Title : HALOTHANE ADSORPTION BY SODA LIME

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Introduction. Dery[1] and Berry[2] describe a pediatric anesthesia circuit which provides 80% relative humidity without adding a humidifier. They place the canister between the fresh gas input and the patient, allowing dry gases to become humidified by taking up water from the soda lime. No serious problems have been described using this circle. We have noted, however, that occasionally a halothane induction is markedly prolonged. This study was designed to investigate whether this prolongation results from an uptake of halothane by soda lime when used in such a circle.

Methods. The uptake of halothane by soda lime was studied by analyzing effluent gas from an anesthesia circle in which the canister contained 1) soda lime samples used during a prolonged induction, or 2) fresh 2300g soda lime samples. The fresh samples were pretreated with a 5 lpm flow of dry or humidified gas, or with a sequence of dry-humidified-dry gas. All samples were placed in the anesthesia canister and 5 lpm of oxygen with 1% halothane was introduced. Halothane concentration of effluent gas from the canister was determined by an infrared gas analyzer. T-50 was defined as the time from the onset of gas flow through the canister to the time when canister output equalled half the vaporizer output. To follow the propagation of the drying front a second experiment was performed in which canisters of soda lime were pretreated and water content determinations made on samples taken from the upper and lower sections. A third study investigated the mechanism of adsorption. Soda lime was placed on the bottom of a sealed flask which contained an evaporating tray. Varying quantities of liquid halothane were injected by microliter syringe onto the tray and the vapor mixed with the soda lime. Vapor samples were analyzed by infrared technique. The volume of vapor adsorbed per volume soda lime[3] was calculated and was defined as the "partition coefficient."[4]

Results. Figure A shows that soda lime adsorbs halothane as a function of the length of time during which the soda lime has been exposed to drying gases, i.e., as an inverse function of its water content. Exposure to humidified gas prevents or reverses this adsorption. After thirty hours of exposure the water content of the upper section of the canister was 3-5% while that of the lower section was 9-11%. At forty hours, the range was 0.1% to 4% and 7-11%, respectively. The partition coefficient was independent of the quantity of liquid halothane injected, i.e., soda lime does not act as a molecular sieve. The partition coefficient is 66 for dry soda lime, 1 for fresh soda lime.

Discussion. If the canister is placed between the fresh gas input and the patient, and if the gas flow is greater than the patient's minute ventilation, or if gas is allowed to run for long periods after an anesthetic is completed, drying occurs. The subsequent use of the dry soda lime results in a delay in delivering halothane to the patient (Figure B). The variability in soda lime uptake in quantitative closed-circuit anesthesia is explained by the same mechanism.[5] Conversely, a subsequent patient can unwittingly be subjected to the complications of halothane and patients susceptible to malignant hyperpyrexia are placed in greater jeopardy.

References.

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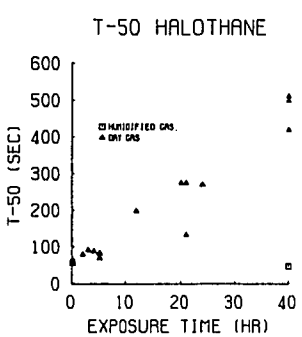

Figure A

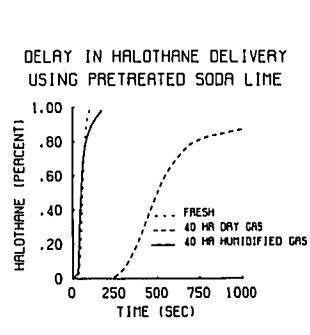

Figure B