Table 1 shows the binding efficiencies obtained using pertechnetate solutions that had been treated with traces of hydrogen peroxide or sodium hypochlorite to give various voltage readings coupled with New England Nuclear polyphosphate and glucoheptonate kits. In each case, half the maximum volume of pertechnetate recommended was used. It is evident from these data that a voltage outside the range of 0.64–0.67 V indicates an oxidant level that might interfere with radiopharmaceutical labeling, and the pertechnetate should not be used in conjunction with radiopharmaceutical kits.

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Sterilization of Technetium-99m-Labeled Human Serum Albumin by Filtration

Sterilization of technetium-99m radiopharmaceuticals by filtration is a widely used, convenient, and practical technique. One of the most widely used filters for this purpose is the Millipore MF filter with a 0.22-μm pore size. We have found, however, that these Millipore filters suffer from a tendency to chemically absorb a certain amount of human serum albumin (HSA). While this may be unimportant in preparations containing relatively large amounts of human serum albumin (either low-specific-activity or large-quantity preparations) it is very important in small HSA preparations of high specific activity. In this case, a significant amount of the radiopharmaceutical will be retained by the filter, thereby giving a reduced concentration of the product and making necessary a larger injection volume.

TABLE 2. WEIGHT OF ALBUMIN ABSORBED ON MILLIPORE FILTERS

	1st Filter (mg)	2nd Filter (mg)	3rd Filter (mg)
Preparation A			
Calculated weight from radioactivity loss	0.84	0.79	0.81
Experimentally determined weight	0.9	0.8	0.8
Preparation B			
Calculated weight from radioactivity loss	0.72	0.77	0.52
Experimentally determined weight	0.7	0.7	0.5

This phenomenon was investigated using two Tc-99m HSA preparations of different specific activity and two types of sterilizing filters. Preparation A contained 1.4 mg albumin/ml while preparation M contained 0.56 mg albumin/ml, both being prepared using electrolytic labeling with tin electrodes. The sterilizing filters were Millipore MF 0.22 μm, a type prepared from mixed acetate and nitrate esters of cellulose, and Nucleopore 0.2 μm, which is a polycarbonate membrane in which the holes have been produced by an irradiation and etching process. Four milliliters of each Tc-99m HSA solution were passed through a series of three filters of the same type, and the radioactive concentration and percentage of Tc-99m bound to albumin were determined after each filtration. The results recorded in Table 1 show that the Millipore filter removes a relatively large portion of the radioactivity while the Nucleopore filters show no such retention. The radioactive concentration of the solution passing through each filter may be used to calculate the weight of albumin represented by the reduction in radioactive concentration using the equation:

$$\text{Weight of albumin on filter} = \frac{C_o - C_x}{C_o} \times W_o$$

where: C_o = radioactive concentration before filtration; C_x = radioactive concentration after filtration; and W_o = total weight of albumin in preparation before filtration.

Table 2 shows the weight of albumin retained by the Millipore filters, estimated both by the foregoing calculation

TABLE 1. FILTRATION OF TECHNETIUM-99m HUMAN SERUM ALBUMIN

Millipore MF	Conc. before filtration mCi/ml	% Tc bound to albumin	Conc. after 1st filtration mCi/ml	% Tc bound to albumin	Conc. after 2nd filtration mCi/ml	% Tc bound to albumin	Conc. after 3rd filtration mCi/ml	% Tc bound to albumin
Preparation A	3.25	99.5	2.76	99.7	2.30	99.0	1.83	99.3
Preparation B	6.67	98.4	4.53	98.7	2.23	98.7	0.68	98.0
Nucleopore								
Preparation A	3.14	99.4	3.04	99.6	3.03	99.5	3.01	99.4
Preparation B	6.45	98.0	6.34	98.2	6.30	98.1	6.29	98.3

and by drying and weighing previously weighed filters. It can be seen that not only are the calculated and measured weights in good agreement but also that the weights absorbed on the Millipore filters are relatively constant despite considerable change in the total weight of albumin being passed through the filter. Thus, it appears that the filtration of small amounts of high-specific-activity Tc-99m HSA through cellulose-type filters will result in the loss of a significant amount of the labeled albumin—approximately 0.8 mg on a 25-mm-diameter filter.

