

LOCOMOTORY DISTURBANCES IN SOWS: PATHOLOGICAL FINDINGS

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Locomotor disturbances in sows have been reported in various parts of the world. Data presented herein was derived from nineteen lactating or recently weaned sows which were submitted for necropsy with a history of lameness, weakness or paralysis. A complete necropsy was done in each case and selected tissues were taken for histological, microbiological and radiological studies. Cross sections of sixth rib (mid-shaft) were cut using a band saw and mounted on plexiglass plates. Sections, approximately 100 microns thick, were cut using a diamond rotary saw (Gillings-Hamco Thin Sectioning Machine, Hamco Machine Inc., Rochester, New York). All sections were photographed at the same magnification and the C/T ratio (ratio of cross-sectional area of cortex to total cross-sectional area of cortex and medulla) was determined using a grid and a point counting system. Specific gravity of the fifth metacarpal bone and of the femur was determined by dividing the weight of the bone (cleaned of soft tissue) by the volume which was determined by water displacement. Numerical data were analyzed using an analysis of variance.

Data relating to age, litter size, duration of lactation, as well as specific gravity and C/T ratio of bone and bone ash are given in Table I. For the purposes of this study, animals were divided into two groups; Group I - Animals with osteoporosis and pathological fractures and Group II - Nonosteoporotic animals with vertebral osteomyelitis and various other lesions.

Sows with osteoporosis and pathological fractures (Group I) typically developed lameness or paralysis one or two days after weaning. Pathological fractures involved various bones (femur, tibia, scapula, humerus, tuber calcis and lumbar vertebra) with four of 10 sows having a fracture involving the femur. Osteoporosis varied in degree and, in general, was characterized by a reduction in thickness of cortical bone and by a reduced amount of trabecular bone in the epiphysis and metaphysis. The specific gravity (of fifth metacarpal bone and femur) and the C/T ratio (rib) were significantly lower in animals in Group I than in Group II. Bone ash values were significantly lower ($P < 0.05$) in Group I than in Group II. Sows in Group I were fed cereal grains plus some (often an inadequate amount) protein and mineral supplement. Actual nutrient intake was not determined.

Vertebral osteomyelitis in Group II animals occurred almost exclusively in the upper lumbar spine. It was characterized by extensive suppurative and destruction of pre-existing bone and often appeared to arise in the metaphyseal area of the vertebral body. *Corynebacterium pyogenes* was isolated from areas of vertebral osteomyelitis in 2 sows. Most sows in Group II developed locomotory problems shortly after weaning although 3 sows had clinical signs of lameness prior to weaning. Significant lesions other than vertebral osteomyelitis in Group II included rupture of the semimembranosus muscle, a large abscess involving the left sacroiliac joint and adjacent soft tissues and spinal stenosis associated with degeneration of intervertebral discs and numerous vertebral osteophytes. All sows in Group II were fed a supplemented cereal grain ration or a commercial sow ration.

Results of this study show that while inadequate mineral intake, osteoporosis and pathological fractures of various bones are common findings in recently weaned sows with locomotory disturbances,

various other pathological processes, especially vertebral osteomyelitis, may also be involved. The diversity of lesions seen in this study is not unexpected and verifies the need for a complete post mortem examination.

Severe osteoporosis in animals fed unsupplemented cereal grain rations is to be expected and the reduction in bone mass was obvious in these animals at necropsy. Osteoporosis was assumed to be related to a calcium deficiency and an abnormal Ca:P ratio although other possibilities, such as confinement and a lack of exercise, exist. Nutritional bone disease in young animals (Group I) may relate to skeletal immaturity and increased nutrient requirements compared to animals in Group II. Vertebral osteomyelitis as seen in six sows in Group II was assumed to be hematogenous.

Values for specific gravity and C/T ratio of bone were calculated in an attempt to determine their usefulness in evaluating bone mass. In general, both parameters appear to be useful and values obtained are similar (but not identical) to values reported by other workers. The C/T ratio is an absolute measure of bone mass which is more useful than cortical thickness alone since the size of a bone will vary from animal to animal. In the animals described herein, the C/T ratio appeared to be a reliable measure of bone mass, being lowest in animals which grossly appeared to have severe osteoporosis and being significantly greater in animals in Group II.

In the present study, bone ash values were significantly reduced in Group I animals. However, the difference between the mean values for the two groups was small and, while this might be interpreted as evidence of osteomalacia, lower values in Group I could, in part, be a reflection of the younger age of animals in this group. Conversely, sows fed unsupplemented cereal grain rations could be expected to be deficient in many nutrients including phosphorus and vitamin D and osteomalacia could occur. Recognizing that osteoporosis and osteomalacia may co-exist in the same skeleton, it was concluded that the skeletal lesions in Group I sows were characterized by marked osteoporosis with a mild degree of osteomalacia superimposed.

TABLE I

	GROUP I	GROUP II
Age	1-2 years	1-4 years
Litter Size	7-13 piglets	8-15 piglets
Duration of Lactation	3 1/2-6 weeks	2-6 weeks
Sp. Gr. - Femur	1.23±0.05*	1.31±0.03
- 5th Metacarpal	1.41±0.07	1.55±0.03
C/T Ratio (Rib)	0.22±0.04	0.32±0.05
Bone Ash (%)	60.06±2.68	63.20±1.72

*Standard Deviation

Selected references: Gayle, L.G., and Schwartz, W.L.: Southwest vet. 1980, 33:69-71; Kornegay, E.T., Thomas, H.R., and Meacham, T.N.: J. Anim. Sci. 1973, 37:493-500; Spencer, G.R.: Am. J. Path. 1975, 95:277-280; Spencer, G.R., El-Sayed, F.I., Kroening, G.H., Pell, K.L., Shoup, N., Adams, D.F., Franke, M., and Alexander, J.E.: Am. J. vet. Res. 1971, 32:1751-1774; Whitehair, C.K., and Miller, E.R.: Fourth edition, Iowa State University Press, 1975, 1092-1093.