Gas analyzer aberrancy: Due to disinfectant?

Madam,

Gas analyzers (GA) help titrate ventilation and depth of anesthesia. Narrow wavelength spectra in the higher range help exclude interference by carbon dioxide, nitrous oxide, isopropyl alcohol, and water vapor, whose absorption peaks lie between 3 and 12 μm. We report unusual faulty detection of halothane by GA due to alcoholic disinfectant.

We have repeatedly noted that at low (≤0.4) minimum alveolar concentration (MAC) of sevoflurane or desflurane, as in when volatile agent (VA) is turned off causing low circuit concentrations or when vaporizer is just switched on, Spacelabs Healthcare (WA) 92518 Multigas Modules (Ultraview SL® Monitor) frequently display MAC, inspired and expired concentrations for halothane [Figure 1]. Once MAC of VA increases, correct agent is identified. This generally occurs during first case of the day and with fresh gas flow ≤2 L/min. Service engineers suggested incorrect agent filling, mixture of VAs in circuit, or halogenated disinfectants as possible causes. Halothane has never been used with our machines and the aberrancy occurs even with single VA. Betadine scrub (povidone iodine 7.5% w/v) used for cleaning masks and breathing circuits in our center is an unlikely cause because iodine’s absorption peak is much lower than the wavelengths used by the GA. Gas sensor membranes need to be checked periodically as per manufacturer’s recommendations and should be replaced, if required, to ensure proper functioning. Because regular servicing is performed at our center, this was an unlikely cause. Water vapor in sampling line was also unlikely since the discrepancy occurs while using fresh lines also. We found that our soda lime canisters were being cleaned with Sterillium® once every 2–3 days, approximately an hour before the days’ first case. Days of aberrancy and canister cleaning with Sterillium® were coinciding, making us conclude that Sterillium® was the cause, because we found supportive physical basis also.

The Spacelabs module uses infrared absorption spectroscopy and selects wavelengths using optical narrow band filters in a chopper wheel assembly. Carbon dioxide, nitrous oxide, and VA concentrations are measured at 3–5 and 8–13 μm, respectively. The operations manual clearly specifies that only halothane, enflurane, isoﬂurane, sevoflurane, and desflurane are suitable for use with the module, and any other halogenated anesthetic agent or a mixture of more than two VAs will be misidentified and/or will interfere with the reported concentrations. We ruled out all known causes of such aberrancy. Alternative vapors/gases such as isopropyl alcohol, expired methane, and compounds such as tetrafluoroethane were unlikely causes.
Sterillium® (containing 2-propanol, 1-propanol, ethyl-hexadecyl-dimethyl ammonium-ethylsulfate) is an alcoholic disinfectant marketed for hand hygiene. Propanol, an isomer of isopropyl alcohol, has very strong and strong absorption at 9.38 μm, and at 8.21 and 10.31 μm, respectively, all in 8–13 μm range. At low VA concentrations, it is probable that evaporated alcohol vapors from canister are detected and analyzed as halothane by the GA. When VA concentration increases, the correct agent is identified. We noticed that whenever the aberrancy occurred, the canister was invariably cleaned with Sterillium® that morning; however, reverse was not true. Amount of Sterillium® left in canister was probably causing this difference. We noticed this aberrancy every 3–4 days. Fortunately, there were no consequent patient complications because we were aware that the displayed readings were factitious as we have never used halothane with our anesthesia machines.

Sterillium® is not marketed for cleaning soda lime canisters. It is an alcohol-based hand disinfectant, but was being used by our staff to clean soda lime canisters. To our knowledge, there are currently no specific recommendations regarding technique of cleaning soda lime canisters. Bleach solutions are used at some places, while some others use sealed canisters that are cleaned outside hospital. However, a change in our practice has solved this problem.

Incorrect measurement of VA may cause light anesthesia or anesthetic toxicity, leading to hypotension, cardiopulmonary arrest, lighter planes of anesthesia, and intraoperative awareness. Using proper techniques and chemicals for anesthesia equipment maintenance is as crucial as their regular servicing. Sensors with narrower range of spectra which do not cross react with other commonly encountered vapors and chemicals in the operating room may avoid such discrepancies.

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There are no conflicts of interest.

**Barkha Bindu, Hemanshu Prabhakar, Siddharth Chavali**
Department of Neuroanesthesiology and Critical Care, Neurosciences Centre, All India Institute of Medical Sciences, New Delhi, India

**Address for correspondence:** Dr. Barkha Bindu, Department of Neuroanesthesiology and Critical Care, Neurosciences Centre, All India Institute of Medical Sciences, New Delhi, India.
E-mail: barkhabindu@gmail.com

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