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THE RETURN OF THE PULMOTOR AS A "RESUSCITATOR": A BACK-STEP TOWARD THE DEATH OF THOUSANDS[1]

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IN no field of scientific activity during the past half century have the advances been greater than in that concerned with the saving of human lives. Yet along with some of these advances there have been very considerable amounts of charlatanism; quackery and their inevitable consequence—increase of mortality. Fortunately what was false and harmful has generally been, after a time, exposed and rejected; but not always or soon. And now a particularly evil affair has developed: that of a device that thirty years ago was introduced as a life-saver, but that was shown to be rather a life-loser, and was therefore rejected; yet that now is again being exploited under another name with all the force of high-powered salesmanship and pseudo-science to the inevitable loss of many lives that could be, and should be, saved.

The device to which I refer is a breathing machine that at first was called a "pulmotor" and that now, slightly changed in form but identical in essentials, is being reintroduced under another name as a "resuscitator." By alternately sucking and blowing, these "pulmotor-resuscitators" were designed, and have been claimed, to remove poisonous gases from the lungs and

[1] For the evidence, experimental and clinical, and full references to the literature upon which this article is based, see: Henderson and Haggard, "Noxious Gases and the Principles of Respiration Influencing Their Action," 2d edition, New York, 1943; Henderson and Turner, "Artificial Respiration and Inhalation," *Jour. Am. Med. Asn.*, 116: 1508, 1941; Henderson, "Adventures in Respiration; Modes of Asphyxiation and Methods of Resuscitation," Baltimore, 1938; and same author, "Tonus and the Venopressor Mechanism: The Clinical Physiology of a Major Mode of Death," *Medicine*, 22: 223, September, 1943.

might be caused by a proteolytic enzyme. Accordingly, 1 per cent. solutions of pancreatin (supplied by the makers of Clarase), and of papain were used. Both preparations were ineffective, and actually caused chromosome clumping. The results were very poor when compared with the checks.

Recent studies by Greathouse, Klemme and Barker[2] on the deterioration of cellulose by fungi, suggested that certain of these organisms might be of value in the present problem. Fortunately we were able to secure cultures of *Aspergillus niger* Van Tieghem, *Chaetomium globosum* Kunze, and a species of *Metarrhizium* through the courtesy of G. A. Greathouse of this Bureau. Single flask cultures were extracted 10 to 15 days after inoculation by grinding the contents of the flask with quartz sand in a mortar containing 10 ml of a sodium acetate buffer, pH 5.0. The supernatant liquid was tested on anther sections as previously described for the enzymes. This series of treatments also included a 5 per cent. solution of Clarase in sodium acetate at pH 5.0. All treatments gave beneficial results and produced slides superior to the checks. The cell walls of most pollen mother cells were softened and the cytoplasm partially digested. As a result of these changes the cells were easily flattened and the chromosomes spread. Tests were also made in which the freshly prepared Clarase solution and fungus extracts were heated to boiling prior to use. The slides resulting from material treated in the boiled solutions were definitely inferior to those from the unheated solutions, which indicates that active enzymes were necessary to produce the beneficial effect.

The results herein briefly reported are preliminary to further work under way with other treatments and modes of application. There are many aspects of the problem needing further investigation. For instance, it is not possible as yet to measure the concentration of the fungus extracts used, or to identify the enzyme or enzyme complex that is effective. So far the method has been used on only one species other than Lilium. Dr. A. E. Clarke of this division has used Clarase on the pollen mother cells of an amphidiploid Allium with beneficial results. Some observations have also been made on smears of treated Lilium root tips. These have shown that fungus extracts affect the middle lamella so that the cells separate readily. Further investigations of pre-treated root-tip smears are under way.

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2 G. A. Greathouse, D. E. Klemme and H. D. Barker, *Ind. and Eng. Chem. Anal. Ed.*, 14: 614–620, 1942.

A NYLON BLOOD AND PLASMA FILTER

FOR the last nine months we ran laboratory tests on Nylon blood and plasma filters. Our observations and tests fully coincided with those made by Dr. S. Brandt Rose, *et al.*, as reported in SCIENCE (Vol. 98, No. 2534).

However, we found the sewing of these tiny filters rather cumbersome, and noted that small, but objectionable quantities of Nylon fibers would be entrained in the filtrate.

We took advantage of the thermo-plastic qualities of Nylon and welded the seams rather than sewing them. This method is much faster than sewing and eliminates the shedding of Nylon fibers. Furthermore, the filters can be fabricated with a cone point, and thereby can be utilized for making the drip count.

The following method was found to be satisfactory in making the filters: A double layer of finely textured Nylon cloth was placed on a flat metallic surface. A sheet metal template was made for the filters, and this was placed firmly over the Nylon cloth. The outline of the template was then traced with an electrically heated metal stylus. The stylus of an electric wood-burning set was used for this with excellent results. Flat, colorless, flexible seams were obtained after only a small amount of practice. These seams were tested carefully and were found to be safer for use in transfusion filters than sewn ones.

Prior to using the electric cutting method, experiments with flame cutting were conducted, but the results were found to be too unreliable.

The filters were welded directly to the glass delivery tube of the transfusion assembly.

Some chemical tests were made on the Nylon material. It was found to be soluble in mineral acids and was destroyed by alkalies. It withstood treatment with hydrogen peroxide and solutions of sodium citrate and sodium citrate-dextrose.

The apparatus was developed in the laboratory only, and was not used in giving transfusions to patients.

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BOOKS RECEIVED

CROSS, ROY. *From a Chemist's Diary.* Illustrated. Pp. 315. Kansas City Testing Laboratory, Kansas City, Missouri.

HUFF, CLAY G. *A Manual of Medical Parasitology.* Illustrated. Pp. x + 88. The University of Chicago Press. $1.50.

MIDDLETON, L. R. *A Textbook of Light.* Illustrated. Pp. viii + 288. G. Bell and Sons, Ltd.

SMART, JOHN. *A Handbook for the Identification of Insects of Medical Importance.* Illustrated. Pp. x + 225. British Museum (Natural History). 15 shillings.

STOUT, WILLIAM B. and FRANKLIN M. RECK. *Tomorrow We Fly.* Pp. 160. Thomas Y. Crowell Company. $2.00.

THORNDIKE, EDWARD LEE. *Man and His Works.* Pp. 212. Harvard University Press. $2.50.