

oraqix[®]

(lidocaine and prilocaine
periodontal gel) 2.5% / 2.5%

THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION



**Nitrous oxide in the dental office. ADA
Council on Scientific Affairs; ADA Council on
Dental Practice**

J Am Dent Assoc 1997;128;364-365

*The following resources related to this article are available online at
jada.ada.org (this information is current as of March 12, 2008):*

Updated information and services including high-resolution figures, can be found
in the online version of this article at:

<http://jada.ada.org/cgi/content/abstract/128/3/364>

This article appears in the following **subject collections**:

Pharmacology <http://jada.ada.org/cgi/collection/pharmacology>

Information about obtaining **reprints** of this article or about permission to reproduce
this article in whole or in part can be found at:

<http://www.ada.org/prof/resources/pubs/jada/permissions.asp>

NITROUS OXIDE IN THE DENTAL OFFICE

ADA COUNCIL ON SCIENTIFIC AFFAIRS; ADA COUNCIL ON DENTAL PRACTICE

The safe use of nitrous oxide in the dental office has been an issue the ADA has monitored for many years. In 1977, an ad hoc committee convened by the Association published a report on the potential health hazards of trace anesthetics in dentistry.¹ Also in 1977, the National Institute of Occupational Safety and Health (NIOSH) reported that, by using several control measures, nitrous oxide levels of approximately 50 parts per million were achievable in dental operatories during routine dental anesthesia/analgesia.² A few years later, in 1980, the ADA Council on Dental Materials, Instruments and Equipment recommended that effective scavenging devices be installed and monitoring programs be instituted in dental offices in which nitrous oxide is used, and the council indicated that using these methods or devices would assist in keeping the levels of nitrous oxide at the lowest possible level.³

NIOSH continued its activities relating to nitrous oxide concentrations in the dental office and, in 1994, published an alert called "Request for Assistance in Controlling Exposures to Nitrous Oxide During Anesthetic Administration."⁴ In the same year, NIOSH also reported on field evaluations and laboratory

ABSTRACT

Nitrous oxide continues to be a valuable agent for the control of pain and anxiety. However, chronic occupational exposure in dental offices not using scavenging systems may be associated with possible deleterious neurological and reproductive effects. This report outlines recommendations for controlling nitrous oxide exposure that were made by an expert panel convened by the ADA.

studies evaluating nitrous oxide scavenging systems and modifications in attempts to achieve the current NIOSH recommended exposure limit of 25 ppm during administration. NIOSH concluded that nitrous oxide levels may be controlled to about 25 ppm by maintaining leak-free delivery systems and using proper exhaust rates, better-fitting masks and auxiliary exhaust ventilation.⁵

In 1995 the ADA Council on Scientific Affairs convened an expert panel to review scientific literature on nitrous oxide and to revise recommendations on controlling nitrous oxide concentrations in the dental office. What follows is an overview of

the conclusions reached by that panel.

CONCLUSIONS AND RECOMMENDATIONS OF THE EXPERT PANEL

Nitrous oxide continues to be a valuable agent for the control of pain and anxiety. However, chronic occupational exposure to nitrous oxide in offices not using scavenging systems may be associated with possible deleterious neurological and reproductive effects on dental personnel. Limited studies show that as little as three to five hours per week of unscavenged nitrous oxide exposure could result in adverse reproductive effects. In contrast, in dental offices using nitrous oxide scavenging systems, there has been no evidence of adverse health effects.⁶ It is strongly recommended, therefore, that while there is no consensus on a recommended exposure limit to nitrous oxide, appropriate scavenging systems and methods of administration should be adopted. A protocol for controlling nitrous oxide is outlined below.

RECOMMENDATIONS FOR CONTROLLING NITROUS OXIDE EXPOSURE

The expert panel identified a number of recommendations that are important to consider in the safe and effective use of

nitrous oxide:

- The dental office should have a properly installed nitrous oxide delivery system. This includes appropriate scavenging equipment with a readily visible and accurate flow meter (or equivalent measuring device), a vacuum pump with the capacity for up to 45 liters of air per minute per workstation, and a variety of sizes of masks to ensure proper fit for individual patients.

