Standard Operating Procedure (SOP)			
Title: **NITROUS OXIDE**			
Approved by:		*Effective Date:*	
David A. Brown,		*Revised Date:*	
Director, EH&S		*Section:*	**CHEM**

1. Purpose

- Use of nitrous oxide as an anesthetic agent in medical, dental, and veterinary environments.

2. Physical Hazards

- Colorless gas with a slightly sweet odor (inhalation anesthetic).
- Shipped as a liquefied compressed gas.
- Nonflammable gas, but supports combustion at elevated temperatures.
- Incompatibilities and Reactivities: aluminum, boron, hydrazine, lithium hydride, phosphine and sodium.

3. Health Hazards

- Symptoms of exposure to nitrous oxide include:
  - Dyspnea (breathing difficulty).
  - Drowsiness.
  - Headache.
  - Asphyxia.
  - Reproductive effects.
- Exposure to the liquid form of nitrous oxide causes frostbite.

4. Personal Protective Equipment

- EYE PROTECTION
  - Safety glasses, goggles or face shields must be worn during operations in which nitrous oxide might contact the eyes (e.g., through vapors or splashes of solution).
  - Ordinary (street) prescription glasses do not provide adequate protection. Adequate safety glasses must meet the requirements of the Practice for Occupational Education Eye and Face Protection (ANSI Z87.1-2003) and must be equipped with side shields.
  - Wearing contact lenses under some circumstances provides workers with a greater choice of eye and face protection (such as goggles or full-facepiece respirators without prescription inserts) as well as better visual acuity. However, the risk is unknown for contact lens wearers compared with nonwearers working with chemicals listed in the NIOSH Pocket Guide to Chemical Hazards [NIOSH 2004]. OSHA recommends against contact lens use when working with acrylonitrile, methylene chloride, 1,2 dibromo-3-chloropropane, ethylene oxide, and methylene dianiline." NIOSH Publication No. 2005-139: Current Intelligence Bulletin 59, Contact Lens Use in a Chemical Environment.
- HAND PROTECTION
  - Use disposable nitrile gloves when working with chemicals.
  - Laboratory personnel should thoroughly wash hands with soap and water before and immediately upon removal of gloves.
- LAB COATS, ETC.
  - Lab coats, closed toed shoes and long sleeved clothing must be worn when handling nitrous oxide to prevent any potential skin contact.
- SAFETY SHOWER/EYEWASH
  - Where the eyes or body of any person may be exposed to nitrous oxide, suitable facilities for quick drench or flushing of the eyes and body must be provided within the work area for immediate emergency use.

- Bottle type eyewash stations are not acceptable.

5. Designated Area for Use and Containment Devices

- All nitrous oxide work must be done in the laboratory fume hood.
- The fume hood's sash must be in the position where a face velocity of 100 feet per minute is achieved.
- Nitrous oxide must only be used in operations that have the requirements listed in Section 6.
- Laboratory or other use area must be marked as follows:

Caution
Nitrous Oxide in Use
Potential Reproductive Toxin

6. Special Handling Procedures and Storage Requirements

- Store nitrous oxide in a flammable liquids storage cabinet.
- Properly secure store cylinders.
- Monitor anesthetic equipment when installed every 3 months thereafter:
  - Leak test equipment.
  - Monitor air in the worker's personal breathing zone.
  - Monitor the environment (room air).
- Prevent leakage from the anesthetic delivery system through proper maintenance and inspection of equipment. Eliminate or replace the following:
  - Loose-fitting connections.
  - Loosley assembled or deformed slip joints and threaded connections.
  - Defective or worn seals, gaskets, breathing bags, and hoses.
- Control waste nitrous oxide with a well-designed scavenging system that includes the following:
  - Securely fitting masks.
  - Sufficient flow rates (i.e., 45 liters per minute) for the exhaust system.
  - Properly vented vacuum pumps.
- Make sure that the room ventilation effectively removes waste Nitrous Oxide. If concentrations of nitrous oxide are above 25 ppm, take the following steps:
  - Increase the airflow into the room.
  - Use supplemental local ventilation to capture nitrous oxide at the source.

7. Exposure Monitoring

Users of this chemical are required to notify WFUSM EH&S at 716-9375 so exposure monitoring can be performed to determine exposure level.

8. Waste Disposal

Return empty cylinders of nitrous oxide to vendor of purchase.
Excess nitrous oxide and all waste material containing nitrous oxide must be placed in an unbreakable secondary container labeled with the following **"HAZARDOUS WASTE NITROUS OXIDE"**. Full containers of nitrous oxide waste must be disposed of according to WFUSM EH&S Hazardous Waste Program.

Excess nitrous oxide and all waste material containing nitrous oxide must be placed in a container which is stored in secondary containment with the following label **"HAZARDOUS WASTE NITROUS OXIDE"** and disposed through WFUSM EH&S.

9. Spill and Accident Procedures

If spill is greater than 300 ml, do not attempt to clean up the spill. Immediately report the spill to WFUBMC Security at 716-9111 and WFUSM EH&S at 716-9375.

If any exposure or contact to the chemical, rinse affected area under a safety shower/eyewash for 15 to 20 minutes, inform supervisor, and report to WFUBMC Employee Health or Emergency Department.

10. Training

- Documented training must be available that a training program that describes nitrous oxide hazards and defines prevention measures exists including:
    - Standard operating procedures for all tasks that may expose workers to nitrous oxide.
    - Proper work practices, controls, equipment, and personal protective equipment that should be used when working with nitrous oxide.