

The yellow discoloration of desflurane

Dong Joon Kim and Ki Tae Jung

Department of Anesthesiology and Pain Medicine, School of Medicine, Chosun University, Gwangju, Korea

One afternoon during surgery, we observed that the desflurane (Suprane[®], Baxter Healthcare, Puerto Rico, USA) in the Dräger vaporizer (Dräger D-vapor, Dräger Medical GmbH, Lübeck, Germany) had turned yellow while filling the vaporizer (Fig. 1). We immediately changed the vaporizer. Yellow discoloration of desflurane occurs relatively infrequently and is not widely known; however, this was the second incident in our hospital.

The yellowing of desflurane is due to by-products of butylated hydroxytoluene (BHT), which is added in the core gasket of the bottle [1,2]. The bottle of desflurane requires a highly effective closure mechanism because of the low boiling point (23°C) of desflurane. Therefore, the core gasket is sealed with elastomers to obtain optimal sealing and BHT is added as an antioxidant to the elastomers. Small amounts of BHT are dissolved by desflurane, an excellent organic solvent, and enter the vaporizer sump during the filling process. Subsequently, BHT is oxidized in air to form by-products, which have a yellow color. Gradual accumulation of the by-products eventually leads to their visibility.

Our case was different from previous events which were noticed during the machine check in the morning [1,2]. We used the vaporizer without any problems in the morning and the desflurane in the sump of the vaporizer was colorless and transparent as normal. However, the sump turned yellow as soon as we filled the desflurane. At the time, the bottle of desflurane had been placed accidentally behind the heat-dissipating fan of

the anesthesia monitor machine, which resulted in an increased surface temperature of 43°C, measured by a noncontact infrared thermometer (Microlife NC 100; Microlife Corp., Taipei, Taiwan). Desflurane should be stored at controlled room temperature of 25°C, with permitted range between 15°C and 30°C. The yellow discoloration of desflurane was possibly due to heating of the bottle by hot air from the heat-dissipating fan. The solubility of BHT is correlated with the temperature of the solvent [3]; hence, it is likely that excess BHT was dissolved by the heated desflurane during filling of the vaporizer. As the concentration of by-products increased, the color changes were accelerated.

Ilseung Pharmacy, the official reseller of Suprane[®], picked up the vaporizer and bottle for drainage and cleaning. The yellow discoloration of desflurane is not associated with contamination or any confirmed pharmacovigilance safety signal because of its negligible volatility [2,4]. Nevertheless, concerns about patient safety remain [5]. Baxter is currently redesigning the valve system of the bottle to replace the elastomeric components [4]. It is



Fig. 1. The yellow discoloration of desflurane observed through the vaporizer window.

Corresponding author: Ki Tae Jung, M.D.
Department of Anesthesiology and Pain Medicine, Chosun University Hospital, 365, Pilmun-dearo, Dong-gu, Gwangju 61453, Korea
Tel: 82-62-220-3223, Fax: 82-62-223-2333
Email: mdmole@chosun.ac.kr
ORCID: <http://orcid.org/0000-0002-2486-9961>

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important to recognize the discoloration phenomenon and utilize the manufacturer's services for removal of accumulated by-products from the affected vaporizer. Additionally, desflurane should be stored at room temperature to prevent accelerated solubilizing of the BHT and consequent discolorations of desflurane.

ORCID

Dong Joon Kim, <http://orcid.org/0000-0002-3072-4734>

Ki Tae Jung, <http://orcid.org/0000-0002-2486-9961>

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