Comments and Communications

Planchets for Radioactive Material

Radioactive materials are commonly put on or into flat or cupped planchets for convenience in handling and to obtain uniform conditions during activity measurements. These planchets are made of glass or some metal such as steel or copper. According to Albert Margnatti (*Tracerlog No. 22,* October, 1949) the best material for this purpose is one with the lowest possible atomic number, because backscattering is thus reduced. On this basis, aluminum becomes the material of choice.

In using planchets of glass or sheet metal, economy requires that they be cleaned and reused if possible. Much time and work could be saved if the planchet were disposable. After some experimentation, the writers have succeeded in producing planchets of aluminum foil which are so easily and cheaply made that they can be discarded after use.

The material finally selected was aluminum foil 0.001 in. thick. This can be purchased at grocery stores in rolls 1 ft wide and 25 ft long. Dies for forming the planchets were made as shown in Fig. 1. The upper

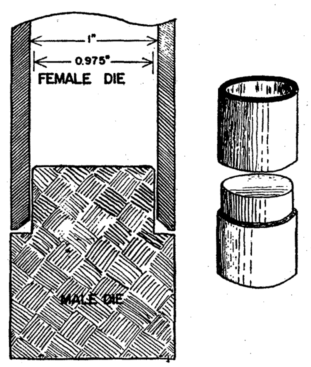

FIG. 1.

part is a 6-in. length of metal tubing with an inside diam of 1 in. The inner edge of one end is beveled slightly. The lower part is a 1¼-in. round steel bar with ½ in. of the end turned down to 0.975 in. Again the sharp edge is beveled slightly. The loose fit permits crimping of the cup without tearing of the foil.

Aluminum foil disks 1½ in. diam are cut on a sheet metal punch. By folding large strips of the foil into packs as many as 50 disks can be cut at once. After separation, these disks are placed on the die and formed. The crimped edges of the cup give it sufficient rigidity for most uses, and heavier cups can be made in the same dies by using two or more thicknesses of the foil, or heavier foil. Flat planchets must be made of foil at least 0.005 in. thick.

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Note on the Freezing Point of Citrate Solutions Used in the Dilution of Bull's Semen

In a recent paper on the freezing point of bull's semen and of the sodium citrate solutions used in diluting the semen for artificial insemination purposes, G. W. Salisbury, C. B. Knodt, and R. W. Bratton (*J. animal Sci.,* 1948, 7, 283) have stated that "heating sodium citrate solutions increases their osmotic pressure. For heated solutions 2.9 grams of $Na_3C_6H_5O_7 \cdot 2H_2O$ per 100 ml of water distilled in glass is isotonic with blood." In view of the stable nature of sodium citrate, it appeared unlikely that the number of osmotically active particles should increase irreversibly when solutions of the salt were heat-treated. This point, which is of interest in connection with research in progress here on semen diluents, was, therefore, investigated by experiment.

Freezing points were determined by the Hortvet technique as used for milk in an improved model of the cryoscope developed at this institute (Temple, P. L. *Analyst,* 1937, 62, 709). The thermometer had been standardized at the National Physical Laboratory, and all thermometer readings were corrected to the International Temperature Scale as recommended by R. Aschaffenburg and J. A. Hall (*Analyst,* 1949, 74, 380). The freezing point of water was determined at the beginning and end of each set of tests.

EXPERIMENT 1

Solution A. $Na_3C_6H_5O_7 \cdot 2H_2O$ of reagent quality (2.9 g) was made up to 100 ml with glass-distilled water at 15° C.

Solution B. $Na_3C_6H_5O_7 \cdot 2H_2O$ (2.9 g) was dissolved in boiling distilled water, transferred with hot water (just off the boil) to a 100-ml measuring flask and, after cooling, made up to the mark.

Freezing point depressions in degrees Centigrade:

	Solution A	B
	0.525	0.525
	0.524	0.527
	0.525	0.525
Mean	0.525	0.526

EXPERIMENT 2

Solution C. Made up like Solution A, Experiment 1.

Solution D. Made up like Solution A, Experiment 1. The flask containing the solution was then immersed in boiling water for 6 hr, cooled to 15° C, and made up to the mark.

Freezing point depressions in degrees Centigrade:

	Solution C	D
	0.527	0.526
	0.525	0.527
	0.527	0.528
Mean	0.526	0.527

It must be concluded that heating sodium citrate solutions does not increase their osmotic pressure, and that solutions containing 2.9 g per 100 ml—whether they have been heated or not—are not isotonic with bull's blood which, according to Salisbury *et al.* (1948), has a mean freezing point depression of 0.56° C.

