



INHALATION ANESTHESIA SYSTEMS

HONEST ANSWERS FROM KNOWLEDGEABLE PEOPLE

Dead Space in Facemasks and Nosecones

For years, small animal anesthesia facemasks have been manufactured specifically for dogs and cats. In research, we adapted feline facemasks to fit our needs. Many of us constructed our own nosecones from syringe cases, baby-bottle nipples and many other assorted items. Because the models are often quite small in relation to the facemasks or nosecones being used, dead space becomes an important issue. This is true regardless of whether we're making our own or using manufactured ones.

Gases Always Follow the Path of Least Resistance

To test this dead space, we conducted smoke tests on some of the more common masks and nosecones we found in use in facilities. Smoke was introduced into the fresh gas flow of a typical non-rebreathing tee circuit at a flow rate of 1 liter per minute (LPM). The fresh gas flowed through the fresh gas tube to the nosecone/endotracheal tube connection, then continued out through the waste gas tube without saturating the patient's nose area.

Dead Space and Dead Patients

Meanwhile, as the animal continues to breathe the static volume of air within the mask (dead space) is sufficient to temporarily fill the animal's minute volume needs. Unfortunately for the animal, the same air is being inhaled and exhaled repetitively. In a short amount of time, the oxygen in the dead space is depleted and replaced with CO₂, at which point the animal begins to breathe faster. A normal response to this symptom would often be to turn up the vaporizer dial because we assume the patient is waking up. We probably wouldn't overdose the patient since it isn't getting much fresh gas anyway, but we also won't meet its metabolic requirements for oxygen and the patient could die as a result.

A Solution

For most uses, we recommend "bubble tubing" nosecones for rats, mice, gerbils and hamsters.

Here are some reasons why:

- They are less likely to leak than other types.
- They have no dead space.



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- They allow far more cranial access than the larger facemasks.
- They can be stored in a cold sterile solution.
- You can make your own - about 100 for less than \$50! If you have an outbreak and still need to do procedures, the ability to change nosecones with each cage or with each animal can be invaluable.

Basically, a nosecone must seal tightly around the patient's nose to avoid leaks and it must be small enough to eliminate dead space. If you are using masks with large amounts of dead space, sufficient fresh gas delivery can be accomplished by increasing the oxygen flow rate. However, it must be mentioned that increased flows may lead to increased trace gas exposure.