

## A Surgery Table with a Mouth Prop for Rodents

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### Summary

Laboratory animal research represents a remarkable source of information. Rodents are often used as an experimental model for studies in the medical field, showing several advantages. The access to the oral cavity allows one to examine it and to perform surgical restorative procedures. The application of topical substances on hard tissues and mucosa is also possible. Literature includes reports on mouth-opening systems for animals, but they are not available on the market. Therefore, researchers must improvise methods that allow access to the oral cavity, but which may compromise the experiment. The purpose of this technical report is to introduce an inexpensive and easy-to-use surgery table containing a device for rodent mouth opening, which facilitates access to the oral cavity, maintaining mouth-opening and spreading the cheeks apart.

### Introduction

Laboratory animal research provides a remarkable source of information. Rodents are often used as experimental models in studies in the biomedical field (*Brookbank, 1990*) showing such advantages as: they are mammals; they are small in size; their reproduction, care handling and acquisition are easy; and the cost for acquisition and maintenance is low (*Jordan, 1971*). Further, mice present a short life span, making them an attractive model for research on the biology of ageing (*Brookbank, 1990*).

Dentistry is a science that, quite often, uses rodents for studies on oral biology, not only for the anatomic resemblance of molars and oral structures, but as well for the similarities in physiological responses during their handling.

Access to the oral cavity of these animals allows one to examine it and to perform surgical and

restorative procedures, as well as to apply of tropical substances both on hard tissues and on mucosa. The size of the teeth and structures that belong to the oral cavity, as well as the posterior location of the molars, creates difficulty for access and viewing (*Jordan, 1971*).

The literature reports systems for oral opening for various animals (*Rizzo, 1959; Moss et al., 1965; Houston, 1964; Johansen, 1952; Amann, 1963*), but the systems described are too old and are not available on the market. Some of these devices (*Rizzo, 1959; Moss et al., 1965; Johansen, 1952*) claim, as an advantage, the ability to perform experiments without anesthesia, which is today completely unacceptable according to the rules for ethics in animal research. As a result researchers must improvise methods that allow them to have access to the oral cavity (*Waynforth, 1996*). Often these methods make viewing difficult, compromising the reliability of the experiment, injuring the animal, and even killing it by asphyxiation.

The aim of this technical report is to introduce an inexpensive and easy-to-use surgery table containing a device for rodents' mouth-opening. The equipment allows the placing of the animal under

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anesthesia in such an inclination that the viewing of the oral cavity is favored, maintaining the maxilla far from the mandible (not to the maximum opening which could obstruct the breathing), as well as spreading the cheeks apart, allowing free access to the oral cavity. This equipment facilitates scientific research in the medical, veterinarian and dentistry fields. In the dentistry field the literature describes the use of rodents in the periodontal, cranium-facial biology, pharmacology, pulp biology, stomatology and oral geriatrics fields. A major part of the research aimed at understanding the nature and etiology of, as well as finding treatments for, oral diseases, depends on the use of laboratory animals.

#### **Description and Operation**

The surgery table consists of a 20 x 25 cm base, over which a white acrylic box measuring 18 x 12 cm is fixed, being 5 cm in height at the rear and 8 cm in height at the front. In the front side of the box, five 1 cm pins are fixed at 1 cm from the base, controlling the length of an elastic band (5 cm in diameter), which holds the upper incisors of the animal. In rear part of the base, a 10 cm vertical metallic rod is attached centrally, from which stainless steel wire (0.8 mm x 15 cm) emerges having a curved, hook-like end. This end is attached to another elastic band measuring 2 cm in diameter, which is placed on the lower incisors of the rodents. An optical fiber cable is coupled to this same vertical rod, extending over the box at a height of 10 cm, connected to a 21 V, 150 W Halogen light source (Fig. 1).

To the side of the box and 4 cm from its front, two vertical rods are attached, one at each side, measuring 10 cm. These rods control the positioning of the lateral openers through the use of fixing screws that can be adjusted both in vertical and horizontal direction. It is possible to keep the animal's abdomen in position by means of an elastic band (5 cm in diameter) that is also attached to the lateral rods. Grooves in the lower portion of the rods regulate the tension on the elastic. The placing of the



**Figure 1.** The surgery table with Halogen light source.

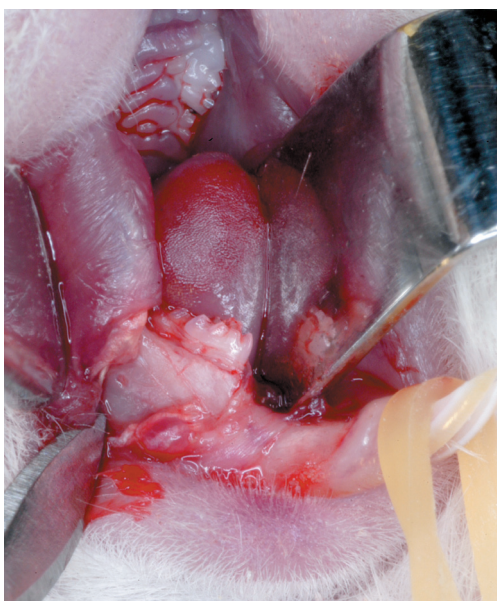
animal is performed in approximately five seconds (Fig. 2).

Rodents have been used as models for oral research. These studies include, but are not limited to, periodontal diseases (*Susin and Rosing, 2003*), mucosal wound healing (*Szpaderska et al., 2003*), topical delivery drugs therapy (*Erjavec et al., 2006*), and surgical procedures (*Inal et al., 2006*). However, access to oral structures remains as a limitation to the use of those animals, especially the mouse. To



**Figure 2.** Placing animal on surgery table.

perform mucoperiosteal flap surgery in mice, in order to provoke alveolar bone loss (*Yaffe et al., 1994*), we developed a surgical table to access mice oral structures. With this table we were able to show that mice can be used as a model for mandibular bone loss (*Rivaldo et al., 2005*) (Fig. 3). It could be



**Figure 3.** Buccal aspect of a mucoperiosteal flap in mice.



**Figure 4.** Access to the oral cavity.

achieved even with their small teeth and posterior location of the molars (*Johansen, 1952*). The new table has been successfully used to perform several oral procedures in mice and rats and, without any modification; it can also be used on hamsters and guinea pigs. The table inclination, the open-mouth elastic device and the buccal retractors provide full accessibility to any oral structures in any size of animal without risk of asphyxia (Fig. 4). The simplification of rodent handling techniques should help facilitate oral investigation (*Moss et al., 1965*). Our surgical table provides a further contribution to achieve it.

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