Waste Anesthetic Gas Leak Detection Program

Background

Anesthetic gases are used in many laboratories. Inhaled anesthetics include two classes of chemicals: nitrous oxide and halogenated agents. Halogenated anesthetic gases include halothane, isoflurane, sevoflurane, desflurane, enflurane, and methoxyflurane (used infrequently).

Waste anesthetic gases (WAG’s) are unused anesthetics that have a potential for human exposure if not properly controlled. The following program is being implemented to measure the exposure of laboratory personnel to waste anesthetic gases.

Ref: Anesthetic Gases, Laboratory Safety Guidelines, www.ehs.indiana.edu/lab_safety.shtml

Regulatory Limits

Presently, the Occupational Safety and Health Administration (OSHA) has not created a regulation regarding WAG’s. The National Institute for Occupational Safety and Health (NIOSH) and the American Conference of Governmental Industrial Hygienists (ACGIH) have recommended exposure limits for WAG’s.

The following table summarizes the recommended exposure limits.

<table>
<thead>
<tr>
<th>Anesthetic Gas</th>
<th>OSHA PEL (ppm) ¹</th>
<th>NIOSH REL (ppm)²</th>
<th>ACGIHTLV-TWA (ppm)³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrous Oxide (N₂O)</td>
<td>None</td>
<td>25⁴</td>
<td>50</td>
</tr>
<tr>
<td>Isoflurane</td>
<td>None</td>
<td>Ceiling⁵</td>
<td>None</td>
</tr>
<tr>
<td>Halothane</td>
<td>None</td>
<td>Ceiling⁵</td>
<td>50</td>
</tr>
<tr>
<td>Desflurane</td>
<td>None</td>
<td>Ceiling⁵</td>
<td>None</td>
</tr>
<tr>
<td>Sevoflurane</td>
<td>None</td>
<td>Ceiling⁵</td>
<td>None</td>
</tr>
<tr>
<td>Enflurane</td>
<td>None</td>
<td>Ceiling⁵</td>
<td>75</td>
</tr>
<tr>
<td>Methoxyflurane</td>
<td>None</td>
<td>Ceiling⁵</td>
<td>None</td>
</tr>
</tbody>
</table>

Notes:
1. PEL: permissible exposure limit, ppm – parts per million
2. REL: recommended exposure limit measured as a time weighted average (TWA) during the period of anesthetic administration, not to exceed one hour.
3. TLV – TWA: threshold limit value – time weighted average. This value refers to an 8-hour workday and a 40-hour work week.
4. Measured as a TWA over the period of anesthetic administration
5. Ceiling limit concentration of no greater than 2 ppm over a period not to exceed one hour.

Sources of Exposure

WAG’s can escape into the room from potential leak sources. Those include:

- Vaporizers and cylinder valves
- High and low pressure connections
- Defects in the rubber tubing or hoses
- Reservoir bags & ventilator bellows
- Y-Connectors
- Poor capture by exhaust ventilation
- Expired charcoal scavenger canisters
- Improper procedure
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In addition, selected anesthesia techniques and improper practices such as leaving gas flow control valves open and vaporizers on after use, spillage of liquid inhaled anesthetics, and poorly fitting face masks or improperly inflated tracheal tube and laryngeal mask airway cuffs can also contribute to the escape of WAG’s into the OR atmosphere.

To arrange for a waste anesthetic gas leak detection test, please complete the following form and submit to the address below or fill out an online request form by clicking on “Leak Detection” under “Services” at:

http://www.ehs.indiana.edu/lab_safety.shtml

EHS will arrange a date and time to test for leaks using a portable Infrared Spectrophotometer during an actual simulation using your anesthetic(s).

Name: ________________________________
Date: ________________________________
Anesthetic(s) used: ________________________________
Anesthetizer: ________________________________
    (i.e. vaporizer, gauze pad in desiccator, etc.)
Anesthetic delivery device: ________________________________
    (i.e. nose cone, vapor chamber, desiccator, etc.)
Gas removal system: ________________________________
    (i.e. fume hood, snorkel, charcoal canister, etc.)
Laboratory or room number: ________________________________
Frequency of use: ________________________________
    (i.e. daily, weekly, monthly, semi-annually, etc.)

Send form via campus mail to:

Laboratory Chemical Safety Program
Office of Environmental, Health, and Safety Management
1514 E Third St.
Bloomington, IN 47405