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Keel-bone fractures are associated with bone quality differences in laying hens

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Abstract

*This study aimed to investigate the relationship between bone quality in terms of metabolism, homeostasis of elements, bone mineral density (BMD), and microstructure and keel-bone fractures in laying hens (*Gallus gallus domesticus*). One hundred and twenty 17 week old Lohmann White laying hens with normal keel bones were individually housed in furnished cages for 25 weeks. Birds were then euthanased and dissected to assess keel-bone status at 42 weeks. Serum and keel-bone samples from normal keel (NK) and fractured keel (FK) hens were collected to determine the previously mentioned bone quality parameters. The results showed FK hens to have higher levels of the components of osteocalcin, greater alkaline phosphatase activity in serum and keel bones, and greater tartrate-resistant acid phosphatase (TRAP) activity in keel bones, compared to NK hens. Additionally, FK hens also had higher concentrations of Li, B, K, Cu, As, Se, Sn, Hg, and Pb, but lower concentrations of Na, P, and Ca. Moreover, FK hens showed decreased bone microstructural parameters including bone volume/tissue volume, trabecular number, degree of anisotropy, connectivity density, and BMD, but increased trabecular separation. Meanwhile, no differences were detected in serum TRAP activity, trabecular thickness, bone surface, or bone surface/bone volume. Results showed laying hens with keel-bone fractures to have differences in bone metabolism, elements of homeostasis, bone microstructure parameters, and BMD. These results suggest that keel-bone fractures may be associated with bone quality.*

Keywords: *animal welfare, bone metabolism, bone microstructure, bone mineral density, keel-bone fracture, laying hen*