

- **OPIOIDS**

- Bradycardia
- Bradypnea
- Hypotension
- Hypothermia
- CNS Depression in Dogs
- Excitement in Cats and Large Animals.
- Sweating in horses

| Drug Name                               | Controlled? | Other   | What is it used for?  | Reversal  |
|---|-------------|---|---|---|
| Preservative Free Morphine (Duramorph®) | C-II        |   | • Epidural Anesthesia and Analgesia   |   |
| Morphine                                | C-II        | <ul style="list-style-type: none"> <li>• Salivation, nausea, vomiting</li> <li>• Panting, anxiety, excitement, dysphoria, increased motor activity</li> <li>• Sweating in horses</li> </ul>   | <ul style="list-style-type: none"> <li>• <b>Mu agonist</b> (highest level of pain control).</li> <li>• Analgesia and sedation</li> <li>• Preanesthetic</li> </ul>   | <ul style="list-style-type: none"> <li>• Naloxone</li> <li>• Butorphanol</li> </ul> |
| Hydromorphone                           | C-II        |   |   |   |
| Oxymorphone                             | C-II        |   |   |   |
| Meperidine                              | C-II        |   |   |   |
| Methadone                               | C-II        | <ul style="list-style-type: none"> <li>• Better for thoracic surgery because less panting and dysphoria</li> <li>• Less excitement, salivation, nausea and vomiting than other Mu agonists</li> <li>• Fentanyl <ul style="list-style-type: none"> <li>○ Very short acting needs to be CRI</li> <li>○ Also patch form that lasts 3 days</li> <li>○ Don't cut or tear patches.</li> <li>○ Be sure patch does not get heated (Don't use in MRI)</li> </ul> </li> </ul> |   |   |
| Fentanyl                                | C-II        |   |   |   |
| Buprenorphine                           | C-III       |   | <ul style="list-style-type: none"> <li>• <b>Partial Mu agonist</b></li> <li>• Less analgesia but longer duration than the Mu agonist opioids.</li> <li>• Analgesia</li> <li>• Preanesthetic</li> <li>• Stronger affinity for the Mu (<math>\mu</math>) receptor than the pure Mu (<math>\mu</math>) opioids.</li> <li>• Has a ceiling effect, giving more doesn't give a greater effect once you reach a certain dose.</li> </ul> | <ul style="list-style-type: none"> <li>• Naloxone</li> </ul>                        |
| Simbadol®                               | C-III       | <ul style="list-style-type: none"> <li>• Lasts 6 - 8 hours when given IM at the same dose as standard Buprenorphine.</li> <li>• Last 24 hours when given SQ at a higher dose than standard Buprenorphine.</li> </ul>  |   |   |
| Buprenorphine XR                        | C-III       | <ul style="list-style-type: none"> <li>• Only to be given SQ and will last for 72 hours.</li> </ul>   |   |   |
| Butorphanol (Torbugesic®)               | C-IV        | <ul style="list-style-type: none"> <li>• Not appropriate for surgical pain control</li> </ul>   | <ul style="list-style-type: none"> <li>• <b>Mu antagonist</b></li> <li>• <b>Kappa Agonist</b></li> <li>• Sedative</li> <li>• Antitussive (cough suppressant)</li> <li>• Analgesia (minimal)</li> </ul>  | <ul style="list-style-type: none"> <li>• Partially reversed by Naloxone</li> </ul>  |
| Nalbuphine                              | No          |   |   |   |

| • Opiate Like Medications |      |   |   |  |
|---------------------------|------|---|---|--|
| Tramadol                  | C-IV | <ul style="list-style-type: none"> <li>• Not labeled for veterinary use</li> <li>• May take up to two weeks to take full effect especially with chronic pain</li> <li>• Efficacy is questionable</li> </ul> | <ul style="list-style-type: none"> <li>• <b>Synthetic Mu receptor opiate-like agonist.</b></li> <li>• Inhibits uptake of serotonin and norepinephrine.</li> </ul> |  |

