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PAIN MANAGEMENT IN REPTILES

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INTRODUCTION

The management of pain in reptiles remains a challenging and evolving field in veterinary medicine. Of the reason is that reptiles are a diverse group that includes approximately 13,361 living species, and their classification is paraphyletic. Few studies on few species have been conducted neuro anatomy, on pain physiology, and on pharmacology. There unique anatomy and physiology make difficult to transpose knowledge from mammals to reptiles.

DO REPTILES FELL PAIN?

The question of whether reptiles feel pain is relevant for veterinary professionals, since pain management is an important part of animal welfare. Nociception, which is the sensory nervous system's process of encoding noxious stimuli, is well-documented in reptiles. Pain, defined as an unpleasant sensory and emotional experience associated with actual or potential tissue damage, is now recognized in reptiles due to the presence of specialized sensory neurons and afferent fibers such as Aβ, Aδ, and C fibers (1).

In reptiles, these fibers transmit pain signals to the posterior horn of the spinal cord. The number of neurons in the thalamus and pallium is limited compared to mammals, but these areas are present and functional. Pain signals are integrated in the thalamic grey matter and relayed to the dorsal pallium. Somatosensory and sensorimotor areas have been identified in species like caimans and geckos, demonstrating that reptiles can process and respond to painful stimuli. Descending fibers from the hypothalamus and brainstem modulate pain transmission in species such as Trachemys and monitor lizards, although pythons lack rubrospinal fibers, which may affect pain modulation.

Pain modulation in reptiles involves mechanisms such as gate control by interneurons in the grey matter, although the role of these neurons is not fully understood. Descending control of pain can be induced by cerebral stimulation. Reptiles possess μ and δ opioid receptors in the central nervous system, and endogenous endorphins have been identified, supporting the presence of pain modulation mechanisms. Reptiles are capable of learning to avoid painful stimuli, which is demonstrated by behavioral adaptations following painful events.

PAIN ASSESSMENT

Recognizing pain in reptiles can be challenging due to their subtle behavioral responses (1). Painful behaviors may include grouped, non-resting postures, lameness, pruritus, abnormal tail movements, decreased appetite, closed eyes, changes in color, and self-mutilation. Ethograms have shown that after surgery, Trachemys may exhibit a drop in food intake, decreased swimming time, and increased respiratory rate. Physiological indicators of pain include increased heart and respiratory rates, elevated blood catecholamines, and changes in behavioral profiles.

Species-specific pain behaviors have been described. In snakes, pain may be indicated by decreased appetite, head and neck extension, bites during handling, lameness, abnormal posture, abnormal breathing, agitation during handling, and a less curved body over the painful area. In chelonians, pain may present as decreased appetite, eyelids closed, head and neck extended outside the shell, bites during handling, lameness, abnormal posture, abnormal breathing, a hunched back, and avoidance of ventral recumbency. Lizards may show decreased appetite, bites during handling, lameness, abnormal posture, abnormal breathing, and changes in scale color.

Pain assessment in reptiles should be performed in the animal's preferred metabolic temperature to minimize stress and obtain accurate behavioral observations. Veterinarians should use species-specific ethograms and clinical judgment to guide analgesic therapy.

PHARMACOLOGY

Pharmacokinetic and pharmacodynamic studies are essential to determine the efficacy and safety of analgesic drugs in reptiles, but only few are available. Overall, according to these studies, he intramuscular (IM) or intravenous (IV) routes are preferred for drug administration, as subcutaneous (SC) administration may result in slow absorption due to poor vascularization. Oral and transdermal routes have variable bioavailability and slow onset of action. Methods to assess analgesic efficacy include measuring limb weight in arthritis or fracture models, temperature or electric thresholds, clinical studies, and pharmacovigilance.

Meloxicam is a commonly used non-steroidal anti-inflammatory drug (NSAID) in reptiles. According to pharmacokinetic studies, in Trachemys, the recommended dose is 0.2 mg/kg IM every 24 hours, while in iguanas, it is 0.2 mg/kg PO or IV every 24 hours. In ball pythons, meloxicam at 0.3 mg/kg IM has shown no effect, possibly due to low cyclooxygenase (COX) expression in cutaneous and muscular lesions (2).

