



Avian Analgesia

Sam Young, DVM

WRNC Symposium

01/20/2024



WHERE DO I COME FROM?



Uncommon Creatures
Mobile Veterinary Services



Tufts CUMMINGS VETERINARY MEDICAL CENTER

Tufts Wildlife Clinic

GREENSBORO
SCIENCE CENTER

ASSOCIATION
OF ZOOS &
AQUARIUMS



DISCOVERY PLACE
SCIENCE | KIDS | NATURE



Lees  McRae
COLLEGE

Uma

Castineiras D, Armitage L, Lamas LP, De Baere S, Croubels S, Pelligand L. Perioperative pharmacokinetics and pharmacodynamics of meloxicam in emus (*Dromaius novaehollandiae*) of different age groups using nonlinear mixed effect modelling. *J Vet Pharmacol Therap.* 2021; 44: 603–618.
<https://doi.org/10.1111/jvp.12923>





Topics

- ▶ Nociception and Pain Perception
- ▶ Recognizing Pain
- ▶ Assessing Pain
- ▶ Initial Triage
 - ▶ What Could Be Causing Pain?
- ▶ Analgesic Methods
 - ▶ Physical, Medicinal, Adjunctive
- ▶ Long-term

Nociception

- ▶ the transduction, conduction, and CNS processing of signals generated by the stimulation of nociceptors



Pain

- ▶ 'Unpleasant' sensory and emotional experience associated with actual or potential tissue damage



- When Completed in a Conscious Animal Results in the Perception of Pain



'Pain' Specifically in Animals

- ▶ An aversive sensory experience caused by actual or potential injury that elicits protecting motor and vegetative reactions, results in learned avoidance behavior, and may modify species specific behavior, including social behavior.

Basic Physiology of Nociception



Peripheral

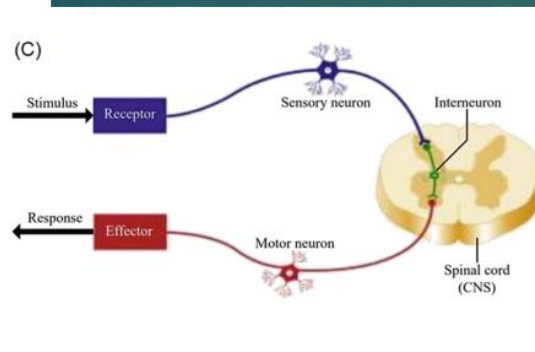
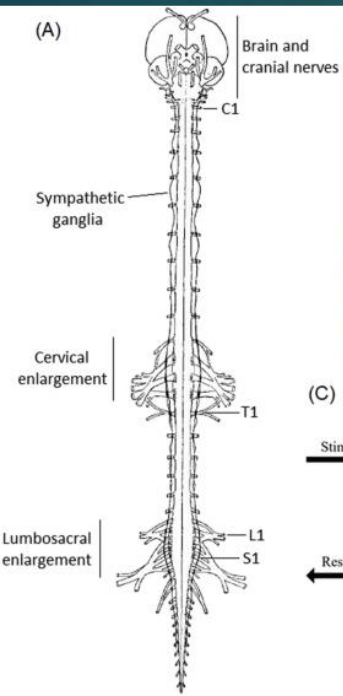
- ▶ Detection and Transmission
- ▶ 3 Main Types of Nociceptors:
 - ▶ High-Threshold Mechanothermal
 - ▶ Mechanical
 - ▶ Thermal

Central

- ▶ Cerebral Response
- ▶ Mid and Forebrain

▶ μ, κ, δ -Opioid Receptors

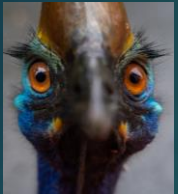
- ▶ Release endogenous opioids to modulate analgesic and physiologic responses



Fousse SL, et al. Varying Expression of Mu and Kappa Opioid Receptors in Cockatiels (*Nymphicus hollandicus*) and Domestic Pigeons (*Columba livia domestica*). *Front Genet.* 2020 Oct 15.

