LETTERS

Osteoporosis: A Cautionary Note

Jean L. Marx, in her excellent article about osteoporosis (Research News, 8 Feb., p. 628), suggests that imbalance between two competing processes—resorption, in the form of dissolution of the calcium-containing mineral, and bone formation—could be at the heart of the osteoporotic puzzle. We would like to comment on some aspects of this pattern.

Morphological data characteristically show osteoporotic bone trabeculae to be less numerous and thinner than normal ones (*1*). However, this phenomenon is not the net result of a bare loss of mineral combined with a loss of organic matrix, it is accompanied by physical and chemical modifications of the mineral and organic phases of the bone.

Osteoporotic bone trabeculae (the inner part of bone, as opposed to cortical bone, the outer weight-bearing structure) have a higher specific gravity and a higher calcium content per unit weight (*2*) or volume (*3*, *4*) correlating with higher calcium and phosphorous-to-hydroxyproline ratios (*5*). Thus, osteoporotic bone is more porous and more mineralized; this if anything, could account for its being more brittle.

In addition, components are more homogeneous in osteoporotic bone than in normal bone: magnesium content (*4*) and noncollagenous proteins (*4*, *6*) both decrease with age and, in osteoporosis, show a negative correlation with specific gravity and calcium content (*4*); furthermore, the collagen molecules of the matrix become less extractable with age (*3*), suggesting stronger cross-links; hence a greater degree of homogeneity and a higher order of organization are achieved in osteoporotic trabecular bone, while the crystallinity of cortical bone has been shown to remain unaltered with age (*7*).

We can speculate therefore that, in order to reverse osteoporosis, any agent influencing the balance between bone deposition and resorption should also be able to reverse the time-dependent evolution of extracellular trabecular bone components toward a more compact and orderly structure.

Basic knowledge of the physics and chemistry of extracellular bone components in humans is still scanty with respect to age groups and in view of the vast problems arising from the mere effects of time [and weightlessness (*8*)] on bone components; more extensive studies of the latter are particularly indicated and caution is justified when optimistic statements are made claiming reversal of osteoporosis on the basis of an exclusively biological approach, no matter how well substantiated experimental results might be.

People in affluent societies expect to lead an active life beyond menopause or andropause. How much such expectations justify the needed heavy investments in view of the population explosion and the ever-widening gap between developing and affluent societies is a matter where self-interest, scientific interest, and worldwide policy are difficult to disentangle.

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The "Ellipsoid Algorithm"

Gina Bari Kolata's article (Research News, 2 Nov. 1979, p. 545) on the algorithm for linear programming (LP) published by L. G. Khachian was the first report on it to the general scientific community. Since then, amid a flurry of comment in the press, many applied mathematicians (and others) have studied it, tried it out, and proposed improvements. The Mathematical Programming Society (MPS) has received 42 technical papers written about the algorithm since Gács and Lovász presented their version at the Tenth International Symposium of the MPS in Montreal last August. These papers are listed in a bibliography (*1*), along with relevant previous work and some of the subsequent press coverage.

Eighty researchers attended the MPS "Workshop on polynomial-time algorithms for linear programming" held in New York on 8 February. The 17 reports presented and lively discussions added much to our knowledge of the subject. There are no written proceedings,