Advisory: Exposures to Gas Anesthesia in Animal Operatories
September 2012

Personal monitoring has revealed animal researchers can easily be over-exposed to isoflurane. Gas anesthesia induction for small animals may be as high as 2-4% (20,000-40,000 ppm) with maintenance up to 2% (20,000 ppm). Loss of this gas into the OR can easily place those present to exposures over the 2.0 ppm National Institute for Occupational Safety and Health’s (NIOSH) REL (Recommended Exposure Limit). A study by the UofR’s Occupational Safety Unit was undertaken to determine simple modifications that can be taken to minimize exposures to isoflurane. Please have personnel incorporate the recommendations listed below when using isoflurane or any other gas anesthetic agent:

Filling the vaporizer:

Fill the vaporizer in a chemical fume hood or ducted biological safety cabinet whenever possible. For locations where this is not possible, the use of a local exhaust system such as an elephant arm/trunk exhaust system can greatly reduce the gas vapors (see photos on next page for these systems).

Tubing/Connections:

Many locations utilize tubing clamps at tubing/valve connections to provide better leak prevention. However, chemical monitoring at the tubing connections has shown that many clamps still permit the leakage of anesthetic gases into the room. Leaks from connections at tubing connections/valves can be checked by placing the particular connection in a beaker of water when gas is flowing through the tubing (a bubble shows leakage; the more frequent the bubbling, the greater the leakage). For this test, Occupational Safety recommends passing only oxygen through the tubing. This test should be done at least weekly or more frequently if the unit is moved. Another testing method is to apply a concentrated soap solution at the connections to see if bubbles are formed. The bottom line is if your location uses hose clamps, don’t assume that replacing a hose clamp will prevent gas leakage. Check the lines/connections for leaks. Recheck.

If using a mini-ventilator system, apply a concentrated soap solution at the connections to verify no bubbles are formed.

Large animal administration (monkeys, sheep, pigs, etc.):

Pack (inflate the cuff but do not over fill with air) the intubation tube to minimize loss of anesthetic gases from the animal. Use a scavenger such as a F-Air canister (these units have a limited use, make sure they are weighed before and after use to make sure they are not saturated) or exhaust the line through a dedicated local exhaust system (a chemical fume hood or a ducted biological safety cabinet) to discharge the waste gases out of the work location.

Small animals (rats/mice, etc.):

An induction chamber is recommended to put the animal under. When these are used, large quantities of anesthetic gases can be released unless the valve redirects the air flow to another
system such as an elephant arm/trunk exhaust system. When the induction chamber is opened, close the chamber as soon as possible to help prevent gas leakage into the room. Remember the anesthetic gases are over 10,000 ppm so the mixture coming out of a chamber can result in an over-exposure.

When utilizing a nose cone system, place the animal's nose as far inside the unit as possible. Although most nose cone systems have a scavenger system, utilize either a vacuum line placed close to the nose cone or an elephant arm exhaust system to help remove any blow by gases that might flow out of the nose cone system.

If you believe there might be a problem with a gas anesthesia at your location, give the Occupational Safety Unit a call (x5-3242).