

# BRIEF COMMUNICATION

## A Head-Holder for Inhalation Anesthesia or Resuscitation of Rats

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WEDEKING, P. W. AND R. G. BABINGTON. *A Head-holder for inhalation anesthesia or resuscitation of rats.* PHARMAC. BIOCHEM. BEHAV. 2(1) 127–129, 1974. — The design of a versatile rat head-holder is described. The head-holder enables the investigator to maintain close control over the level of inhalation anesthesia; and, if desired, to resuscitate the animal.

Head-holder    Resuscitation    Inhalation anesthesia

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IN ORDER to produce chronic anoxic hindlimb spasticity, it is necessary to open the thoracic cavity and clamp the descending aorta for an extended length of time [1]. During such intrathoracic procedures in rats in this laboratory, the animal was maintained under ether anesthesia and resuscitated. In our experience, better spasticity is achieved and fewer fatalities occur if a gas anesthetic is used.

The most common method of maintaining anesthesia in rats utilizing volatile agents is to drop the anesthetic onto gauze contained in a nose cone [4, 5, 7, 8]. Although the cone method is simple, there are disadvantages involved. Wasteful amounts of drugs are utilized; and the danger of explosion is ever present if electrical equipment is being operated in the vicinity. Also a stable level of anesthesia is difficult to maintain without the investigator constantly diverting his attention from the ongoing surgery. Luschei and Mehaffey [6] have improved on the cone method by developing a system to accurately control the concentration of anesthetic vapor. Kozlowski and Woods [3] further improved this system by constructing a closed cylinder to fit over the muzzle of a rat.

The cone method, however, does not facilitate supportive ventilation. In larger animals, endotracheal intubation is fast and non-traumatic; and the animal can readily be switched between an anesthesia system and artificial resuscitation. In rats, however, intubation is more difficult and more traumatic. In fact, the usual method of mechanical resuscitation in rats is through endotracheal cannulation, a procedure that is not feasible if the animal is to be a chronic preparation. The conventional method of artificially respiring a rat is breathing through a piece of rubber tubing

placed over the rat's nostrils [7]; and Ingall and Hasenpusch [2] have described a manual resuscitator. Neither technique, however, is practical for extended periods of supportive respiration. Thus, we constructed a simple, inexpensive head-holder that allows the investigator to maintain a desired plane of anesthesia and/or resuscitate rats during surgery.

The basic design is shown in Fig. 1. The dimensions of the component parts of a head-holder for rats weighing 250–350 g are depicted in Fig. 2. Figure 2 also presents a schematic of the anesthesia-resuscitation system.

Construction is simple. One end of a 16 mm diameter tube is partially compressed in a vise. The tube is measured, the opposite end cut at an 18° angle, and a 3 × 5 mm rectangular hole positioned at the front of the angle end. Next, an 8 mm diameter tube is cut to the appropriate length and an oblong opening made in the middle of one side. The two tubes are soldered together with the oblong hole opening into the compressed end of the larger tube. Threaded nuts are soldered to the top and bottom of the larger tube and are used to mount the head-holder on a vertical threaded shaft fastened to the surgical table.

Utilization of the head-holder is also simple. Prior to positioning a rat in the head-holder, we administer 0.5 mg of methylatropine, intraperitoneally; 5 min later, the animal is etherized in a conventional anesthetizing jar. Then the rat's nose is slipped into the end of the head-holder and its upper incisors fitted into the rectangular opening. To prevent anesthetic or air leakage, a snug-fitting 3 cm length of latex tubing, cut from the finger of a disposable surgical glove, is positioned around the larger tube of the head-

