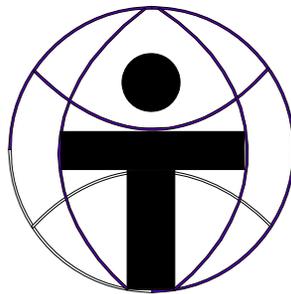


National Institutes of Health

Clinical Center Nitric Oxide Surveillance Program



Reviewed: February 2010

**Technical Assistance Branch
Division of Occupational Health and Safety
ORS**

Clinical Center Nitric Oxide Surveillance Program

INTRODUCTION

A nitric oxide surveillance program has been established at the National Institutes of Health (NIH) to:

- 1) Identify and quantify exposure levels of workers in the Clinical Center potentially exposed to nitric oxide, and
- 2) Provide information on the effectiveness of the controls that are being used to minimize exposures.

Surveys serve to provide documentation of surveillance activities to the Joint Commission on Accreditation of Healthcare Organizations (JCAHO). The program is maintained by the Technical Assistance Branch (TAB) of the Division of Occupational Health and Safety (DOHS). Medical surveillance of NIH employees is provided by the Occupational Medical Service (OMS). Personnel in the Clinical Center are covered by this protocol. All other NIH laboratories where potential nitric oxide exposure results from the handling and use of nitric oxide are covered by the Occupational Safety and Health Administration (OSHA) Laboratory Standard, 29 CFR 1910.1450.

Nitric oxide, NO [CAS 10102-43-9] is a colorless compressed gas. Synonyms include: nitrogen monoxide and mononitrogen monoxide. Nitric oxide is a strong oxidant which can ignite or explode on contact with combustible materials. In contact with air it will react to form nitrogen dioxide.

Short term exposure to nitric oxide causes irritation to the skin, eyes and respiratory system. Exposure can also cause nausea, vomiting, stomach pain, chest pain, difficulty breathing, headache, dizziness, bluish skin color, and lung congestion.

OCCUPATIONAL EXPOSURE CRITERIA

For evaluating employee exposures to nitric oxide, the NIH uses exposure criteria established by the Occupational Safety and Health Administration (OSHA). OSHA has set a permissible exposure limit (PEL) of 25 parts per million (ppm) as an eight-hour time-weighted-average (TWA).

Note: The NIH has also adopted the Threshold Limit Value(s) [TLV] from the American Conference of Governmental Industrial Hygienists [ACGIH]. For nitric oxide, the OSHA PEL and ACGIH TLV are the same: 25 ppm.

WORKPLACE EVALUATION

All work sites in the NIH Clinical Center where nitric oxide is used should be identified and initially evaluated using the Nitric Oxide Workplace Evaluation Sheet (attached as Appendix 1)

to determine if workers in the area may be exposed to nitric oxide. The initial evaluation should be conducted by the Clinical Center Safety Officer or designee.

A copy of the initial evaluation should be given to the TAB, DOHS. If, based on the initial evaluation, it is determined that workers are potentially exposed to nitric oxide levels that can exceed the exposure criteria, the workplace will be monitored by TAB.

ANALYTICAL METHOD

Monitoring devices and dosimeters specific for nitric oxide will be used to take area and personal samples. Monitoring devices will be calibrated before and after use. The dosimeters will be analyzed by the dosimeter manufacturer or an American Industrial Hygiene Association accredited laboratory.

MONITORING PROCEDURE

a. Frequency of Monitoring

Monitoring will be conducted at Clinical Center work sites where a workplace evaluation has determined that workers may be exposed to nitric oxide. Monitoring will be carried out on a yearly basis. If two consecutive surveys are completed without any recorded exposures, monitoring will be discontinued at that location. Monitoring will be re-instituted at any work site if any symptoms of exposure to nitric oxide are reported or equipment or personnel change.

b. Monitoring Locations

Monitoring locations, including procedures and contact persons, are listed in Table 1. It is the responsibility of the Clinical Center Safety Officer and /or Safety Committee to provide the TAB, DOHS with any additions to the list of nitric oxide usage areas within the Clinical Center as they appear in Table 1. The locations listing will be reviewed annually.

c. Field Sampling

Field sampling should take place during worst case situations, cylinder storage and changing, and procedure use. Area and personal sampling should be conducted. Placement of monitoring equipment and dosimeters will be at the discretion of the industrial hygienist conducting the sampling.

d. Ventilation

The directional air flow of the work site, with respect to the corridor, will also be determined and recorded. Any local exhaust ventilation (LEV) devices used will be evaluated and certified by TAB, DOHS to determine that they meet LEV criteria established by NIH.

