As indicated in the procedure above, the preparation of PVP-stabilized technetium-sulfur colloid requires the addition of PVP as the final constituent; if added with thiosulphate *in lieu* of dextran or gelatin, very poor binding results. Experimental work comparing PVP- and gelatin-stabilized technetium sulfur colloids has shown similar binding on chromatography and comparable specificity of both products for the reticuloendothelial elements of the liver and spleen. The colloid has remained stable for the duration of the working day, and initial trials in patients have yielded excellent scans.

PVP forms a stable colloid in aqueous solution and can be sterilized by autoclaving. Large-scale clinical applications which span three decades reveal no evidence of toxicity or incidence of antigenicity. In the radioiodinated form, PVP has been available as an investigative tool for a number of years.

For the small nuclear medicine department which provides organ-scanning facilities without the benefit of a trained radiopharmacist, the use of PVP as a stabilizer would entail far fewer manipulative procedures than that of gelatin, which, as previously indicated, involves frequent preparation, sterilization and pyrogen testing or makes autoclaving of the final product mandatory before patient use.

PVP may also prove a better substitute for human serum albumin which can be affected adversely by the temperature of the solution to which it is being added, is more expensive and finally should be kept available for therapeutic purposes.

This macromolecule has proved so satisfactory a constituent of technetium-sulfur colloid that we are exploring its potential use in the preparation of indium products. While the current availability of whole blood and human serum albumin has removed PVP from high on the list of priority therapeutic items, its stable physical properties and availability in sterile nonpyrogenic solution ready for intravenous use may render it a versatile, useful reagent on the radiopharmacist's shelf.

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SPECIAL METHODS FOR THE DETERMINATION OF THYROID UPTAKE OF IODINE

Two papers have appeared in the *Journal of Nuclear Medicine* dealing with two presumably high quality, research-type methods for the measurement of thyroidal uptake of iodine (*1,2*). The former method uses two sodium iodide crystals in a 90-deg arrangement, applied to the skin of the patient's neck; the latter uses a lithium-drifted germanium detector that looks at the thyroid isthmus from directly in front (distance not specified). For convenience let us refer to these as the "two-crystal method" and the "germanium method." I have misgivings about both. They are related because thyroid uptakes measured with the two-crystal system are cited as confirming those made with the germanium detector.

The germanium paper discusses several sources of error but fails to mention the problem of the patient's extrathyroidal body background. The detector is described as "uncollimated," and the neck count is taken with the patient straddling the Dewar flask that supports the germanium detector. The Plexiglas phantom in which the dose standard is counted contributes, of course, no extrathyroidal background, and it is not made clear why we should assume that the patient's neck and adjacent areas similarly do not. A 30-hr uptake is reported as 2.0%, implying that it is known to be neither 1.9 nor 2.1%. Thus we are asked to believe, without benefit of evidence, that the extrathyroidal tissues contributed no more than a negligible counting rate in comparison with 2% of the dose. Isn't a reader entitled to just one scrap of experimental evidence to justify this assumption?

A figure of 1.7%, obtained by the two-crystal technique, is offered as confirmation of the 2.0% figure of the germanium study. Accordingly it might be well for us to examine the two-crystal procedure, particularly with regard to its method of handling the body-background problem. In this case the patient's thigh is taken as a stand-in for an athyroid neck, and on page 89 in Ref. *1* we are shown the two spectra. The shapes are similar, but there is quantitative trouble: the ordinate is logarithmic, and when one takes the difference in height between the two curves and compares it with the vertical scale, one finds that the athyroid neck produced a counting rate about twice that of the thigh, all along the line. It appears that the figure for the extrathyroidal background correction is only about half what it should be, and this can cause large errors when the uptake is low. Just how much is this "1.7%" worth?

To make matters worse, the two-crystal procedure uses a faulty formula for the calculation of the uptake (Ref. *1*, page 91, Table 1, line 1). This method attempts to allow for the unknown depth of the patient's thyroid gland by determining "*P/S*," the ratio between the counts under the primary spectral peak and those in a selected scatter band. The ratio was measured, in a plastic phantom, for several source depths, and the resulting graph is used to infer thyroid depth in the patient. But the phantom presents no neck background, so if the theory is to be valid, the patient's nonthyroid spectrum must be stripped from the total neck spectrum before the true *P/S* for the patient can be determined. Supposing that the thigh count could be trusted, then, the *P/S* ratio should be:

$$\frac{\text{Neck} - \text{thigh (both in the 364-keV peak)}}{\text{Neck} - \text{thigh (both in the scatter band)}},$$

or $\frac{N_p - T_p}{N_s - T_s}$. This is by no means identical with the $\frac{N_p}{N_s} - \frac{T_p}{T_s}$ that is offered in Table 1 (*1*).

All in all, it appears that the 1.7% of the two-crystal method can hardly be called firm support for the 2.0% found with the germanium detector. In the germanium paper, *P/S* is calculated, apparently, with no concern whatever for the extrathyroidal background—not even an unreliable thigh count is used.

The two-crystal method, in its turn, is "confirmed" by comparing it with the University of Cincinnati's "standard method," and unfortunately the latter stands on similarly shaky foundations. Its detecting crystal—also described as "uncollimated"—is placed 25 cm from the skin (Ref. *1*, page 87), and thus can receive counts from a wide area of the patient. Body background is determined "with the crystal placed on the thigh," and the thigh count is subtracted from the neck "in the usual way" to obtain the thyroid count. The phantom used in the measurement of the dose standard consists of 100 cc of solution in a flask, with 2 in. of masonite behind it to provide backscatter. Since backscatter is thus intentionally generated, we must assume that it is included in the count (the description being silent on this point), and if backscatter is accepted, the smaller-angle scatter would also be. In the patient's neck there will be scatter, of course, not only from behind but from all other directions as well. In terms of both absorption and scatter, therefore, the counting situation for the standard must differ considerably from that in the patient's neck, which the phantom is supposed to imitate.

In view of these shortcomings, nobody should be astonished to find the "standard" method's uptakes reaching up to, and above, 100% (Ref. *1*, page 94, Fig. 10). Perhaps, in this figure, we should remove the four points that are suspiciously close to 100%, and where would the regression line lie then?

"With the reliability of the system proven" (Ref. *1*, page 93), the two-crystal method proceeds to tackle a 1-month-old premature infant. There is no hint of awareness that a smaller phantom might be advisable, that the salivary glands and other unwanted structures might intrude into the field of vision of the 3-in. detectors, that the equivalence between thigh and neck might well be re-examined, etc., etc.; the claim for versatility is staked without a shadow of supporting evidence. The data are plotted out (*ibid.*, page 96, Fig. 11) and solemnly discussed, and the graph assures us, among other things, that the whole-body count *increased* with time, becoming more than twice as high on Day 17 as it was on Day 3. In my high-school days we had a quip about pink alligators . . .

New methods are to be welcomed once their validity has been properly established. It appears that the procedures referred to are in dire need of help in the validation department.

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