

7659 P

Effect of Calcium and Phosphorus in Diet of Mothers upon Weight of Young.

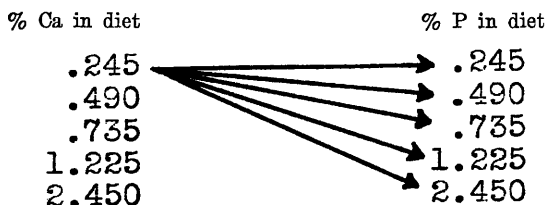
WARREN M. COX, JR., AND MIRIAM IMBODEN. (Introduced by C. E. Bills.)

From the Research Laboratory, Mead Johnson and Company, Evansville, Indiana.

In spite of an immense amount of work on the *retention* of calcium and phosphorus under various conditions the amount or ratio of these elements recommended for pregnant or lactating animals is still almost empirical. Before dependable knowledge of the optimal ratio and amounts of these elements during such periods can be obtained numerous animals should be studied through their whole reproductive life. In order to test thoroughly any one calcium and phosphorus mixture it would be desirable (1) to secure as *rapid reproduction* as possible, and (2) to provide constant quantities of these elements during the animal's entire reproductive history. We have made such a study during the past 2 years, using female rats, and report in this preliminary communication one of our more important findings.

Method. Virgin female rats weighing approximately 200 gm. at 100 days of age, were allowed to raise their first, "qualifying" litter on stock food. The females were remated at the end of 21 days' lactation and placed on the experimental diet.* All litters were reduced to 6 pups. When the young were 21 days old they were killed, and the mother immediately remated—thus allowing no rest period between cycles. In this way 10 successive gestations and lactations were studied. Five females were placed on each mineral combination, and the average "success" of the 5 mothers was used as a criterion of the adequacy of the calcium and phosphorus mixture. The "success" of the rats was gauged by averaging, over 10 reproductive cycles, the weight of the young at 21 days of age.

Salt Mixtures. Each of 5 levels of calcium was combined with 5 levels of phosphorus to give 25 experimental diets, with Ca/P ratios from 0.1 to 10.0. This is best presented graphically,



* Acid-washed casein 20%; dextrin 50.1-55.1%; lard 9%; yeast concentrate 4%; wheat germ oil 1.6%; carotene 3:1000, 0.3%; salts (Ca and P free) 3.1%; rice cellulose 1.2-5.9%; Ca and P salt mixture 1.0-10.7%. No vitamin D.

These percentages were obtained by mixing suitable quantities of CaHPO_4 , $\text{Ca}(\text{CH}_3\text{COO})_2$, and $(\text{NH}_4)_2\text{H}_2\text{PO}_4$, and incorporating in the standard diet.

Results. In the course of this experiment 3,431 rats have been raised to 21 days of age. The average weight of the rats *actually raised* on each diet is charted in Fig. 1 against the Ca/P ratio of

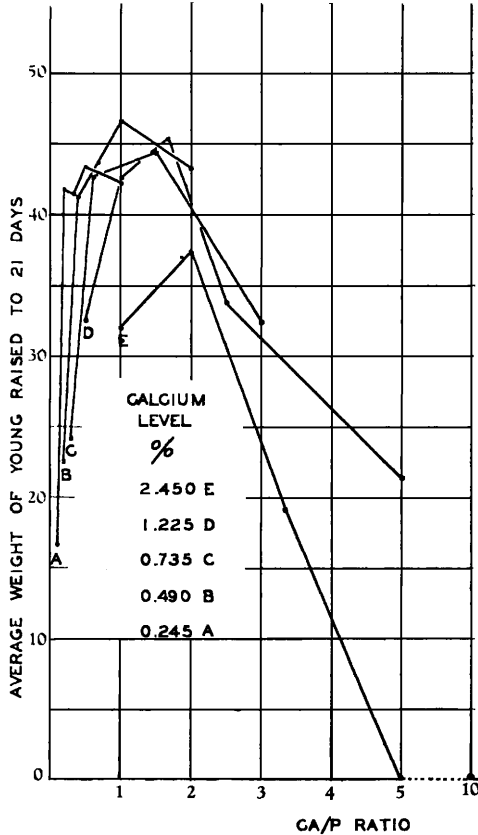


FIG. 1.

Average weight of total number of young raised by mothers on each experimental diet plotted against the Ca/P ratio of the diet. A, B, etc., refer to the percentage calcium in the diet.

the diet. There are 5 curves, each corresponding to a given level of calcium, and (from right to left along the curve) increasing levels of phosphorus. Viewed as a whole, 4 of the 5 curves presented in Fig. 1 permit the construction of an average curve that would indicate maximum performance at, or very near to, a Ca/P ratio of 1.0.

However, when the individual curves are examined it is seen that at the 0.245% calcium level the largest rats were raised at a Ca/P ratio of 0.5. When the calcium level was 0.490%, the Ca/P ratio at which the largest rats were raised, was 1.0. The results of such examination can be tabulated as follows:

% Ca in diet	Largest Young Raised at Ca/P ratio of	Average wt. at 21 days
0.245	0.50	43.3
0.490	1.00	46.7
0.735	1.50	44.4
1.225	1.66	45.4
2.450	2.00	37.3

It is, we believe, fair to consider the average weight of the young raised during 10 reproductive cycles as a criterion for the suitability of the Ca/P ratio of the diet. As stated previously, if an *average* curve for the 4 lowest levels of calcium were constructed, the optimum ratio would be at, or very near to, 1.0, but inasmuch as *each* level of calcium used showed a maximum weight of young at a different Ca/P ratio we must conclude that no one optimum ratio can be stated unless at the same time the amount of calcium is known. The level of calcium in a diet, therefore, determines what level of phosphorus, *i. e.*, what Ca/P ratio, is optimal.

7660 C

Nature of the Blood-Cerebrospinal Fluid Barrier Permeability Revealed by Isohemagglutinin Tests.

LELAND W. PARR AND RAYMOND H. GOODALE.

From the Department of Bacteriology, Hygiene and Preventive Medicine, School of Medicine, The George Washington University, Washington, D. C., and the Laboratory Department, City Hospital, Worcester, Mass.

It has been stated that blood-cerebrospinal fluid barrier permeability is capricious. This is possibly a confession that the meaning and mechanism of permeability are yet incompletely understood. It is not surprising that this is so for careful study of standard texts and original papers since 1910 leads one to conclude the theories of origin, function and fate of cerebrospinal fluid are far from agreed upon.