

# Examples of Anaesthetic and Pain Management Protocols for Large Animals

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## Sites of Action of Anaesthetic and Analgesic Drugs

### PERCEPTION

To alter perception:

- Alpha-2 agonists
- Phenothiazines
- Benzodiazepines
- Opioids
- Injectable Anaesthetics
- Inhalational Anaesthetics

### SYNAPTIC TRANSMISSION and MODULATION

To inhibit central sensitization:

- Alpha-2 agonists
- Opioids
- NMDA antagonists (ketamine)
- Nonsteroidal anti-inflammatories

### IMPULSE CONDUCTION

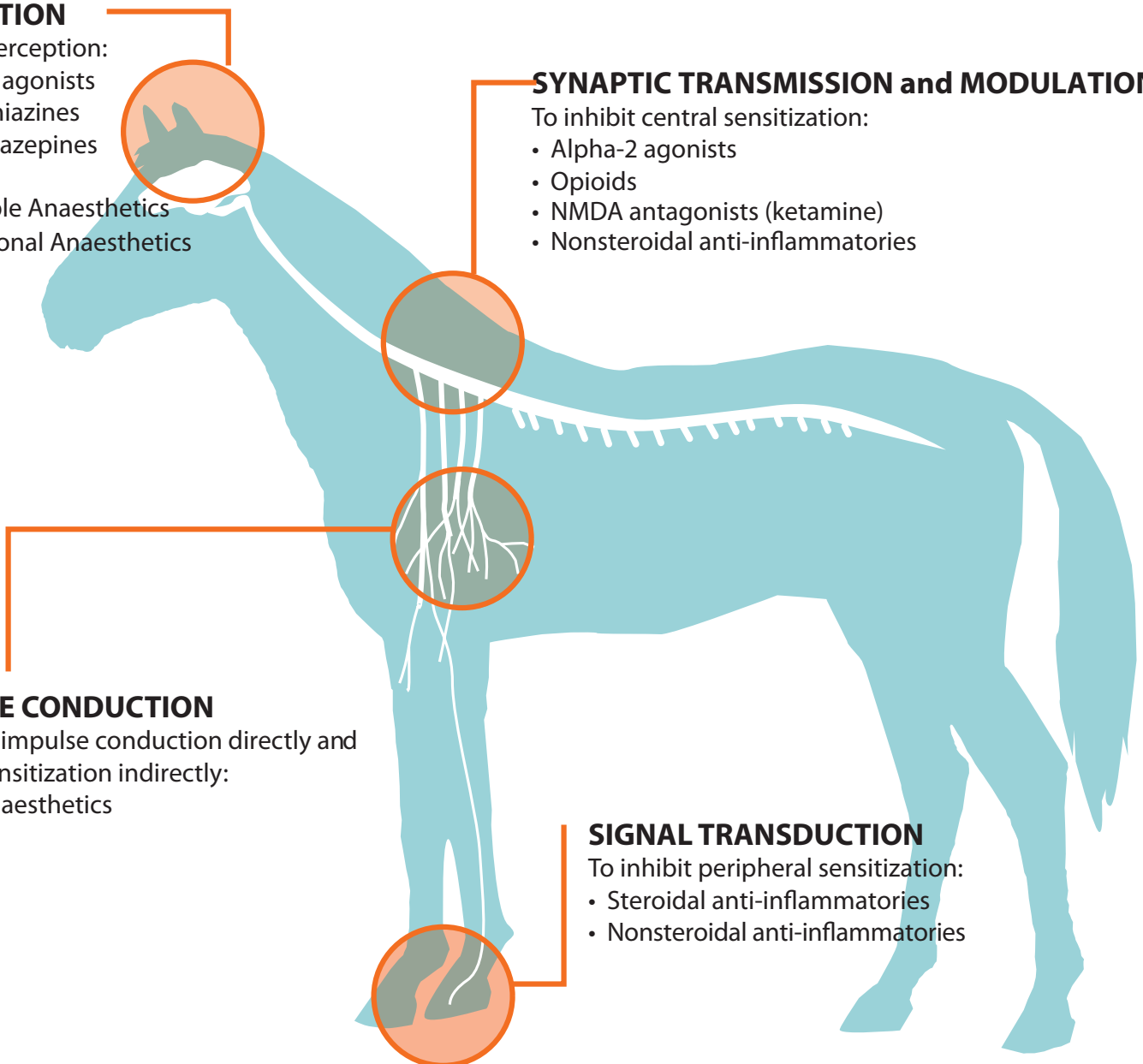
To inhibit impulse conduction directly and central sensitization indirectly:

- Local anaesthetics

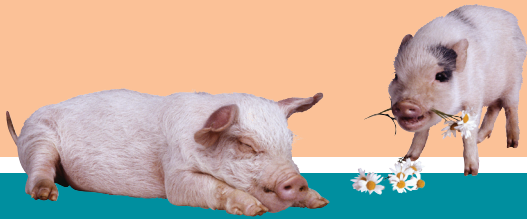
### SIGNAL TRANSDUCTION

To inhibit peripheral sensitization:

- Steroidal anti-inflammatories
- Nonsteroidal anti-inflammatories



# Principles of Effective Perioperative Pain Management



- ✧ **Surgical trauma and the resulting inflammatory process are responsible for the development of perioperative pain.<sup>1</sup>** They are the physiological triggers that activate nociceptors and lead to peripheral and central sensitization of the nociceptive pathways. Atraumatic surgical technique is often the most effective way to limit activation and sensitization of the nociceptive pathways, and to reduce postoperative analgesic requirements.
- ✧ **Most injectable and inhalational anaesthetic drugs simply produce unconsciousness and do not substantially alter nociceptive processing.** Consequently, analgesic drugs are often given preoperatively as well as postoperatively. If analgesic drugs are not given before the surgical procedure is started, unnecessarily high doses of anaesthetic drugs are required intraoperatively and pain is more difficult to manage postoperatively.
- ✧ **Opioids, alpha-2 agonists, dissociative anaesthetics, local anaesthetics, and anti-inflammatories are the classes of analgesic drugs that are used perioperatively to manage pain in large animals.<sup>1,2</sup>** Monotherapy using a single class of analgesic drug may be effective for minor surgical procedures, but multimodal therapy using several classes of analgesic drugs is usually required for more painful procedures.
  - ✧ **Opioids** (butorphanol, morphine) produce analgesia and reduce anaesthetic requirements in most species. However, parenteral administration of opioids can cause abnormal behavioural and locomotor effects in horses, and clinical research on the effects of opioids in cattle and swine is limited.
  - ✧ **Alpha-2 agonists** (xylazine, detomidine, romifidine) produce sedation, analgesia, and muscle relaxation, and reduce anaesthetic requirements. These drugs also potentiate the effects of other analgesic drugs and reduce the neuroendocrine or “stress” response to surgical trauma.
  - ✧ **Dissociative anaesthetics** (ketamine) produce immobilization at low doses and anaesthesia at high doses, and attenuate development of central sensitization. Subanaesthetic doses of these drugs can also be used in combination with other analgesic drugs to manage moderate to severe postoperative pain.
  - ✧ **Local anaesthetics** produce complete sensory blockade and prevent development of central sensitization. These drugs also reduce intraoperative requirements for anaesthetic drugs and postoperative requirements for other analgesic drugs.
  - ✧ **Steroidal and nonsteroidal anti-inflammatories** reduce the inflammatory response associated with surgical trauma and attenuate development of peripheral sensitization. These drugs have a relatively long duration of action (12-24 hours), and can be given alone or in combination with other analgesic drugs.

<sup>1</sup>Lemke KA. Understanding the pathophysiology of perioperative pain. *Can Vet J* 2004;45:405-413.

<sup>2</sup>Hewson CJ, Dohoo IR, Lemke KA, Barkema H. Use of analgesic drugs in cattle, pigs, and horses by Canadian veterinarians in 2004 and 2005.

*Can Vet J* 2007;48:155-164. This research was funded through grants from the Animal Welfare Foundation of Canada and the Sir James Dunn Animal Welfare Centre.