|  |       |  |  |  |
|--|-------|--|--|--|
| <b>BENZODIAZAPINES</b> <ul style="list-style-type: none"><li>○ CNS depression</li><li>○ Respiratory depression</li><li>○ Hypothermia</li><li>○ Gabba agonist</li><li>○ PU/PD</li><li>○ Use in caution in patients with liver disease</li></ul> |       |  |  |  |
| Diazepam (Valium®)   | C-IV  | <ul style="list-style-type: none"><li>• Lipid Soluble – can't be given IM (IV only)</li><li>• More likely incompatible when mixed with other medications in the same syringe.</li><li>• Dysphoria and aggression in cats</li><li>• Muscle fasciculations in horses</li></ul> | <ul style="list-style-type: none"><li>• Anticonvulsant</li><li>• Sedative</li><li>• Pre-anesthetic</li><li>• Anti-anxiety</li><li>• Appetite Stimulant in Cats</li></ul> | <ul style="list-style-type: none"><li>• Flumazenil</li></ul> |
| Midazolam (Versed®)  | C-IV  | <ul style="list-style-type: none"><li>• Water Soluble – can be given IM or IV</li><li>• More likely incompatible when mixed with other medications in the same syringe.</li></ul>  |  |  |
| Alprazolam (Xanax®)  | C-IV  |  | <ul style="list-style-type: none"><li>• Sedative</li><li>• Pre-anesthetic</li><li>• Anti-anxiety</li></ul>   |  |
| Zolazepam (found in Telazol®)  | C-III |  |  |  |

|  |       |   |   |        |
|--|-------|---|---|--------|
| <ul style="list-style-type: none"> <li>• <b>CYCLOHEXAMINES / DISSOCIATIVES</b> <ul style="list-style-type: none"> <li>○ CNS depression</li> <li>○ Marked respiratory depression at higher doses</li> <li>○ Mild cardiac stimulation - Use with caution with certain cardiac conditions?</li> </ul> </li> </ul> |       |   |   |        |
| Tiletamine (Found in Telazol®)   | C-III |   | <ul style="list-style-type: none"> <li>• Dissociative</li> <li>• Anesthetic</li> <li>• Sedative</li> <li>• Block NMDA receptors in the central nervous system at the level of the spinal cord.</li> <li>• Prevents wind-up</li> </ul> | • None |
| Ketamine   | C-III | <ul style="list-style-type: none"> <li>• Painful when giving IM</li> <li>• <b>Apneustic breathing</b> – inspiration followed by a long pause and short expiration (animal will look like it is holding its breath).</li> <li>• Eyes open, pupils central and dilated – eye position not a reliable indicator of anesthetic depth.</li> <li>• <b>Nystagmus</b> – erratic eye movements</li> <li>• Exaggerated reflexes, muscle rigidity tremors, spasticity, and seizures</li> <li>• Increased salivation</li> </ul> |   |        |

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|---|----|---|--|--|
| <ul style="list-style-type: none"> <li>• <b>Phenothiazines</b> <ul style="list-style-type: none"> <li>○ Hypotension</li> <li>○ Respiratory depression</li> <li>○ Bradycardia</li> <li>○ CNS depression</li> </ul> </li> </ul> |    |   |  |  |
| Acepromazine  | No | <ul style="list-style-type: none"> <li>• Reported to lower seizure threshold in the literature, but more recent studies indicate that this may not be true.</li> <li>• Paraphimosis in stallions</li> </ul> | <ul style="list-style-type: none"> <li>• Pre-anesthetic</li> <li>• tranquilizer</li> <li>• Anti-anxiety</li> <li>• Antiemetic</li> </ul> | <ul style="list-style-type: none"> <li>• None</li> </ul> |

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|---|----|---|--|--|
| <ul style="list-style-type: none"> <li>• <b>ALPHA 2 AGONISTS</b> <ul style="list-style-type: none"> <li>○ Initially: <ul style="list-style-type: none"> <li>▪ Vasoconstriction which causes <ul style="list-style-type: none"> <li>• Pale mucous membranes</li> <li>• Hypertension <ul style="list-style-type: none"> <li>○ Bradycardia</li> </ul> </li> </ul> </li> </ul> </li> <li>○ After the initial period of vasoconstriction vasodilation can occur before the heart rate speeds back up decreasing cardiac output resulting in hypotension</li> <li>○ Bind to alpha 2 receptors that typically release Norepinephrine</li> <li>○ Norepinephrine production has decreased</li> <li>○ Norepinephrine maintains alertness—absence produces sedation</li> <li>○ Dose-dependent sedation – can be profound</li> <li>○ Some analgesia</li> <li>○ Vomiting (especially in cats)</li> <li>○ Hypothermia</li> <li>○ Arrhythmias (2nd degree AV Block)</li> </ul> </li> </ul> |    |   |  |  |
| Dexmedetomidine<br>(Dexdomitor®)  | No | <ul style="list-style-type: none"> <li>• Decreased response to stimuli – CAUTION: some animals will override the effects of alpha 2 agonists</li> <li>• Agitation or aggression when touched</li> <li>• Reactions to loud noises</li> </ul> | <ul style="list-style-type: none"> <li>• Anesthetic</li> <li>• Sedative</li> <li>• Emetic</li> </ul> | <ul style="list-style-type: none"> <li>• Atipamezole (Antisedan®)</li> </ul> |
| Xylazine  | No | <ul style="list-style-type: none"> <li>• Emetic of choice in cats</li> </ul>  |  | <ul style="list-style-type: none"> <li>• Yohimbine</li> </ul>                |

