



Small Animal Formulary

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Sedation/immobilization protocols

Sedative combinations for dogs

Acepromazine (ACP) as sole agent: Acepromazine alone is not a particularly effective sedative. For further information see monograph.

ACP/opioid mixtures (neuroleptanalgesia): Acepromazine used in combination with opioid analgesics reduces the dose requirement of both components and also the incidence of adverse effects. Acepromazine (0.01–0.05 mg/kg, except in Boxers 0.005–0.01 mg/kg) can be combined with:

- Pethidine (2–10 mg/kg i.m.)
- Morphine (0.05–0.4 mg/kg i.v., i.m.)
- Papaveretum (0.05–0.4 mg/kg i.v., i.m.)
- Buprenorphine (0.02–0.03 mg/kg i.v., i.m.)
- Butorphanol (0.1–0.4 mg/kg i.v., i.m.)
- Pentazocine (1–3 mg/kg slow i.v.).

Alpha-2 agonists as sole agents: Although authorized for single-agent use, it is generally preferable to use medetomidine or dexmedetomidine in combination with opioids (see below).

Recommended dose in dogs and cats of medetomidine is 5–20 µg (micrograms)/kg i.m. and of dexmedetomidine is 2.5–10 µg (micrograms)/kg i.m. Repeated dosing is not advised. Although both drugs are authorized for use at up to 4 times these doses, such higher doses are associated with marked effects on cardiopulmonary function. Low doses (2.5–5 µg (micrograms)/kg) of medetomidine or dexmedetomidine may be given intravenously.

Adverse effects may be antagonized with i.m. atipamezole at 5 times the agonist dose rate; the (unauthorized) i.v. route is preferable in critical situations.

For information on xylazine see below.

Alpha-2 agonist/opioid mixtures: Including opioids with medetomidine or dexmedetomidine lowers the dose required to achieve a given level of sedation, thereby limiting the marked effects that alpha-2 agonists exert on cardiopulmonary function. If sedation is still inadequate, it is better to proceed to induction of general anaesthesia using an i.v. induction agent, such as alfaxalone or propofol, rather than by giving a repeated or higher dose of alpha-2 agonist. Whilst alpha-2 agonist/opioid combinations are safer than alpha-2 agonists alone, currently their use is only recommended in healthy animals.

Medetomidine or dexmedetomidine, at the doses described above, can be combined with:

- Pethidine (2 mg/kg i.m.)
- Buprenorphine (0.01–0.02 mg/kg slow i.v., i.m.)
- Butorphanol (0.1–0.3 mg/kg slow i.v., i.m.).

Although xylazine (1–3 mg/kg) may be used alone or in combinations with opioids, given i.m. or i.v. (unauthorized), its use in dogs and cats has been superseded by use of medetomidine or dexmedetomidine, and it is not recommended. Adverse effects may be antagonized with i.m. or i.v. atipamezole, although this use is unauthorized.

Acepromazine/alpha-2 agonist/opioid mixtures: A mixture of acepromazine (0.05 mg/kg) with any of the combinations given for alpha-2 agonists and alpha-2 agonist/opioid mixtures (higher end of dose ranges) is suitable for the chemical restraint of large, dangerously aggressive dogs. Severe depression can be antagonized using naloxone and atipamezole.

Low doses of acepromazine (0.01 mg/kg) and medetomidine (2.5–5 µg (micrograms)/kg) or dexmedetomidine (2.5–5 µg (micrograms)/kg) combined with opioid agonist drugs provide profound sedation without signs of severe cardiopulmonary depression.

Benzodiazepines and benzodiazepine/opioid mixtures: Benzodiazepines do not reliably sedate healthy dogs when used alone; indeed, stimulation ranging from increased motor activity to gross excitation may be seen. The risk of excitation is proportional to the health of the recipient: the chances of producing sedation are highest (but not guaranteed) in very sick cases. Diazepam or midazolam (0.2–0.3 mg/kg i.v.) given during anaesthesia can smooth recovery in animals prone to excitability, provided adequate analgesia is present.

Opioid/benzodiazepine mixtures are satisfactory and relatively safe in critically ill animals. These combinations are more effective when given i.v. (with the exception of pethidine). Transient excitation may occur when given by this route. When given i.m., excitation is unlikely although the depth of sedation is also reduced. Midazolam or diazepam at the dose described above can be given with:

- Pethidine (2–10 mg/kg i.m.)
- Morphine (0.1–0.2 mg/kg i.v., i.m.)
- Papaveretum (0.2–0.5 mg/kg i.v., i.m.)
- Buprenorphine (0.02–0.03 mg/kg i.v., i.m.)
- Butorphanol (0.1–0.4 mg/kg i.v., i.m.)
- Fentanyl (0.01 mg/kg slow i.v.).

Alfaxalone: Although not authorized for this use, 2 mg/kg i.m. will provide sedation in dogs lasting 10–15 minutes.

General notes:

- A well managed light level of general (inhalational) anaesthesia is frequently safer than heavy sedation in sick animals.
- Neuroleptanalgesic combinations are safer than alpha-2 agonist/opioid mixtures, but are less likely to produce adequate conditions for minor operations or investigations involving abnormal body positions. Furthermore, only the opioid component can be antagonized.
- In very ill animals, benzodiazepines given 20–30 minutes after neuroleptanalgesic combinations have been injected are likely to produce the best compromise between adequate conditions and patient safety.
- Most of the aforementioned combinations will have a profound sparing effect on i.v. and inhalational anaesthetics, should a general anaesthetic be required after sedation. This is particularly true of combinations containing alpha-2 agonists.

Sedative combinations for cats

Acepromazine: Acepromazine alone is not a particularly effective sedative and increasing the dose incurs the same problems as in dogs. Doses of 0.01–0.1 mg/kg may be given i.v., i.m. or s.c. Cats often require higher doses of acepromazine than dogs to achieve comparable sedation.

Neuroleptanalgesia: Neuroleptanalgesic combinations confer the same advantages in cats as in dogs. Acepromazine (0.01–0.1 mg/kg) can be combined with:

- Pethidine (2–10 mg/kg i.m.)
- Morphine (0.1–0.3 mg/kg i.v., i.m.)
- Methadone (0.1–0.5 mg/kg i.v., i.m.)
- Papaveretum (0.2–0.4 mg/kg i.v., i.m.)
- Buprenorphine (0.02–0.03 mg/kg i.v., i.m.)
- Butorphanol (0.1–0.3 mg/kg i.v., i.m.)

Use the lower end of the dose ranges i.v.

Alpha-2 agonists as sole agents and alpha-2 agonist/opioid mixtures:

See information given for dogs.

Benzodiazepines:

Diazepam (0.2–0.3 mg/kg) or midazolam (0.2–0.3 mg/kg) i.v. can provide satisfactory sedation in very sick cats. The inclusion of opioids at doses given for alpha-2 agonist/opioid mixtures may improve conditions. Benzodiazepine/opioid combinations do not provide reliable sedation in most cats.

Ketamine and ketamine-based techniques:

Ketamine is relatively safe in ill animals, but high doses cause prolonged recoveries and are associated with muscle rigidity. Acepromazine (0.05–0.1 mg/kg) with midazolam (0.25 mg/kg) or diazepam (0.25 mg/kg) and ketamine at 2.5 or 7.5 mg/kg, mixed and injected i.m., provides good conditions with only modest cardiopulmonary depression. The higher doses of ketamine should be used in excitable animals undergoing more stimulating interventions. Lower doses of acepromazine and/or ketamine may be used in very ill animals, although acepromazine should be avoided in animals with cardiovascular collapse due to vasodilation. Excluding the benzodiazepine component or the acepromazine from this combination reduces its efficacy without increasing safety.

Alternatives: Ketamine (2.5 mg/kg) combined with diazepam or midazolam (0.2–0.3 mg/kg) i.v. provides profound sedation which lasts for about 15–20 minutes. Higher doses of ketamine (5 mg/kg) may be required if given i.m. This combination is preferred over ketamine/acepromazine combinations in sick cats. Diazepam can cause pain on injection, therefore use of midazolam is preferred.

Ketamine (5 mg/kg) with medetomidine 10–40 µg (micrograms)/kg i.m. produces profound sedation but should only be used in healthy cats. Atipamezole may be given if severe problems are encountered.

Although ketamine elimination depends heavily on renal function in cats, a full recovery still occurs, albeit more slowly, in animals with renal disease or urinary tract obstruction. However, low doses should be used in such cases.

Alfaxalone: Although not authorized for this use, 2 mg/kg i.m. will provide sedation in cats lasting 10–15 minutes.

General notes:

- A crush cage is useful for restraining violent cats for i.m. injection. If injection of sedatives proves impossible, anaesthesia can be induced using a large induction chamber into which volatile anaesthetic agents can be delivered via an anaesthetic machine. Most of the aforementioned combinations will have a profound sparing effect on i.v. and inhalational anaesthetics should a general anaesthetic be required after sedation. This is particularly true of combinations containing alpha-2 agonists.
- The high body surface area to volume ratio of cats results in rapid heat loss compared with dogs. Attention to thermoregulation must be diligent.