in experimental scurvy.

CONCLUSIONS.

1. Guinea-pigs fed on a diet lacking in vitamin C do not develop scurvy more rapidly when the diet contains an excess of either protein, fat or carbohydrate.
2. Death is slightly accelerated in guinea-pigs suffering from scurvy when the diet contains an excess of either protein or carbohydrate.
3. The loss of weight is greatly increased in guinea-pigs suffering from scurvy when the diet contains an excess of carbohydrate.

REFERENCE.

Funk (1914) *Zeitsch. physiol. Chem.* **89**, 378.