A MODIFICATION OF THE MUDD ELECTRO-ENOSMOSIS APPARATUS[1]

IN further experiments on electroenosmosis across intact dog tooth enamel membranes,[2] the writer has found the following modification of the Mudd electro-enosmosis apparatus of assistance in eliminating the tendency of the rubber stoppers to loosen in the electrode chamber.

The changes in the apparatus concern the zinc electrode cell, Z (Fig. 1). The cell described by Mudd[3] makes use of a cylinder of glass, open at both ends. In the upper end is placed a perforated rubber stopper through which passes a glass tube which connects the electroenosmosis apparatus proper with the zinc electrode chamber. In the lower end of the glass cylinder is placed a second perforated rubber stopper, through which the zinc electrode passes into the glass electric chamber.

When the chamber is filled with zinc sulfate and then tightly closed top and bottom, the rubber stopper at the lower end carrying the zinc electrode tends to loosen and move out of the chamber. As a result the volume of the chamber changes, so interfering with the accuracy of the readings of the amounts of fluid transferred during the experiment.

The substitution of a sealed glass collar for holding the zinc electrode eliminates these difficulties. A pyrex glass cylinder has sealed within its lower end a piece of pyrex tubing B, slightly larger in inside diameter than the diameter of the zinc electrode C. The lower end of the glass cylinder containing the glass collar is warmed slightly, and the zinc electrode is placed in the chamber through the glass tubing. DeKhotinsky cement A is then sealed in the space between the zinc electrode and the inside of the glass collar.

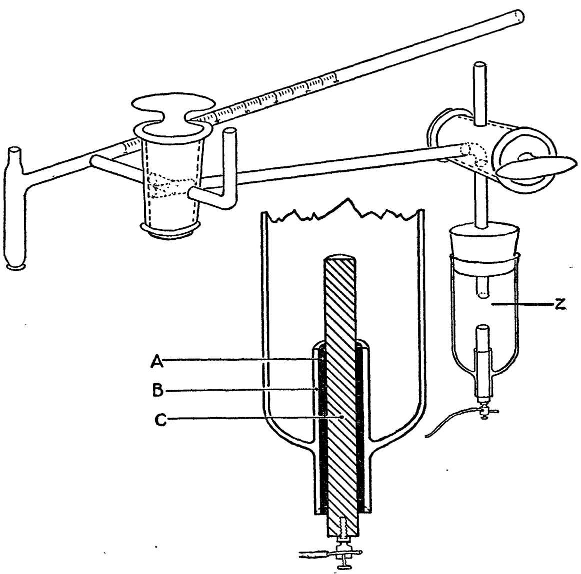

FIG. 1.

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1 From the Laboratory of Pathology, Yale University School of Medicine.

2 H. Klein, *Journal of Dental Research*, 12: 87, 1932.

3 S. Mudd, *Journal of General Physiology*, 9: 369, 1926.

SPECIAL ARTICLES

PENETRATION OF GASEOUS PYRIDINE, PIPERIDINE AND NICOTINE INTO THE BODIES OF CERTAIN INSECTS[1]

THE cuticula of insects presents an effective barrier to most injurious substances which are found in the environments of these animals. Its physical structure and chemical composition afford great resistance to all but the most active chemical agents, and the view has long been held that gases and substances in solution do not penetrate the cuticula directly, but rather enter the body through the spiracles and pass from the tracheal system to the tissues.

Recently, however, it has been shown that the cuticula of some insects, at least, is not only permeable to respiratory gases but to certain toxic substances as well. For instance, Thorp[2] has found that elimination of carbon dioxide takes place largely through the cuticula of many small, thin-skinned insects, the tracheal system being in such forms of minor respiratory importance. In some adult Coleoptera, carbon dioxide seems to pass through the cuticula, although the permeable areas may be limited, and among pupal forms, the evolution from the cuticula may be slow or rapid. Hartzell and Wilcoxon[3] have shown that pyrethrins penetrate directly the cuticula of insects when they are applied to the body surface at points remote from the spiracles. Ethyl thiocyanate, methyl isothiocyanate and nicotine also were found to penetrate the cuticula in quantities large enough to provoke toxic reactions. Portier[4] immersed the tips of the antennae of butterflies in solutions of nicotine and

1 Rockefeller Fluid Research Fund Project No. 9, Iowa State College.

2 W. H. Thorp, SCIENCE, 68: 1766, 433–434, 1928.

3 A. Hartzell and F. Wilcoxon, *Contrib. Boyce Thompson Inst.*, 4: 1, 107–117, 1932.

4 P. Portier, *Compt. rend. soc. biol.* (Paris) 105: 367–369, 1930.