Essay

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The Importance of Changing CO2 Absorbent in Veterinary Anesthesia Machines

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The purpose of a CO2 absorbent in a rebreathing anesthesia circuit is to absorb and remove CO2 from the patient's exhaled gases so it cannot be rebreathed. Rebreathing CO2 is likely to increase the partial pressure of CO2 in the patient's blood, resulting in hypercapnia and respiratory acidemia, as well as increased circulating catecholamines. Increased catecholamines may have beneficial effects on the cardiovascular system, such as improved cardiac output and blood pressure, but they can also increase cardiac work and cause or exacerbate cardiac arrhythmias, effects that may be quite detrimental to some patients.

It is important, therefore, to be sure that the CO2 absorbent is functioning as it should, which means it must be changed before it becomes exhausted. "Exhausted" absorbent is that which has already undergone reaction with CO2 and is incapable of further absorption.

There are several factors that determine how quickly a CO2 absorbent will become exhausted, and, therefore, how often it should be changed:

- The size of the absorbent canister
- The number of patients the anesthesia machine is used with and the duration of the anesthesia procedures
- The size of each patient
- The metabolic rate of each patient
- The fresh oxygen flow into the rebreathing circuit

Because of the variability of these factors from practice to practice, or even within the same practice from day to day, it is impossible to make uniform recommendations for how often to change the CO2 absorbent. The only way to be absolutely confident that all CO2 is being removed from the breathing circuit is to measure the CO2 in the inspired gas which can be done with a capnograph with a waveform display. If CO2 is not being removed and is being rebreathed, the capnograph waveform will not return to zero "baseline" between exhalations. It is important to check that both one-way valves (inspiratory and expiratory) are present and functioning properly, as well as check the CO2 absorbent, if this occurs.

If a capnograph with waveform display is not available, color change and heat production are the main criteria that can be used to indicate absorbent exhaustion. Most absorbents contain a chemical indicator that changes color because of the pH changes that occur with CO2 reaction. When the color change shows strongly through a large portion of the canister wall, it is time to change the absorbent. Most absorbents, however, revert to their original color with rest; that is, the color change is not permanent once the machine is no longer in use. The best time to check for color change is before the end of each case. There is one new absorbent, however, Sodasorb® LF, that undergoes a permanent color change, making it possible to assess absorbent exhaustion at any time.

Additionally, periodically noting the temperature of a canister during a case is useful, with the amount of heat generated being proportional to the amount of CO2 absorbed. If there is no heat production midway through the case, the absorbent probably is not working. If there is some heat, the absorbent is, or has been, reacting with CO2 , but there is no way of knowing how much capacity is left—the canister could stay warm for a period of time after the reaction has stopped. Conversely, there may not be much heat produced early in the case, even though the absorbent is fine—it just has not yet reacted with much CO2.

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