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**Characterization of Bone Mineral Composition in the Proximal Tibia of Cynomolgus Monkeys Using Infrared Microspectroscopy**

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**ABSTRACT:** Post-menopausal osteoporosis, characterized by decreased bone density and altered bone architecture, is a common and costly disease afflicting millions of women. It has been suggested that chemical differences in bone, such as mineral composition and organic matrix organization, may contribute to bone strength and disease severity. To date, we find that the phosphate:matrix ratio is similar between ovariectomized monkeys and sham controls in all three bone regions. Conversely, the ovariectomized animals have an increase in  $\text{HPO}_4^{2-}$  content and a 15% reduction in total carbonate content in the cortical and subchondral bone regions. The reduction in carbonate content is primarily due to a loss of labile carbonate, as indicated by curve-fit analysis of the  $\nu_2\text{CO}_3^{2-}$  band. This loss is partially restored after treatment with nandrolone. Neither ovariectomy nor nandrolone treatment has any observable effect on the total  $\text{HPO}_4^{2-}$  or carbonate content in the trabecular bone region. These results support the hypothesis that ovariectomy increases bone remodeling in the cortical and subchondral bone areas, such that a greater amount of newly formed bone is present. On the other hand, bone resorption dominates in the trabecular bone region, so that bone volume is reduced but the observed maturity of the remaining bone is not noticeably affected. Treatment with nandrolone decreases bone turnover from ovariectomy, preventing a loss of trabecular bone and allowing the maturation of cortical and subchondral bone.