Safe, Convenient Pipetting Device

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A finger-mounted pipetting device which can be fabricated in the laboratory is described.

Devices designed to control and contain biological agents being worked with in many laboratories must possess a high degree of user convenience if they are to become widely accepted. Experience has shown that safety devices that are inconvenient or time consuming to use are frequently cast aside at the earliest opportunity. An ideal safety pipettor cannot be less accurate or less convenient than mouth pipetting if it is to gain the desired acceptance in a biological laboratory.

The finger-mounted pipettor described in this note (Fig. 1) offered the greatest level of safety and pipetting convenience when compared with a number of other safety pipetting devices.

The original concept of a finger-mounted pipettor was developed several years ago by safety personnel at Fort Detrick, Frederick, Md. The first finger-mounted pipettor, constructed primarily of brass, had to be fabricated in a shop with tools and equipment not commonly found in most laboratories.

The pipettor described in this note was constructed of autoclavable polycarbonate (PC) plastic that has a heat distortion temperature of 270 to 280 °F (160.8 to 170.3 °C). When heated to this temperature, this plastic was quite easily molded to the desired shape. PC plastic can be cemented with dichloromethane (CH₂Cl₂) and easily shaped with simple hand tools usually available in most laboratories.

Fabrication procedures. A 0.625-inch (1.6 cm) piece of PC plastic tubing with an internal diameter (ID) of 0.75 inch (1.9 cm) was split longitudinally, and a 0.25-inch (0.64 cm) section of the wall was removed. The “C”-shaped ring of plastic was then placed over a steel bar mold (Fig. 2, detail 1) and heated to its distortion temperature. A modified hose clamp was then tightened over the plastic to maintain the desired shape until it cooled. The ring was then shaped to its final form by using a small carborundum grinder.

A 0.188-inch (0.41 cm) piece of PC tubing (0.5-inch (1.27 cm) ID) was cemented onto the flattened surface of the ring. A 0.125-inch (0.32 cm) hole was drilled into the tubing at its juncture with the ring (Fig. 2, detail 2).

The point was removed from a 2.5-inch (6.4 cm), 18-gauge needle, and it was shaped to fit the contour of the ring. The needle was inserted into a 1-inch (2.54 cm) piece of 0.125-inch ID poly-

FIG. 1. Finger-mounted pipettor.

vinyl chloride (PVC) tubing. The end of the needle, enclosed in the PVC tubing, was inserted into the hole in the tube (0.5-inch ID) and cemented securely to the side of the ring (Fig. 2, detail 2).

A size B vaccine bottle stopper was used to form
the suction cup of the pipettor. It was modified as illustrated in Fig. 2, detail 3.

A wrist clip, to support the vacuum tube and in-line filter, was made from a piece of PC plastic (0.125 by 0.438 by 7 inches; 0.32 by 1.13 by 17.78 cm). It was heated and formed on a wooden mold (Fig. 2, detail 4).

The in-line filter housing, a 1.5-inch piece of PC plastic tubing [0.25-inch outer diameter (OD)] secured in the center of a 0.75-inch diameter, 0.375-inch (0.953 cm) thick ring of PC plastic, was mounted on top of the wrist clip. Loosely packed cotton, inserted into the 0.25-inch OD tubing, served as the filter medium (Fig. 2, detail 5).

A 6-inch (15.24 cm) piece of 0.25-inch latex rubber tubing was used to connect the 18-gauge needle to one end of the filter housing. A 30-inch (76.2 cm) piece of 0.25-inch latex rubber tubing, fitted with a mouthpiece or attached to a vacuum source, was attached to the other end of the filter housing (Fig. 2, detail 6).

Material list. PC tubing (Cadillac Plastic and Chemical Co., Detroit, Mich.): 0.75-inch ID, 0.875-inch OD, 0.625-inch long; 0.5-inch ID, 0.625-inch OD, 0.188 inch long; 0.125-inch ID, 0.25-inch OD, 1.5 inches-long. PC sheeting (Cadillac Plastic and Chemical Co.): 0.125 by 0.438 by 7 inches. PC rod (Cadillac Plastic and Chemical Co.): 0.75-inch diameter; 0.375-inch long. PVC tubing (Cadillac Plastic and Chemical Co.): 0.063-inch ID, 0.125-inch OD, 1 inch long. Latex tubing: 0.125-inch ID, 0.25-inch OD, 36 inches long. Hypodermic needle: 18 gauge; 2.5 inches long. Vaccine bottle stopper: size B. Dichloromethane (CH₂Cl₂). Vinyl to dissimilar material cement (Cadillac Plastic and Chemical Co.).

This pipettor functions much like a mouth port with the suction cup located between the first and second joint of the index finger. To operate, the delivery end of the pipette is placed in the fluid and the opposite end in the pipettor. When the desired fluid level is reached, the end of the pipette is transferred from the pipettor to below the first joint of the index finger, and fluid can be drained from the pipette as usual. The size of pipettes that can be used is limited only by the size of the suction cup.

This device has been in use in the biological safety research laboratory for over a year with good acceptability and quite satisfactory performance. It can be used with either hand and can be removed quickly when not in use.