The ultimate solution, or at least the one that is most to be desired, it seems to me, will be a universal time scale which shall have its basis in paleontology and shall adhere to the classic names, and in which the cycles and epicycles of diastrophism will be regarded as probably the most useful criteria for delimiting formational or larger sedimentary units, but never *per se* as criteria for the division of geological time.

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SPECIAL ARTICLES

THE INFLUENCE OF DRY VERSUS FRESH GREEN PLANT TISSUE ON CALCIUM ASSIMILATION

In early work on mineral metabolism with both the cow and the goat we showed that milking animals, receiving grains and dry oat straw as a roughage, are brought into a decided negative calcium balance. In the case of a goat the interesting observation was made that after a period of negative calcium balance, followed by access to fresh green grass, a positive calcium balance was observed, using the same ration as was used in the period preceding the access to green plant tissue. In extensive experiments Forbes and associates and Meigs and his associates have observed negative calcium balances with milking cows receiving rations liberally supplied with calcium. The rations used were from air *dried* materials, supplemented in some cases with silage. The striking feature of all the data obtained in these experiments was the large amount of fecal calcium, indicating a failure to assimilate satisfactorily this base.

In these our preliminary experiments, we have used milking goats. They have readily been brought into negative calcium balance on a ration consisting of air dried grains and air dried straw, with more calcium excreted in the fecal residue than was ingested with the ration. When the *dry* cereal straw was displaced by an equivalent in dry matter of fresh *green* material, with no increase in the total calcium intake, the negative calcium balance was reduced in one animal from 1.6–2.7 grams CaO to .6 CaO per day. With another animal it was reduced from 1.5–2.5 grams CaO per day to .3–.8 gram per day. On the low calcium intake of 8 to 9 grams of CaO per week we could not expect a positive calcium balance to ensue, but this remarkable difference in the amount of calcium assimilated from the two rations we believe, has very great significance.

These changes in calcium assimilation are not to be attributed to variation in water intake or to unavailability of the calcium. Apparently there is something having its source in fresh green materials, which controls or assists calcium assimilation. It is suggested that under the extra strain of rapid growth or milk production not enough calcium can be assimilated for the liberal uses made of this element, unless there is present an abundance of calcium in the diet as well as an abundance of this something that assists calcium assimilation. Possibly we are dealing with the anti-rachitic vitamine, assumed as the fourth food accessory factor. In any case this problem touches growth, milk production and egg production. In the case of nursing women the relation of diet to a positive or negative calcium balance and to dental conditions will assume new aspects.

The supposition that we are dealing with something influencing calcium assimilation and which is more abundant in green than in dried plant tissue and consequently variable with the season's milk, would explain the variations in the seasonal frequency of rickets, as observed and commented upon by Hess.

Our data are not yet inclusive enough to indicate definitely the factors involved in this problem, yet we have been sufficiently impressed with the constancy of the observations made that it appears desirable to re-emphasize this relation to mineral metabolism which we anticipated some years ago and expressed in an earlier publication.

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