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### Effect of grape seed proanthocyanidins extract on alteration of mechanical properties of metaphysis tibia bone in rats fed a low-calcium diet

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**Abstract** The effects of grape seed proanthocyanidins extract (GSPE, 3 mg in 100 g of high-calcium diet with a calcium content of 1697 mg/100 g) on rat metaphysis tibia formation following feeding of a low-calcium diet (30% of calcium in the standard diet) were investigated by examining bone density, mineral content, geometric and bone strength. Five-week old male Wistar rats (n = 40) were randomly divided into a control (Co) group, a low-calcium diet (LC) group, a low-calcium diet-high-calcium diet (LCH) group, and a low-calcium diet-high-calcium diet with supplementary GSPE (LCHG) group. The metaphysis tibia bones were analyzed using three-dimensional peripheral quantitative computed tomography (pQCT), while whole tibia bones were tested for mechanical resistance using a material testing machine. We found no significant differences in body weight among the 4 groups. All bone parameters in the LC group were significantly lower than these in the Co group ( $P < 0.01$ ). Furthermore, trabecular bone density (TrBD), trabecular bone mineral content (TrBMC), cross-sectional moment of inertia to the reference axis y (yCSMI), and stress-strain index to the reference axis x (xSSI) in the LCHG group were significantly higher than those in the LCH group ( $P < 0.05$ ;  $P < 0.01$ ;  $P < 0.05$ ;  $P < 0.05$ , respectively), while stiffness in the LCHG and LCH groups were significantly higher than that in the LC group ( $P < 0.01$ ). We concluded that a mixture of high-calcium and GSPE in the diet has a more beneficial effect on bone formation for the treatment of metaphysis tibia bone debility in rats than does a high-calcium diet alone.

**Key words** Dietary therapy, Grape seed proanthocyanidins extract, High-calcium, Metaphysis tibia bone, Rat

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