Kentucky Equine Research®
World Leaders In Equine Nutrition

Advances in Equine Nutrition

Volume II

Edited by

J.D. Pagan

STALLING YOUNG HORSES ALTERS NORMAL BONE GROWTH

K.E. HOEKSTRA, B.D. NIELSEN, M.W. ORTH, D.S. ROSENSTEIN,
H.C. SCHOTT, J.E. SHELLE
Michigan State University, East Lansing, MI

A major concern with young performance horses is the high incidence of skeletal injury. Young, growing horses transferred from pasture to stalls prior to yearling sales or commencement of training may be predisposed to injury. A decrease in bone density of the third metacarpal has been demonstrated in young racehorses soon after the onset of training. However, it is unknown whether the decrease in bone density was the result of bone remodeling caused by increased strain rates on the bone associated with training or bone modeling resulting from decreased strain rates associated with a change in housing from pasture to stalls at the start of training. Transferring young horses from pasture to stalls has been shown to result in decreased osteocalcin concentrations (indicative of osteoblastic activity), indicating a slowdown in the rate of bone formation due to decreased physical activity. Studies of other species have demonstrated similar decreases in bone strength in response to confinement rearing. Though horses on pasture may not run excessively, only a few fast strides per day may be necessary to prevent bone loss associated with limited physical activity available to horses housed in stalls. Consequently, pastured horses may have a skeletal structure that is better prepared for training and competition. If so, the common practice of housing yearling horses in stalls prior to yearling sales or commencement of training causes concern about the effects of stalling on bone growth. This study was designed to determine if bone development is negatively affected when yearlings are taken from pasture to be housed in stalls and allowed limited exercise. In addition, the consequential effects of the change in housing on bone modeling/remodeling at the onset of training were determined. Sixteen Arabian yearlings, with an average age of 18.6 mo, were pair-matched by age and randomly placed into two groups. One group was housed in box stalls while the second group was kept on pasture. Radiographs of each horse's left front leg were taken every 28 d to measure mineral content of the third metacarpal, as determined by radiographic bone aluminum equivalencies (RBAE). Blood samples were taken every 14 d to determine serum osteocalcin concentrations and 24-hour urine collections were taken every 28 d to measure urinary deoxypyridinoline. After an 84-d pre-training period, six horses from each group were randomly selected to complete a 56-d training period. Analysis of the radiographs showed that stall-housed horses had a decrease in lateral RBAE from d 0 to d 28 ($P < .05$). Pasture-reared horses had greater lateral RBAEs at d 28, 56, and 140 ($P < .05$), and a tendency to be greater at d 112 ($P = .07$). The change in RBAEs of the medial cortex from d 0 tended to be greater in the pastured horses ($P < .1$). Serum osteocalcin concentrations were lower in the stalled horses at d 14 ($P < .05$). Following d 14, the osteocalcin concentrations in the stalled horses returned to baseline. Urinary deoxypyridinoline (indicative of bone resorption) was greater at d 28 in horses housed in stalls than horses

maintained on pasture ($P < .01$). Following d 28, deoxypyridinoline in the stalled horses returned to baseline. It appears that housing yearlings in stalls may negatively affect normal bone growth experienced by yearlings allowed to remain on pasture. Although it was not tested in this study, free access to exercise may have provided sufficient loading on the legs of pastured horses to promote normal bone growth. Results suggest that housing yearling and two-year-old horses in stalls without access to forced or free exercise impairs normal bone growth, compared with horses maintained on pasture. Initial training did not appear to alleviate the negative effects of stalling on bone formation.