- The vacuum exhaust and ventilation exhaust should be vented to the outside (for example, through the vacuum system) and not in close proximity to fresh-air intake vents.

- The general ventilation should provide good room air mixing.

- Each time the nitrous oxide machine is first turned on and every time a gas cylinder is changed, the pressure connections should be tested for leaks. High-pressure-line connections should be tested for leaks on a quarterly basis. A soap solution may be used to test for leaks. Alternatively, a portable infrared spectrophotometer can be used to diagnose an insidious leak.

- Prior to first daily use, all nitrous oxide equipment (reservoir bag, tubings, mask, connectors) should be inspected for worn parts, cracks, holes or tears. Replace as necessary.

- The mask may then be connected to the tubing and the vacuum pump turned on. All appropriate flow rates (that is, up to 45 L/min. or per manufacturer's recommendations) should be verified.

- A properly sized mask should be selected and placed on the

patient. A good, comfortable fit should be ensured. The reservoir (breathing) bag should not be over- or underinflated while the patient is breathing oxygen (before administering nitrous oxide).

- The patient should be encouraged to minimize talking and mouth breathing while the mask is in place.

- During administration, the reservoir bag should be periodically inspected for changes in tidal volume and the vacuum flow rate should be verified.

- On completing administration, 100 percent oxygen should be delivered to the patient for five minutes before removing the mask. In this way, both the patient and the system will be purged of residual nitrous oxide. Do not use an oxygen flush.

- Periodic (semiannual interval is suggested) personal sampling of dental personnel, with emphasis to chairside personnel exposed to nitrous oxide, should be conducted (for example, use of diffusive sampler [dosimeters] or infrared spectrophotometer).

RESEARCH PRIORITIES

The expert panel identified a number of areas that require high-priority research:

- the elucidation of biological mechanisms that result in the adverse health effects associated with exposure to nitrous oxide;

- studies to gain a full understanding of the potential health effects of chronic low-level exposure to nitrous oxide, with emphasis on prospective studies that use direct nitrous oxide exposure measurement;

- the investigation of possible cognitive effects related to exposure to low levels of nitrous oxide;

- the development of equipment to evaluate and control exposure to nitrous oxide;

- the study of ventilation systems and air-exchange mechanisms for dental office designs;

- the evaluation of advantages associated with the use of nitrous oxide in combination with other sedative drugs.

The councils will continue to work with industry and the research community to address research and development needs that will further reduce occupational exposure to nitrous oxide. ■

Address reprint requests to ADA Council on Scientific Affairs, Department of Information and Policy, 211 E. Chicago Ave., Chicago, Ill. 60611.

1. ADA Ad Hoc Committee on Trace Anesthetics as Potential Health Hazard in Dentistry. Reports of subcommittees of the ADA Ad Hoc Committee on Trace Anesthetics as Potential Health Hazard in Dentistry: review and current status of survey. *JADA* 1977;95(10):787-90.

2. Whitcher CE, Zimmerman DC, Piziali RL. Control of occupational exposure to N₂O in the dental operator. Cincinnati: National Institute of Occupational Safety and Health, 1977; DHEW publication no. (NIOSH) 77-171.

3. Council on Dental Materials, Instruments and Equipment. Council position on nitrous oxide scavenging and monitoring devices. *JADA* 1980;101(1):62.

4. Alert: request for assistance in controlling exposures to nitrous oxide during anesthetic administration. Cincinnati: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Institute of Occupational Safety and Health, 1994; DHHS publication no. (NIOSH) 94100.

5. Technical report: control of nitrous oxide in dental operatories. Cincinnati: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Institute of Occupational Safety and Health, Division of Physical Sciences and Engineering, Engineering Control Technology Branch, 1994; DHHS publication no. (NIOSH) 94-129.

6. Rowland AS, Baird DD, Weinberg CR, Shore DL, Shy CM, Wilcox AJ. Reduced fertility among women employed as dental assistants exposed to high levels of nitrous oxide. *N Engl J Med* 1992;327:993-7.