THE SIGNIFICANCE OF THE SOIL TO HUMAN AND ANIMAL NUTRITION

Kenneth C. Beeson and J. A. Le Clerc

It has long been recognized that localities have peculiar and individualistic effects on the health and well-being of both man and animals but it has been only in recent times that it has been shown that one of the main causes of these differences lies in the ability of the soil to supply in proper proportions and quantities those essential and vital constituents of diet, the mineral elements. The solution of problems connected with many animal deficiency diseases has depended almost entirely upon the recognition of the necessity in our metabolic processes for some one or several of these elements, some in only trace amounts.

No continent is free of localities or soils that produce crops lacking or deficient in some elements essential to the animals' well-being. Thus, Corlette in the Medical Journal of Australia for 1928 (11) has stated: "In working through veterinary literature on osteomalacia, rickets, and associated conditions of disease, I found my attention over and over again attracted to the character of the soil, climate and vegetation in their relation to the prevalence of cases." In our own country as well as in other lands, there are vast areas deficient in iodine, cobalt, manganese, copper, phosphorus, and similarly essential elements.

Likewise, there may be present in the soil undesirable quantities of elements that inhibit the growth of plants or that, when ingested by the animal, may cause nutritional disorders. Selenium in our own agricultural and grazing districts is a problem with which we have to contend because of the adverse effects of its presence in plants or animals.

While the soil is one of the primary factors in determining the composition of a plant growing thereon, other factors such as climate, the maturity of the plant, the number of cuttings of such plants as alfalfa, irrigation, and the variety are also important. It has been shown that fertilization can effect very materially the composition of the plant and when it is economical, fertilization of the plant is probably the best means of correcting a mineral deficiency in animals. If this is not done, mineral supplements must be fed the animal, and this is a common procedure throughout the world.

Many investigators in the field of animal nutrition believe that it is not a deficiency of minerals in the plant that leads to nutritional disorders in the animal but that it is often a problem of unbalanced mineral elements in the plant. Thus, forage grown on an acid moor soil is deficient in basic constituents or contains excessive acidic constituents such as sulfur, and phosphorus, the metabolic processes become disordered and the animal sickens.

In the investigation of any deficiency disease in plants or animals, difficulties of identification of the cause of that disease multiply as the mobility of the subject increases. Thus, a plant stationary as far as its orbit of activity is concerned represents a relatively simple subject for investigation. Any discrepancies or abnormalities in its growth or appearance can be readily discerned and checked against the source of nutrients, the soil. As the effects of more than forty elements on the growth and health of plants have been investigated and are more or less known.

The typical domestic animal, likewise, confined to a relatively small area, particularly in modern times. The animal apparently has a keen sense of regard to the healthfulness of its food when, as in ancient times, it was allowed to roam over large areas of the better lands, nutritional disorders were probably not observed. However, the ever-increasing population forced the adoption of fundamental changes in the habits of the herdsman. He was required to confine his cattle to a portion of his own landscape that he controlled or he was required to move to entirely new, and probably much less...