



## *Institutional Animal Care and Use Committee Guidelines and Policies*

---

### **GUIDELINES FOR USE OF HYPOTHERMIA ANESTHESIA OF NEONATAL RODENTS**

This guideline provides the rationale and methods for inducing hypothermia as an anesthetic technique for neonatal rodents in research. Newborn rats and mice are functionally poikilothermic; body temperature and metabolic rate are closely correlated with ambient temperatures. Thermoregulatory abilities do not develop until the third week of life. Also, because of their small body mass, rapid core cooling of neonatal pups can be effectively achieved simply by surface cooling. They are also more resistant to arrest of the brain's blood supply. In people, tissue cooling to 20°C results in a 75% reduction in neural conductivity. It is estimated that at 9°C, complete blockage of neural conduction occurs. Hypothermia is known to cause decreased circulatory flow, decreased brain volume and CSF pressure, and increased resistance of the nervous system to anoxia.

**Age of Pups:** Rodent pups less than 8 days of age can be anesthetized via hypothermia alone. Beyond 8 days, the pups are too mobile and this adds too much variability to this procedure.

**Induction Technique:** The most rapid chilling is achieved by submerging the pup up to its neck in water containing crushed ice or placing the pups on a paper towel on ice, then fold the paper towel over them and place more ice on top. A 3-4 minute exposure to ice water or paper towel/ice produces torpor that lasts approximately 10 minutes. If the surgical procedure requires a longer anesthetic period, the pup can be kept chilled on a cold pack during the operation. Alternatively, you can place them in a paper-lined test tube and pack the tube in crushed ice or dry ice. Note: with the latter method, pups require up to 15 minutes to reach torpor because of the lack of direct contact with ice. Use of a fiber optic light is preferable to a warm incandescent bulb to avoid heating of pups.

**Recovery:** Over heating by a heating pad and lamp should be avoided because it can result in tissue damage. This can be avoided by using a thermostatically controlled heat lamp to maintain the chamber air temperature. The most important aspect of recovery is gentle stimulation with constant monitoring until the pups are actively mobile again. Either placing the pups in an incubator maintained at nest temperature (33 - 36°C) or allowing the pups to recover in a paper-lined heat-controlled cage that provides more even warming. Pups generally become active and responsive within 20-30 minutes.

**Reference:** (1) Phifer, C.B. and Terry, L.M. 1986. Use of Hypothermia for General Anesthesia in Preweanling Rodents. *Physiol. & Behav.* 38:887-890.