Bell jar or Open-Drop System

1.0 Purpose:

1.1 This SOP outlines the proper use of a bell jar or equivalent chamber often referred to as an open drop jar, for delivery of inhalant anesthesia to rodents, rats, mice or other small mammals. Other species must be anesthetized with inhalants via a calibrated vaporizer. A bell jar may only be used to deliver inhalant anesthesia for very short-term procedures (i.e. 30-60 seconds). If longer duration anesthesia is needed or if a calibrated vaporizer is available the vaporizer must be used.

2.0 Responsibility:

2.1 This SOP applies to all veterinary or laboratory staff using a bell jar to deliver inhalant anesthesia to mice and rats.

3.0 Materials

3.1 Fume hood
3.2 Bell jar or other glass container of known volume with tightly fitting lid (Fig. 1)
3.3 Mesh platform (plastic or woven wire)
3.4 Cotton balls or gauze squares
3.5 Conical tube(s) (Fig. 2)
3.6 Isoflurane
3.7 Propylene glycol (1,2-Propanediol USP grade)
3.8 Recovery cage with supplemental heat source

4.0 Procedures:

4.1 Ensure Safety of Personal Exposure

4.1.1 Bell jar anesthesia contains no provisions for scavenging anesthetic waste gases. Therefore, the bell jar must be used in a fume hood to protect personnel from inhalation exposure to anesthetic gases. If the use of a bell jar is required outside of a fume hood, an isoflurane exposure test must be performed by EH&S to ensure adequate safety exposure levels. Please contact Veterinary Services at 335-6264 or ocv.alert@wsu.edu to set up the testing. Refer to IACUC policy #31 for further details on Safety Requirements.

4.2 Calculate volume of isoflurane for size of bell jar

4.2.1 Volatize the liquid anesthetic (isoflurane) by placing it on the cotton or gauze in the bottom of the jar. The following chart illustrates the approximate concentration of anesthetic achieved based on volume of the chamber and volume of isoflurane used.
Volumes in the shaded area are in mL and indicate the volume of isoflurane to be applied to a cotton swab or gauze in the bell jar.
From: “Anesthesia and Analgesia in Laboratory Animals” 2nd edition pg. 86

4.3 Alternatively, the isoflurane can be diluted in propylene glycol solution before soaking the cotton or gauze. Diluting the isoflurane reduces the vapor in the bell jar and creates a more stable anesthetic without using calibrated vaporizer.
   4.3.1 For mice use a 20% v/v isoflurane in propylene glycol solution
   4.3.2 For rats use a 30% isoflurane in propylene glycol solution
   4.3.3 Example:
      4.3.3.1 To make 500 mls of 20% v/v isoflurane in propylene glycol: \( \{500 \times 0.2 = 100 \text{ml of isoflurane} + 400 \text{mls of propylene glycol}\}\)
      4.3.3.2 To make 500 mls of 30% v/v isoflurane in propylene glycol: \( \{500 \times 0.3 = 150 \text{ mls isoflurane} +350 \text{ mls of propylene glycol}\}\).
   4.3.4 Use one ml (1cc) isoflurane/propylene glycol mixture per 500 cc volume of jar.

4.4 Induction
   4.4.1 Working inside a fume hood, soak a cotton ball or gauze with the appropriate amount of isoflurane for volume of jar.
   4.4.2 Cover the isoflurane/propylene glycol mixture soaked cotton ball or gauze with a mesh platform. This is to prevent the rodent from coming in direct contact with the anesthetic agent. Place one animal at a time in the jar and place the tight fitting lid on the jar.
   4.4.3 Closely monitor the animal while in the jar, observing the breathing pattern. Once the animal has loss of righting reflex and the breathing has slowed (~50% i.e. 80-100 breaths/min) but is regular, a plane of anesthesia has been reached.
   4.4.4 Remove the animal from the bell jar. Check mucous membrane color, respiration and withdrawal reflexes. If no reflexes are noted and mucous membranes and respiration appear normal, the procedure can begin.
   4.4.5 For short duration maintenance, a conical tube (15mls or 50 ml) can be used
for smaller or larger rodents.

4.4.5.1 In the fume hood wet a cotton ball or gauze with the isoflurane/propylene glycol mixture (0.5-1ml).

4.4.5.2 Place the cotton ball or gauze in the conical tube at the end so that there is no contact with the animal.

4.4.5.3 After induction in the bell jar, transfer to the animal to the conical tube. Place the nose of the animal close to the end of the conical tube. Do not put the entire face in the nose cone, there should be space for oxygen to get in and around the animals airway. (Figure 2)

4.5 The outlined SOP is only intended for terminal or short procedures (30-60 seconds).

4.6 When the procedure is complete, place the animal in the recovery cage or euthanize as outlined in the ASAF.

4.7 For Euthanasia purpose, the use of 5% isoflurane is recommended to render the animal unconscious quickly.

4.8 Fill out the appropriate surgery or procedure form.

4.9 Clean the bell jar before the next use.

Figure 1.

Figure 2.
References

https://iacuc.wsu.edu/documents/2016/06/policy_31.pdf/

https://www.buffalo.edu/content/dam/www/research/pdf/1af/sop/2A8.pdf

http://web.jhu.edu/animalcare/rdf/open-drop.html

Revision History:

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