

# Policy on Minimizing Occupational Health Hazards Associated with Nitrous Oxide

## Review Council

Council on Clinical Affairs

## Latest Revision

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### Purpose

The American Academy of Pediatric Dentistry (AAPD) recommends that exposure to ambient nitrous oxide (N<sub>2</sub>O) 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<sup>®</sup> electronic data base 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.<sup>1-2</sup> Expert opinions and best current practices were relied upon when sufficient scientific data were not available.

### Background

Effects of occupational exposure to ambient N<sub>2</sub>O are uncertain, especially since the introduction of methods to scavenge N<sub>2</sub>O and ventilate operatories.<sup>3</sup> Studies that linked increased general health problems and reproductive difficulties among dental personnel to chronic exposure to significant levels of ambient N<sub>2</sub>O have been challenged.<sup>3</sup> A maximum safe level of ambient N<sub>2</sub>O in the dental environment has not been determined.<sup>4-6</sup>

Reduction of ambient N<sub>2</sub>O 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.<sup>1,2,7</sup> Frequent and regular inspection and maintenance of the N<sub>2</sub>O delivery system, together with the use of a scavenging system, can reduce ambient N<sub>2</sub>O significantly.<sup>8</sup> Using a well-fitted mask and an appropriate amount of suction via the scavenging system will minimize leakage, reducing ambient N<sub>2</sub>O levels.<sup>8,9</sup> NIOSH has recommended that the exhaust ventilation of N<sub>2</sub>O 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.<sup>2</sup> However, scavenging at this rate has been shown to reduce the level of psychosedation achieved with N<sub>2</sub>O inhalation.<sup>10</sup> Where possible, outdoor air should be used for dental operator ventilation.<sup>1</sup> Supply and exhaust vents should be well separated to allow good mixing and prevent short-circuiting.<sup>1</sup>

Patient selection is an important consideration in reducing ambient N<sub>2</sub>O levels.<sup>7</sup> 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<sub>2</sub>O should be managed by other behavior guidance techniques.<sup>7</sup> In the dental environment, patient behaviors such as talking, crying, and moving have been shown to result in significant increases in baseline ambient N<sub>2</sub>O levels despite the use of the mask-type scavenging systems.<sup>11,12</sup> Furthermore, the use of scavenging systems alone cannot lower the ambient N<sub>2</sub>O levels to the recommended standards.<sup>8,11,13</sup> 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<sub>2</sub>O levels significantly.<sup>11,14</sup> During the first three to five minutes after terminating N<sub>2</sub>O administration, a significant amount of the gas is exhaled by the patient. Once N<sub>2</sub>O administration is discontinued, administering 100 percent oxygen to the patient for at least five minutes allows oxygen to replace the N<sub>2</sub>O in the gas delivery system.<sup>2,15</sup> 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<sub>2</sub>O to the levels recommended by NIOSH.<sup>14,16</sup> Measurement of N<sub>2</sub>O levels in the dental operator 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<sub>2</sub>O in the dental environment while using N<sub>2</sub>O. Adherence to the recommendations below can help minimize occupational exposure to N<sub>2</sub>O.

- Use scavenging systems that remove N<sub>2</sub>O 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<sub>2</sub>O.
- 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<sub>2</sub>O.
- Encourage patients to minimize talking and mouth breathing during N<sub>2</sub>O administration.
- Use rubber dam and high volume dental evacuator when possible during N<sub>2</sub>O administration.
- Administer 100 percent oxygen to the patient for at least five minutes after terminating nitrous oxide use to replace the N<sub>2</sub>O in the gas delivery system.

## References

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