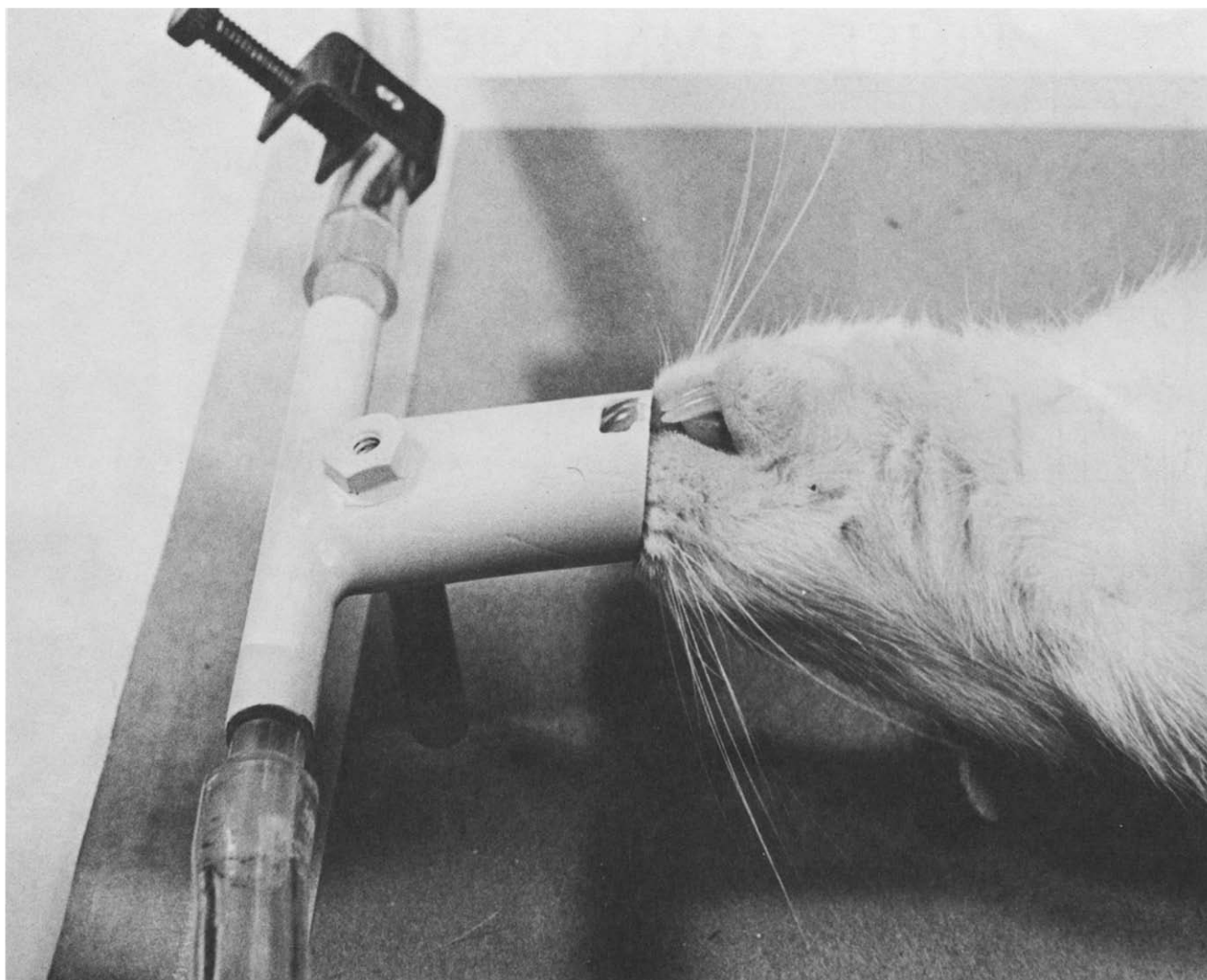


FIG. 1. The basic head-holder illustrating the position of the rat's head with the upper incisors inserted in the rectangular opening. The latex cuff is not shown for illustrative purposes.

holder and over the rat's snout.

Airflow within the system is produced by a respiratory pump (Phipps and Bird, Inc. Model 7088-600). By adjusting the appropriate valves, the anesthetic concentration can be varied instantly as can the degree of insufflation of the lungs.

The head-holder has proved to be a valuable surgical aid. It holds the rat's head firmly when the animal is in either the dorsal or ventral position, implements resuscitation, and

facilitates the use of any gas anesthetic.

The head-holder can easily be modified for use with larger or smaller rodents and can be fitted to other surgical equipment. We have adapted the head-holder to fit a rat stereotaxic apparatus and now routinely use ether anesthesia during the implantation of permanent electrodes. The use of ether not only allows a finer control over the level of anesthesia during surgery but also promotes rapid recovery from anesthesia when the operation is completed.

