

## Canine Catch-Neuter-Return (CNR) Good Practice Guides

### Good standards of practice in anaesthesia and analgesia - Pain pathway and analgesics

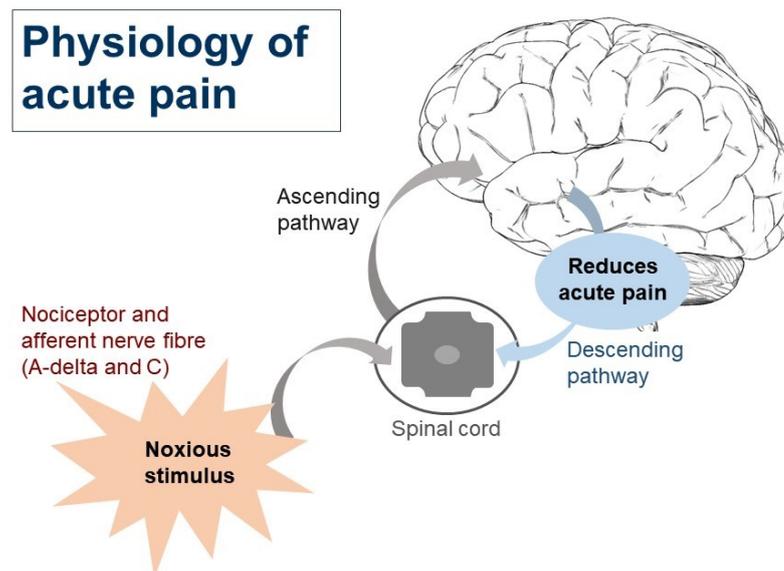
#### Learning Outcomes:

1. Describe and annotate the pain pathway of a dog
2. Explain the importance of pre-emptive multi-modal analgesia

An understanding of the pain pathway and analgesics are required to ensure adequate analgesia is provided to all dogs undergoing spay or neuter surgery in a CNR programme.

The brain is able to process painful stimuli even when animals are anaesthetised and so in addition to anaesthesia, analgesic drugs that provide both intra- and post-operative analgesia should be given. The dog's responses to the analgesics should then be monitored, and then further analgesia provided as required to meet each individual dogs' needs until the pain response has subsided. Without sufficient analgesia the dog will experience intra- and post-operative pain which will increase the risk of post-operative infection, self-trauma and wound breakdown. The provision of adequate pain relief pre-, intra- and post-operatively is crucial to minimise the negative impact on dog welfare as well as for successful outcome of neuter surgery.

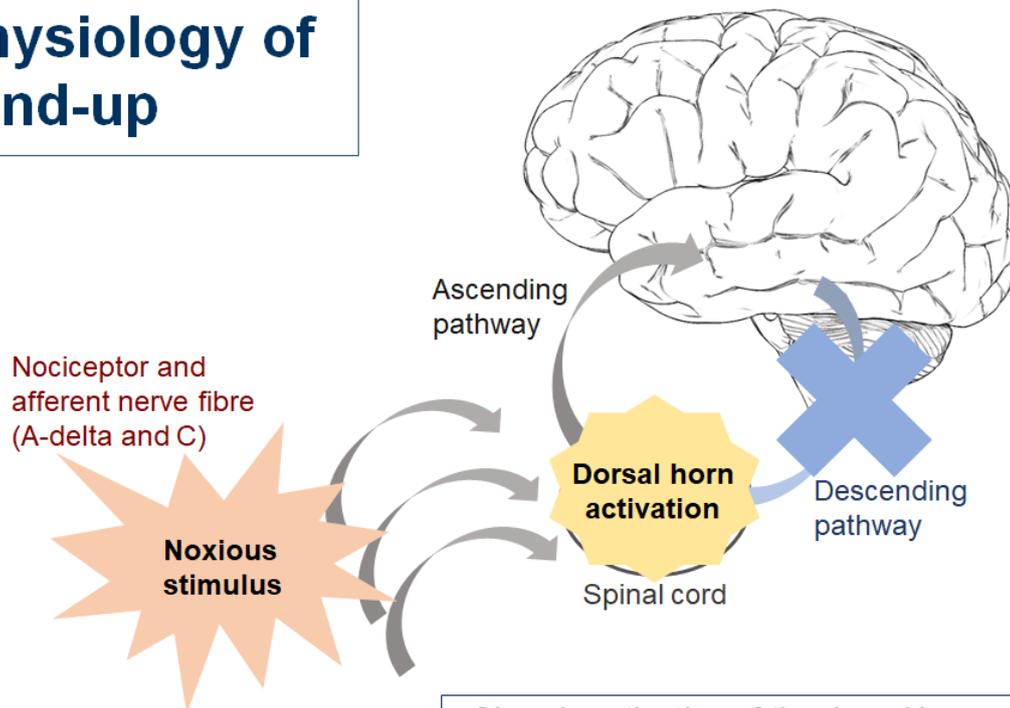
The pain pathway in dogs:



A noxious stimulus such as a scalpel blade cutting the skin of the dog will stimulate the nociceptor and afferent nerve fibres in the skin. This signal will be carried by the nerves to the dorsal horn of the spinal cord and then up the ascending pathway to the brain where the brain interprets this signal as pain. The signals sent along the descending pathway from the brain to the spinal cord will try to reduce the acute pain experience.

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### Physiology of wind-up



Chronic activation of the dorsal horn of the spinal cord results in neuropathic pain that can last for days - months

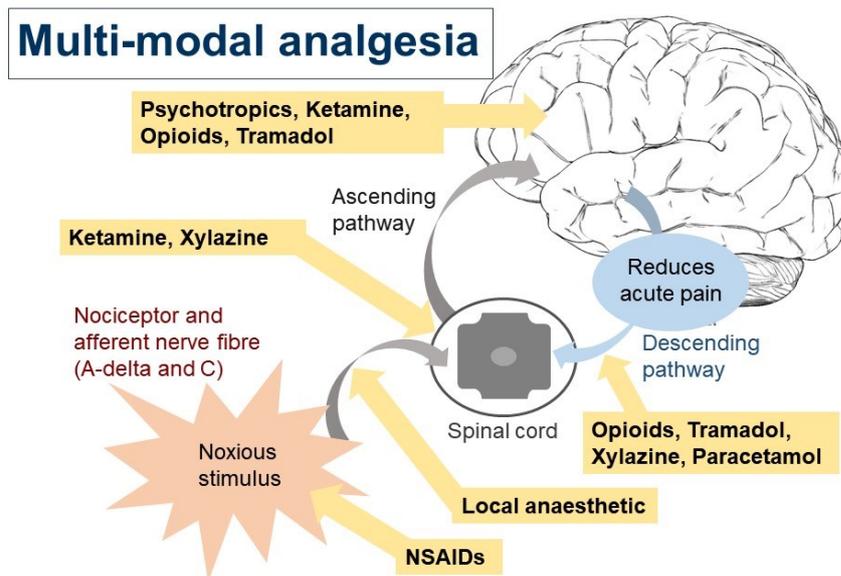
Analgesic drugs will have better efficacy if they are used pre-emptively, before the dog is exposed to the noxious stimulus, such as surgery. This is because once the brain receives the pain signals, it will mount a response which increases central nervous system sensitivity to pain meaning if the same stimulus is experienced again the dog will experience a much greater pain response which is more difficult to treat with analgesics.

We know that surgery is painful, and although the anaesthetised dog may not perceive pain, the central nervous system will still receive and process this painful stimulus. We must give an appropriate dose of analgesics before the surgery starts instead of waiting for the dog to show signs of pain intra-operatively or post-operatively, as once pain is felt, it is much more difficult to treat effectively.

#### Analgesics

A multimodal approach to analgesia is recommended, where multiple aspects of the pain pathway are targeted using several analgesic drugs. Access to analgesic drugs may vary depending on the local geography and regulations. Veterinary drugs should only be used if their mechanism of action and side effects are understood and administered under the direction of suitably qualified veterinary professional.

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### 1. Non-steroidal anti-inflammatory drugs (NSAIDs)

Act at the site of the painful stimulus to reduce pain and inflammation. The NSAID should be administered prior to surgery unless there is concern the dog may have renal or hepatic disease. They have a long duration of action of 24 hours. However, they are not comprehensive at treating all types of pain. Never combine different NSAIDs or combine NSAIDs with steroids, as this is extremely dangerous and may result in severe side effects.

