IMPORTANCE OF CALCIUM IN DAIRY RATIONS*

COWS require a supply of digestible protein, sugars, starches and fats from the feed sufficient to maintain the body in good health, and to provide the proteins, milk sugar and butterfat in the milk. In addition, they need small but definite amounts of calcium, phosphorus, common salt and other mineral elements to maintain themselves, and to provide the mineral matter in milk. A hundred pounds of milk contains nearly nine-tenths of a pound of mineral matter, or about 0·7 pound of ash. This amount of ash contains about 0·17 pound of calcium oxide (lime) and 0·22 pound of phosphorus pentoxide. Fortunately, cows do not change the amounts of calcium and phosphorus in milk to correspond with the levels in the feed.

In the natural feeds, calcium (lime) occurs mainly in the roughages. Legume hays usually contain from four to five times as much lime as do grasses grown on the same land. On acid, low-lime soils, even the grasses build less lime into the forage than on high lime soils. Grains and milling by-products, especially wheat bran and the oilmeals, contain a good proportion of phosphorus. If rations for dairy cows contain a fair proportion of legumes and grains, there seldom is need to consider the necessity of additional mineral matter. However, if these are not in good proportion, or if the soil upon which they were grown was deficient in these elements, then provision must be made to supply them.

Cows normally store calcium and phosphorus in the skeleton in times of surplus, and draw upon them when in heavy milk production, or when the feeds are deficient in either of these elements. If the feeds contain an inadequate supply of minerals the cows continue to draw upon the supply in the skeleton until the bones become extremely weak, and are easily broken. The milk yield then decreases in proportion to the minerals supplied by the feeds. After this condition is reached, even if the lacking mineral elements are supplied, the milk yield cannot be expected to return to normal until after the next calving.

A study of this condition has been made over a period of years at the Florida Experiment Station. The feeds given to the station dairy herd during the first part of the study included pasture grasses and corn, sorghum or cane silage as the roughages used with a mixture of ground corn, bran, cottonseed meal and other concentrates. The forages are grown on acid sandy soils. Rations containing them were calculated to provide only a part of the calcium needed, although the phosphorus content was adequate. While receiving these low-calcium rations, an unusual proportion of the dairy cows had broken hips and ribs. The leg bones from a

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cow with a newly-broken pelvis had an average breaking strength of only 335 pounds. Records were assembled of 12 Jersey cows receiving the low-calcium rations. These cows had 44 complete lactations which averaged 3,980 pounds of milk per lactation.

A change was made in the feed by adding two pounds of finely ground feeding bonemeal per 100 pounds of concentrates. While these same 12 Jersey cows were in good state of mineral storage, their milk records increased to 6,425 pounds per lactation (average of 22 lactations). These records were made by cows of different ages, but even when calculated to a uniform age basis, the 12 cows produced over 50 per cent. more milk on the supplemented rations than they did on the low-calcium rations. Tests made on the bones of eight of the same Jersey cows showed that the mineral matter had been restored to such an extent that the heavy leg bones had average strengths in excess of 3,000 pounds. This mineral matter could have been drawn upon for milk production.

When cows depend on pasture grasses and silages as the sole sources of roughage, it is desirable to supply added calcium in the form of bonemeal, up to 2 per cent. of the concentrates. Bonemeal is a practical and economical form of mineral matter for this purpose.