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## A REPLY

Dr. Johannsen has clearly demonstrated one of the advantages of gel chromatogram scanning as opposed to elution of the gel column, since it avoids the question of whether the activity retained on the column is hydrolyzed, reduced technetium or whether it is due to a reaction between the Sephadex column and the technetium chelate. If Sephadex is chosen for gel chromatography, then the column scanning technique is faster, since less elution time is required, and the results are unambiguous.

His conclusion, however, that the results he provides indicate that technetium diphosphonate does not exhibit any artifact as in the case of weak complexes is incorrect. The fact that for a total time interval of 30 min 33% of the $^{99m}$Tc remained on the Sephadex column as opposed to 11% on the Bio-Gel column clearly shows that it is a weak complex compared to the $^{99m}$Tc-DTPA (*1*), which showed no association with the Sephadex column other than that of the hydrolyzed, reduced technetium. It would appear, however, that the strength of the $^{99m}$Tc-diphosphonate was more like that of $^{99m}$Tc-glucoheptonate than either the $^{99m}$Tc-pyrophosphate or the $^{99m}$Tc-gluconate (*1*). On the other hand, as has been pointed out by Valk and McRae (*2*), the binding on the Sephadex column depends on a number of undefined parameters, and comparisons of nonidentical systems are not very reliable.

With all chelates there is a definable dissociation constant and related rate constant; it is these constants together with the rate of elution that determine the amount of $^{99m}$Tc left on the column. Steigman and Williams (*3*) correctly point out that if the eluant is a solution of the complexing agent, i.e., diphosphonate in this case, then all the $^{99m}$Tc is recovered from the column. In such a case the technetium that becomes associated with the column material is also subject to dissociation from the column material and if the eluant is a complexing agent it will probably then associate with the eluant rather than reassociate with the column. However, if the eluant is saline then the reduced technetium has only the column material to complex with once the bolus of labeled complexing agent has passed.

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## RADIATION DOSE TO THE LIVER FROM $^{201}$Tl

To show the effectiveness of $^{201}$Tl for myocardial scanning, Bradley-Moore, et al (*1*) have presented data on its retention and distribution in goats and estimated the radiation doses in humans. Because we had also recently calculated the radiation dose from $^{201}$Tl we compared their results with ours. With the exception of the dose to the liver, our results compare well with their published dose estimates. Using the biologic data from their paper, we calculate the liver dose to be 0.43 rads/mCi of $^{201}$Tl administered; their estimate is 0.17 rads/mCi. When we assume that the liver has little or no activity and is only irradiated by activity in surrounding organs and the remainder of the body, we obtain an estimate that agrees with their estimate of 0.17 rads/mCi. However, Table 1 of their paper shows that 15.4% of the $^{201}$Tl is in the liver 25 min after administration. The 0.17 rads/mCi value is apparently the dose to the liver when the activity in the liver is not included in the calculation of the dose.

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