In vitro efficiency of 16 different Ca(OH)$_2$ based CO$_2$ absorbent brands

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OBJECTIVES

Current clinical practice trends show an increase in the use of low-flow anesthesia. This practice depends on effective removal of exhaled CO$_2$ from the gas flow circuit. Efficiency and ultimately cost effectiveness is determined based on the amount of CO$_2$ removed from the circuit per unit of measure. This study sought to analyze and compare the relative efficiency of 16 commercially available CO$_2$ absorbents tested in identical and clinically relevant conditions.

STUDY METHODS

An anesthesia machine by GE was connected to a circle breathing system ventilated with a tidal volume of 500 mL, respiratory rate 10/min, and zero PEEP. CO$_2$ from a wall outlet was titrated into the circuit using a 250 mL glass syringe. The air mixture was flowed through a known volume of CO$_2$ absorbent granules until the glass syringe was empty. The volume of granules was measured along with the length of time required to infuse the 250 mL of CO$_2$. Efficiency was expressed as minutes per mL of product.

RESULTS

Products ranged in efficiency from 50 to 100 minutes per 100 mL of product. Medisorb™ was among the most efficient, measuring 88 min/mL and was similar in efficiency to Intersorb Plus™ (88 min/mL), FLOW-i™ (90 min/mL), Drägersorb 800+™ (91 min/mL), and SpiraLith CA® with indicator (95 min/mL). There were no statistically significant differences between this group of products.
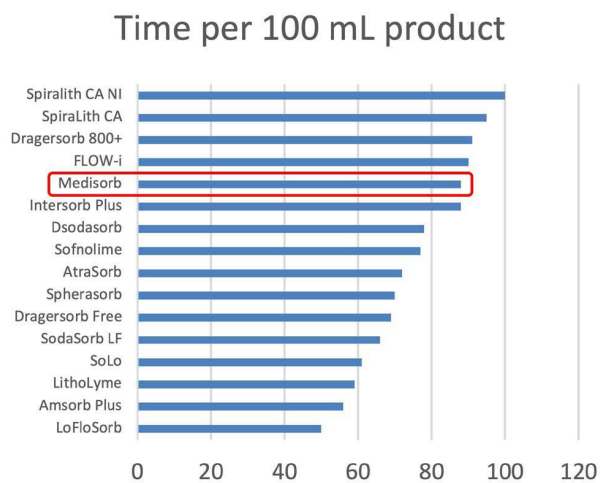
Time per 100 mL product

Figure 1 Patient desaturations during procedure

WHAT IS MEDISORB™?

Medisorb™ is a soda lime-based carbon dioxide absorbent product line used to support GE Healthcare anesthesia machines. It is also available in a lowalkaline formulation, Medisorb™ EF. In this series, efficiency of each product increased with higher levels of NaOH1 and with either broken fragment or preformed channels design of the medium. Medisorb™ utilizes the efficient broken fragment microscopic shape in a granular macro shape.

Figure 2 Medisorb™ CO2 Absorbent

Take home message

- CO$_2$ absorbents utilizing higher levels of NaOH are more efficient.
- Medisorb™ was among the most efficient of the 16 products tested in this experiment.
- Medisorb™ uses the broken fragment microscopic structure with a higher NaOH content.
- Side-by-side comparisons of CO$_2$ absorbent materials are challenging due to differences in formulation and packaging.