

AnesthesiaDotCalm Newsletter



News You Can Use

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Soda Lime Versus Baralyme: Does It Really Make a Difference?

The other day I overheard a discussion about the merits of using soda lime versus Baralyme as the carbon dioxide absorbent during the administration of sevoflurane.

Such discussions usually don't spike my interest because in my mind the significance of the issue lies at about the same level as what type of cereal I should have for breakfast. But when the participants concurred that it was probably safer to give sevoflurane with soda lime rather than with Baralyme®, something didn't set right with me especially when it was posited that Baralyme® was more alkaline than soda lime because it contained potassium hydroxide and under desiccated conditions it is this substance that lends toward the production of more Compound A, the potentially nephrotoxic vinyl ether by-product of sevoflurane. To verify the validity of this assertion I did a Google search and found the circular that usually accompanies the anesthetic. And sure enough, there it was in black and white:

“When in contact with alkaline CO₂ absorbents (e.g Baralyme® and to a lesser extent soda lime) within the anesthesia machine, sevoflurane can undergo degradation under certain conditions. Sevoflurane degradation and subsequent degradant formation are enhanced by ... desiccated CO₂ absorbents (especially with potassium hydroxide containing absorbents e.g. Baralyme®)”

I found this statement substantiated by laboratory experiments where the exposure of sevoflurane to the desiccated KOH resulted in the detection of substantially greater degradant levels of Compound A. when compared to carbon dioxide absorbants not containing this substance. According to another study when both Baralyme® and soda lime were dehydrated, the inspired concentration of Compound increased 7 fold when Baralyme® was used but **decreased** when soda lime was the absorbant of choice. That's it. I was convinced. I was bound and determined to dispose of my cache of Baralyme®. No sir! No more Baralyme® for me especially if I plan to use low flow anesthesia, that is when my diluent flows are 2 liters per minute or less. After all, according to a 2002 study coming out of Japan when low-flow anesthesia was utilized, the concentrations of Compound A, obtained from the inspiratory limb of a circle system increased steadily from a baseline of about 2 ppm to 14.3 ppm after 2 hours of exposure to 1% sevoflurane. In all fairness, however they also found that Compound A increased to 13.2 ppm when soda lime is used under the same conditions. Oh woe is me. What's a fellow to do. The researchers from Japan suggested that maybe the use of absorbents deplete of sodium hydroxide(NaOH) or potassium hydroxide(KOH) be utilized when sevoflurane is given. They

suggested using Medisorb™ (Datex-Ohmeda, Louisville, CO) and Amsorb™ (Armstrong, Coleraine, Northern Ireland) because even at 1 liter per minute gas flows for two hours, 1% sevoflurane degrades to only 8.6 ppm and 2 ppm respectively. Yep that convinced me no more carbon dioxide absorbants with KOH or NaOH

But wait, Baralyme® does not contain KOH or NaOH. Where's my head?! Baralyme is comprised of barium hydroxide and calcium hydroxide whereas soda lime is comprised of sodium hydroxide, calcium hydroxide and potassium hydroxide. Maybe, researchers convinced themselves that Baralyme was the culprit because they had stock in soda lime and they didn't want to unload their stock. I mean who wants to buy soda lime in today's market. And maybe the absorbent really doesn't matter. Maybe the amount of Compound A that is formed is really a function of the rate at flow that passes through the absorber. After all, the water content of soda lime and Baralyme® are not much different (15% vs 13% respectively). Consider the the 1996 report coming out of California that showed when applying a gas flow rate relative to absorbent volume (i.e roughly equal to the rate/volume found in clinical practice) both absorbents produced roughly equal concentrations of Compound A. The researchers even found that dry and nearly dry absorbents produced less Compound A early in exposure to sevoflurane, and more later. They also found that both absorbents, especially when dry, also **destroyed** Compound A and that maybe the variability of concentrations of Compound A found in clinical practice may be largely explained by the inflow rate used (i.e., by rebreathing), which is confounded by absorbent temperature and dryness. In fact, maybe it's time to put a little reality back into my practice. A recent report coming out of the Uniformed Services University of the Health Sciences in Bethesda, Maryland even tends to negate the importance of temperature as a causative factor in the rise of Compound A. In twenty three trials, Baralyme® was exposed to 5 liter/min oxygen flows for 12 hours (reducing the moisture of the absorbent to 10.8%) and then subsequently exposed to either isoflurane or sevoflurane with oxygen inflow rates of either 3 or 5 liters/min. Without the presence of an agent the temperature of the Baralyme® was 44.5 degrees C at 3 liter/min and 41.5 degrees C at 5 liters/min. When exposed to the anesthetic agents, 3 liter per minute oxygen flows through the Baralyme® absorbent, the exothermic reaction generated 44.8 degrees C when the anesthetic was isoflurane and 44.2 degrees C when the agent was sevoflurane; similarly with 5 liter per minute flows the temperature of Baralyme® decreased to 41.8 degrees C with isoflurane and 41.1 degrees C with sevoflurane.

So here's my take-home point. Avoid low flow anesthesia, don't throw out the Baralyme and eat Wheaties...it's the breakfast of Champions.

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