Policy on Minimizing Occupational Health Hazards Associated with Nitrous Oxide

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Purpose

The American Academy of Pediatric Dentistry (**AAPD**) recommends that exposure to ambient nitrous oxide (N_2O) be minimized to reduce occupational health hazards for dental personnel.

Methods

This policy was originally developed by the Clinical Affairs Committee and adopted in 1987. This document is a revision of the previous version, revised in 2008. The policy is based on a systematic literature search of the PubMed®/MEDLINE database using the terms: nitrous oxide, occupational exposure, AND dentistry; fields: all; limits: within the last 10 years, English. Sixteen articles met these criteria; three additional papers from the previous policy statement were reviewed and added to the references. Guidelines and recommendations from the National Institute for Occupational Safety and Health (**NIOSH**) also were reviewed.[1-2] Expert opinions and best current practices were relied upon when sufficient scientific data were not available.

Background

Effects of occupational exposure to ambient N_2O are uncertain, especially since the introduction of methods to scavenge N_2O and ventilate operatories.[3] Studies that linked increased general health problems and reproductive difficulties among dental personnel to chronic exposure to significant levels of ambient N_2O have been challenged.[3] A maximum safe level of ambient N_2O in the dental environment has not been determined.[4-6]

Reduction of ambient N_2O through system maintenance, scavenging, ventilation, use of the minimal effective dose, and patient management is important to maintaining the lowest practical levels in the dental environment.[1,2,7] Frequent and regular inspection and maintenance of the N_2O delivery system, together with the use of a scavenging system, can reduce ambient N_2O significantly.[8] Using a well-fitted mask and an appropriate amount of suction via the scavenging system will minimize leakage, reducing ambient N_2O levels.[8,9] NIOSH has recommended that the exhaust ventilation of N_2O from the patient's mask be maintained at an air flow rate of 45 L/min and vented outside the building away from fresh air intakes.[2] However, scavenging at this rate has been shown to reduce the level of pyschosedation achieved with N_2O inhalation.[10] Where possible, outdoor air should be used for dental operatory ventilation.[1] Supply and exhaust vents should be well separated to allow good mixing and prevent short-circuiting.[1]

Patient selection is an important consideration in reducing ambient N_2O levels.[7] Patients who are unwilling or unable to tolerate the nasal hood and those with medical conditions (e.g., obstructive respiratory diseases, emotional disturbances, drug dependencies) that contraindicate the use of N_2O should be managed by other behavior guidance techniques.[7] In the dental environment, patient behaviors such as talking, crying, and moving have been shown to result in significant increases in baseline ambient N_2O levels despite the use of the mask-type scavenging systems.[11,12] Furthermore, the use of scavenging systems alone cannot lower the ambient N_2O levels to the recommended standards.[8,11,13] Use of supplemental measures, such as a high-volume dental aspirator placed in proximity to the dental operative site, has been shown to reduce ambient N_2O levels significantly.[11,14] During the first three to five minutes after terminating N_2O administration, a significant amount of the gas is exhaled by the patient. Once N_2O administration is discontinued, administering 100 percent oxygen to the patient for at least five minutes allows oxygen to replace the N_2O in the gas delivery system.[2,15] This post-procedural oxygenation also decreases the risk of diffusion hypoxia to the patient. Diligent use of the above practices in the pediatric dental environment has allowed for the reduction of ambient N_2O to the levels recommended by NIOSH.[14,16] Measurement of N_2O levels in the dental operatory can be helpful in determining the type and extent of remediation necessary to decrease occupational exposure.

Policy statement

The AAPD encourages dentists and dental auxiliaries to maintain the lowest practical levels of N_2O in the dental environment while using N_2O. Adherence to the recommendations below can help minimize occupational exposure to N_2O.

ABBREVIATIONS
AAPD: American Academy Pediatric Dentistry. **N_2O:** Nitrous Oxide.
NIOSH: National Institute for Occupational Safety and Health.

- Use scavenging systems that remove N_2O during patient's exhalation.
- Ensure that exhaust systems adequately vent scavenged air and gases to the outside of the building and away from fresh air intake vents.
- Use, where possible, outdoor air for dental operatory ventilation.
- Implement careful, regular inspection and maintenance of the nitrous oxide/oxygen delivery equipment.
- Carefully consider patient selection criteria (i.e., indications and contraindications) prior to administering N_2O.
- Select a properly-fitted mask size for each patient.
- During administration, visually monitor the patient and titrate the flow/percentage to the minimal effective dose of N_2O.
- Encourage patients to minimize talking and mouth breathing during N_2O administration.
- Use rubber dam and high volume dental evacuator when possible during N_2O administration.
- Administer 100 percent oxygen to the patient for at least five minutes after terminating nitrous oxide use to replace the N_2O in the gas delivery system.

References

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