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|---|-------|----------------------------|--|--------|
| <ul style="list-style-type: none"> <li>• <b>Barbiturates</b> <ul style="list-style-type: none"> <li>○ CNS depression</li> <li>○ Caution with liver disease</li> </ul> </li> </ul> |       |                            |  |        |
| Phenobarbital   | C-IV  |                            | • Anticonvulsant   | • None |
| Pentobarbital   | V-II  |                            | <ul style="list-style-type: none"> <li>• Anticonvulsant</li> <li>• Euthanasia</li> </ul> | • None |
| Thiopental  | C-III | • No longer used in the US | • Induction Antiesthetic   | • None |

| Other Induction Drugs |      |  |              |        |
|-----------------------|------|--|--------------|--------|
| Propofol              | No   | • Expires 6 – 24 hours after opening depending on brand  | • Anesthetic | • None |
| Propofol 28           | No   | <ul style="list-style-type: none"> <li>• Expires 28 days after opening.</li> <li>• Use with caution in cats due to preservative. (OK for single anesthetic even but not for multiple days in a row or a CRI).</li> </ul> |              | • None |
| Etomidate             | No   | <ul style="list-style-type: none"> <li>• Less hypotension than propofol so better for critical patients.</li> <li>• Induction and recovery generally less smooth than propofol.</li> </ul>                               |              | • None |
| Alfaxalone (Alfaxan®) | C-IV | • Can be administer IM (off label use)   |              | • None |

| LOCAL ANESTHETICS       |    |  |                    |        |
|-------------------------|----|--|--------------------|--------|
| Lidocaine               | No | <ul style="list-style-type: none"> <li>• Also used to treat ventricular arrhythmias</li> <li>• Faster acting / shorter duration</li> </ul> | • Local Anesthetic | • None |
| Bupivacaine (Marcaine®) | No | • Slower acting / longer duration  |                    | • None |

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|--|----|--|--|--|
| <ul style="list-style-type: none"> <li><b>ANTICHOLONERGICS</b> <ul style="list-style-type: none"> <li>Blocks the action of acetylcholine</li> <li>Tachycardia</li> <li>Decrease bronchial secretions</li> <li><b>Mydriatic:</b> Dilates the pupil</li> <li>Blocks vagally mediated reflexes</li> <li>Atropine and Glycopyrrolate used to be used as a routine part of a preanesthetic but now we wait until a patient demonstrates a need or used if there is a high likelihood of vagal stimulation.</li> </ul> </li> </ul> |    |  |  |  |
| Atropine   | No | <ul style="list-style-type: none"> <li>Faster onset of action</li> <li>Shorter duration</li> </ul> | <ul style="list-style-type: none"> <li>Treats bradycardia</li> <li>Treats 2<sup>nd</sup> degree AV block.</li> </ul>   | <ul style="list-style-type: none"> <li>None</li> </ul>           |
| Glycopyrrolate   | No | <ul style="list-style-type: none"> <li>Slower onset of action</li> <li>Longer duration</li> </ul>  | <ul style="list-style-type: none"> <li>Does not increase blood pressure but can be used to treat hypotension when hypotension is accompanied by bradycardia (blood pressure increase is secondary to increased heart rate)</li> <li>Use with caution (if at all) in patients that have received an alpha 2 agonist.</li> </ul> | <ul style="list-style-type: none"> <li>None</li> <li></li> </ul> |
| Pralidoxime (2-PAM®)   | No |  | <ul style="list-style-type: none"> <li>Treats Organophosphate Toxicity</li> </ul>  | <ul style="list-style-type: none"> <li>None</li> </ul>           |