Recognizing Pain

- ▶ **Subtle**
- ▶ **Stress** can play a major role: Your Presence/Last 24hrs
- ▶ Requires Some Level of Familiarity w/ Species Norms
- ▶ **Vary/Contradictive** Between **Species/Age/Gender/Individuals**
 - ▶ Prey vs. Predator
 - ▶ **Fight or Flight** → • Escape, Struggle, Vocalizations
 - Or
 - ▶ **Conservation** → • Withdrawal, Immobility, No Vocalization
- ▶ Can Vary w/ Chronicity
- ▶ Can be **Progressive**

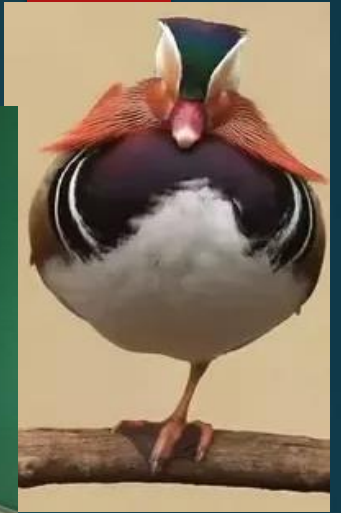


MJ Gentle, LN Hunter
Physiological and behavioural responses associated with
feather removal in *Gallus gallus* var domesticus
Res Vet Sci, 50 (1) (1991), pp. 95-101



Recognizing Pain

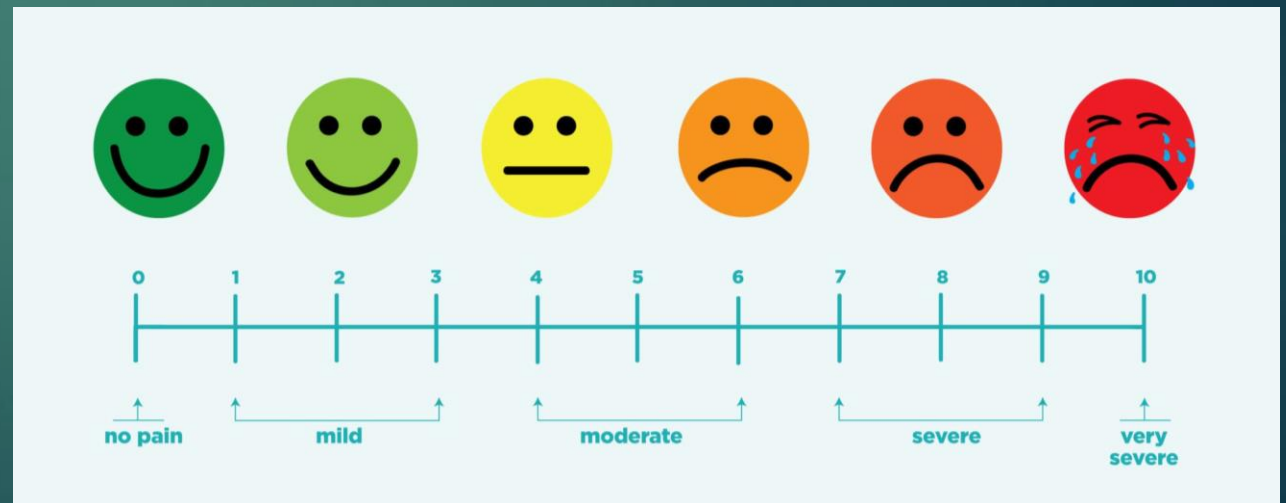
- ▶ Some Generalized Behaviors:
 - ▶ Down, Un or Less Responsive/Dull
 - ▶ Eyes Closed
 - ▶ Separated from Flock
 - ▶ Increased Aggression
 - ▶ Vocal/Not
 - ▶ Suspension of Grooming/Feather Plucking
 - ▶ Ruffled Feathers
 - ▶ Favoring Limb/Atypical Body Posture
 - ▶ Wing Droop
 - ▶ Inappetence/Weight Loss
 - ▶ Tail/Crest Droop
 - ▶ Tachypnea/Tachycardia
- ▶ All Could be a Sign of Something Else



Assessing Pain

- ▶ Subjective/Ambiguous
- ▶ Validated and Reliable Methods Still Early in Development
- ▶ Underestimation Can Lead to Adverse Sequelae:
 - ▶ ↑ Morbidity
 - ▶ ↑ Mortality
 - ▶ ↓ QOL/Welfare

- ▶ **Pain Scale/Score**
- ▶ Species Specific May be Most Accurate
 - ▶ 10,000 + Species
 - ▶ Commercial Poultry



Assessing Pain

Respiratory Rate

- 🐾 0 = < 10% increase
- 🐾 1 = < 50% increase
- 🐾 2 = < 100% increase
- 🐾 3 = > 100% increase

Heart Rate

- 🐾 0 = < 10% increase
- 🐾 1 = < 50% increase
- 🐾 2 = < 100% increase
- 🐾 3 = > 100% increase

