A device for the easy administration of volatile anesthetics to rats undergoing stereotaxic surgery*

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Conventional procedures do not provide a practical method for the administration of volatile anesthetics such as halothane to rats while they are undergoing stereotaxic surgery. This paper describes a device which meets this need and which is easy and inexpensive to construct. A two-piece cylinder cut from the mouth of a polyethylene bottle forms a closed system around the muzzle of a rat and does not interfere with the stereotaxic apparatus or with the operation itself. The cylinder is attached to any standard device for the dispensation of volatile anesthetics. The immediate advantage is that behavioral assessments can be made relatively soon after surgery.

Volatile anesthetics such as ether or halothane are often preferred to anesthetics whose duration of action is relatively uncontrollable, such as the barbiturates. But volatile anesthetics are not commonly used in conjunction with stereotaxic surgery in small animals, due to the difficulty of tracheal cannulation and hence the lack of a closed system. The present paper describes an easily constructed and inexpensive device which circumvents this problem. The device consists of a two-piece cylinder which, when placed tightly around the rat's head, forms an almost completely closed system (see Fig. 1). The arm, mounted to one of the two pieces, is attached to any standard device for the administration of volatile anesthetics (e.g., the system for halothane administration described by Luschei & Mehaffey, 1967).

The mouth of a 1-liter polyethylene bottle serves as the cylinder, and the bottle cap, cut to provide two appropriately threaded rings, serves to hold the halves of the cylinder together when necessary. One of these threaded rings is simply a shortened

cap (Fig. 1A) and the other a threaded ring. In halving the cylinder, a zig-zag pattern is followed along its length to minimize slippage. Each cut is made at approximately a 45-deg angle from the

surface and perpendicular to the preceding cut (see Fig. 1B). The ends of the cylinder are fitted with foam rubber to increase the tightness of fit over the stereotaxic mouthpiece at one end and the rat's muzzle at the other (see Fig. 1, C and D). The original opening of the bottle faces away from the rat. The cylinder should be long enough to cover the nose and mouth of the animal and yet not reduce the operating area on the top of the skull. (The animal's end of the cylinder can be cut at an angle providing a relatively longer ventral than dorsal wall.)

The rat is first anesthetized with the volatile anesthetic (see Luschei & Mehaffey, 1967). The flow of the gas is then shunted to the arm of the cylinder, and the cylinder is placed around the rat's muzzle. The cylinder is held tightly by threading the shortened cap onto it. The mouthpiece of the stereotaxic instrument is removed, and the threaded ring is slipped over it. The ear bars are attached in the normal manner. The

Fig. 1. Diagram of the cylinder used to administer volatile anesthetics to rats. (A) Side view of the threaded cap of the cylinder. (B) Side view of the two rejoined halves of the cylinder. (C) Top view of the cylinder. The two holes are for the mouthpiece apparatus of the stereotaxic instrument. (D) Bottom view of the cylinder. The hole is for the muzzle of the rat. The stippled areas of C and D represent foam rubber.

*This project was supported in part by NIH Grant 1 RO1-AM 15647-01 to S. Woods and in part by NIMH Training Grant 2T01-MH 07556-11 under which L. Kozlowski was a trainee.

Fig. 2. Photograph of an anesthetized rat in a stereotaxic instrument with the cylinder attached. Bregma (A) and lambda (B) are shown to demonstrate the accessibility of the top of the skull. C is the arm of the cylinder through which the anesthetic is administered. D is the threaded polyethylene ring which holds the two halves of the cylinder together.

mouthpiece apparatus is remounted on the stereotaxic instrument, the cylinder is momentarily removed from the rat, and the rat is affixed to the mouthpiece. The cylinder is then quickly replaced and joined by the threaded ring, completing the maneuver. Figure 2 shows a rat in a stereotaxic instrument with the cylinder in place.

This device has been used with halothane, and we have had good success with the gas flow (around 150 ml/min) and concentration (2%-3%) suggested by Luschei & Mehaffey (1967). If the surgery is completed and the animal's skin sutured or wound-clipped prior to removal of the cylinder, about 20 min are required for relatively complete recovery from the anesthesia. This time could be decreased by removal of the cylinder at any desired stage of the operation. If immediately postoperative behavioral analyses are desired, local anesthesia of the skin on the top of the head might be desirable to minimize the discomforts of the surgery.

REFERENCE

- LUSCHEI, E. S., & MEHAFFEY, J. J. Small animal anesthesia with halothane. *Journal of Applied Physiology*, 1967, 22, 595-597.

ERRATUM

TARPY, R. M. A superior method for constructing a shock grid for rats. (Vol. 4, p. 175).—Figure 2 is unfortunately upside down. We apologize.