Anesthetic Gas Safety Policy

I. Purpose

The Environmental Health and Safety (EHS) Department has developed this policy to protect employees at Indiana University Purdue University at Indianapolis (IUPUI) who have an occupational exposure to anesthetic gases. 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).

The policy set forth is intended to ensure compliance with federal, state, and local requirements. Presently, the Occupational Safety and Health Administration (OSHA) has not adapted a regulation regarding waste anesthetic gases (WAG’s). The National Institute for Occupational Safety and Health (NIOSH) and the American Conference of Governmental Industrial Hygienists (ACGIH) both have recommended exposure limits for WAG’s.

II. Scope

This policy applies to all employees who work with or supervise work involving anesthetic gases at the IUPUI campus. Anesthetic gases are used in laboratories throughout campus during animal surgical procedures and in the dental school during surgical procedures.

III. Responsibilities

EHS is responsible for:
1. The development, implementation, and oversight of the program.
2. Area and personal air monitoring to determine exposure.
3. Ensuring compliance with all federal, state, and local regulations.

The Departments are responsible for:
1. Ensuring that all personnel have been trained prior to anesthetic gas use.
2. Following all safety guidelines for anesthetic gas use.
3. Anesthetic gas equipment maintenance.
4. Reporting any liquid agent spills or releases to EHS.
5. Compliance with IUPUI’s Hazard Communication Program.
6. Reporting results of all monitoring to employees.
7. Ensuring completion of an incident report for any health or safety related incidents and forwarding the report to Occupational Health Services and EHS.

Employees are responsible for:
1. Completing the anesthetic gas training course.
2. Following all safety guidelines when working with anesthetic gases.
3. Inspecting all equipment prior to and after each use.
4. Ensuring the scavenge system is used with all anesthetic gas machines.
5. Ensuring that a scavenge system (such as a fume hood, a vacuum line out of the building, a down draft table, or a ducted biosafety cabinet) is used when using a bell jar or any other anesthesia induction method that releases anesthetic gases into the procedure area.
6. Reporting any problems with equipment to department management.
7. Reporting any liquid agent spills or releases to department management and EHS.
8. Following IUPUI’s Hazard Communication Program.
9. Reporting any health or safety concerns to department management and completing an incident report.

IV. Regulatory Limits

Presently, the Occupational Safety and Health Administration (OSHA) has not created or adapted a regulation regarding WAG’s. The National Institute for Occupational Safety and Health (NIOSH) and the American Conference of Governmental Industrial Hygienists (ACGIH) both 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>ACGIH TLV-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>Ceiling 2⁺</td>
<td>None</td>
</tr>
<tr>
<td>Halothane</td>
<td>None</td>
<td>Ceiling 2</td>
<td>50</td>
</tr>
<tr>
<td>Desflurane</td>
<td>None</td>
<td>Ceiling 2</td>
<td>None</td>
</tr>
<tr>
<td>Sevoflurane</td>
<td>None</td>
<td>Ceiling 2</td>
<td>None</td>
</tr>
<tr>
<td>Enflurane</td>
<td>None</td>
<td>Ceiling 2</td>
<td>75</td>
</tr>
<tr>
<td>Methoxyflurane</td>
<td>None</td>
<td>Ceiling 2</td>
<td>None</td>
</tr>
</tbody>
</table>

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.

V. Exposure Monitoring

EHS can perform air monitoring to determine the anesthetic gas concentrations in the air. The two types of monitoring performed are personal and area. Personal monitoring is conducted at the employee’s breathing zone to determine WAG exposure for the
employee. The monitoring is performed using a passive dosimeter which collects gas on a media and is then analyzed by a laboratory. Area monitoring is conducted in the work area to give WAG concentrations in work areas. A portable infrared spectrophotometer, or direct read instrument, is used to collect real time samples. EHS can also perform leak testing on the equipment to determine if gas is escaping from various locations in the machine. A portable infrared spectrophotometer is used to detect leakage.

VI. Training

All employees who work with or supervise work with anesthetic gases shall complete online training via EHS’s website prior to using any anesthetic gas. The training shall consist of the following: regulatory limits, health effects of nitrous oxide and halogenated agents, sources of exposure, scavenge systems, anesthetic gas equipment inspections, engineering controls, work practices, administrative controls, liquid agent spills, air monitoring, medical surveillance, and hazard communication. The training shall be conducted upon initial assignment and whenever there is a change in process or procedure.

VII. Information

For additional information regarding IUPUI’s anesthetic gas policy, please refer to EHS’s Anesthetic Gas Training Program at www.ehs.iupui.edu or contact EHS at 274-2005.