

## Is it really true?

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There are many ideas about anesthesia that are not based on fact. Some of them are based on a theoretical principle, that may or may not hold true in practice. Many are misconceptions through the extrapolation of knowledge concerning the effects in people. A few have developed from the occurrence of isolated idiosyncratic reactions that are publicized out of proportion. Although I hate to admit it, the occasional error may have even been taught in Anesthesia 101 in your veterinary college. It may not be too late for an old dog veterinarian

to learn new tricks, or at least to update on a few concepts.

I have tried to make the learning process a bit of a game. Some of the following statements are true. Some are more like "old wives' tales." Can you determine which are based on reasonable fact? **Choose one of the following answers: A. True, B. False, C. Facts aren't available to either verify or deny such a statement.** The correct answer (based on my best judgement) is found on page 502.

### Small animal practice

1. Meperidine (demerol) is a very good analgesic of practical duration for use in small animals.
2. Acepromazine is effective in reducing the chance of arrhythmias.
3. Administration of blood should always be in combination with a crystalloid fluid.
4. Cetacaine laryngeal spray can produce methemoglobinemia in the cat resulting in death by hypoxia.
5. Subcutaneous emphysema has resulted from the improper use of a stylet while intubating.
6. Certain breeds of cats are more sensitive to anesthesia.
7. Sight hounds (greyhound, saluki, etc.) become excessively depressed with normal doses of acepromazine.
8. Old dogs should not be given acepromazine.
9. Low dosages of either atropine or glycopyrrolate should reduce the incidence of arrhythmias and tachycardia following administration.
10. Accurate noninvasive blood pressure monitors are not yet available for the dog and cat.
11. There is a maximum dose of barbiturate that should not be exceeded during anesthetic induction, even if the patient does not achieve a surgical plane of anesthesia.

### Mixed practice

1. Atropine appears to cause more arrhythmias and tachycardia than glycopyrrolate, and in horses can produce significant colic.
2. Meperidine when given intravenously to a horse can produce a significant histamine reaction associated with urticaria and hypotension.
3. In animals showing a degree of bradycardia, better blood pressure can be produced by increasing the heart rate.
4. Halothane is one of the worst inhalant anesthetics for enhanced production of arrhythmias during anesthesia.
5. Epinephrine induced arrhythmias are enhanced with xylazine in dogs and horses.
6. Butorphanol is similarly effective as an analgesic in all species.
7. The ECG monitor is an effective method for detection of deep anesthesia.
8. Increasing heart rate will always be apparent with hypotension due to blood loss in the patient under anesthesia.
9. There is no benefit in combining a local block with xylazine/ketamine anesthesia in the horse.

# Anesthesia update: Answers to questions

## Small animal practice

1. Although meperidine is very acceptable in humans for analgesia, one should be aware of the limitations in small animals. The short duration (1/2 h is common) and variable effectiveness, related to the severity of the pain, make it a poor choice in small animals. (B)
2. A search of the literature reveals a study in dogs on the arrhythmogenicity of acepromazine (1). The dose of acepromazine used was not practical for preanesthetic administration (0.4 mg/kg body weight (BW)), which is commonly accepted as 0.05 mg/kg – 0.2 mg/kg BW. The dose is especially high for the older animal (preanesthetic dosage is usually reduced in older patients by up to one half). Older or traumatized dogs may be the type to cause concerns regarding arrhythmias. Recently, unpublished results indicate that a dose of 0.025 mg/kg BW acepromazine is effective in reducing the chance of epinephrine induced arrhythmias in the presence of halothane anesthesia. (A)
3. It is often recommended that blood be given in combination with crystalloid fluids. This rule comes from the treatment of hemorrhagic shock when volume depletion still exists and sludging (slow flow due to increased viscosity) is a concern. The PCV is high and the vasculature is still constricted. Vascular volume can be more rapidly achieved with the use of blood, while fluids will enhance perfusion by reducing viscosity.  
If an animal is anemic or the vascular volume is replaced with crystalloids to the point of having a PCV <25, there is no reason to give fluids with the blood. Sludging will not be a problem. If packed red cells are given to the animal that is volume replenished but anemic, some fluid may be added to the packed cells to allow easier flow through the intravenous tubing. Usually 50 mL – 100 mL of saline are added to the bag (200 mL) of packed cells. This is not required if a reasonable volume of plasma remains in the bag following preparation of the packed cells. (B)
4. Cetacaine can cause methemoglobinemia in cats, reducing the ability to form oxyhemoglobin. (A)
5. Stylets that protrude beyond the tip of the tube or result in a very rigid tube can damage the trachea during intubation. (A)
6. Little research has been done in small animals on anesthetic risk. Results of surveys are not consistent. There is a slightly greater risk in cats (1:552) than dogs (1:870) in Britain (2). In Vermont, there appears to be a reduced risk (1:1667) in cats compared to dogs (1:1000) (3). The high number of mixed breed or domestic shorthaired cats compared to specific breeds reduces the chance of determining a slight difference in risk among breeds. One might extrapolate from the brachycephalic dog that the pug-faced, Persian cat could have more risk associated with airway problems than other cats. (C)
7. Sight hounds have definitely been shown to have a problem with thiobarbiturate elimination (prolonged recoveries), but no association has been made with acepromazine and excessive degree of sedation. (B)
8. Older dogs may have a greater tendency than young dogs for arrhythmias; therefore, the antiarrhythmic potential of acepromazine could be beneficial. Older dogs may be more sensitive to the cardiac depressant effects of halothane. In healthy dogs, the use of acepromazine with halothane resulted in better cardiovascular stability than observed with halothane alone due to the halothane sparing effect of acepromazine (4). If monitoring is carried out and the level of anesthesia is adequately reduced when acepromazine is used, the benefits may outweigh the risks.  
The risk associated with acepromazine is the alpha-blocking effect which can cause hypotension (5). Fluid administration should counter this effect if it occurs and is recognized. (B)
9. Arrhythmias are worse when atropine is given in too low a dose. Evidence does not exist at this time for the incidence of arrhythmias or the effectiveness of glycopyrrolate in low dose. Research in progress indicates that there may be no real advantage or disadvantage to underdosing glycopyrrolate. (B)
10. The oscillometric monitor (Dinamap, Critikon, Johnson and Johnson, Peterborough, Ontario) has been assessed in medium to large dogs and found to be reasonably accurate (6). The accuracy in small dogs (<10 kg BW) and cats has not been reported. Doppler blood pressure determination appears to be accepted as a reasonable technique to estimate systolic blood pressure in small animals. Ongoing research and clinical experience suggests that the oscillometric technique is less reliable in the smaller animals, especially cats, and that the Doppler technique may be more accurate. (C)
11. Slow administration of thiobarbiturates or methohexital will result in redistribution of the drug and slow achievement of an anesthetic plane, which will require much more than the standard dose. A total maximum dose is not very critical. It is important to limit the duration of time that an animal is maintained with a thiobarbiturate. A maximum duration of 30 min appears reasonable. Methohexital is much better metabolized allowing anesthesia of long duration without adversely affecting the time for recovery. (B)

## Mixed practice

1. Both these facts have been shown to be true. In dogs, there may be little detriment in the healthy animal to the arrhythmias (short term) or the tachycardia that can occur with atropine, but in the older patient that could be compromised by the production of arrhythmias or tachycardia, the use of glycopyrrolate may be beneficial. Tachycardias and arrhythmias are produced with glycopyrrolate in dogs, but possibly at a lesser frequency. Evidence is more convincing in research carried out in humans. In horses, the concern about atropine causing colic is a sufficient contraindication to its use. Only glycopyrrolate should be used (0.005 mg/kg BW maximum dose). (A)
2. It is not recommended that meperidine be given intravenously in any animal due to the histamine release. It has been used intravenously in horses without these effects, but the potential exists and one has to question if the risk is worth the benefit. (A)
3. Bradycardia should be treated. A slow heart rate limits the cardiac output, if diastolic filling is complete for any time before the next contraction. An increased heart rate does not always improve blood pressure but has been shown to do so in some patients under anesthesia. The question that can't be answered in absolute terms is "What is the heart rate at which treatment is needed?" Recommendations are as follows: cats <100/min, small and medium-sized dogs <60–70/min, large breed dogs <55–60/min, horses <25–30/min. (A)
4. Isoflurane is the least arrhythmogenic, while halothane is the most. (A)
5. Evidence exists that there is potential for epinephrine-induced arrhythmias to be enhanced with the use of xylazine in dogs, but recently xylazine has been shown to have little effect on epinephrine-induced arrhythmias in horses. (B)
6. There is a variation in effect and in duration between species. Recent studies indicate that butorphanol is ineffective in sheep for certain postoperative pain. The duration of effect in the cat is shorter than in dogs. Good postoperative studies in large animals are lacking. The veterinary literature is very deficient in studies on analgesia in birds and other less commonly dealt with species. (B or C)
7. The ECG does not indicate depth of anesthesia. It is a very insensitive monitor except for arrhythmias. (B)
8. Although the heart rate will increase in the awake patient that is hypotensive due to volume loss, the patient exposed to drugs affecting sympathetic responses may not predictably show this sign of hypotension. Anesthetic agents are known to obtund sympathetic responses. (B)
9. Local blocks in combination with anesthesia can always be beneficial by reducing the amount of anesthetic required to do a procedure and reducing pain in the early recovery period. A longer anesthetic effect

can be achieved with xylazine/ketamine in the horse, if stimulation or pain is not perceived by the animal.

Extremity and ocular blocks can be useful in large animals in association with any form of general anesthesia. In small animals, the use of dental blocks, epidural anesthesia, and intercostal blocks has been advocated. (B)

How did you do? Since approximately 50% of the information is based on fairly new evidence, a score greater than 12 might be considered good. Whether you did well or not is not as important as the added information that you may have gained by doing the exercise.

## References

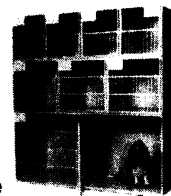
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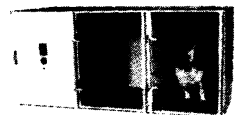
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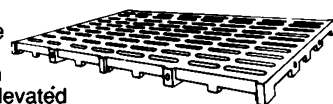
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