

FACTORS AFFECTING THE PHYSIOLOGICAL
BEHAVIOR OF CALCIUM IN ANIMALS.

Presented by Sam L. Hansard

During the past several years many factors known to influence the absorption, laydown and physiological behavior of radiocalcium in the animal body has been investigated. Although experiments were designed to study the nutritional aspects of stable calcium movement, the results are applicable to basic health physics problems involving the alkaline earth metals (Sr^{89} , 90 , Ba^{140} , Y^{88} and Ce^{144}), which are localized almost exclusively in the skeleton, and which are effected by essentially the same conditions influencing calcium metabolism. The relationships of age of animal, methods of isotope administration, variations in rations fed, and effects of hormone therapy have been investigated. Observations from the results of these studies have shown that:

1) Calcium absorption decreased in cattle and rats from 95 percent in very young animals to 40 percent at sexual maturity; to about 20 percent at maturity. Absorption was greater in calves on a milk diet than on a ration of grain and hay. Absorption was greater on a normal and high protein level than on a 9 percent casein ration for both old and young rats. It was apparent that vitamin D had more influence upon phosphorus than upon calcium absorption.

2) Endogenous calcium losses from the body were higher in rats than for cattle, and were more a function of the plane of calcium nutrition than of age. Metabolic calcium losses were

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relatively constant; whereas endogenous fecal phosphorus was variable and appeared to be more nearly a function of total fecal phosphorus excreted.

3) Calcium maintenance requirements, as a function of the endogenous losses and true availability values, increased with age of animal and, on a milligram per kilogram basis, were nearly three times higher for rats than for cattle.

4) Results from balance studies with young and mature steers pair fed on rations containing sub-optimum levels of calcium from some fifty organic and inorganic calcium sources indicated true availability to be more a function of age than of source.

5) Calcium deposition was dependant upon both the access of bone to plasma calcium and the specific characteristics of the bone salt crystal itself. The discrete deposition beneath the epiphyseal plate in young animals, as contracted with the spotty accumulation and decreased localized deposition in bones of the aged animals, has been demonstrated by autoradiographs.

6) Both exchange and calcium deposition with apparent fixation occurred in young growing animals; whereas in mature and aged animals exchange was less, but appeared to be the major factor involved in radiocalcium retention.

7) Calcium readily crossed the placental barriers in rats and all species of farm animals. In the rat about 70 percent of the fetal calcium was calculated to be from the feed and 30 percent from maternal sources.

I¹³¹ IN DAIRY COWS

Presented by F. W. Lengenann

Radioactive iodine is being used as an indicator to determine the influence of season, lactation, and pregnancy on thyroid activity of dairy cows. The seasonal influence tends to be the most important, obscuring other effects.

Iodine¹³¹ is also being used to study the secretion in milk of this element. Five cows, dosed orally and/or intravenously have been used. About 5 percent of the administered dose was found in the milk in a 7-day collection period. The extremes found were 1.43 to 16.4 percent of the dose. This iodide did not appear to be protein bound. Dietary iodide caused only a small variation in the level of secretion. Increasing the iodide intake of one cow from 20 mg. to 2000 mg. per day decreased the I¹³¹ content of the milk from 4.6 to 3.0 percent of the daily dose.

There appears to be little delay in the absorption and excretion of iodide. About 0.02 percent of an oral dose was

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found in milk 30 minutes after administration indicating that iodide is rapidly absorbed through the rumen wall. The peak excretion occurred on the first day and decreased rapidly thereafter. About 70 percent of the iodide was found in the urine during the 7-day collection.

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