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Relative Value of Various Forms of Vitamin D Milk in Prevention of Infantile Rickets.

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Antirachitic agents obtained from different sources but containing identical numbers of rat units appear to have different values for various species when used in the prevention or treatment of rickets. Steenbock *et al.*[1] have shown the difference that exists in the reaction of chickens to irradiated ergosterol, irradiated yeast and natural fish liver oils. Our own experience[2] with infants, which has since been amply confirmed, sufficiently demonstrated this difference when the same daily rat unit dose of specially assayed cod liver oil and irradiated ergosterol were used. Hess[3] has shown satisfactory results with small prophylactic doses, *i. e.*, 40 to 50 rat units per day, when taken as irradiated milk.

Accepted standards for the proper dosage of cod liver oil, irradiated ergosterol and irradiated milk are still based largely upon clinical opinion rather than controlled observational material. The statement of Hess[4] is that the relative equivalent rat unit dosage is: of cod liver oil, 240 rat units; viosterol, 600 rat units; irradiated milk, 40 rat units. His conclusions seem to have been arrived at without careful comparative studies having been made. It was with the idea of approaching the minimal prophylactic dosage of cod liver oil vitamin D that this study, giving each infant daily 50 Steenbock units of vitamin D as the Zucker[5] cod liver oil concentrate (emulsified in milk), was made. It also affords an opportunity to compare a carefully measured intake of cod liver oil vitamin D with vitamin D from other sources. This makes no provision obviously for the occasional refractory case that is best safeguarded by a more liberal intake of vitamin D.

The study conducted during the winter of 1932-33 shows the following:

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1 Steenbock, H., Kletzien, S. W. F., and Halpin, J. G., *J. Biol. Chem.*, 1932, **97**, 249.

2 Barnes, D. J., Brady, M. D., and James, E. M., *Am. J. Dis. Child.*, 1930, **39**, 45.

3 Hess, A. F., and Lewis, J. M., *J. Am. Med. Assn.*, 1932, **99**, 647.

4 Hess, A. F., and Lewis, J. M., *J. Am. Med. Assn.*, 1933, **101**, 181.

5 Zucker, T. F., Pappenheimer, A. M., and Barnett, M., PROC. SOC. EXP. BIOL. AND MED., 1922, **19**, 167; Zucker, T. F., PROC. SOC. EXP. BIOL. AND MED., 1922, **20**, 136; Zucker, T. F., *Am. J. Pub. Health*, 1933, **23**, 10.

Thirty-two normal infants were completely protected against rickets from November and December to April on 50 units of vitamin D given as concentrate in milk.

Six infants entering the study showed slight X-ray signs of rickets. These healed gradually and definitely through the period of study, and in no case did the X-ray signs become worse.

Of the 38 infants in the study 19 were under 6 months of age and 19 were between 6 months and one year. Of the 19 who were under 6 months of age 11 were under 4 months of age. Weight gains were satisfactory, being on the average about a pound a month. No antirachitic substance or treatment had been previously given.

A control group of 25 infants, who had received no antirachitic treatment during the winter, were selected at random as they came to the clinic. They were comparable in age and size to the groups studied and were X-rayed in April. Fourteen of these, or 56%, showed active rickets, the remainder being normal.

In this group of 38 infants, 50 rat units of vitamin D as cod liver oil concentrate, emulsified in milk, afforded protection against rickets. No difference was found in the older and younger age groups. According to these results the ratio of 40 to 240 for the vitamin D of irradiated milk and the vitamin D of cod liver oil concentrate, emulsified in milk, does not hold. The units seem, for infants, to compare about equally as far as their relative efficacy is concerned. Considering the relatively small number of infants, the error of biological assay, and the difficulties of quantitative clinical evaluation it would not be safe to say that one differs from the other. However, we feel that a larger number of patients must be studied before so low a daily vitamin D intake should be generally recommended. If satisfactory clinical comparisons are to be made between various antirachitic substances it will be necessary to set up and follow a standardized procedure for the various studies made.