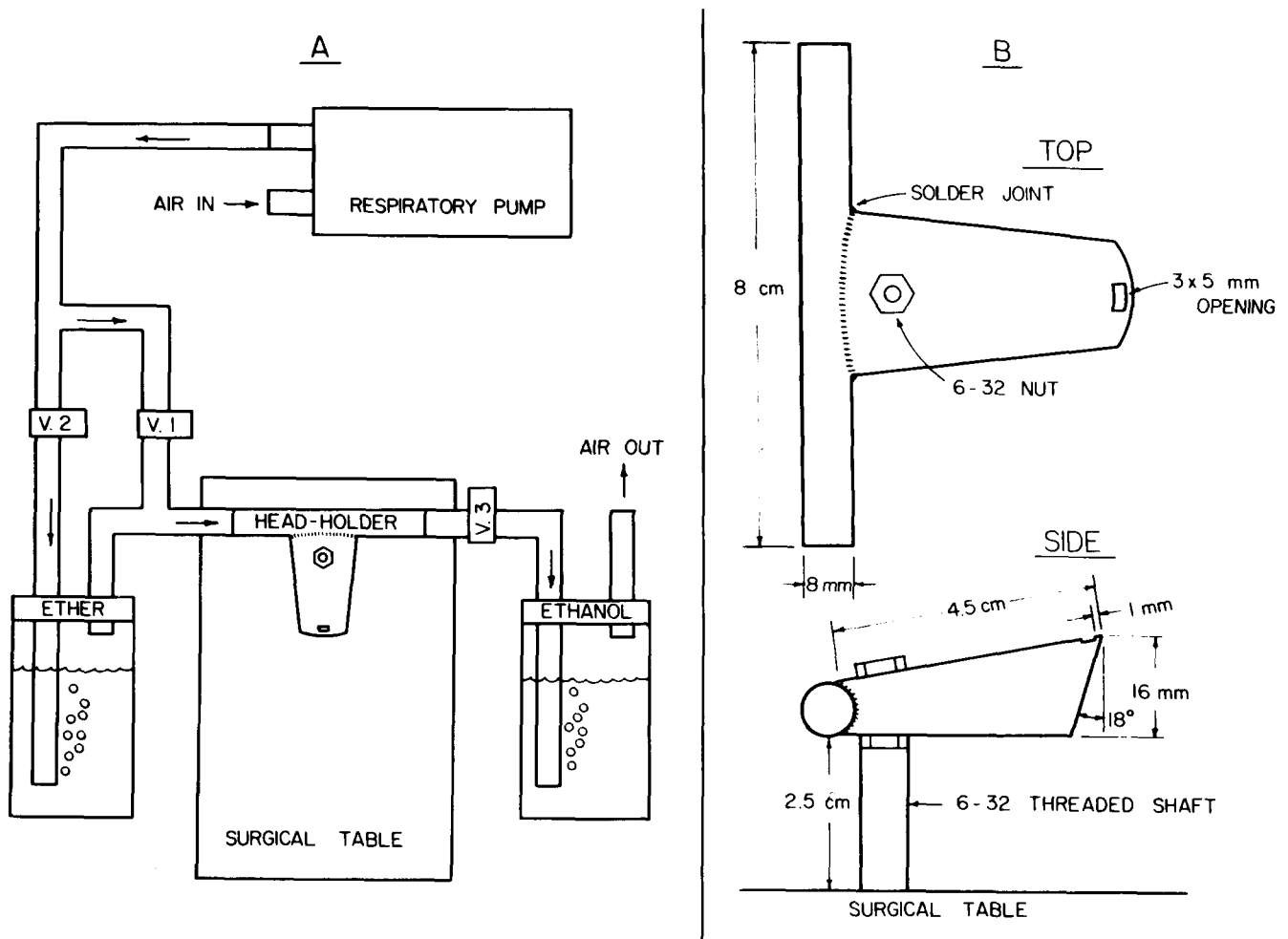


FIG. 2. Panel A is the schematic of the airflow from the respiration pump to the head-holder. Valve 1 controls the amount of airflow directly to the rat; Valve 2 controls the amount of air passing through the ether; and Valve 3 controls the ventilation pressure during resuscitation. Panel B presents the basic design and dimensions of a head-holder for a rat weighing 250–350 g.

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