Of course, an advanced gamma camera system rather than a rectilinear scanner should be used if a valid comparison is to be made with computerized tomographic equipment just a few months off the production line.

The above comments are not meant to belittle the definite advancement in noninvasive imaging represented by computerized axial tomography. However, the definitive comparison of the CTT with advanced cerebral scintigraphy has yet to be made.

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Radiochemical Purity of Technetium Pyrophosphate

In a recent editorial, Eckelman called for more stringent criteria for radiochemical purity (*1*). He proposed as a necessary criterion the demonstration of a single discrete band in two different chromatographic systems, in neither of which the agent remained fixed to the support nor moved with the solvent front. Existing analytical methods often fall short of these requirements. The technetium phosphate bone-scanning agents are a case in point. No analytical methods meeting Eckelman's criterion have been described for these agents.

We have found two column chromatographic systems in which technetium pyrophosphate gives peaks that are neither at the void volume nor at the origin, and thus can demonstrate chemical heterogeneity of the technetium pyrophosphate preparation used routinely in our clinic. The present methods are slow and impractical for routine use, but they yield interesting results and with further development should lead to rapid methods.

The accompanying figure shows two chromatograms of a technetium pyrophosphate preparation. Curve A is the elution profile for a column of Bio-Rad DEAE-cellulose eluted with de-aerated 0.1 *M* $Na_4P_2O_7$ (pH adjusted to 7.0 with HCl). Curve B is the elution profile for a column of Fisher Rexyn CG-3 eluted with de-aerated 0.1 *M* $Na_4P_2O_7$, 0.1 *M* KNO_3 (adjusted to pH 7.0 with HCl). Only the pyrophosphate peaks are shown; the initial portion (including the void volume) and the later portion (including a peak for free pertechnetate) are not included.

Although both methods are based on ion exchange, there is enough difference in substrate (polystyrene vs. cellulose) to perhaps allow distinction as two distinct methods and thereby meet Eckelman's criterion. A method of even higher resolution is desirable, however, since there is a suggestion of a third component preceding the major peak in Curve B. Further development is needed for routine use, aimed at both higher resolution and greater speed. We would appreciate hearing from other investigators of progress along these lines.

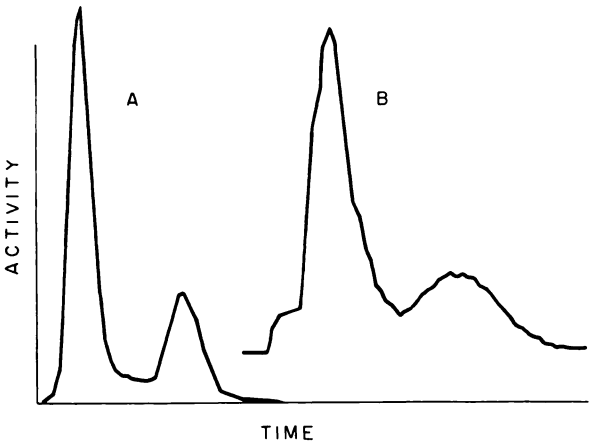

FIG. 1. Chromatograms of technetium pyrophosphate on two different ion-exchange media.

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Calculation of Radioactive Decay with a Pocket Calculator

Radioactive decay is customarily expressed by the equation

$$A = A_o\, e^{-\lambda t}, \qquad (1)$$

where t = time; λ = decay constant in t^{-1} units; A = activity, usually μCi or mCi; A_o = activity at $t = 0$; and e = 2.718 . . . , the natural logarithm base.

However, the decay parameter most readily available is not λ, but the half-life, T. Therefore, the relationship $\lambda T = \ln 2 = 0.693$ . . . is invoked and the decay equation becomes

$$A = A_o\, e^{-0.693\, t/T}. \qquad (2)$$

From this it would appear that the way to calculate A, given A_o, t, and T, is first to determine $x = -0.693\ t/T$ and then to obtain A/A_o from e^x. However, a simplifying feature that is overlooked in this procedure is that $e^{-0.693} = \frac{1}{2}$, and the decay equation may therefore be expressed as

$$A = A_o\, (\tfrac{1}{2})^{t/T}. \qquad (3)$$

Thus, if a pocket calculator having a y^x function is used, A/A_o may be calculated simply by entering 0.5 as y, calculating t/T as x, and calling y^x. This saves several steps when compared with using Eq. 2. For negative values of t, the same procedure works, but alternatively the number 2 may be entered as y and the absolute value of t used.

These procedures are similar to the slide-rule method of setting T against 0.5 or 2.0 on a log-log scale and reading