Rodent Euthanasia Guidelines and Recommendations
In their 2020 report, the AVMA Guidelines for the Euthanasia of Animals: 2020 Edition reviewed the current literature and concluded that “the practice of immersion, where conscious animals are placed directly into a container prefilled with 100% CO2, is unacceptable” and mandated the gradual displacement method of 30-70% CO2 euthanasia as the only acceptable method.

For complete information, please refer to the full text of the UK IACUC Policies Guidelines, and Procedures 103 found on the IACUC website.
Euthanasia Guidelines

Observe the procedure during a one on one training session before doing it yourself.

Keep the animal as calm as possible.

Maintain a professional demeanor; keep your focus on the animal.

Make sure the procedure is performed correctly and accomplished humanely.

NEVER perform euthanasia in an animal housing room.
In All Cases, Death Must Be Ensured

By allowing a sufficient period of time in a chamber when using inhalant gases

By utilizing an unequivocal secondary means of ensuring death (decapitation, opening of the thoracic cavity) *This is a required procedure when using CO\textsubscript{2}*
What to Expect

The animal must lose consciousness first

Then motor function is lost

Animals may continue to have random reflex motor activity after losing consciousness

This is NOT evidence of pain or distress.
Inhalant Agents

Cause death by indirect hypoxia; anesthesia first, then hypoxia

Safety issues: can also be breathed by the technician!

Use proper concentrations

Maintain equipment properly

Do not use CO$_2$ as sole method in neonates— they are very resistant to hypoxia
Carbon Dioxide (CO$_2$)

Is Rapid, Effective, Easy to Use, Inexpensive, and Safe

Correct concentration is important to minimize distress in the animals:

* 100% CO$_2$ at a flow rate of 30-70% of chamber volume per minute
* CO$_2$ must be supplied from either gas cylinders or building CO$_2$ gas distribution systems equipped with an appropriate pressure reducing regulator and flow meter combination (or equivalent) to permit precise regulation of gas flow to the chamber
How Many Mice/Rats Can I Put In The Cage

**Mice:** If you are grouping animals you should not put more than 8-12 if they are weanlings and no more than 8 adults.

If you can’t see the floor and the animals can’t move around, you have too many in the cage.

Weanling don’t have a problem with grouping nor do most females, but any adult males regardless of the strain will become aggressive.

The best thing is to not combine cages unless you absolutely have to.

**Rats:** No more than 4-5 depending on size, age, or weight if adults.

No more than 10-12 if weanlings (less than 40 days of age).
Steps for Using Carbon Dioxide for Euthanasia

Place animals in appropriate chamber
Place top securely on cage
Turn CO$_2$ tank on
Introduce 100% carbon dioxide at a rate of 30-70% of the chamber volume per minute
Adjust flow meter to appropriate setting for cage size according to chart located above tank
Allow time for animal(s) to become unconscious and for all motion to cease
Carbon Dioxide Method

Do Not pre-fill the chamber
Use correct setting
Consult wall chart for proper settings
Remember to turn off gas at main tank when finished
Carbon Dioxide Method

When placing mouse cages INSIDE the large cage to euthanize, be sure to set flow meter for mice to 5-7 liters per minute. Rats 8 up to 12 liters/min.

- Static micro-isolator small cage 3-4 liters per min.
- Small mouse IVC inside large cage 5-7 liters per min.
- Large mouse IVC inside large cage 5-7 liters per min. Rats 8 up to 12 liter/min.
Flow Rates for Carbon Dioxide

It is strongly recommended that animals stay in their home cage whenever possible. It is less stressful for the animals. All sizes of mouse cages fit in the large cage. Be sure to leave the wire bar lid in place.

<table>
<thead>
<tr>
<th>Cage Type</th>
<th>Cage Size (W x L x H)</th>
<th>Flow Rate per IACUC Policy 103</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small (Mouse cage)</td>
<td>7.5” x 11.75” x 5”</td>
<td>For mice 3-4 liters/min</td>
</tr>
<tr>
<td></td>
<td></td>
<td>For Rats 8 up to 12 liters/min</td>
</tr>
<tr>
<td>Large (Rat cage)</td>
<td>10.5” x 19” x 8”</td>
<td>For mice 5-7 liters/min</td>
</tr>
<tr>
<td></td>
<td></td>
<td>For rats regardless of cage size 8 Up to 12 liters/min</td>
</tr>
</tbody>
</table>

You must remain with the animal during the procedure
Carbon Dioxide Method

Maintain gas flow for 1 minute after apparent death

Turn off CO$_2$ tank and allow animals to remain in unopened chamber undisturbed for several minutes to ensure that death has occurred

Ensure death by secondary method (cervical dislocation, pneumo-thorax, or decapitation for neonates is required)

_The secondary method to ensure death is an IACUC requirement when using CO$_2$ is your method of euthanasia._

**Required Secondary Methods to Ensure Death When Using Carbon Dioxide**

- Decapitation (pups)
- Thoracotomy: open the chest to prevent breathing *
- Exsanguination (bleed out)
- Cervical dislocation

* When collecting tissue or major organs, the opening of the major body cavity and subsequent thoracotomy (disruption of the diaphragm) can serve as your secondary method.
Decapitation of Neonate Mouse Pups with Scissors

After the pups have been euthanized with Carbon Dioxide, the secondary means of euthanasia is decapitation for Pups (0-10 Days Old).