Nevertheless, in making up egg yolk-citrate diluents for semen, the use of solutions containing 2.9 g of $Na_3C_6H_5O_7 \cdot 2H_2O$ per 100 ml appears *theoretically* sounder than that of solutions containing 3.6 g (as earlier recommended by C. B. Knodt and G. W. Salisbury [*J. Dairy Sci.*, 1946, **29**, 285]) for which a freezing point depression of 0.645° C was found by the Hortvet technique. Since egg yolk has an average freezing point depression of 0.60° C (Needham, J., and Smith, M. *J. exp. Biol.*, 1931, **8**, 286), mixtures of equal parts of yolk and 2.9% citrate solution with a freezing point depression of 0.526° C are likely to be nearly isotonic with fresh bull's semen which has an osmotic pressure equal to, or slightly higher than, bovine blood (Salisbury *et al.*, 1948). Mixtures of equal parts of yolk and 3.6% citrate solution, on the other hand, are clearly hypertonic to semen. Whether this point is of *practical* importance, however, remains to be seen. The good results of artificial insemination obtained in the past with 3.6% citrate solution suggest that, within limits, bull's semen is not very sensitive to variations in the tonicity of the diluent.

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A Simple Method for Opening Quartz Capsules Containing Radioactive Materials

The authors encountered considerable difficulty in opening capsules containing either irradiated red phosphorus or phosphorus pentasulfide obtained by service irradiation at Oak Ridge National Laboratories on authorization from the Atomic Energy Commission. These materials were submitted for service irradiation sealed in quartz capsules of less than 3 in. in length and ½ in. in diam, packed under nitrogen at less than atmospheric pressure. The phosphorus was obtained in 1-g lots with an activity of 50 mc, and the phosphorus pentasulfide was obtained in a 4-g sample with an activity of 150 mc.

The apparatus shown in the accompanying drawing was used to open the sample of P_2S_5 without any laboratory or personnel contamination and also served to minimize the exposure of the operator's hands. (The survey meter read less than 2 mr/hr outside the case.)

After unpacking, the quartz capsule (Fig. 1, *4*) was placed in a hole of the proper dimensions in a lucite rod (Fig. 1, *5*) 1½ in. × 2½ in. A cement of lucite dissolved in chloroform was used to secure the capsule in the lucite rod. This lucite rod was placed in a lucite box (Fig. 1, *7*) 4 in. × 4 in. × 4 in. with walls ½ in. thick. This box was equipped with a retaining screw for holding the lucite rod and with a filter packed with glass wool (Fig. 1, *8*) to remove any radioactive materials that might be dispersed when the capsule was opened. The filter was con-

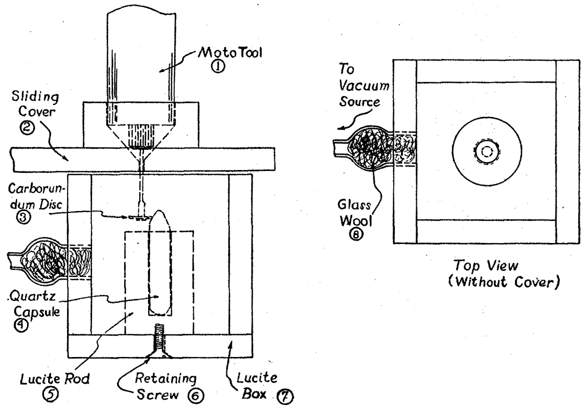

FIG. 1.

nected to a vacuum source to insure a flow of air into the box through the shaft opening and at the junction between the cover and the box. The sliding cover (Fig. 1, *2*) was of ½-in. lucite, 6 in. × 6 in. A Dremel Moto Tool, or equivalent, was mounted on the sliding cover with the shaft projecting into the box. A carborundum cutting disk (Fig. 1, *3*) was mounted on the shaft, which was ~~positioned in the chuck so as to bring the cutting disk in~~ proper alignment with the quartz capsule. The cover was then placed on the box slightly off center so as to bring the edge of the carborundum disk into contact with the side of the quartz capsule. The sliding cover was then moved slowly so that the carborundum disk cut a groove completely around the capsule.

The authors have found it desirable to cut the top off completely with the cutting tool rather than break it at the groove by a sharp blow, since the sudden rush of air into the capsule tends to disperse the radioactive material. After the top is sawed off, the retaining screw is loosened and the lucite rod is removed with tongs to transfer the radioactive materials to the reaction flasks.

For gamma emitters the box and sliding lid can be constructed of lead, with lucite employed for the side of the box away from the operator in order to provide light. A lead-glass observation window in the front or a mirror placed behind the box would enable the operator to observe the position of the carborundum disk and the progress of the cutting operation.

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Water-soluble Riboflavin Derivative

The recent paper "A Very Water-soluble Riboflavin Derivative" by George B. Stone (*Science*, 1950, **111**, 283) prompts us to report our own findings, which have a relation to his. During our search for water-soluble, biologically active riboflavin derivatives, which resulted in the preparation of methylol derivatives of riboflavin (Schoen, K., and Gordon, S. M. *Arch. Biochem.*, 1949, **22**, 149) we prepared in 1947 a riboflavin sulfate ester by essentially the same method as reported by Stone.