### 2. Local anaesthetics e.g. Lidocaine or Bupivacaine

Local anaesthesia if performed correctly is the only drug which will completely block any pain signals from reaching the brain. However, local anaesthesia alone is not sufficient for surgical procedures that enter a body cavity. They are often widely available, are relatively inexpensive, and are often hugely underutilised. Using Lidocaine or Lignocaine has a fast onset and lasts for up to 1.5 hours. We recommend using local anaesthesia to perform intra-testicular blocks prior to dog castrate surgery, and infiltrative blocks near the incision prior to suturing the skin.

Intratesticular block



Infiltrative block



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A small volume of Lidocaine can also be aseptically injected into the fluid bag or bottle to provide further pain relief during anaesthesia. The constant rate infusion (CRI) dose for lidocaine is 2 mg/kg IV followed by 20–50 µg/kg/min. Many patients will benefit from a loading bolus dose of 1 mg/kg slow IV.

Typically this is 3ml of 2% Lidocaine mixed into a 500ml bottle of fluids or 6ml of 2% Lidocaine mixed into 1000ml bottle mixed into a xml bag. Care should be taken to dose this correctly as lidocaine may cause cardiac arrhythmias. This should not be used in cats.

### 3. Alpha-2 agonists e.g. Xylazine or Medetomidine

Often used in the pre-medication or in combination with an anaesthetic drug such as ketamine for induction. These drugs cause sedation, central nervous system depression, provide pain relief and muscle relaxation. They have the added benefit of having an antagonist drug available to reverse the effects of the drug, but if it is reversed, then the analgesic activity will also be lost. Xylazine should not be used in sick, old or debilitated animals as it has severe effects on the cardiovascular system and on renal perfusion which may cause long term morbidity.

### 4. Ketamine

Widely available and is often used as an anaesthetic drug but it also has analgesic properties. It acts on the central nervous system to reduce the sensitisation of pain and also reduces the development of chronic pain. Ketamine should not be used alone for anaesthesia but should be combined with other analgesics and sedatives to provide appropriate muscle relaxation. Ketamine should always be used when transecting nerves as it prevents neuropathic pain from developing. Low dose ketamine may be used post-operatively to reduce pain.

### 5. Opioids e.g. Morphine, Methadone, Buprenorphine, Butorphanol

Opioids are sometimes difficult to obtain in many countries but are very effective analgesics. They act in the brain to reduce sensitisation to pain, reduce perception of pain and increase pain tolerance. The pain signals are still going on, but the perception of pain has been reduced.

### 6. Tramadol

Tramadol mimics the effects of opioids on the brain and can be used in conjunction with a variety of anaesthetics to provide an opioid-like analgesia during and after surgery. Research has shown that tramadol is an effective pain relief in about 50% of canine patients, so it is not as reliable as opioids and reflects the need for pain assessment of all dogs peri- and post-operatively.

### 7. Paracetamol

Paracetamol is an effective analgesic for inflammatory pain and acts on a different part of the pain pathway than NSAIDs. Paracetamol should never be used in cats.

### 8. Gabapentin

Gabapentin is a human drug effective at relieving chronic neuropathic pain, incisional pain and arthritis. It has been found to have similar analgesic effects in animals. Its mechanism of action is unknown, but it is thought to increase the activity of the descending pathway to prevent the activation of the dorsal horn and wind-up which leads to chronic pain.

There is no drug protocol which works for all CNR programmes as there will be limitations in drug availability in different countries. Examples of good anaesthetic drug protocols used in CNR programmes include:

1. Pre-medication with an opioid and xylazine, plus NSAID, ketamine for induction and ketamine-xylazine maintenance, and infiltration of local anaesthetic at the incision site.



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2. Premedication with opioid/Tramadol and Acepromazine, plus NSAID, propofol for induction and isoflurane gas for maintenance, and infiltration of local anaesthetic at the incision site.

### Note:

Corticosteroids have analgesic, antipyretic and anti-inflammatory effects and historically have been used to treat several musculoskeletal disorders, including osteoarthritis, myositis, and immune-mediated arthritis. However, there are many adverse side effects of corticosteroids seen in all animal species and dogs seem to be particularly susceptible. These side effects include; increased susceptibility to infections, decreased ability to heal, corneal ulceration, gastric ulceration and many more. Due to these adverse side effects, they are not appropriate for use as peri-operative analgesics in CNR.

### Checklist:

- ✓ Recognise the pain pathway
- ✓ Prevent central sensitisation with pre-emptive analgesia
- ✓ Multi-modal analgesia to target the whole of the pain pathway

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