61.0%). These excretion values, determined colorimetrically by the p-dimethylaminobenzaldehyde reaction(13) are almost twice as high as those reported above for 9 normal subjects (average excretion of Rimifon after 125 mg dose = 32% and after 192 mg dose = 33%) and correspond closely to the total excretion of isonicotinic acid plus Rimifon as determined by the cyanogen bromide-ammonia method (average total excretion of both 125 and 192 mg doses = 60%). This difference may be due to a) non-specificity of the p-dimethylaminobenzaldehyde reaction or b) a difference between tubercular and normal subjects. Although no Rimifon data have been obtained by the cyanogen bromide test on tubercular patients, the latter possibility appears unlikely in view of the similarity in excretion patterns of Marsilid by both types of subjects. Five male tubercular patients excreted approximately the same percentage of Marsilid in 24 hours as the above normal subjects (10-18%), the Marsilid in both groups being determined from the difference between assays by the cyanogen bromide method before and after permanganate treatment. Since isonicotinic acid, which is measured by direct assay with cyanogen bromide, does not react with p-dimethylaminobenzaldehyde, the differences in Rimifon excretions by the two assay methods can not be due to the isonicotinic acid present. It is possible that the hydrazine split from the Rimifon appears in the urine in another form which is measured by the p-dimethylaminobenzaldehyde reaction.

The Rimifon excretions by normal subjects as determined by the cyanogen bromide test have been confirmed microbiologically by the method of Tabenkin *et al.*(14), which measures Rimifon but not hydrazine or isonicotinic acid. Pooled, 24-hour urines from the test shown in Fig. 2 yielded microbiological assays for Rimifon, which were generally in close agreement with the chemical values.

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A Method of Positive Pressure Anesthesia for the Rat.* (19477)

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Herein described is a method of positive pressure anesthesia for the rat that has proved to be superior to those methods employing intubation and tracheotomy.

The apparatus consists of 2 Erlenmeyer flasks joined by rubber tubing to a positive pressure mask (Fig. 1). Flask A contains water and receives oxygen from a standard tank. The water serves to humidify the gas

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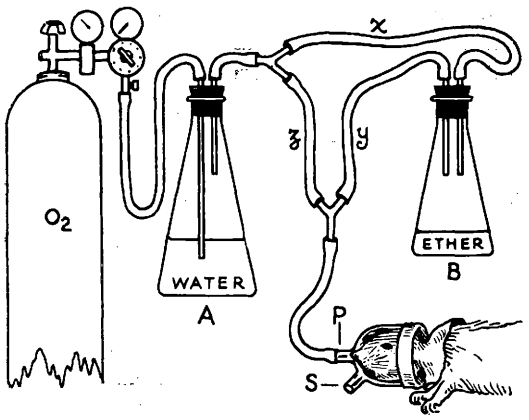

FIG. 1. Closed positive pressure system with mask attached. Letters x, y, and z indicate clamping points on tubing for the variation of the oxygen-ether mixture. The rat's head is shown in proper position.

and also acts as an indicator of its rate of flow. Flask B contains ether and is connected into the system in parallel with Flask A and the mask. The glass tubing used has an external diameter of 0.7 cm. The positive pressure mask consists of a rounded glass chamber of sufficient depth (4.5 cm) and diameter (4 cm) to receive the head of the animal (Fig. 1). The inlet tube (P) is connected to the oxygen-ether supply. A second tube (S), 2 cm in length and 1.4 cm in external diameter, leads directly to the outside. The opening of the mask is equipped with a rubber cuff that permits the entrance of the head and neck and forms a tight seal without constriction. This cuff is readily obtained by removing the thenar and thumb section from a size 7½ or 8 standard surgical glove. The tip of the narrower thumb section is removed. The remainder of the thumb section is then fitted over the rim of the mask. The resulting orifice can be varied as desired by increasing or decreasing the overlap of the thumb section upon the body of the chamber. The remaining rubber flange is tightly tucked about the animal's neck to produce a better seal. As the esophageal orifice of the rat is considerably larger than the laryngeal, the oxygen-ether mixture passes more easily into the stomach than into the lungs when it is delivered under positive pressure. To prevent this, counterpressure is exerted upon the abdomen by means of a tight abdominal binder that can easily be made by cutting a strip of rubber 4 centimeters wide from a surgical glove.

