

Correspondence

Control of Nitrous Oxide Exposure

The article "Control of Nitrous Oxide Exposures In Dental Operatories Using Local Exhaust Ventilation: A Pilot Study" by Jacobs and Middendorf (*Anesth. Progr.* 33:235, 1986) raises some serious questions in my mind. The authors did not mention what type of N₂O/O₂ machines or nasal scavenging systems were being used by the three dentists. During 1978-80, I had access to a Miran 1A Infrared Gas Analyzer and tested several N₂O/O₂ machines (Fraser-Harlake, Porter and McKesson Analor) and their respective scavenging systems as well as the Brown Scavenging System. Two of the machines had structural leaks (the Porter machine did not leak). I tested six machines from one company and the company representative went to the factory and checked the new machines coming off the assembly line and found most of them had leaks in the rebreathing valve over the reservoir bag. The company was not interested in correcting the leak in 1980. Only one of the scavenging systems (the Brown Scavenging System), worked and kept the N₂O level to below 50 ppm in the operator's breathing area if it were connected to the Porter machine. The Brown mask does not require a tight fit on the patient's face because the outer mask picks up any N₂O which may leak out. The use of a rubber dam greatly facilitated keeping the levels down as a result of patients exhaling through their mouths as they talked. If a rubber dam cannot be used the dentist has to educate the patient to breathe through the nose and not to talk. In view of the success that can be obtained with a good machine and scavenging systems, I am skeptical of these authors need to invent a local exhaust ventilation system. I question the validity of the study they referenced (#10 on page 236) which indicated that in the "Surveys of Georgia dental operatories . . . exposures in scavenging operatories were not necessarily lower than those in unscavenged operatories." This apparently was their own study. I wonder if they measured the machines for leakage or if the dental operatories were utilizing the Brown Scavenging System . . .

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The authors' reply:

We would like to thank Dr. Miller for his comments regarding our article and are pleased to have the opportunity to respond to them. We also believe that the elimination of chronic occupational exposures to

an agent manifesting adverse health effects is the best of all possible control measures. In our first article,¹ we explained why nitrous oxide should not be used unless absolutely necessary. However, feedback from practicing dentists indicates that the use of N₂O/O₂ sedation has beneficial effects for some patients, and that its use will continue. With this in mind, we discussed various options for controlling N₂O exposure, several of which were reiterated by Dr. Miller.

We also agree with Dr. Miller's observation that low occupational exposures to nitrous oxide can be obtained in an experimental setting where all contributing factors to occupational exposure, such as scavenger flow rate, suction flow rate, mask fit, sealed valves, etc., are well controlled and routinely monitored. The essential point is that in real-world operatories these variables appear to be poorly controlled. In fact, Dr. Miller's own experience with leaky equipment is consistent with our findings that leaks are commonplace in the operatories of practicing dentists.

The fundamental question is whether additional control measures are required in the dental operatoriy. If not, then all that is needed is improved training in the proper use of scavenging equipment and increased availability of monitoring equipment. While such training could certainly be improved, we believe that, by itself, it would be inadequate.

Occupational exposures in dentistry can be defined by three source terms: (1) Variations in techniques (rubber dams, length of operation, delivery flow rate, scavenger use, scavenger flow rate, etc); (2) mask or equipment leakage, and; (3) mouth breathing and talking.

Any group of control measures should attempt to control *all three sources*. Our earlier study shows that, *in practice*, operatories equipped with scavengers do not necessarily exhibit lower ambient concentrations of N₂O when compared with operatories not equipped with scavengers. While perhaps surprising, this seems reasonable if one considers the fact that scavengers can only control emissions from inside the nose mask. Of course, this does not mean that scavengers are useless, or that some scavengers are not better than others; it simply means that their contribution to reducing exposures is often overwhelmed by other emission sources.

Local exhaust ventilation offers one additional way of controlling nitrous oxide exposures from these other emission sources. It has the additional advantage of producing a negative pressure in the operatoriy, thus minimizing exposures to other office workers by reducing diffusion into other areas. Exposures