of weanlings than in adults(1). Differences in rate of activation, therefore, cannot account for the results obtained here except in the case of OMPA where the susceptibility of adult and weanlings may be explainable on the basis of incomplete development of the microsome oxidase which catalyzes the activation of this compound.

Previous studies(2) have provided substantial evidence that some phosphorothioates are detoxified by the catalytic action of microsome enzymes and that the toxicity of some phosphorothioates and dithioates is governed to various degrees by these metabolic reactions. It has been well established that the microsome enzymes that catalyze drug metabolism develop after birth of some species of experimental animals(4). It appears that rate and extent of detoxification of certain of the anticholinesterase insecticides more closely parallels the liver microsome enzyme levels than does the activation reaction which the compound must also undergo to exhibit anticholinesterase activity. It appears that activation of the compounds requires only a small fraction of the total amount of microsome oxidase activity in the adult liver. Thus rate of detoxification would tend to have a marked influence on toxicity of the compounds.

Summary. A comparison was made of the acute toxicity of a number of anticholinesterase insecticides in weanling and adult male rats. The results indicate that weanlings are about twice as susceptible as adults to parathion, methyl parathion, Systox, Di-Syston, Guthion, Malathion, Delnav, and Folex. A smaller increase in susceptibility of weanlings was noted with Ethion, Phosdrin, Dipterex and Sevin. Weanlings were about 5 times more susceptible to EPN and about 4 times more susceptible to Trithion than adult male rats. In the case of OMPA adults were about 5 times more susceptible than weanlings. The age differences in susceptibility are probably due to incomplete development of enzymes which catalyze the metabolism of anticholinesterase insecticides in the livers of young animals.

1. Murphy, S. D., DuBois, K. P., *J. Pharm. Exp. Therap.*, 1958, v124, 194.

2. DuBois, K. P., Puchala, E., PROC. SOC. EXP. BIOL. AND MED., 1961, v107, 908.

3. Litchfield, J. T., Wilcoxon, F., *J. Pharm. Exp. Therap.*, 1949, v95, 99.

4. Fouts, J. R., Adamson, R. H., *Science,* 1959, v129, 897.

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Artificial Respiration in Mice During Thoracic Surgery: A Simple, Inexpensive Technic.* (28717)

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During experiments designed to determine the effect of unilateral thymectomy on the unilateral development of thymic lymphoma in mice(1,2) an apparatus for artificial respiration with positive pressure oxygen in mice was developed. Use of the device permits wide surgical exposure of the thorax and approximates the conditions accomplished by modern anesthesia machines. Because the device decreases the hazard of pneumothorax during experimental surgery on mice and is inexpensive to construct, the apparatus is presented for possible interest to other investigators.

The apparatus consists of 3 parts: 1) a flow valve, bubble meter, and high pressure limit assembly; 2) a valve to provide intermittent oxygen flow, and 3) an endotracheal catheter (Fig. 1.)

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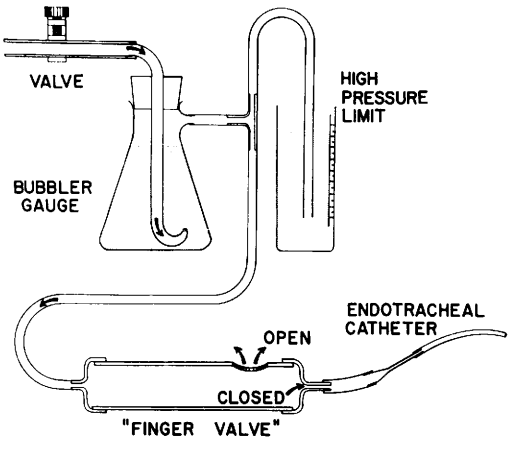

FIG. 1

1. *Flow valve, bubble meter, and high pressure limit assembly.* The regulation of small amounts of oxygen is accomplished by use of a screw clamp on the oxygen supply rubber tubing which leads directly from the reducing valve of a standard oxygen tank. The rate of flow of oxygen is visually observed by bubbling the gas through water. By means of a "T" tube, the high pressure limit tube is connected to the metered gas flow. This last device consists of a length of glass tubing immersed in a column of water. The height of water above the open lower end of the tube determines the pressure at which excess oxygen will blow off. The upper end of the pressure limit tube is twice as high as the water column to prevent water from rebounding into the supply line.

