Dietary silicon and arginine affect mineral element composition of rat femur and vertebra.

Biol Trace Elem Res. 2002 Dec;89(3):239-50.

Seaborn CD1, Nielsen FH.

Author information:

1University of Wisconsin-Stout, Menomonie, WI, USA.

Abstract

Both arginine and silicon affect collagen formation and bone mineralization. Thus, an experiment was designed to determine if dietary arginine would alter the effect of dietary silicon on bone mineralization and vice versa. Male weanling Sprague-Dawley rats were assigned to groups of 12 in a 2 x 2 factorially arranged experiment. Supplemented to a ground corn/casein basal diet containing 2.3 microg Si/g and adequate arginine were silicon as sodium metasilicate at 0 or 35 microg/g diet and arginine at 0 or 5 mg/g diet. The rats were fed ad libitum deionized water and their respective diets for 8 wk. Body weight, liver weight/body weight ratio, and plasma silicon were decreased, and plasma alkaline phosphatase activity was increased by silicon deprivation. Silicon deprivation also decreased femoral calcium, copper, potassium, and zinc concentrations, but increased the femoral manganese concentration. Arginine supplementation decreased femoral molybdenum concentration but increased the femoral manganese concentration. Vertebral concentrations of phosphorus, sodium, potassium, copper, manganese, and zinc were decreased by silicon deprivation. Arginine supplementation increased vertebral concentrations of sodium, potassium, manganese, zinc, and iron. The arginine effects were more marked in the silicon-deprived animals, especially in the vertebra. Germanium concentrations of the femur and vertebra were affected by an interaction between silicon and arginine; the concentrations were decreased by silicon deprivation in those animals not fed supplemental arginine. The change in germanium is consistent with a previous finding by us suggesting that this element may be physiologically important, especially as related to bone DNA concentrations. The femoral and vertebral mineral findings support the contention that silicon has a physiological role in bone formation and that arginine intake can affect that role.