6. Jain D, Burg M, Soufer R, Kerns R, Zaret BL. Silent left ventricular dysfunction during routine structured interveiw and induced mental stress in coronary patients: impact of type A behavior. 40th Annual Scientific Session, American College of Cardiology, Atlanta, GA, March, 1991.
7. Carey J, Stewart J, Merrill W, et al. Continuous radionuclide monitoring of left ventricular systolic performance in postoperative cardiac surgery patients: validation of the Capintec-VEST. 39th Annual Scientific Session, American College of Cardiology, New Orleans, March, 1990.

**Jessica I. Bede**
*Capintec, Inc.*
*Ramsey, New Jersey*

## Reconstitution and Fractionation of Radiopharmaceutical Kits

**TO THE EDITOR:** Several reports have appeared in the literature describing cost-saving measures by which radiopharmaceutical kits are reconstituted with saline, divided into portions in separate vials and refrigerated or frozen. These vials are thawed at a later time (hours to days) after which [$^{99m}$Tc]-pertechnetate is added. Piera et al. (*1*) and Ballinger (*2*) were able to demonstrate sustained stability of $^{99m}$Tc-HMPAO kits prepared from divided, reconstituted fractions, particularly if the kits were reconstituted with nitrogen-purged saline and subsequently frozen at −10°C. We have extended this approach to two of the newer radiopharmaceutical kits $^{99m}$Tc-sestamibi (DuPont/Merck, Billerica, MA) and $^{99m}$Tc-mertiatide (Mallinckrodt, St. Louis, MO).

The kits were initially reconstituted with 2 ml of low-dissolved-oxygen (LDO) saline and divided into four aliquots of 0.5 ml and placed in sterile vials. Three of the vials were frozen, while 20 mCi of $^{99m}$Tc-pertechnetate (obtained 1 hr after elution of a generator) was added to the other vial using the procedure recommended by the manufacturer. The radiochemical purity of the kits was also determined according to the manufacturer's instructions (ITLC for the sestamibi kit; a Sep-Pak cartridge for the mertiatide kit). The frozen kits were thawed 1–5 days after the initial reconstitution, and [$^{99m}$Tc]pertechnetate was added as described above. This procedure was repeated several times for each kit.

The $^{99m}$Tc-sestamibi kits exhibited excellent stability, even for the reconstituted aliquots that had been frozen for five days. A 90%–96% radiochemical purity was observed for all samples tested. However, the radiochemical purity of the mertiatide kits was unacceptably low for frozen aliquots stored for longer than one day.

The mertiatide kit is supplied as a lyophilized powder stored under argon gas. The instructions for the preparation of this kit call for the removal of this argon layer and replacing it with air in the vial. When the vials were reconstituted with LDO saline, the stored, frozen vials no longer had this argon layer. Thus, the low radiochemical purity observed for the frozen, reconstituted aliquots may have been due to the oxidation of the stannous chloride in the kit. This is apparently the same phenomenon observed by Ballinger during the preparation of reconstituted $^{99m}$Tc-HMPAO kits (*2*). Therefore, an adjustment was made in which the reconstituted aliquots were added to sterile vials that were purged with argon gas. The argon was added using a pressurized tank and an in-line 0.22 micron filter. These vials were then treated similarly to the other $^{99m}$Tc-mertiatide preparations and subjected to the same quality control procedures. A radiochemical purity of greater than 97% was observed for all aliquots, including one that had been frozen for 21 days.

These procedures are easily performed in a nuclear medicine department and can lead to substantial savings. By using the appropriate reconstitution procedures, the stability of the kits can be maintained for a time to sufficiently maximize the utility of the kit. While we have not evaluated the effect of the reconstitution, freezing and thawing of the kits on the quality of the scan, we assume that as long as the number of doses extracted from one kit does not exceed the manufacturer's recommendations, this should not be a problem.

### REFERENCES

1. Piera C, Pavia A, Bassa P, Garcia J. Preparation of $^{99m}$Tc-HMPAO [Letter]. *J Nucl Med* 1990;31:127–128.
2. Ballinger J. Preparation of technetium-99m-HMPAO [Letter]. *J Nucl Med* 1990;31:1892.

**William K. Fleming**
**Michael Jay**
**U. Yun Ryo**
*University of Kentucky*
*Lexington, Kentucky*

## Calculation of the Radiation Dose at a Bone-to-Marrow Interface

**TO THE EDITOR:** With great interest, we read the article by Johnson et al. (*1*). This article proposes a simple anatomical model and uses straightforward calculations to improve understanding of the absorbed dose distribution in bone marrow. The presentation of the results as a dose profile may enhance our understanding of the myelotoxicity of high activity doses of radionuclides. However, we would like the authors' comment on the following items:

1. Is the proposed anatomical model applicable to humans, in whom the marrow is always embedded in trabecles, even in the mid-femur (*2*)?
2. Do the authors expect a homogeneous absorbed dose in marrow cavities in humans, where the trabecle distances [± 1000 μm (*3,4*)] are comparable to the percentile distances $X_{90}$ [1000 μm for $^{153}$Sm and 1800 μm for $^{186}$Re (*5*)]?
3. Do the authors expect the results to change significantly because of possible deviations from the planar source approximation? Why is application of the lateral correction algorithm (LCA) not required?
4. With the EGS4 code, electrons less than 10 keV are neglected. However, these electrons do occur in the decay spectrum (*1,6,7*) of $^{153}$Sm and $^{186}$Re (Table 1) and may be

**TABLE 1**

| | β constant (g-cGy/μCi-hr) | | Electron constant (g-cGy/μCi-hr) | |
|---|---|---|---|---|
| Isotope | Johnson | MIRD | All E | E < 10 keV |
| $^{153}$Sm | 0.48 | 0.48 | 0.089 | 0.0083 |
| $^{186}$Re | 0.69 | 0.70 | 0.031 | 0.0022 |