2. *"Finger valve."* The intermittent flow of positive pressure oxygen is controlled by a manually operated open-type valve. This device is constructed by cutting a 2 cm round hole in a 4 inch length of ¾" polyethylene drying tube. The oxygen gas (previously metered and high pressure limited) enters one end of this tube. The other end is connected to the endotracheal catheter. The 2 cm hole in the side of the tube is so large in relation to the small endotracheal catheter that, when this remains open, all the oxygen flows out of the system and no oxygen enters the endotracheal catheter. When the hole in the side of the tube is closed by the finger of an asssistant, the pressure of the inflowing oxygen increases rapidly to the limit set by the height of water column. It then enters the thin endotracheal catheter and inflates the lungs. When the lungs are sufficiently expanded, the assistant removes the finger from the hole, allowing the pressure in the endotracheal catheter to return to atmospheric pressure. The lungs then deflate by their own passive elastic forces. Reapplication of the finger over the hole again increases the pressure of the oxygen in the catheter. The cycle is maintained by an assistant, who observes the condition of the lungs by direct inspection, and can vary the phase duration of the cycle more smoothly than an automatically operated device.

3. *Endotracheal catheter.* Teflon® "Spaghetti" tubing is available in several sizes ranging from an inner diameter of 0.015" (15/1000 inch) to 0.106" (106/1000 inch). The trachea of most mice will accommodate a 0.222" or 0.034" tube. The tip of the endotracheal tube may be smoothed after cutting by warming slightly in a tiny flame, and rolling the softened end in the palm of the hand. A 5 cm length of appropriate width tube is attached to a Luer-lock needle shank after the point has been filed off. This is connected to the drying tube "finger valve" by adapters. It is important to keep the distance between the trachea and the finger hole in the drying tube as short as possible to reduce the volume of dead space.

Procedure. The animal is anesthetized with Nembutal or Nembutal-ether, placed on its back on the board, and the feet secured. A midline skin incision is made from the mental angle level to the xiphoid process, and the skin is mobilized and retracted. The trachea is exposed from the sternal notch to the larynx by blunt dissection in the midline. The trachea is mobilized, and the lower border of the larynx is grasped gently with thumb forceps. The catheter attached to the needle hub is introduced into the posterior pharynx and rotated gently in a ventral direction. At the same time the larynx is gently tilted ventrally with the thumb forceps. The catheter slips under the epiglottis and can be observed through the translucent wall of the trachea. The needle hub is then connected

to the finger valve, through which the oxygen is already running.

The thorax is then opened by passing a blunt probe from above under the sternal notch with the tip directed anteriorly, away from the heart. By means of the probe, traction is exerted on the sternum away from the heart, and a scissor point passed alongside the probe. The sternum is cut in the midline. With this incision the thorax is opened, and the lungs are now inflated by activating the finger valve.

Ether may be administered during the procedure if Nembutal is to be avoided by introducing a plenum chamber between the high pressure limit tube and the finger valve. For extended procedures a 95% oxygen-5% CO_2 gas mixture is commercially available and may be desirable to prevent respiratory alkalosis.

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1. Siegler, R., Rich, M. A., *Trans. N. Y. Acad. Sci.*, 1963, v25, 590.

2. ———, *Cancer Research*, 1963, v23, in press.

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Quantitative Response of Rat Mammary Glands to Mammogens. III. Growth Hormone and/or Lactogen with Estrogen.* (28718)

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Growth hormone (STH) is dependent upon the presence of a steroid hormone for an expression of mammogenic properties, whereas lactogen (LTH) is mammogenic when administered alone to hypophysectomized, castrated, and adrenalectomized rats(1). The simultaneous injection of STH and LTH stimulates mammary growth(2) and crude anterior pituitary extracts stimulate mammary growth in suckling, ovariectomized rats when given alone(3) or in conjunction with estrogen(3,4). Since mammary growth response to these mammogens had not yet been placed on a quantitative basis, an attempt to do so was made in the experiment reported here.

Methods. Assay animals and time sequences(5) and mammary area measurement (6) were as previously described. Estradiol dipropionate (ED), 1.0, 2.0, or 4.0 μg/0.05 ml corn oil, was injected (sbc) every other day. Lactogen (Squibb, Prolactin S-Pro-1†), 0.5, 1.0, or 2.0 mg/0.1 ml distilled water, and STH (Armour Somar A‡), 0.5 mg/0.05 ml distilled water, were injected (sbc) daily for 10 days.

Results and discussion. Either 1 mg LTH or 0.5 mg STH in combination with 1 μg ED significantly increased mammary area (mm^2 per 100 cm^2 of body surface area) of suckling, ovariectomized rats over that of similar rats receiving 1 μg ED alone, 52.3 and 59.6 *vs* 37.5 ($P < 0.01$). Mammary areas of rats injected with 2 μg ED alone (51.8), 2 μg ED + 0.5 mg LTH (57.1), 2 μg ED + 1.0 mg LTH (58.1), 2 μg ED + 2.0 mg LTH (53.4), 2 μg ED + 0.5 mg STH (54.8), or 2 μg ED + 1.0 mg LTH + 0.5 mg STH (58.2) were not significantly different ($P > 0.05$) one from another, but all were significantly greater ($P < 0.01$) than the mammary area of rats injected with 1 μg ED alone. Injecting 4.0 μg ED alone, 4 μg ED

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