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In Reply:—Drs. Parker and Behringer correctly point out that in our review[1] on the potential toxic effects of nitrous oxide we did not cover its contribution to the greenhouse effect; this omission was predicated by considerations of space, direct relevance to patient care, and a lack of relevant data that is less than 20 yr old. Correctly, Drs. Parker and Behringer indicate that nitrous oxide contributes to the greenhouse effect (±0.05%); however, as 99% of the nitrous oxide in the atmosphere originates from industrial and agricultural sources, the total elimination of medical use of nitrous oxide will likely have a negligible effect on the greenhouse effect. What also needs to be considered is the effect of increased use of another greenhouse gas, namely halogenated anesthetics, as a possible replacement for nitrous oxide. Furthermore, we need to understand the totality of the environmental impact of the volatile gases, and that includes its manufacture, transport, and storage. In absence of reliable data on these issues, it would be too simplistic to state that there would be an environmental benefit were we to abandon the anesthetic use of nitrous oxide.

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Prof. Maze has acted as a paid consultant for Air Products, Allentown, Pennsylvania, and both Prof. Maze and Dr. Sanders have acted in this capacity for Air Liquide Sante International, Paris, France. In addition, Dr. Sanders has received an unrestricted travel grant from BOC Ltd., Guildford, United Kingdom, to attend the World Congress in Anaesthesia. Air Products and BOC Ltd. have funded and continue to fund work in these authors' laboratories.

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Lumbar Plexus or Lumbar Paravertebral Blocks?

To the Editor:—We read with interest the report of Gadsden *et al.*[1] implicating the role of high-pressure injection during the performance of lumbar plexus blocks in producing contralateral and epidural spread of local anesthetic in more than 50% of their patients. We wish to make three points regarding this report.

1. Does one or more of the authors have any financial interest in the device used in the study? If so, it would have been proper to disclose this.
2. It is important to emphasize that *both* injection under a higher pressure *and* a large volume of injectate (35 ml in this study) constitute "necessary but insufficient conditions" for epidural/contralateral spread of local anesthetic. That is, high pressure alone with a small volume injectate will likely not lead to epidural/contralateral spread of the local anesthetic. Likewise, as the authors showed, one can inject substantial amounts of local anesthetic under low pressure without significant risk of this complication. In our practice nearly all lumbar plexus blocks involve placement of a continuous catheter, and it has been our experience that even large-volume injection through these catheters does not lead to bilateral blockade. Of course, it is impossible to generate high pressures with such an injection because of the high resistance offered by the catheter, thereby obviating the need for an injection pressure monitoring device.
3. A lumbar plexus block is not a procedure with a consistently defined anatomic end point and really consists of two separate blocks—the psoas sheath block and the psoas compartment block—either of which result in blockade of the lumbar plexus. To add to the confusion, these terms are often used incorrectly and interchangeably. The former involves injection within the psoas sheath and into the body of the psoas muscle. The latter represents an injection posterior to the psoas sheath in the tissue plane between the psoas and the quadratus. That tissue plane is the lateral extension of and contiguous with the lumbar paravertebral space. A high-volume/high-pressure injection within the psoas compartment (as opposed to the psoas sheath) would thus have a reasonable likelihood of prevertebral and epidural spread *via* the intervertebral foramen. In this sense a lumbar paravertebral block or its more lateral cousin, the psoas compartment block, would behave no differently than a thoracic paravertebral block. Because one can never be certain whether the needle tip or catheter lie within or posterior to the psoas, it seems prudent to assume, as the authors caution, the risk of paravertebral spread in all cases.

An alternative approach would be to intentionally perform a lumbar paravertebral block using low-volume injections. Our technique is simply an adaptation of the thoracic paravertebral technique and is applicable to either single-shot or continuous neural blockade. We've recently described the use of L1 to L2 single-shot lumbar paravertebral blocks for hip arthroscopy.[2] This approach has a number of advantages, including the lack of need for nerve stimulation, low risk for epidural spread, and the facility with which it can be performed. Moreover, the lumbar paravertebral block seems to provide far better preservation of hip flexor and quadriceps strength than the lumbar plexus block—a significant advantage towards early ambulation and discharge. We would encourage others to further study this promising technique.

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