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Vial Rinser for Reuse of Scintillation Vials

While some users of liquid scintillation counting vials discard each vial after use, others prefer to wash and reuse their vials. A typical automatic laboratory washing machine can wash 100 vials in one load at low cost. It seems unwise to empty radioactive vials into a waste bottle and then load them directly into the machine, as the adhering radioactivity is likely to contaminate clean areas in the wash room. Since washers generally recycle part of the wash water, radioactivity can accumulate to an appreciable extent in the machine's reservoir. We prerinse each vial with aqueous detergent solution prior to loading the vials into the washing machine. The section below describes the rinsing device and gives some idea of its effectiveness.

Cold water from the house line is led to an electrically operated solenoid valve, then to a garden spraying device, then to the rinser shown in Fig. 1. The spraying device (such as the Ortho "spray-ette 4") is of the type that is ordinarily attached to a garden hose for spraying a concentrated solution of insecticide or weed poison. As the water from the house supply goes through the sprayer, it dilutes (in our case) a concentrated solution of detergent and the mixture spurts out through the rinser, which has a central jet at the bottom and three side holes (A) in the inner wall. When an emptied radioactive vial is placed mouth down in the rinser, and the solenoid valve is activated by a foot switch, the jets of detergent solution rinse the inner, and part of the outer, surfaces of the vial. More details follow.

The cold water supply should exit through an adjustable valve, to enable shutting off the water when the system is not in use, and to adjust the flow rate. The flow of water should be sufficient to produce a reasonable jet in the rinser; too low a flow will prevent the aspirator effect needed for the spray action. The low flow rate will be recognized by entrance of water into the spray bottle and leakage out the top. The vertical jet stream should be strong enough to hit the bottom of the vial but without hurling the vial out of the rinser. A large solenoid valve is needed, such as the Skinner Electric L2DA4150 (a ½ in. orifice valve).

The solenoid valve is connected to the water by ¼ in. polyethylene tubing by means of plastic compression fittings, but a few pipe fittings will be needed to go from this tubing to the spray bottle, which is fitted

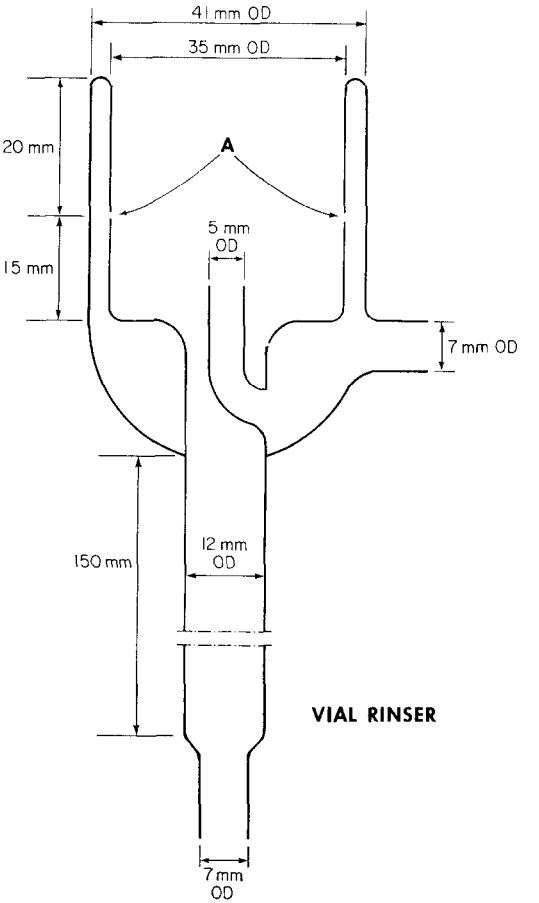

FIG. 1. Scintillation vial rinser. The water-detergent mixture enters through the side arm on the right and spurts out through the vertical center tube and three holes, *A* (only two of which are shown). The holes are made in the inner tube before sealing it to the outer tube by "drilling" with a heated tungsten wire 1/16 in. diam. The entire device is mounted on a small support stand in the sink and a rubber tube attached to the bottom carries the rinse liquid directly into the sink drain. A small washer-shaped piece of metal screening (not shown) rests on the bottom of the inner section and the scintillation vial mouth rests on it during the rinsing operation. The rinser may be obtained from our glassblower, Mr. Peter Severn, 2221 E. Engineering, University of Michigan.

with a hose connection. These fittings can be obtained from hardware stores, which also sell the lawn sprayer. Our sprayer is of the 4-gal size, which we fill with 8 fluid oz of Micro (International Products Corp., Trenton, NJ) and then with water to the top of the bottle. The sprayer

bottle is not actually 4 gal in volume, but *delivers* 4 gal of diluted detergent. Lately many detergent concentrates for washing laboratory glassware have been offered and it is possible that another brand would be better. The sprayer outlet leads to Tygon tubing to the rinser. It is necessary to plug the finger hole on the sprayer with a small stopper (Arthur H. Thomas Co. microstopper).

The sprayer normally leaks a small amount of water (not detergent) from the air intake, so we cover this with aluminum foil and support the sprayer above the sink.

Users should be warned to avoid losing the small wire screen at the bottom of the jet.

Tests of the effectiveness of rinsing were made by pouring out the contents of highly radioactive vials (into storage bottles for later disposal), rinsing the vials as described above, storing the vials briefly mouth down on a paper towel, then adding scintillation solvent and recounting. The solvent used consisted of 0.5 ml water and 11 ml of a toluene scintillant containing Bio-Solv BBS-3 (Beckman Instruments, Inc.). When vials previously filled with high levels of tritium compounds were rinsed and counted, no activity could be detected. When similar vials containing ^{32}P compounds were counted, residual activity ranging between 0.02% and 1.6% was found. Evidently some substances are adsorbed fairly strongly but are removed completely by the hot detergent used in the washing machine. At any rate, the rinsing device removes the loosely bound ^{32}P that would otherwise contaminate the washing area. It is probably safest to let ^{32}P vials decay to 10,000 cpm or less before washing them.

The use of glass for fabricating the rinser might seem dangerous on the basis of fragility, but our rinser has been used for many months with many thousands of vials without damage. No doubt a similar one could be made of metal; the dimensions should not be changed much because the spray device does not work if the resistance to flow is increased appreciably. A metal rinser built to rinse two vials simultaneously would be useful for a large laboratory. However the limiting speed factor is the time required to unscrew and empty the vials.

When large numbers of vials are handled, the scintillation solvent odor becomes obnoxious. We have minimized this problem by installing a kitchen range hood above the sink (vented to an air exhaust) and by emptying the vials with a suction tube connected to the disposal bottle furnished by our Radiation Control Service. Neoprene tubing or Viton tubing is suitable for the suction tube.

We found that some lab assistants skimp on the rinse time and may

produce incompletely rinsed glassware. We therefore installed a 2-sec self-resetting timer switch between the foot switch and the solenoid valve (circuit diagram available on request).

The reader might prefer to use a floor-mounted water valve (BL-5000-2, T & S Brass and Bronze Works, Westbury, L.I., N.Y.) instead of the electrically controlled water valve. This too is operated by a single push with the foot.

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