A similar binding of albumin to cellulose has been reported in the case of paper chromatography by Lin et al. (*1*), who found that pretreatment of the paper with unlabeled albumin avoided the problem. When the same approach was applied here, the radioactivity retained by the filter was reduced to approximately one third of the amount on the untreated filter. It should be noted, however, that such a procedure would result in a loss of specific activity, and is therefore less than optimum where material of high specific activity is desired.

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Using the *S* Tables of MIRD Pamphlet 11

Through the recently published Pamphlet 11 (*1*), the Society of Nuclear Medicine's MIRD Committee has sought to simplify greatly the calculation of absorbed doses from internally administered radionuclides. In this pamphlet, tables of *S*, the mean absorbed dose per unit cumulated activity, have been published for 117 radionuclides, with promises of more in the future. The implication is that to estimate the dose to a target organ from a radionuclide uniformly distributed in a source organ, the user need only calculate the cumulated activity in the source organ and multiply it by the value of *S* from that source organ to the desired target organ. The pamphlet contains a brief summary of the derivation, assumptions, and limitations of the tables, as well as three examples of their use.

We feel that clarification of some of the notations and explanations, especially those of Example 3, may be helpful to those who have occasionally used previous MIRD pamphlets. First, let us emphasize that the tables of Pamphlet 11 combine into each value of *S* the contributions resulting from both penetrating and nonpenetrating emissions, and that nonpenetrating *S* values occur in the tables (A) whenever source and target regions are the same, and (B) in all entries pertaining to the total body. Separate entries for penetrating and nonpenetrating components of *S* for some radionuclides, as well as a more detailed explanation of *S*, are available in ORNL-5000 (*2*).

Second, in Example 3 the value of $\tilde{A}_{bone}$ is listed as 3.0 μCi-h; $\tilde{A}_{bladc} = 0.6$ μCi-h; and $\tilde{A}_{rB} = 0.4$ μCi-h where "the latter represents activity uniformly distributed in the total body, in addition to the activity present in the other organs." In past MIRD publications, the symbol $\tilde{A}_r$ has implied the *total* cumulated activity uniformly distributed in region *r*. Note that Example 3 defines the cumulated activity symbols differently. Recalling the notations of Cloutier et al. (*3*), the cumulated activity values given in Example 3 were previously called $\tilde{A}^*_{bone}$, $\tilde{A}^*_{bladc}$, and $\tilde{A}_{unif}$, where the latter is the cumulated activity uniformly distributed throughout the body, and the first two are the differences between $\tilde{A}_{unif}$ and the total cumulated activities in the bone and bladder contents, respectively. (Note: $\tilde{A}^*_r$ may be either positive or negative, depending on whether the concentration of activity in region *r* is greater or smaller than the concentration that is uniformly distributed in the body. Also $\tilde{A}^*_r = \tilde{A}_r$ if and only if $\tilde{A}_{unif} = 0$, as is the case in Examples 1 and 2 of Pamphlet 11.) As pointed out by Roedler et al. (*4*) these distinctions in cumulated activities affect the final dose estimates most significantly if a large portion of the activity in the body is unaccounted for in specific organs.

In summary, we wish to emphasize: (A) the *S* values of MIRD Pamphlet 11 contain a nonpenetrating component for all total-body entries as well as for those entries in which target and source are the same; and (B) the symbols for the cumulated activities $\tilde{A}_{bone}$, $\tilde{A}_{bladc}$, and $\tilde{A}_{rB}$ as used in Example 3 of this pamphlet replace $\tilde{A}^*_{bone}$, $\tilde{A}^*_{bladc}$, and $\tilde{A}_{unif}$, respectively, describe previously by Cloutier et al. (*3*).

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An Improved FORTRAN Program for Calculating Modulation Transfer Functions

In a recent concise communication by Benedetto and Nusynowitz (*1*) describing a FORTRAN program for cal-