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|---|----|---|---|--|
| <ul style="list-style-type: none"> <li><b>ADRENERGICS</b> <ul style="list-style-type: none"> <li>Work by stimulating the CNS</li> </ul> </li> </ul> |    |   |   |  |
| Epinephrine   | No | <ul style="list-style-type: none"> <li>Used to treat anaphylaxis</li> </ul>                               | <ul style="list-style-type: none"> <li>Vasoconstrictor: increases blood pressure</li> </ul>               | <ul style="list-style-type: none"> <li>None</li> </ul> |
| Norepinephrine  | No |   | <ul style="list-style-type: none"> <li>Increases cardiac output / stimulates the heart to beat</li> </ul> | <ul style="list-style-type: none"> <li>None</li> </ul> |
| Dobutamine  | No |   |   | <ul style="list-style-type: none"> <li>None</li> </ul> |
| Dopamine  | No |   | <ul style="list-style-type: none"> <li>Vasoconstrictor: increases blood pressure</li> </ul>               | <ul style="list-style-type: none"> <li>None</li> </ul> |
| Vasopressin   | No | <ul style="list-style-type: none"> <li>Antidiuretic hormone: used to treat diabetes insipidus.</li> </ul> |   | <ul style="list-style-type: none"> <li>None</li> </ul> |
| Phenylephrine   | No |   |   | <ul style="list-style-type: none"> <li>None</li> </ul> |

| RESPIRATORY STIMULANTS |    |   |   |  |
|------------------------|----|---|---|--|
| Dopram (Doxapram®)     | No | <ul style="list-style-type: none"> <li>Until recently used to be used to stimulate respirations during CPR or while resuscitating puppies and kittens after c-section. This is now contraindicated due to increased cerebral oxygen demands. (May still see this on the VTNE?).</li> <li>Mostly now used to stimulate respirations to evaluate airway for laryngeal paralysis.</li> </ul> | <ul style="list-style-type: none"> <li>Respiratory stimulant</li> </ul> | <ul style="list-style-type: none"> <li>None</li> </ul> |

- **Non-Steroidal Anti-inflammatory Drugs (NSAIDs)**

- Inhibit prostaglandin synthesis
- Inhibit cyclooxygenase
- Well absorbed orally
- Eliminated by liver and renal mechanism
- Little abuse potential
- COX-1
  - Prostaglandins always activated
    - Help maintain gastric mucosa to protect the stomach.
    - Helps maintain renal perfusion by dilating blood vessels.
    - Helps in the production of platelets.
- COX-2
  - Prostaglandins are activated when tissue is damaged
    - Promotes inflammation
    - Promotes pain
    - Promotes fever
    - Inhibit platelets
  - FEWER SIDE EFFECTS THAN COX-1

|                                |             |    |   |   |      |
|--------------------------------|-------------|----|---|---|------|
| Aspirin                        |             | No | <ul style="list-style-type: none"> <li>• Analgesia, antipyretic, anti-inflammatory, decreased platelet aggregation, caution in cats</li> </ul>                        | <ul style="list-style-type: none"> <li>• Non-selective COX inhibitor</li> <li>• (Inhibits COX-1 and COX-2)</li> </ul>             | None |
| Phenylbutazone “Bute”          |             | No | <ul style="list-style-type: none"> <li>• Primarily used in horses, high incidence of GI ulcers, highly protein bound – caution in animals with low albumin</li> </ul> |   |      |
| Ketoprofen (Ketofen®)          |             | No | <ul style="list-style-type: none"> <li>• Treatment of musculoskeletal pain for a maximum of 5 days</li> </ul>   |   |      |
| Flunixin Meglumine (Banamine®) |             | No | <ul style="list-style-type: none"> <li>• Used in cattle and horses for muscular or colic pain, inhibits cyclooxygenase, analgesic, anti-pyretic</li> </ul>            |   | None |
| Carprofen (Rimadyl®)           |             | No | <ul style="list-style-type: none"> <li>• Metabolized in the liver (prolonged use can lead to liver toxicities).</li> </ul>  | <ul style="list-style-type: none"> <li>• Selective COX-2 Inhibitors</li> <li>• (Inhibits COX-2 more than COX-2)</li> </ul>        | None |
| Meloxicam (Metacam®)           |             | No | <ul style="list-style-type: none"> <li>• Used for arthritis and other pain in dogs.</li> <li>• Approved in cats as a one-time injection before surgery.</li> </ul>    |   | None |
| Robenacoxib (Onsior®)          |             | No | <ul style="list-style-type: none"> <li>• Approved for use in cats and dogs for a maximum of 3 days</li> </ul>   | <ul style="list-style-type: none"> <li>• Highly Selective COX-2 Inhibitors</li> <li>• (Inhibits COX-2 / minimal COX-1)</li> </ul> | None |
| Firocoxib                      | (Equioxx®)  | No | <ul style="list-style-type: none"> <li>• Equine formulation for osteoarthritis for a maximum of 14 days</li> </ul>  |   | None |
|                                | (Previcox®) | No | <ul style="list-style-type: none"> <li>• Used daily to treat osteoarthritis or a maximum of 7 days for post-op analgesia</li> </ul>                                   |   | None |