PERSONAL PROTECTIVE EQUIPMENT

In those locations or during those procedures where it is determined by monitoring that nitric oxide levels exceed the exposure criteria set by NIH, appropriate engineering controls will be instituted to lower exposures.

TRAINING

Training and information on the hazards of nitric oxide will be provided by the area supervisor to those employees working in NIH locations where exposure levels to nitric oxide exceed NIH criteria.

REPORTS

Written monitoring reports will be prepared by the TAB as soon as possible after receipt of the laboratory results and sent to the appropriate supervisor in each location (see Table 1). It is the responsibility of the supervisor in each location to initiate and follow-up to completion on the recommendations made in the report. Implementation of recommendations shall be coordinated by the Clinical Center Safety Officer.

In the event that personal monitoring of NIH employees for nitric oxide measures concentrations exceeding the NIH exposure criteria, employees will be notified in writing, of the results of the monitoring within 15 days of the results being received from the analytical laboratory. The written notification will also describe procedures or changes being instituted to correct the overexposure.

Records of monitoring activity will be maintained by the TAB, DOHS. Records will include: 1) name of person conducting monitoring, 2) date survey was conducted, 3) sampling and analytical method used, 4) work site ventilation characteristics at the time of sampling, 5) monitoring results, 6) any personal protective equipment worn and 7) recommendations for corrective action, if required.

MEDICAL SURVEILLANCE

NIH workers who are exposed to nitric oxide in concentrations exceeding the NIH criteria will be referred to the NIH Occupational Medical Service (OMS) for evaluation. In these instances, copies of the workplace evaluation and monitoring results will be sent to the Medical Director, OM

REFERENCES

1. Charney, William, and Joseph Schirmer (eds.), Essentials of Modern Hospital Safety: Vol. 1-3, Lewis Publishers, Ann Arbor, Michigan, 1994.
2. Threshold Limit Values for Chemical Substances and Physical Agents, 2008, American Conference of Governmental Industrial Hygienists, Cincinnati, Ohio.
3. Documentation of the Threshold Limit Values and Biological Exposure Indices, 6th edition, American Conference of Governmental Industrial Hygienists, Cincinnati, Ohio.
4. Material Safety Data Sheet (MSDS) for Nitric Oxide, MSDS # 66, Effective Date 12/16/02, Matheson Tri-Gas, Inc., Parsippany, New Jersey.
5. Pocket Guide to Chemical Hazards, National Institutes for Occupational Safety and Health (NIOSH), Cincinnati, Ohio, 1997

Table 1

NIH Nitric Oxide LOCATIONS, SUPERVISORS AND REPORT RECIPIENTS (2009)				
Location	Supervisor	IC	Ext.	Report Recipients
Pentamidine Suite CRC/3-3640 SW (Monitoring performed July 2008)—protocol no longer active	Jim Nichols	CC	301 451 6361	Jim Nichols & Kevin Cole (August 2008)
CRC/3-3650 SW (Monitoring performed August 2009)	Gregory Kato	CC	301 451 8497	Michele Evans Gregory Kato Marlene Peters Lawrence

Appendix 1

Nitric Oxide Workplace Evaluation Sheet

Building: _____ Room: _____ IC:

Supervisor: _____ Telephone #:

Number of employees who work in area:

Describe any reports of eye, skin, or respiratory tract irritation:

Procedure(s) where nitric oxide is used:

Engineering controls used in area:

Personal protective equipment used: