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Anesthetic Pollution in the O.R. and the use of the F/AIR Canister

A major source of anesthetic pollution in the O.R. is from overflow gases emitted from patient breathing systems. The commonly used CO_2 absorber circle breathing system should be equipped with a relief valve (pop-off valve) which has a connection to conduct the overflow gases to a disposal means. One such disposal means is the F/Air activated Charcoal canister. The F/Air canister can absorb a minimum of 50 grams of halogenated anesthetic, such as; halothane, enflurane, methoxyflurane, isoflurane, and sevoflurane. However, the F/Air canister will not retain the lighter gas molecules such as nitrous oxide, and should not be used to prevent nitrous oxide pollution.

The useful life of a F/Air canister depends upon the rate of gas flow and the percent concentration of the gas passing through it. In an "average" semi-closed breathing system used on an adult human patient, the F/Air canister will yield approximately 12 to 15 hours of useful life before becoming saturated. A more positive method of determining F/A gain of 50 grams, at which time it should be noted that there are other source just collecting the overflow gas from the "pop-off" valve on the anesthesia machine such as:

- 1. Gas escaping when intubating the patient.
- 2. Leakage in the anesthesia machine and/or breathing circuit.
- 3. Vapor escaping into the room when filling a vaporizer.
- 4. Post anesthesia dissipation of anesthetic into the room by the patient.

All of the above may contribute to some degree of O.R. pollution

To insure that the pollution level is reduced to within acceptable limits, it is advisable to employ an analyzer capable of measuring down to a few parts per million of anesthetic trace gases. Alternatively, one of the testing firms may be employed to periodically check the anesthesia equipment and take sample readings of the atmosphere in the O.R.

Additional Facts

The F/Air does an effective job of removing anesthetic vapor from the waste gas outlet of the anesthesia machine during its useful life. The F/Air canister is the simplest, lowest cost way to do this job. Since it is not connected in any way external to the anesthesia machine, it leaves the machine portable for moving around the operating room without cumbersome hoses, pipe connections, or electric, air roving appliances.

In using the F/Air vs outdoor discharge of anesthetic gases, there will be no question about environmental pollution of the atmosphere, ozone depletion, etc. from the E.P.A.



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F/Air Questions and Answers

Q: Is the F/Air activated charcoal canister, when used to collect anesthesia waste gases expelled by the pressure relief (pop off) valve, approved by OSHA?

A: No, OSHA does not approve such devices. However, OSHA has recommended arbitrary limits for anesthetic pollution of the air in the work area. These limits are 2 parts per million for anesthetic agents and 25 parts per million for nitrous oxide. Note that the limits are set for the total room atmosphere which would be the sum of all air pollution sources mixed with the volume of air in the room.

Q: How can the amount of pollution in my operating area be determined?

A:When you have made a reasonable approach to eliminate or reduce the sources of anesthetics escaping into the room air, then to prove their effectiveness, you can have tests of the amount of trace gases which may be present. There are a number of firms who offer this service and have the special instruments to measure parts per million of pollution in the air.

Q: How can we tell when a F/Air canister has reached saturation?

A: The most positive way is to record the weight of the F/Air canister before use (weight upon receipt is estimated to be 290 g), then periodically check the weight gain. When the F/Air shows a gain of 50 grams, it is approaching saturation and should be changed. With experience over time, it can be determined how long a canister will last in the conditions of use. The life of a F/Air canister depends upon the amount of anesthetic introduced, which, in turn, is dependent of the amount of gas flow and the vaporizer setting, as well as the patient size. In the extreme, where a closed or nearly closed breathing circuit is used, the F/Air canister will see very little anesthetic and will last indefinitely.

Q: Will the F/ Air canister absorb all the anesthetics?

A: Yes, the F/Air canister will be effective for all anesthetics (i.e. Halothane, Methoxyflurane, Enflurane, Isoflurane) commonly used with only slight variations. However, the F/Air will <u>not</u> be useful to absorb nitrous oxide, ether, or carbon dioxide.

Q: If we connect an F/Air canister to our waste gas outlet on the anesthesia machine, can you guarantee that working in the operating room will cause no complications with a pregnancy or abnormalities in a child after birth?

A: No.

First, it has not been proven that anesthetic vapor in the work area causes physical or medical problems to personnel. The National Institute of occupational Safety and Health (NIOSH), to be on the safe side, has recommended a limit of 2 ppm in the work atmosphere, which is another way of saying no pollution should be present. Second, there are a number of sources for anesthetic pollution of the room air, such as; gas leaks in the anesthesia machine, vapor escaping during filling of a vaporizer, spills of liquid anesthetic, gas escaping during intubation of the patient, and gas expelled by the patient during recovery. Any female operating room personnel who are pregnant should be diverted to another job until after the birth of her child.