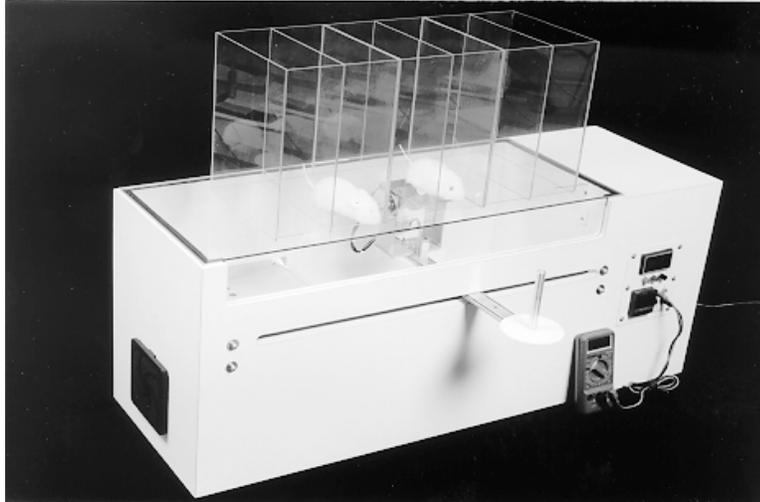


PAW THERMAL STIMULATOR SYSTEM



To assess thermal nociceptive responses, a commercially available device modeled conceptually after that described by Hargreaves et al. (1988) was fabricated. This device consists of a glass surface upon which the rats are placed individually in Plexiglas cubicles (9 x 22 x 25 cm). The glass surface temperature is maintained at either $30 \pm 0.1^\circ\text{C}$ or $25 \pm 0.1^\circ\text{C}$ by a feedback-controlled, under-glass, forced-air heating system.

The heating system is controlled by a thermocouple attached to the bottom surface of the glass plate. The thermal nociceptive stimulus originates from a focused

projection bulb mounted in a stimulus tower that is manually manipulated in a two-dimensional axis on ball bearing slides to permit the stimulus to be delivered separately to either hind paw of each test subject. This stimulus is positioned under the foot pad with the aid of an angled mirror mounted on the stimulus source which permits an exact visual targeting of the stimulation site prior to stimulus initiation. A timer is automatically actuated with the light source, and response latency is defined as the time required for the paw to show an abrupt withdrawal. Paw withdrawal is detected by an array of photodiode motion sensors mounted on the stimulus tower that stops the timer and terminates the stimulus. Stimulus current from a regulated source is monitored continuously to determine the amperage delivered to the light source and, thereby, the magnitude of the radiant stimulus to which the paw is subjected. In all cases, a cut-off of 20 seconds is employed to avoid tissue injury.

The device designed and built by the University Anesthesia Research & Development Group (UAR&D) provides a number of advantages over many of the laboratory constructed models that are currently being used. Advantages of this device include the following:

- **CONCURRENT TESTING OF GROUPS OF ANIMALS**

The large stimulus area combined with the easily adjustable stimulus probe allows for testing of up to 6 rats or mice in adjacent plastic enclosures.

- **AUTOMATIC CUT OFF**

Paw withdrawal leads to changes in reflectance; use of an array of 3 spatially arranged photo transistors ensure adequate sensitivity to movement and determination of latency.

- **SURFACE TEMPERATURE CONTROLLER WITH DIGITAL DISPLAY**

Thermocouple controlled feedback circuit controls the temperature of circulating air allowing selection of glass temperature for reliable baseline despite minor changes in room ambient temperature. A LED display updated at 10 Hz will indicate glass or stimulus temperature.

- **THROUGH FLOOR STIMULUS LOCALIZATION**

A mirror positioned on the moveable stimulus tower allows the investigator to position the stimulus by direct visualization of the plantar surface of the paw no matter the posture of the animal.

- **EASY CONTROL OF STIMULUS LOCATION**

Stimulus tower location is controlled by ball bearing-mounted, positive mechanical linkage to maintain consistent spacing between stimulus and test device surface.

- **DIGITAL TIMING**

Time to respond (movement of the paw) indicated by digital clock; circuit provides automatic stimulus cut off at 20.5 seconds.

- **STIMULUS CALIBRATION**

The dual purpose surface temperature thermocouple allows calibration of the stimulus temperature and current setting.

- **STIMULUS REPRODUCIBILITY**

Stimulus intensity is governed by a highly regulated constant current power supply and is monitored with the external digital current meter (included).

- **ADJUSTABLE STIMULUS INTENSITY**

A range of stimulus intensities is available through easy adjustment of the monitored stimulus current.

Description of the Instrument

The instrument consist of 9 modules:

1. The 12 volt regulated power supply for the halogen stimulus bulb.
2. The 5 volt regulated power supply for the electronic circuits.
3. The temperature controller regulates the heating element thus maintaining the glass surface temperature.
4. The heating element of the temperature control module which generates and disperses heat inside the box using a circulating air fan.
5. The stimulus intensity controls. These controls adjusts the stimulus intensity by changing the current to the stimulus bulb.
6. The logic circuit board controls the latency timer and the animal movement sensors.
7. The bulb carriage head (stimulus tower), positions the halogen bulb stimulus utilizing the under glass mirrored surface and contains the motion sensors to monitor animal movement.
8. The timer module consist of the timer digital output display and the START, STOP and RESET switches.
9. The Digital Multimeter, Wavetek, DM15XL, to monitor the bulb stimulus current.

Reference:

Characterization of variables defining hindpaw withdraw latency evoked by radiant thermal stimuli, Dirig et al, Journal of Neuroscience Methods, 76 (1997), 183-191

Device is available from UNIVERSITY OF CALIFORNIA, SAN DIEGO, ANESTHESIA RESEARCH LABORATORY. For current price, availability and information on this device please contact:



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