11578 P

Manganese as a Possible Factor Influencing the Occurrence of Lameness in Pigs.*

R. C. MILLER, T. B. KEITH, M. A. MCCARTY AND W. T. S. THORP.
From the Pennsylvania State College.

Impairment of the normal movement of the legs frequently occurs in swine. This condition is variously termed lameness, stiffness, posterior paralysis or incoördination, depending on its severity and etiology. A characteristic stiffness occurs in rickets in pigs, a condition in which there is abnormal bone development. Incoördination occurs in pigs as the result of vitamin A deficiency, in which there are degenerative changes in the central nervous system. In addition, however, lameness of one type or another occurs in some instances in which calcium, phosphorus, and vitamins A and D do not appear to be the limiting factors.

In the course of growth studies of pigs conducted by the authors during the past few years, a type of stiffness or lameness has been encountered which appears to be etiologically different from any of the forms described in the literature. This condition occurred in pigs which were fed similar rations, all of which were comprised of yellow corn, tankage, soy bean oil meal, ground alfalfa hay and salt. The pigs were fed individually and indoors but had access to direct sunlight at all times in outdoor paved pens.

The growth of the pigs was good but lameness occurred at about the time they reached a body weight of 150 pounds. The condition was at first characterized by a slightly halting gait, but it slowly progressed in severity until it was only with difficulty that the pigs could rise to their feet. The behavior of the pigs indicated that the condition was painful. Gross manifestations, in addition to stiffness, were enlarged hock joints and crooked legs which occurred even with some pigs which never became stiff. It should be noted that only 30 out of a total of 60 pigs receiving the above treatment were affected with stiffness. During the period of experiment 9 of the unaffected pigs did not attain the weight of 150 pounds, the weight at which stiffness usually occurred.

In outward appearance the condition resembled rickets. However, it was not alleviated or affected in any way by the addition of calcium and phosphorus to the ration or by the administration of cod

* Authorized for publication on June 8, 1940, as paper No. 974 in the Journal Series of the Pennsylvania Agricultural Experiment Station.

liver oil and irradiated yeast. Subsequent analysis of the ulni and radii of 18 affected pigs showed that the mineral content of these bones was normal, the average value for bone ash being 58.92% on the dry, fat-free basis. Normal values were also obtained for the inorganic phosphorus content of the blood. However, there were certain constantly occurring changes observed in the leg bones which indicate abnormal development. Upon gross examination, the distal extremity of the radius and of the ulna showed enlargement. Roentgenographs of this area of these bones indicate that there is an increased activity of the tissues at the osteochondral junction, this area being definitely enlarged, but there was no apparent irregularity of the zone of ossification and no other changes present other than hypercalcification, thus eliminating the possibility of rickets.

The occurrence of stiffness was first noticed during the feeding of rations which had relatively high mineral contents. These ranged from 6 to 9% and suggest a point of similarity between these rations and those producing perosis in chicks. In view of the reported efficacy of manganese in preventing perosis, the swine rations were analyzed and found to have low manganese contents ranging from .0011 to .0014%.

Manganese sulfate was then added to the swine rations in amounts to supply 50-60 parts per million of manganese. As a result 15 pigs which received the manganese supplemented rations showed no signs of stiffness. Fifty percent of litter and pen mates of these same pigs fed the unsupplemented rations became stiff as usual. However, the addition of manganese to the ration was ineffective in curing stiffness after it had developed.

Hogan[1] has recently presented evidence to show that factors other than manganese may be involved in the prevention of perosis in chicks. The authors do not claim any similarity between perosis in chicks and the type of stiffness in swine described above, but wish to suggest a possible rôle of manganese in the nutrition of swine which apparently involves bone development.

[1] Hogan, A. G., Richardson, L. R., and Homer, Patrick, paper presented at the New Orleans Meeting of the American Institute of Nutrition, March 13, 1940.