Detection of Carbon Monoxide with Mass Spectroscopy during Anesthesia

To the Editor:—I read with interest the case report in which Woehlck et al. proposed that the detection of mixed halogenated agents during isoflurane anesthesia is a clinically useful sign to suggest the presence of carbon monoxide. The authors correctly note that clinical mass spectrometry cannot directly measure carbon monoxide because its molecular weight is the same as nitrogen and its fragmentation products are similar to those of carbon dioxide.

Yet, mass spectrometry may be helpful in the direct detection of changing carbon monoxide fractions in respiratory gas. In canine studies in which carbon monoxide poisoning was induced by injection of a molar amount of the gas into the inspired limb during closed-circuit anesthesia, we monitored complete uptake of carbon monoxide from the circuit by mass spectrometry (model 6000, Ohmeda, Madison, WI). In that study, carbon monoxide in the circuit was qualitatively detected as spillover into and increase of the nitrogen channel (same molecular weight) and the carbon dioxide channel (conversion to C\textsuperscript{12} fragment). As complete pulmonary uptake of carbon monoxide occurred, the nitrogen and carbon dioxide mass spectrometry signals decreased to baseline levels.

In Reply:—I agree with Breen that carbon monoxide may be detected and quantitated directly by mass spectrometry in certain situations. However, significant human toxicity may result from less than 1,000 ppm carbon monoxide. This may be as much as 100 times less than the amount administered in the study by Breen et al.

The potential sources of interference with the technique of direct measurement of carbon monoxide by mass spectrometry includes changing levels of nitrogen and carbon dioxide as well as the presence of anesthetic agents and other gases. The changes in concentrations of nitrogen and carbon dioxide found in breathing circuits are likely to be many times greater than the amounts of carbon monoxide, which may result from anesthetic breakdown. An increase in indicated nitrogen may be due to the presence of carbon monoxide or the presence of nitrogen from air leaks, patient denitrogenation, or the

References