Method. The animal is first anesthetized with ether in a bell jar. Upon applying the mask, care must be taken that the rubber cuff is not applied too tightly about the neck. The flow of oxygen is controlled by the standard gauge attachment of the oxygen tank. A flow of 1 to 4 liters per minute is usually sufficient depending upon the size of the rat. The suitability of the flow-rate of the oxygen-ether mixture is easily judged by the degree of distention of the rubber portion of the mask. The concentration of ether and oxygen is varied as necessary by the application of a surgical clamp at appropriate positions on the rubber tubing in the system (Fig. 1, x, y, z). In general, a satisfactory level of anesthesia can be maintained by leaving the entire system open. The anesthetist controls the pressure within the mask, and the respiratory rate, by opening or closing the outlet tube (Fig. 1, S). The transparency of the glass mask permits constant observation of the color of the mucous membranes.

This method has been used successfully in over 130 thoracotomies. Eighty-seven of these were for ligation of the left pulmonary artery. With mastery of the technic there have been no operative deaths in the last 50 operations. This compares very favorably to the loss of 3 out of every 5 animals by Ellis and his associates(1) for the same operation using the translaryngeal intubation method described by Porter and Small(2).

The method described here has several advantages over that of Porter and Small(2) in that it eliminates the necessity of intubation, the danger of trauma to the upper respiratory tract, and the possibility of obstruction of the intratracheal tube. The use of ether alone permits not only close control of the anesthesia, but also a short post-operative reaction period. Neither of these is possible with the use of intraperitoneal barbiturates. Although rats are unusually prone to respiratory diseases, the number of post-operative deaths following the use of ether has been reasonably small.

The tracheotomy method of positive pressure anesthesia as described by Farris(3) has limited application. It was designed for use in terminal experiments where the survival of the animal is not necessary.

As an additional aid in the performance of the thoracotomy, a special operating table easily constructed from a standard cigar box is used. The extremities are tied in such a way that the animal is partly suspended and partly supported upon a soft-rubber sponge. This permits more freedom of thoracic movement and easier expansion of the unoperated lung. The use of the rat-board has proved to be more restricting and the results have not been as satisfactory.

Summary. A method of positive pressure anesthesia for the rat using a mask and an abdominal binder is described. It is applicable to the use of ether, intraperitoneal barbiturates or both as anesthetic agents. A closed system for the administration of the oxygen-ether mixture is also illustrated.

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Occurrence of a Sodium-Potassium Antagonism in Nerve Block.* (19478)

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It is recognized that sodium ions are required for activity of nerve fibers(1-6). It is also well known that potassium ions, in concentrations above normal, cause a depolarization of the nerve membrane, a decrease in excitability and a block of conduction(4, 7-9). A long series of experiments has culminated in the theory that entrance of sodium during the period of the rising phase of the action potential spike, and the exit of potassium during the falling phase, are central events in the mechanism of conduction(5). This theory recognizes the important point that the movements of these two ions are not independent and unrelated events but rather, integrated processes which occur in sequence. The sodium and potassium mechanisms thus interlock at some point in the chain of reactions of the nerve impulse. The problem, therefore, is to discover the means whereby such interlocking occurs. This communication will report an interaction between sodium and potassium in the maintenance of conduction in frog nerve fibers which seems to be of more than passing interest. At this stage of development it is only necessary to present a simple and factual report of the results without interpretation.

Procedure. Except for certain essential information, no details of procedure need be given, since these were reported in a previous communication(6). Isolated and desheathed sciatic-peroneal nerves of bullfrogs were laid across stimulating and recording electrodes in a moist lucite box. A 20 mm segment of nerve between the stimulating and the recording electrodes was set within a glass cup. Various test solutions were added to the cup, thus exposing the segment to the solutions. Phosphate Ringer's solution at a pH of 7.0-7.3 was used. This contained 0.11 M NaCl and 0.0018 M KCl in addition to the other usual components of frog Ringer's solution. Potassium enriched solutions, when required, were made by adding crystalline KCl to unaltered Ringer's fluid. As Shanes(10) has pointed out, this procedure is not only permissible but is requisite in a system which is

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