

Isoflurane vs. Sevoflurane

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Veterinarians have been using isoflurane since 1986, when it was approved for use in horses. Approved for use in dogs in 1988 it gained widespread use in many species and in many practices especially when the price dropped from its original \$1/ml of liquid. Advantages of isoflurane over older inhalants are: speed of induction and recovery, greater control of depth of anesthesia, less metabolism by the drug in the liver and significantly less sensitization of the heart to catecholamines. These properties have made it an outstanding choice for all anesthesia procedures, but especially for the older, sicker patients more commonly seen in practice today.

Sevoflurane has been around for a long time; it was first synthesized in the late 1960s, but was not developed for approval until 1990 in Japan, because of concerns about degradation with soda lime (to produce compound A, which can produce renal toxicity) and release of fluoride ion during metabolism (which can also produce nephrotoxicity). Neither of these concerns has been proven to be clinically important in the human or veterinary field.

What is different about sevoflurane?

It is less soluble than isoflurane, which means that inductions and recoveries are even faster. Mask inductions with sevoflurane were faster and of better quality than with isoflurane in one study (Johnson, et al, 1998). Sevoflurane also appears to be better tolerated by mask induction, because it has low pungency and low airway irritability. Since sevoflurane is less potent than isoflurane (MAC for sevoflurane is 2.4% for dogs), the vaporizer setting usually needs to be higher than for isoflurane. Although the amount of metabolism of sevoflurane by the liver is slightly greater than for isoflurane, the extent of metabolism is similar to isoflurane due to its insolubility (hence rapid elimination).

Is a faster recovery from anesthesia a significant advantage?

It may be if you are performing a non-painful procedure on an “out-patient” basis. However, if you are using analgesics or tranquilizers intra- or post-operatively you may not recognize a faster recovery, since all drugs administered affect recovery time, not just the speed of the inhalant. In horses, recoveries from sevoflurane were shorter and of better quality, but when xylazine was administered in recovery, the time advantage was lost (Matthews, et al, 1998)

Is sevoflurane safer than isoflurane?

This is definitely a hard question to answer, because it depends on your definition of “safe”. Does sevoflurane produce less cardiopulmonary depression than isoflurane? No! They appear to produce very similar degrees of depression in a dose-dependent manner. The only advantage sevoflurane may have over isoflurane is the ability to change depth of anesthesia slightly quicker. This means you can “lighten” the depth of anesthesia quickly, but it also means that if the animal is not closely observed, it may get too “deep” quickly also.

Are there patients where you must use sevoflurane instead of isoflurane, because sevoflurane is safer?

In my opinion... no. Safety of anesthesia is much more dependent on vigilant monitoring, familiarity with the technique and experience of the anesthetist than it is dependent on the agents used. Isoflurane is also quite a “safe” anesthetic.

What types of cases would I prefer to use sevoflurane for?

At this point, let me make it clear that this is just my opinion, and that we have been using sevoflurane in both horses and dogs since 1996. If available, I would prefer to use sevoflurane for mask or chamber inductions, cases requiring Caesarian sections and those very sickest, moribund patients where I want the best possible control of anesthetic depth. It is also convenient for an uncomplicated, non-painful short procedure where you want to send the animal home as quickly as possible.

How much of a transition and adjustment is there to use sevoflurane?

For practitioners (and their technicians) who are using isoflurane, the adjustment to using sevoflurane is fairly minimal. As previously mentioned, vaporizer settings need to be higher and animals need to be closely monitored to recognize depth of anesthesia. For practitioners who might be using halothane, the transition and adjustment is greater, but probably really worth the effort, since either sevoflurane or isoflurane offers significant advantages over halothane.

If I want to use sevoflurane, how can I minimize the cost?

Since the current cost of sevoflurane is about \$1/ml of liquid it is more expensive to use. Cost can be minimized by limiting waste of the gas; making sure there aren't leaks in the machine, breathing circuit or leaks around the cuff of the endotracheal tube. Mask and chamber inductions are expensive since higher oxygen flows must be used. Premedication with sedatives or analgesics will help decrease the MAC-value needed for maintenance, which will help reduce the cost.

References

Johnson RA, Striler E, Sawyer D and Brunson D. Comparison of isoflurane with sevoflurane for anesthesia induction and recovery in adult dogs. 1998. AJVR 59:478-481.

Matthews NS, Hartsfield SM, Mercer D, Bealeu MH and MacKenthun A. Recovery from sevoflurane anesthesia in horses: comparison to isoflurane and effect of post medication with xylazine. 1998. Veterinary Surgery 27:480-485.