Butorphanol, an opioid, has shown no effect in ball pythons at 5 mg/kg IM, bearded dragons at 20 mg/kg IM, iguanas at 1 mg/kg IM, or Trachemys at 2.8–28 mg/kg SC (3). However, it is effective in corn snakes at 20 mg/kg IM every 24 hours, although it may cause respiratory depression.

Tramadol, a codeine analog, acts as a μ-opioid antagonist, inhibits noradrenaline reuptake, and increases serotonin release. Its affinity for opioid receptors is low, and its onset of action after oral administration is about 15 minutes, with a duration of 6–12 hours. Tramadol is indicated for moderate pain and can be used for rescue analgesia at home. Side effects may include dysphoria and nausea. In red-eared sliders (Trachemys scripta elegans), tramadol is dosed at 5–10 mg/kg PO SID–BID. Subcutaneous administration is less analgesic and has a shorter duration. In yellow-eared sliders (Trachemys scripta scripta), 10 mg/kg IM is recommended, with faster analgesia when injected into the front limb. Maximum antinociception occurs at 24 hours. In marine turtles (Caretta caretta), 5 mg/kg PO provides a therapeutic dose for 72 hours. In bearded dragons (Pogona vitticeps), 11 mg/kg PO has been used in clinical cases.

Buprenorphine, a partial μ-agonist, has limited efficacy in reptiles. In Trachemys, 0.1 mg/kg SC every 24 hours has been studied, but 0.2 mg/kg SC shows no effect. In iguanas, doses of 0.1–1 mg/kg have also shown no effect.

Morphine, a pure μ, δ, and κ agonist, has moderate affinity for opioid receptors. Morphine is indicated for severe pain and may cause sedation, respiratory depression, cardiovascular depression, vomiting, constipation, urinary retention, and dysphoria. In Trachemys, the recommended dose is 1.5–6.5 mg/kg IM every 8 hours, with respiratory depression observed at doses above 5 mg/kg. In Kinixys spekii, 7.5–10 mg/kg IM is used. In bearded dragons, 10–20 mg/kg IM every 24 hours is recommended, with an onset of 8 hours (3). In iguanas, 1–5 mg/kg IM every 24 hours is used, but in corn snakes, 1–40 mg/kg SC has shown no effect.

Methadone, another pure μ, δ, and κ agonist with NMDA antagonist properties, has moderate affinity for opioid receptors. Methadone is indicated for severe pain. It is not recommended for epidural use due to preservatives. A pharmacodynamic paper presented suggest that 3 to 5mg/kg IM is efficient for 24 hours, to relieve pain using a thermic thresholds model. In lizards, case reports or review articles describe dosage from 1 to 5mg/kg SID administered subcutaneously or intramuscular.

Fentanyl, a pure μ, δ, and κ agonist with high affinity, has usually a short onset of action and a short duration. It is indicated for severe to very severe pain and may cause respiratory depression, especially with IV bolus administration. Transdermal fentanyl patches have been studied in ball pythons and Corucia zebrata, but they do not reach analgesic plasma concentrations which have analgesic effect in other species.

Alpha-2 agonists such as clonidine have been used intrathecally in Pelomedusa at doses of 37.5–65.5 μg/kg, demonstrating efficacy, although the duration of action is uncertain. Local anesthesia techniques include mandibular blocks in alligators, caimans, and Osteolaemus tetraspis using mepivacaine 1 mg/kg SC. In Trachemys, intrathecal injections of lidocaine 4 mg/kg/hour, bupivacaine 1 mg/kg/2 hours, and morphine 0.1–0.2 mg/kg/48 hours have been described. Brachial plexus blocks in tortoises have been studied using methylene blue injections of 0.1, 0.2, and 0.3 mL, with 0.2 and 0.3 mL providing complete infiltration in all cases.

Adjuvant therapies for pain management in reptiles include ice packs, rehabilitation, acupuncture, massages, bandages, less traumatic surgeries, cold laser therapy, and traditional medicine. These modalities can complement pharmacological treatments and improve patient outcomes.

CONCLUSION

Reptiles are physiologically and pharmacologically distinct from mammals, which presents challenges for pain assessment and management. Many data gaps remain, and veterinarians must adapt their knowledge and protocols to the specific needs of each species. It is essential to use validated ethograms, clinical judgment, and appropriate analgesic protocols to ensure the welfare of reptiles under veterinary care.

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