Take a **SHARP** pair of scissors and cut between the ears and the point of the shoulders.
Cervical Dislocation in Mice and Rats as a Secondary Means of Ensuring Death
Skeletal Anatomy of the Mouse
Skeletal Anatomy of the Mouse

Area of Concentration
Skeletal Anatomy of the Rat
Skeletal Anatomy of the Rat

Area of Concentration

By AVMA Guidelines cervical dislocation should only be performed on rats 200 grams and lighter.
Cervical Dislocation Using an Instrument

A pen, pencil or similar object may be placed directly behind the ears at the base of the skull to apply slightly forward and downward pressure to assist with the disarticulation. Grasp the base of the tail, NOT the end (as it may deglove) and with the head held securely in place, with a steady pulling motion, lift the tail slightly and disarticulate the spinal vertebra.
Cervical Dislocation Without Instruments

Grasp the mouse directly behind the ears and at the base of the tail. Do not grasp tail in the middle or at the end since it may cause it to deglove.

While keeping the head stationary, with a firm steady pulling motion lift the tail slightly and disarticulate the spinal vertebra.
Thoracotomy

With mouse or rat on its’ back, grasp a small flap of skin at the end of the sternum.

With sharp scissors, cut a small hole in the skin and musculature at the diaphragm.
Thoracotomy

Insert one blade of scissors into the opening at the point of the sternum.

Cut through the rib cage opening the thoracic cavity.
IACUC requirements for proper handling of rodents after euthanasia are that all euthanized rodents (this includes neonates) **Must Be:**

Placed in leak proof bags

Clearly labeled (using tape, tags, or markers) with the Principal Investigator’s name, your initials, and the date

If you observe someone who is not following proper euthanasia procedures, make DLAR aware of this or contact the IACUC.
Proper Handling of Rodents Post Euthanasia

Step 1. Properly label the body bags with PI Name, Date, *(time optional)*, and your Initials

Step 2. Place animals in bag and tie the opening

Step 3. Place securely tied and labeled bag in refrigerator or cooler
Keep it Clean

Clean the chamber and surrounding area with disinfecting agent (MB-10 solution)

Place empty home cages/water bottles in designated area for dirty/used caging

*Do not leave in procedure rooms*

Your mom doesn’t work here so clean up is up to you!
# Who to Call if You Need Assistance

<table>
<thead>
<tr>
<th>Name</th>
<th>Office Phone</th>
<th>Pager Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kim Tomaschko (Animal Care Supervisor)</td>
<td>859-323-2816</td>
<td>859-330-2112</td>
</tr>
<tr>
<td>Carolyn Bratcher (Supervisor, Animal Care)</td>
<td>859-323-6010</td>
<td>859-330-1991</td>
</tr>
<tr>
<td>Steve Tudor (Animal Care Supervisor)</td>
<td>859-323-6224</td>
<td>859-330-2715</td>
</tr>
<tr>
<td>Raghda Abukhaled (Animal Care Supervisor)</td>
<td>859-562-2933</td>
<td>859-330-0737</td>
</tr>
<tr>
<td>Carolyn Bratcher (Animal Care Supervisor)</td>
<td>859-323-6010</td>
<td>859-330-1991</td>
</tr>
<tr>
<td>Dr. Jeanie Kincer (DLAR Veterinarian)</td>
<td>859-323-5469</td>
<td>859-330-2082</td>
</tr>
<tr>
<td>Dr. Jeff Smiley (DLAR Veterinarian)</td>
<td>859-323-0289</td>
<td>859-330-2099</td>
</tr>
<tr>
<td>Dr. Cheryl Haughton (DLAR Veterinarian)</td>
<td>859-257-3548</td>
<td></td>
</tr>
<tr>
<td>Ken Hays (Training Coordinator)</td>
<td>859-323-5697</td>
<td></td>
</tr>
<tr>
<td>Gary Pattison (Training Coordinator)</td>
<td>859-257-0013</td>
<td></td>
</tr>
</tbody>
</table>
Reference Sources & Acknowledgements

Assistant Laboratory Animal Technician Manual
(American Association for Laboratory Animal Science)

2020 Report of the AVMA Panel on Euthanasia

Policy Procedures and Guidelines:
IACUC-103 (Institutional Animal Care and Use Committee, University of Kentucky)

Division of Laboratory Animal Resources Veterinarians

Research Analysts DLAR (for their assistance in graphic representation)
QUESTIONS

Ken Hays
DLAR Training Coordinator
859-323-5697
H41C
ken.hays@uky.edu

Gary Pattison
DLAR Training Coordinator
859-257-0013
H41E
gary.pattison@uky.edu

Dr. Cheryl Haughton, DVM
Senior Clinical Veterinarian
859-257-3548
H41F
Cheryl.haughton@uky.edu