Chemicals and Materials

Waste Anesthetic Gases, Hazards of

On this page

What are waste anesthetic gases?

Anesthetic gases are used during medical or research procedures. Small amounts of anesthetic gases can be released or leak out into the workplace. These gases and vapours are known as waste anesthetic gases (WAGs).

Gases most commonly used are nitrous oxide, isoflurane, desflurane, and sevoflurane.

Who can be potentially exposed to WAGs?

People who work in hospitals in operating rooms, labour and delivery rooms, recovery rooms, and remote anesthetic locations such as radiology or post-anesthetic care units, as well as those who work in dental offices, veterinary clinics, and animal research facilities, may be exposed to WAGs.

These occupations include:

- Anesthesiologists
- Dentists
- Nurses (operating room, recovery room)
- Operating room technicians and other personnel
- Surgeons
- Veterinarians and support staff

What are the health effects of occupational exposure to WAGs?

Exposure to waste anesthetic gases may cause:

- Headache
- Irritability
- Fatigue
- Nausea
- Drowsiness
- Difficulties with judgment and coordination
- Liver and kidney disease
- Sterility
- Miscarriage and birth defects
- Cancer

How does exposure to WAGs occur?

Workers are most likely to be exposed to WAGs in environments without ventilation or scavenging systems, or where these systems are not properly maintained. Workers can also be exposed under the following conditions:

- Anesthetic gas may escape when filling vapourizers.
- WAGs may escape during the initial hookup and disconnection of the anesthesia system or the scavenging system.
- WAGs can escape from around the patient's anesthesia mask, especially if the mask is a poor fit.
- WAGs can escape from around the patient's endotracheal tube (ETT) or laryngeal mask airway (LMA) if the cuff is not properly inflated or the wrong size is used.
- Leaks in the anesthesia system.
- Leaks in the high-pressure system between the nitrous oxide (N_2O) cylinder and yoke assembly or between the anesthetic gas column outlets and the (N_2O) hose.
- When the system is flushed or purged at the conclusion of a medical procedure.
- Ineffective or poor ventilation or gas scavenging systems.

- Leakage from any tubing, seals, and gaskets if they are not properly maintained or connected.

What are some measures for controlling exposure to WAGs?

- Use a well-designed WAG scavenging system to collect, remove, and properly dispose of gases.
    - Make sure that the gases are not discharged near the air intake of the building or surrounding buildings.
    - The scavenging system should be kept in good repair to prevent leaks using a maintenance and inspection program.
    - The scavenger system must be independent of the main hospital ventilation system. In the event of a “Code RED”, hospital ventilation is shut down to reduce the potential spread of a fire but the scavenger system must continue to work. If the scavenger system is shut off, the decision to provide a total intravenous anesthetic (TIVA) must be considered and anesthetic gases must be stopped if clinically safe for the patient.
    - Consider using a WAG collection canister that can be attached to an anesthetic gas machine before the scavenger. It will capture the agents (except for nitrous oxide). This technology reduces emissions to the atmosphere by capturing the agents and recycling them.
- Use a properly designed heating, ventilation, and air conditioning (HVAC) system to help contribute to the dilution and removal of WAG not collected by the scavenging system.
    - Proper room ventilation will make sure that any WAG that escape the patient circuit are properly ventilated, thereby reducing exposure to all staff.
    - Make sure that no objects, such as a desk, cart, or chair, that block the ventilation in the surgical suite, reducing the air exchanges.
- Prepare proper maintenance and inspection programs for the WAG scavenging system, anesthesia machines, and the ventilation system. The scavenging system, anesthesia machines, and respirators must be checked daily for leaks and properly monitored.
- Follow recommended manufacturer guidelines for the inspection and preventive maintenance programs for the anesthetic gas machines.
- The anesthetic gas system must be inspected and pass the checkout procedure before administering an anesthetic as outlined by the Canadian Anesthesiologists Society (CAS) or equivalent for your area.

- Clean up any liquid anesthetic spills right away. Spills should be treated as emergencies. Spills of anesthetic agents must only be cleaned up and controlled by properly trained and equipped personnel.
- Fill vapourizers in a well-ventilated room and fill them in a way that minimizes spills, such as using a “key-fill” spout. In some situations, a local ventilation hood, ventilation cabinet, or a local scavenging device is preferred. Follow the manufacturer’s instructions for use and safety for each type of equipment.
- Flush out the breathing system by administering non-anesthetic gases before extubating a patient’s trachea or removing their mask.
- Perform area and personal air monitoring to measure exposure to WAGs. Monitoring can aid in identifying the presence and location of leaked gases and the effectiveness of corrective measures.
    - As most halogenated anesthetic gases cannot be detected by smell (unless they are in high concentration), proper monitoring becomes all the more critical. Nitrous oxide is an odourless and colourless gas and can only be detected by WAG monitor.
- Develop and implement a written hazard communication program regarding WAGs that includes a description of the physical and health hazards of anesthetic agents in use, safety data sheets on all anesthetic gases used, proper labelling of canisters, tanks, and containers, and a comprehensive employee training and information program.
    - The program should list steps workers can take to protect themselves from the hazards of WAGs. It should also include information on steps taken by the employer, such as engineering controls, clearly outline emergency procedures to contain spills, describe safe work practices and the use of personal protective equipment, and detail the use of sampling devices.

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