

Silicon deprivation decreases collagen formation in wounds and bone, and ornithine transaminase enzyme activity in liver.

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Abstract

We have shown that silicon (Si) deprivation decreases the collagen concentration in bone of 9-wk-old rats. Finding that Si deprivation also affects collagen at different stages in bone development, collagen-forming enzymes, or collagen deposition in other tissues would have implications that Si is important for both wound healing and bone formation. Therefore, 42 rats in experiment 1 and 24 rats in experiment 2 were fed a basal diet containing 2 or 2.6 microg Si/g, respectively, based on ground corn and casein, and supplemented with either 0 or 10 microg Si/g as sodium metasilicate. At 3 wk, the femur was removed from 18 of the 42 rats in experiment 1 for hydroxyproline analysis. A polyvinyl sponge was implanted beneath the skin of the upper back of each of the 24 remaining rats. Sixteen hours before termination and 2 wk after the sponge had been implanted, each rat was given an oral dose of ¹⁴C-proline (1.8 microCi/100 g body wt). The total amount of hydroxyproline was significantly lower in the tibia and sponges taken from Si-deficient animals than Si-supplemented rats. The disintegrations per minute of ¹⁴C-proline were significantly higher in sponge extracts from Si-deficient rats than Si-supplemented rats. Additional evidence of aberrations in proline metabolism with Si deprivation was that liver ornithine aminotransferase was significantly decreased in Si-deprived animals in experiment 2. Findings of an increased accumulation of ¹⁴C-proline and decreased total hydroxyproline in implanted sponges and decreased activity of a key enzyme in proline synthesis (liver ornithine aminotransferase) in Si-deprived animals indicates an aberration in the formation of collagen from proline in sites other than bone that is corrected by Si. This suggests that Si is a nutrient of concern in wound healing as well as bone formation.