FOOTNOTES

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Reply

We have read with interest the letter of Barth et al. in which they report an identical organ distribution pattern of Tc-99m-labeled leucocytes irrespective of whether they used their technique or our method of labeling. The important difference, however, is in the much lower bone uptake (7.1–9.5%) noted by them, as against 33% bone accumulation of Tc-99m-labeled leucocytes reported by us.

Barth et al. measured radioactivity in both femora and tibiae and computed the total skeletal activity on the premise that these four bones account for 20% of skeletal weight. We have found the average weight of both femora and tibiae removed from the hind limbs of five Wistar rats (weight between 170 and 185 g) to be 1.56 g. The total skeletal weight on the basis of their assumption would thus be 7.8 g, which is less than half the estimate, if the bone weight is assumed to be 10% of body weight (17.5 g in a 175-g rat). Durbin et al. have reported the skeletal weight of female Sprague-Dawley rats to be 9 ± 0.08% of the total body weight (*1*). As indicated in our paper, we have assumed the bone weight to be 10% of the body weight. More than twofold increase in the bone weight would boost the 7.1–9.5% bone accumulation reported by Barth et al. to 15.8–21.4%, which is closer to our figure.

Our pertechnetate was obtained by liquid-liquid extraction method from (n,γ)-produced, low-specific-activity Mo-99. The Tc-99m eluate in M.E.K. was passed through an alumina column before evaporation of M.E.K. and dissolution of Tc-99m in saline. Billinghurst et al. did not find Ru-103 or Np-239 in the Tc-99m eluate obtained by the liquid-liquid extraction method, and the amount of I-131 was so small that it could not be measured (*2*). We have not found Mo-99 breakthrough in any of the spot tests done by us periodically.

Although radioactive contaminants are not likely to affect the distribution of Tc-99m leukocytes, the presence of varying amounts of inactive contaminants in generator-eluted and M.E.K.-extracted Tc-99m may conceivably affect the efficiency of leukocyte labeling and the degree of localization in the bones.

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Measurement of the Axial Skeleton for Diagnosis of Osteoporosis by Neutron Activation Analysis

The recent paper of Wahner, Riggs, and Beabout (*1*) points out that the photon-absorption method does not differentiate, in individual cases, between osteoporotic and normal bone, and that the Singh Index is better in this regard. The paper ends by saying that "an instrument capable of quantitative measurement of trabecular bone in the axial skeleton would be desirable." We believe that the partial-body, in-vivo neutron activation analysis technique (IVNAA), used here (*2–5*) and at Birmingham (*6*), goes a long way toward providing such an instrument, and that it is capable of differentiating between patients with osteoporosis and those with normal bone. In the procedure some of the stable calcium in the body is converted to radioactive Ca-49 by neutron capture. The count of the radiocalcium is related to the amount of stable calcium in the part of the body exposed to the neutrons.

Mineral mass would be expected to increase with body size, and mineral mass is known to decrease with aging. It is necessary, then, to take body size into account when evaluating calcium data, and also to compare calcium content with that of a person who has not lost Ca due to aging. In our work this latter point is taken into account by using adults aged 55 yr or less as "standards." The Calcium Bone Index (CaBI) used by us (*3*) then relates the Ca count obtained from an adult (of any age) to that of a normal (≤55 yr) having the same size body frame.

The two figures show results obtained from 29 normal volunteers (≤55 yr) and 75 osteoporotics. Calcium count is plotted against body size, H being the mean of arm span and height (pre-deformation height in the case of osteoporotics). The data in Fig. 1 are confined to people ≤55 yr. The lines indicate the mean and ±2 s.d. for the normal volunteers. It is clear that, as a group, the "young" osteoporotics are separated from the normals, though 1 out of the 32 cases is within the normal range.

