

FIG. 2. Schematic of remote start circuit.

simple direct-coupled bistable. With switch S1 closed, momentary depression of the "stop" button removes the base drive from Q2, turning it off and allowing Q1 to turn on through R2. Q1 maintains the ground at point R when the camera is switched to "auto". Actuation of ribbon switch S2 turns on Q2, turning

off Q1 to remove the ground and permit normal operation.

Lamp L1 facilitates determination by the technologist that the circuit is active. Component values were dictated by convenience and are not critical, and the circuit draws only minimal power from the Pho/Gamma supplies.

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ADAPTATION OF A WELL COUNTER FOR MEASUREMENT OF CARDIAC OUTPUT

In their paper on cardiac output determination using short-lived radionuclides (1), Myers and colleagues measured the activity passing through the arteriovenous line by winding the tubing around a scintillation crystal. The same measurement can be made using a standard well counter, fitted with an easily machined perspex former to hold the tubing in position. Details of such a former and its position when in use are shown in Figs. 1A and B.

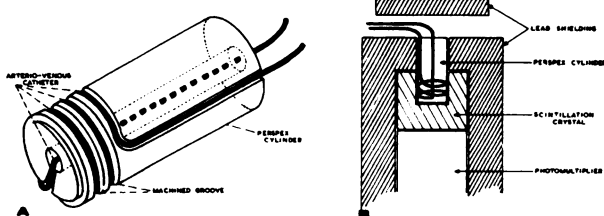


FIG. 1. (A) Enlarged view of perspex former. (B) Schematic diagram showing former in position within well counter.

This arrangement has the following advantages:

1. A purpose-built piece of apparatus is not necessary as any well counter can be adapted. It can still be used in the normal way for sample counting at other times.
2. The geometry is such that the counting efficiency is more than twice as great as when the tubing is wound round the scintillation crystal.
3. As the perspex former is removable the tubing can easily be changed. If desired, fresh sterile tubing can be inserted before each patient measurement.

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1. MYERS JH, STEADHAM RE, BLACKWELL LH: Usefulness and reliability of short-lived radionuclides for cardiac output determination. *J Nucl Med* 12: 591-595, 1971

SULFUR COLLOID FLOCCULATION DUE TO ACID-LEACHED ALUMINUM

Kits for the rapid preparation of routinely formulated radiopharmaceutical products have grown in popularity over the last several years. A kit for the preparation of ^{99m}Tc -sulfur-colloid has recently been marketed which contains syringes with an aluminum disposable needle attached to the glass barrel of the syringe by means of an aluminum crimp. One of the syringes in the kit contains 2 ml of sterile 0.25 N

hydrochloric acid. In a large percentage of the kits received in this laboratory, the acid syringe leaks when pressure is applied during use of the syringe to prepare the sulfur colloid product. The leak occurs around the aluminum crimp previously mentioned and is not evident until attempted use.

Recently, a batch of ^{99m}Tc -sulfur-colloid was prepared using a leaking acid syringe and another (non-

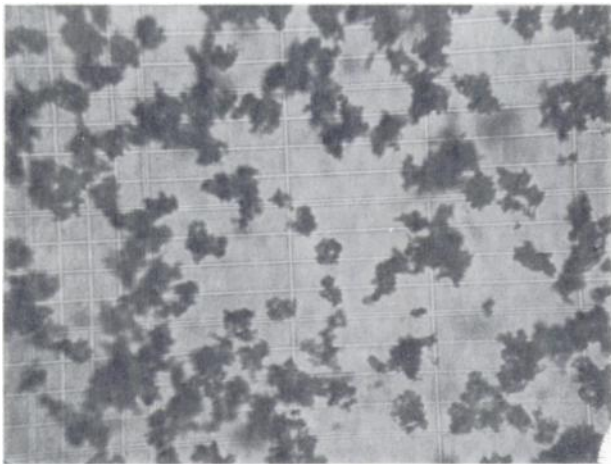


FIG. 1. Macroaggregates of ^{99m}Tc -sulfur-colloid resulting from excess of aluminum (10 \times magnification).

leaking) syringe to provide the needed volume of acid. The volume used from the leaking syringe was estimated to have been about 1 ml. After the prepared sulfur colloid had been at room temperature for 30 to 45 min, a flocculent precipitate was noted to be forming.

Estimation of the particle size of the flocculent was done using a binocular microscope and a conventional hemocytometer with a 50-micron grid. Many aggregates up to 150 microns were evident from the photomicrograph (Fig. 1). Similar results have been previously seen in other batches prepared in this laboratory.

Quantification of the aluminum content of the pertechnetate used, the finished product and of the remaining acid in the leaky syringe was done by spectroscopy. The pertechnetate was not found to contain aluminum. The supernate from the finished sulfur colloid preparation was found to contain 10 to 15 μg of aluminum/ml, inferring an aluminum content of about 95–140 μg in the preparation. The acid remaining in the leaky syringe was estimated to contain at least 100 μg of aluminum/ml, inferring about 100–120 μg of aluminum in the prepared colloid. Previous experimentation in this laboratory

has indicated that this level of aluminum usually results in flocculation when using this kit.

This occurrence illustrates the possibility that sufficient aluminum may be leached from the crimp and/or needle to result in an unusable preparation, as evidenced by the formation of a flocculent precipitate. The flocculent precipitate may be formed so slowly that one or more patients could receive the product before the problem became evident.

We feel that the best approach, in the event of a leaking acid syringe, is to start over, using another kit, with a nonleaking acid syringe.

Another component of the kit is a syringe containing 2 ml of phosphate buffer solution (66 mg/ml of dibasic sodium phosphate and 1 mg/ml of monobasic sodium phosphate). This syringe, on numerous occasions, has also been observed to leak when pressure is applied during the production of sulfur colloid. The problems associated with a leaking buffer syringe involve product stability and may be avoided if the final pH of the product is checked with appropriate pH indicator paper. In the event that the pH is below 6, sufficient buffer from another syringe can be used to adjust the final pH to between 6.2 and 6.6.

The availability of ^{99m}Tc -sulfur colloid kits has enabled nuclear medicine laboratories to use this valuable radiopharmaceutical with some degree of safety and reliability, which previously may have been unavailable to them. However, the usefulness of these kits may be diminished by a deficiency in any of its component parts, including the packaging. It is incumbent on each user of commercial kits to carefully examine every component of the kit before and during use, and to institute quality control procedures, so that the highest quality of radiopharmaceutical is assured.

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