Preparation of Technetium-99m-HMPAO

TO THE EDITOR: We were very interested to see the letter from Piera et al. (*1*) in which they showed that technetium-99m-exametazime (^{99m}Tc-HMPAO) can be prepared in higher radiochemical purity (RCP) and at lower cost if the non-radioactive kit is first reconstituted with saline and split into fractions to which pertechnetate is added at different times. We have been working along similar lines and wish to offer two extensions of Piera's work and some precautions based on our experience.

First, the sterile saline or distilled water with which the kit is reconstituted should be *nitrogen-purged* to minimize oxidation of the small amount of stannous chloride present in the kit. Maintaining a nitrogen atmosphere over the fractions further protects the tin.

Second, after the dissolved kit has been split in this manner, the fractions can be *frozen* at −10°C and are stable for days rather than for hours in the refrigerator.

Four HMPAO kits were each reconstituted with 5 ml nitrogen-purged sterile water in a laminar airflow hood. Aliquots of 1 ml each were transferred into 20 evacuated multidose vials and overlayered with nitrogen. Sixteen vials were immediately frozen at −10°C. The remaining four vials were reconstituted with 2 ml saline which contained 1500 MBq pertechnetate at time of elution (up to 4 hr previously, generator ingrowth 24 hr). RCP in each vial was determined five times over the course of 90 min using the ethyl-acetate extraction method (*2*) and the decline in RCP with time was fitted to a monoexponential function to determine decomposition rate constant, k_d (*3*). After 1, 2, 3, and 6 days of storage, four vials were thawed and reconstituted as described above.

Table 1 presents RCP as measured at 5 and 60 min after reconstitution. Initial RCP gradually declined with storage but remained acceptable at 6 days. Stability, as reflected by k_d, was not adversely affected by storage. In fact, the mean k_d was lower for each of the frozen vials than for the control vials on day 0. However, stability was affected by the age of the pertechnetate used. For pertechnetate in the 1st, 2nd, 3rd, and 4th hr after elution, respectively, k_d values were 0.108 ± 0.019, 0.132 ± 0.026, 0.176 ± 0.102, and 0.182 ± 0.025 hr^{-1} (mean ± s.d., n = 5). Thus, the split kits are very sensitive to the "quality" of pertechnetate used, presumably due to the small amount of tin in each fraction. We have previously shown that initial RCP of intact kits is not affected by the age of the eluate up to 4 hr (*4*).

Although ^{99m}Tc-HMPAO can be stabilized in vitro by addition of gentisic acid and pH adjustment, these manipulations must be performed after the addition of pertechnetate (*3*). However, Lang et al. have reported that ^{99m}Tc-HMPAO can be stabilized with an alternative weak chelating agent which can be present before addition of pertechnetate (*5*); thus it may be possible to add this stabilizer at the time the kit is dissolved and split. Quite apart from the stabilizer, Lang also found that the optimal formulation of HMPAO contained almost exactly one-half of the amounts of ligand and stannous chloride in the Amersham kit (*5*). Therefore, splitting the kit into a minimum of two fractions may actually improve the RCP and stability of the product.

TABLE 1
Effect of Storage at −10°C on Radiochemical Purity and Stability of ^{99m}Tc-HMPAO Prepared from Split Fractions

Days of storage	Radiochemical purity (%)* t = 5	Radiochemical purity (%)* t = 60	Decomposition rate constant k_d (h^{-1})
0	92.6 ± 1.1	78.7 ± 4.2	0.177 ± 0.034
1	91.4 ± 1.5	80.8 ± 4.3	0.137 ± 0.044
2	87.6 ± 2.8	77.3 ± 9.4	0.166 ± 0.125
3	85.4 ± 6.6	76.7 ± 6.8	0.120 ± 0.025
6	86.0 ± 4.9	77.1 ± 7.0	0.147 ± 0.017

* At t min. after reconstitution. Each value is mean ± s.d. for four determinations.

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Defective Parallel-Hole Collimator Encountered in SPECT: A Suggested Approach to Avoid Potential Problems

TO THE EDITOR: During recent acceptance testing of the Picker SPECT unit, we encountered a defective parallel-hole collimator. Data from our recent experience with a defective parallel-hole collimator is provided in the discussion below. A simple approach to test the integrity and acceptability of the collimator in the SPECT environment and detect two major problems with defective collimators is suggested.