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Radiochemical Purity of Technetium-99m-HMPAO Depends on Specific Activity

TO THE EDITOR: Radiochemical purity (RCP) quality control is routinely carried out before administering ^{99m}Tc-HMPAO. After following kit instructions for labeling (*1*), we observed a low RCP related to the use of pertechnetate eluates obtained approximately 24 hr after the previous elution (generator in-growth 24 hr). We suspected that the technetium used was not of sufficient quality due to radiolysis or an excess of ^{99}Tc (i.e., low-specific activity ^{99m}Tc), so we decided to use only the second eluates obtained within 1–4 hr after the previous elution (generator in-growth 1–4 hr).

Quality control of RCP was carried out using the method of extraction with chloroform by Ballinguer (*2*). The correlation obtained from a study carried out previously in our laboratory when this method was compared with the chromatographic method of Neirinkx (*3*) was:

$$y\ (\text{Chromatographic Method}) = 0.909\ x\ (\text{Extraction Method}) + 6.36, \quad \text{Eq. 1}$$

where $r = 0.986$, $p < 10^{-6}$, and $n = 27$.

Labeling carried out with technetium obtained with a generator in-growth 24 hr (22.6 ± 2.6) gave:

$$RCP = 85.2\% \pm 16.4\%\ (n = 42). \quad \text{Eq. 2}$$

In 15 preparations, the RCP was <90% and in 10 preparations <80% (Table 1). The results were analyzed for the effect of total amount of radioactivity. No statistical significant difference in RCP was found between both groups.

Labeling with technetium obtained with a generator in-growth 1–4 hr (2.5 ± 0.7) gave:

$$RCP = 93.9\% \pm 1.6\%\ (n = 181). \quad \text{Eq. 3}$$

Only one preparation resulted in a RCP <90%. Table 2 shows various preparations according to the radioactivity used for labeling.

TABLE 1
RCP for Two Pertechnetate Eluates

Activity (MBq)	Generator in-growth (hr)	RCP %	n
1087 ± 159	23.9 ± 2.1	83.3 ± 18.4	22
2723 ± 533	22.6 ± 2.5	87.3 ± 13.7	20

TABLE 2
Various Pertechnetate Preparations

Activity (MBq)	RCP %	n
1591 ± 222	92.0% ± 1.4	5
2216 ± 44	93.6% ± 1.5	94
2941 ± 78	94.3% ± 1.4	77
3626 ± 148	94.0% ± 1.8	5

To obtain high RCP with ^{99m}Tc-HMPAO, an elution obtained a few hours after the previous elution (within 1–4 hr) should be used. This permits an increase of radioactivity labeling to at least 3000 MBq. Furthermore, this would represent a considerable economic saving since it would result in several doses from a single vial.

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Renal Clearance of Technetium-99m-MAG3: Normal Values

TO THE EDITOR: We are frequently asked about normal values for ^{99m}Tc-MAG3 clearance. Technetium-99m-MAG3 has become the renal agent of choice in many clinical contexts. Its clearance, easily calculated from a single timed blood sample, can be used directly as a measure of renal function and can also be converted to effective renal plasma flow (ERPF) by applying a correction factor (*1*).

When ^{99m}Tc-MAG3 clearance (C_{MAG3}) is converted to ERPF (or C_{PAH}), conventional normal values for ERPF can be employed, such as the normal values obtained at this center from OIH clearance (C_{OIH}) in a series of normal transplant donors (*2*). Since renal donors have such extensive presurgical evaluation, they constitute a normal reference population in which renal disease has been truly ruled out.

We now have accumulated enough experience with ^{99m}Tc-MAG3 in transplant donors to report normal values measured directly with ^{99m}Tc-MAG3 rather than with OIH. Data from 200 donors were reviewed (86 male, 114 female, ranging in age from 20 to 66 yr). C_{MAG3} was calculated from a single 45-min blood sample by two methods (*3–5*) and ERPF was estimated by a third method (*6*). Normal values are reported for each method.

At our clinic, ERPF has been measured routinely for many years with the Tauxe one-sample method using ^{131}I-OIH. The Tauxe ERPF formula yields values about 10% higher than true C_{OIH} (*1*), compensating for the difference between C_{OIH} and C_{PAH} (*7*). When we switched from OIH to ^{99m}Tc-MAG3, we