100°C water bath for 3½ min. Cool in running water for 5 min. Add 0.1 ml of albumin and shake vigorously. Add 2 cc phosphate buffer and shake again. The amount of albumin added is adequate for a final volume of 7 cc. Larger volumes of ^{99m}Tc require additional reagents in the same proportion.

It is suggested that the reagents be ordered in amounts that will be used over a 1-month period. Storage for a longer time, particularly of the buffer, increases the possibility of a chemical breakdown. There should be no interchange between old and new batches of reagents.

SUMMARY

A nontoxic stabilizer for the ^{99m}Tc-sulfur suspension has been found. Addition of human serum albumin stabilizes the suspension for 6 hr or longer. Reaction-free liver-scanning material is now available for better-quality scans. The ability to make the preparation on a one-time daily basis is a major advantage to any productive isotope clinic.

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TIME FACTOR AND ITS RELATION TO ABSORBED DOSE

In a recent letter to the Journal (*J. Nucl. Med.* **9**:499, 1968) King and O'Foghludha discuss the time factor in relation to the absorbed dose in procedures in nuclear medicine. While the matter certainly deserves consideration particularly with respect to therapeutic procedures, I feel, as I think others do, that in the case of diagnostic isotope tests it is important to keep a proper perspective.

In diagnostic radiology doses of the same order as those in many isotope procedures (300 mrads) have been and are being given in times smaller by a factor of around 20,000 even in comparison with an isotope with a half-life as short as 1 hr. Moreover, in special radiological procedures 20 or more of these doses may be given in a few minutes, and in fluoroscopy up to 25 rads or more have been and are frequently given in similar periods of time.

Literally millions of these cases are available as evidence and are being added to daily by the thousands. On the other hand, the number of patients receiving isotopes, while it is growing, is still considerably less than those being examined by x-rays so that if restraint is going to be exercised on this point, surely the logical place to start is in diagnostic radiology, not only in respect to the time relationship but to the total dose administered.

While remembering that other factors such as homogeneity, distribution and type of radiation differ between diagnostic radiology and diagnostic nuclear medicine, it is perhaps time that controls and conditions imposed on the two fields should be brought somewhat closer together. Which is to move? Perhaps, hopefully, both diagnostic nuclear medicine and diagnostic radiology will move from the extreme positions of no control and somewhat repressive control that they hold at present.

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RETENTION AND STORAGE SITES OF RADIOACTIVE POLYVINYLPYRROLIDONE

The authors of the article "Retention and Storage Sites of Radioactive Polyvinylpyrrolidone" (*1*) report the results of whole-body retention, organ content and excretion measurements on mice and rats as well as of urine and fecal excretion and (in 2 cases) blood clearance in humans. They refer to Tothill's work (*2*) and disagree with his assumption that all the polymer retained in the body (50% from 24 hr onwards) was selectively stored in the liver. The authors quote a maximum of 5% of the in-

jected material concentrated in the liver, but it is not quite clear how they arrive at this figure, except by extrapolation from the mice and rat experiments. Our work (*3*), which was carried out at about the same time as Tothill's, using the A_1 ^{131}I-PVP preparation, reports results midway between these two.

Direct measurements were made over the liver; in two patients they were repeated over 13 days and were compared with measurements over a phantom liver in an A.R.L. Manikin. These measurements showed that about 15% of the administered dose is in the liver at 24 hr, and the amount rises to about 22% of the dose at 13 days. Our blood clearance obtained on one patient only—33% at 24 hr and 18% at 48 hr—was slower than reported.

Our general conclusions were similar to those of the authors, but we found the liver uptake to be higher. About half the dose is excreted fairly rapidly, about 20% is taken up more slowly by the liver and some seems to remain circulating in the blood and is slowly excreted. Our estimate for the radiation dose to the liver was 0.02 rads/μCi.

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COMMENT BY TOTHILL ON PVP

Miss McAlister has kindly shown me a copy of her letter so that I am able to supplement, rather than duplicate, her contribution. Hulme *et al* say that they cannot confirm my deduction that most of the retained ^{131}I-PVP is in the liver. It does not seem to me that the evidence they present leads to this conclusion. They confirm my findings that approximately 50% of the A_1 material is retained for a long period and that less than 1% of the administered dose is in the plasma after 4 days. If the same concentration is maintained in extravascular, extracellular space, only a few percent of the dose are accounted for. Where then is the rest?

The means at my disposal at the time of the investigation for determining sites of concentration were rather crude, and it may well be that there was significant localization in, for example, the spleen. As I pointed out in the original paper, concentration in other organs of the reticuloendothelial system would lower the dose to the liver. The reduction factor is likely to be less than two, and not ten as Hulme *et al* suggest. It may be that a rat's liver retains only 5% of the dose, but, sir, I am not a rat!

I agree that, whatever the degree of organ concentration, the radiation dose arising from the amounts used in investigating renal function or protein-losing enteropathy is quite acceptable; my earlier paper aimed to draw attention to the possible high doses arising from the administration of 500 μCi for brain scanning.

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THE AUTHOR'S REPLY

The human data reported in our paper are very similar to the findings of Tothill and markedly different from those of Miss McAlister. The sites of storage of polyvinylpyrrolidone (PVP) are within the reticuloendothelial system and the point of dispute is the proportion of material located within the liver. We quote a value of 5% of the injected material within the liver by extrapolation from animal experiments, confirming the findings of Ravin *et al* who investigated ^{14}C-PVP and, at autopsy, they found 4% of the injected material located within the liver (Table 3, Ref. *1*) and 1.3% within the spleen.

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