

Anesthetic Gas Safety in Veterinary Practice

The California Division of Occupational Safety and Health (Cal/OSHA) enforces regulations that require anesthetic gas monitoring programs for practices in which employees are exposed to greater than two parts per million in any single hour of isoflurane or halothane anesthetic gas. The requirement for vapor monitoring is stated in California Code of Regulations, Title 8, Section 5155(e)(1) (“Workplace Monitoring”):

Whenever it is reasonable to suspect that employees may be exposed to concentrations of airborne contaminants in excess of levels permitted, the employer shall monitor (or cause to have monitored) the work environment so that exposures to employees can be measured or calculated.

This law references an appendix that includes both isoflurane and halothane on the list of airborne contaminants and sets the permissible exposure limit of 2 ppm for each.

CCR Title 8, Section 5155 also mandates that, if exposures to airborne contaminants are found or are expected to exceed allowable levels, measures to control such harmful exposures shall be instituted. CCR Title 8, Section 5141 describes the types of control measures that must be instituted, including engineering controls, administrative (management) controls, and use of respiratory protective equipment when necessary.

While Cal/OSHA does not endorse specific methods or businesses for monitoring airborne contaminants, common practice is for workers to periodically wear an anesthesia measuring device at collar level during a normal workday. While no legal minimum has been established for how often workers must wear monitoring devices, the U.S. OSHA recommends testing at least twice yearly. After being worn, badges are

mailed to a testing facility, where the ambient levels of anesthetic gas can be measured. Levels above 2 ppm per hour would then require corrective action.

The U.S. OSHA offers the following tips to reduce workplace gas exposures:

- Avoid turning on the anesthetic gas vaporizer until the circuit is connected to the animal. Switch off the vaporizer when not in use. Maintain oxygen flow until the scavenging system is flushed.
- Select the optimal size tracheal tube for the animal and make sure the cuff, if present, is adequately inflated. Adequacy of cuff inflation may be evaluated by delivering a positive-pressure breath while the APL or pop-off valve is closed and listening for a leak originating from around the tracheal tube cuff.
- Occlude the Y-piece if the breathing circuit must be disconnected during surgery.
- Once anesthesia is discontinued, empty the breathing bag into the scavenging system rather than into the room.
- At the end of the surgical procedure, continue to administer non-anesthetic gases/agents as long as possible, using high oxygen flow rates through the breathing circuit to wash the anesthetic gases out of the system and the animal. This allows exhaled anesthetic gases to be collected by the scavenging system.
- Reduce fresh-gas flow rates in an anesthetic circle system. In a circle system where oxygen is the only carrier gas, the amount of fresh gas flowing to the animal should be adjusted to closely match the animal's metabolic oxygen requirement. Use of the lowest fresh-gas flow rate possible is recommended.
- Select masks to suit various patient sizes and breeds encountered in veterinary practice. When a mask is used for induction or maintenance of anesthesia, use a mask that properly fits the contour of the animal's face to minimize gas leakage. Minimize the time of mask anesthesia to reduce waste.
- Use a box for induction of anesthesia in small, uncooperative animals. As with

the mask technique, the induction box method requires high gas-flow rates, with substantial anesthetic spillage. Methods to minimize this spillage include tight seals on the box and placement of the box near the ventilation port of a well-ventilated room. The box can also be connected to an anesthetic gas-scavenging system to evacuate the gases in the box prior to removing the animal.

- Make certain that the reservoir bag, used to store excess anesthetic waste gas until the vacuum system can remove it, is adequate to contain all scavenged gas. This reservoir bag is especially designed to connect to anesthetic gas-specific fittings.
- Fill vaporizers in a well-ventilated area with as few people in the room as possible. Filling vaporizers under a ceiling mounted hood with an active evacuation system is ideal. Use of a pouring adapter with a spout is recommended to avoid spillage.
- Routinely inspect anesthetic equipment to check for leaks or malfunctions. Keep a log to document inspections and any corrective actions.
- Use and maintain a functional scavenging system in anesthetic machines.
- Avoid administering inhalant anesthetics by open drop (i.e., periodically dripping liquid anesthetic onto an open gauze sponge).
- Educate and train staff on anesthesia safety, including information on anesthetic systems in use in the practice and how to minimize anesthesia gas exposures with each.

In addition to these tips, the U.S. OSHA offers more veterinary-specific recommendations at: [osha.gov/waste-anesthetic-gases/workplace-exposures-guidelines#F4](https://www.osha.gov/waste-anesthetic-gases/workplace-exposures-guidelines#F4)

Anesthetic gas safety and compliance is important for the safety of both patients and veterinary practice staff. Meeting minimum regulatory standards will also reduce the likelihood of a workplace violation while ensuring adequate protections are in place. ■

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