Occupational Exposure to Nitrous Oxide

Presented by the Office of Environmental Health and Safety
Uses of Nitrous Oxide

• Anesthetic agent in medical, dental, and veterinary operatories
• Food processing propellant
• Component of certain rocket fuels
• Oxidant for organic compounds
• Nitrating agent for alkali metals
Chemical Description

- Synonyms: laughing gas, factitious air, nitrogen oxide, dinitrogen monoxide
- Chemical formula: $\text{N}_2\text{O}$
- Clear, colorless gas at room temperature
- Slightly sweet odor and taste
Routes of Exposure

• Exposure to nitrous oxide occurs primarily through inhalation.

• Skin exposure to liquefied gas may occur when handling compressed gas cylinders. This is a result of the rapid evaporation of the liquefied gas.
Health Effects

• Acute: dizziness, slurred speech, difficulty breathing, headache, nausea, fatigue, irritability
• Chronic: tingling and numbness; difficulty concentrating; interference with gait; reproductive effects; neurologic, renal, and kidney disease
• Pure nitrous oxide will result in asphyxiation.
• Cryonic burns may occur when handling compressed gas cylinder.
How EH&S Monitors Exposure

- An Assay Technology ChemDisk monitor for nitrous oxide is worn for the duration of the procedure on the lapel to represent the breathing zone.
- The disk is collected and sent to an AIHA accredited laboratory for testing.
- A report of the results is distributed to the supervisor and the employee.
Employee Exposure to Nitrous Oxide

• OSHA does not regulate nitrous oxide exposure.
• ACGIH TLV: 50 ppm as a TWA
• EH&S compares your exposure to the ACGIH TLV.
ACGIH TLV TWA

- ACGIH Threshold Limit Value is the average concentration for a normal 8-hour workday and a 40-hour workweek to which nearly all workers may be exposed repeatedly, day after day, without adverse effects.
When Will Monitoring Take Place?

• Initial monitoring.
• Annual monitoring.
• Periodic monitoring when initial results are above the TLV or there is a change in the procedure.
Protective Work Clothing and Equipment

• Scavenging system provides adequate respiratory protection when operating within design specifications.

• Thermal resistant gloves are necessary when handling compressed gas cylinders, as this may present a cryogenic hazard.
Leaks

- Stop the leak (shut off cylinder) if it is possible to do so without risk.
- Provide additional ventilation to the area.
- Isolate the area until gas has dispersed.
Storage

- Cylinders should be secured with straps or chains to prevent physical damage.
- For additional storage information, visit www.ecu.edu/oehs/LabSafety/compressed.htm
Control Measures for Anesthetic Delivery System

• Check all rubber hoses, connections, tubing, and breathing bags.

• Check both high and low pressure connections.

• Check nitrous oxide and oxygen mixing system.

• Perform leak testing of the equipment.
Control Measures for Scavenging System

- Assure that the nitrous oxide is turned on only if the scavenging system is also activated.
Control Measures for Scavenging System

• Scavenging system exhaust rates should be approximately 45 L/min, regardless of the number of systems operating at a time.
• Monitor flow rate with a flowmeter.
Control Measures for Scavenging System

- Supply scavenging mask in a variety of sizes to ensure a secure fit over the patient's nose or face.
- All scavenging pumps should vent to the outside of the building away from fresh air intakes, windows, and walkways.
Work Practices to Control Exposure

• Do not fill the breathing bag to capacity with nitrous oxide.
• Minimize speech and mouth breathing by the patient during the procedure.
• After the procedure, flush the system of nitrous oxide.
Contact Information

• For additional information, please contact EH&S at (252) 328-6166, visit our website at www.ecu.edu/oehs, or visit our office located at 210 East 4th Street.
• Send completed quiz via e-mail or mail to EH&S to receive credit.
• Click the link to complete the QUIZ