In Fig. 2 are shown the normal range from Fig. 1, and

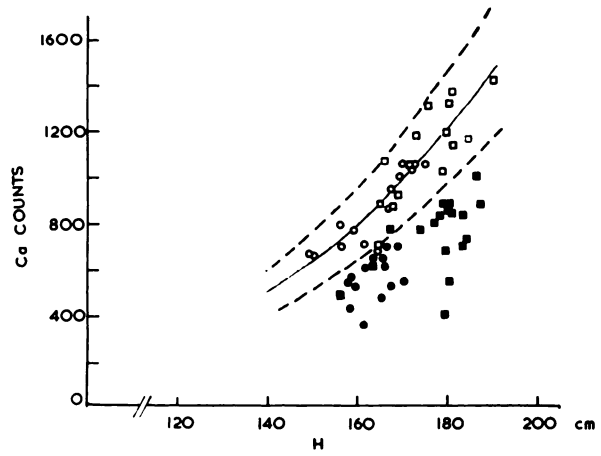

FIG. 1. Calcium-49 counts, from all patients and volunteers not over 55 yr of age, as a function of body size (mean of maximum height and arm span). Males are indicated by squares, females by circles. Open symbols are for normal volunteers, closed symbols for patients with proven osteoporosis. Solid line shows mean for normal volunteers, dotted lines ±2 s.d.

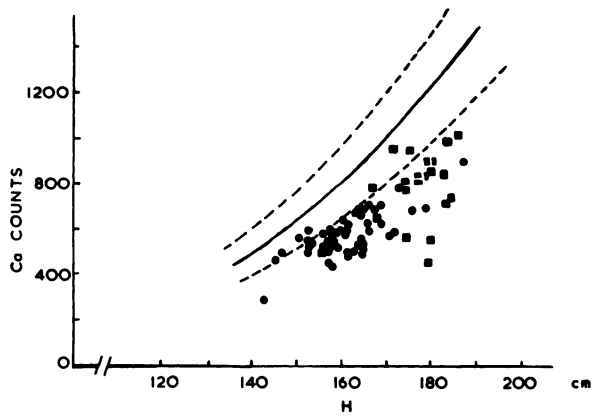

FIG. 2. Results for osteoporotics of all ages. Males are indicated by squares, females by circles. Lines are taken from Fig. 1.

values for osteoporotic patients of all ages. Again, the separation between normal adults ≤55 yr and patients is clear.

In terms of CaBI, the normal mean is 1.00 (s.d. = 0.1), and that for all osteoporotics is 0.69 (s.d. = 0.11). The mean age for all osteoporotics was 56 yr (range, 21–78). Subdividing, the 32 patients ≤55 yr had a mean CaBI of 0.66 (±0.10), and the 43 subjects over 55 yr had a mean value of 0.70 (±0.10); these two groups are not significantly different ($p > 0.05$). We note that 88% of the osteoporotic subjects have a CaBI less than 0.80–2 s.d. below the normal mean.

Finally, 26 volunteers over 55 (mean age 64 yr, range 59–75) had a mean CaBI of 0.88 (±0.13), the 11 men having a higher value (0.96 ± 0.13) than the 15 females (0.83 ± 0.10).

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Reply

Our statement regarding the need for an instrument capable of measuring bone mineral in the axial skeleton was not made with the intention to minimize the contributions already made in this direction. On the contrary, several very promising new techniques have been developed in the last decade. The most promising approaches in my opinion are the neutron activation analysis as described above by McNeill, et al. and the dual photon attenuation techniques developed independently by Price, et al. (*1*) and Mazess, et al. (*2*). While the technical problems of these techniques seem almost resolved, the definition of normal and abnormal and clearly defined indications for the usefulness of these techniques are still being considered.

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A Case Report of Lymphangioleiomyomatosis?

In the article by J. M. Woolfenden and T. B. Struse, entitled "Diagnosis of Chylothorax with ^{131}I-Triolein: Case Report", in the February issue of the *Journal*, they describe a method of diagnosing chylous effusion and present a case report of a chylothorax in a 37-year-old woman, in whom a definite diagnosis has not been established.

In their discussion they analyze various causes of chylothorax but fail to include lymphangioleiomyomatosis as one of the differential possibilities. Lymphangioleiomyomatosis was first recognized as a special entity by Laipply and Sher-