Appearance

- 🐾 0 = cooing, standing on perch, feathers normal, preening
- 🐾 1 = cooing, not standing on perch, or feathers ruffled
- 🐾 2 = quiet, not standing on perch and feathers ruffled
- 🐾 3 = huddled, not preening, anorexic, unwilling to move

Body Weight

- 🐾 0 = < 5% weight loss
- 🐾 1 = < 10% weight loss
- 🐾 2 = < 15% weight loss
- 🐾 3 = > 15% but < 20% weight loss
- 🐾 4 = > 20% weight loss

Table 2. Behavioral scoring system used to assess Hispaniolan parrots with experimentally induced arthritis and receiving various analgesic treatments

Behavior	Score
Voluntary Activity	Voluntary 0 = Moving around cage, 1 = moving on perch, 2 = no activity
Inactive time	0 to 15 = No. of minutes parrot was inactive
Locomotion	0 = Both pelvic limbs, 1 = only 1 pelvic limb, 2 = no movement
Perching posture	0 = 2 limbs visible, 1 = 1 limb visible, 2 = hock-sitting, 3 = unilateral hock-sitting
Perching grasp	0 = Both feet, 1 = only 1 foot
Stand and ambulate with arthritic limb	0 = No, 1 = yes
Hang from top of cage	0 to infinity = No. of times parrot hung for >10 s
Appearance	0 = Smooth feather, 1 = slightly fluffed, 2 = very fluffed; feathers sticking out, 0 = no, 1 = yes
Feathers ruffled	0 to infinity = No. of times parrot ruffled feathers
Feather ruffling	1 = With beak and feet, 2 = with beak only, 3 = none
Preening	0 = No, 1 = yes
Grooming	0 = Alert, 1 = signs of slight depression, 2 = signs of depression
Rub beak on metal perches	0 = No, 1 = yes
Rub beak on wood	
Attitude	0 = No, 1 = yes
Use injected limb to hold food reward while eating it	0 to infinity = No. of times to food and water
Use noninjected limb to hold food reward while eating it	0 to 15 = No. of minutes
Visits to food dish	0 = No, 1 = yes
Time spent eating food	
Picking at arthritic limb with beak	
<i>Motivated (associated with obtaining grape food reward)</i>	
<i>Attempts made to get food reward</i>	0 to infinity = No. of attempts
<i>Time from introduction of food reward to first contact with reward</i>	0 to 15 = No. of minutes
<i>First contact with food reward</i>	0 to 15 = No. of minutes
<i>Time spend eating food reward</i>	0 to 15 = No. of minutes

(Paul-Murphy, J. R., Sladky, K. K., Krugner-Higby, L. A., Stading, B. R., Klauer, J. M., Keuler, N. S., Brown, C. S., & Heath, T. D. (2009). Analgesic effects of carprofen and liposome-encapsulated butorphanol tartrate in Hispaniolan parrots (*Amazona ventralis*) with experimentally induced arthritis, American Journal of Veterinary Research, 70(10), 1201–1210. Retrieved Sep 23, 2022,

Score Behavioral observation

Pigeon's attitude in the presence of the observer

- 0 Alert and attentive; tries to escape and fly with insistence.
- 1 A little curious; still tries to escape but with only mild effort.
- 2 Stays quiet on its perch with little reaction to the presence of the observer.
- 3 Stands on the floor and displays little reaction to the presence of the observer.
- 4 Stands on the floor and displays no reaction to the presence of the observer.
- 5 Lies on the floor and displays no reaction to the presence of the observer.

Fractured limb position in the presence of the observer

- 0 Appears to bear equal weight on both limbs.
- 1 Bears weight on both limbs but appears to bear a little less weight on the fractured limb.
- 2 Bears weight on both limbs but obviously bears much less weight on the fractured limb.
- 3 Able to bear weight on both limbs but appears reluctant to do so on the fractured limb.
- 4 Does not bear weight on its fractured limb but stands on its nonfractured limb.
- 5 Lies on the floor.

Subjective observer evaluation of pigeon's degree of pain (overall assessment)

- 0 No signs of pain; pigeon appears as it did before surgery.
- 1 Appears uncomfortable on 1 limb but discomfort not always obvious.
- 2 Evidence of discomfort on 1 limb but no other obvious sign of pain.
- 3 Overall, appears moderately disturbed by pain in its fractured limb.
- 4 Overall, appears highly disturbed by pain in its fractured limb.
- 5 Lies on the floor; does not appear able to stand.

Pigeon's motor activity during 10 minutes of video recording

- 0 Highly active; perches, moves around, explores, preens, or eats.
- 1 Moderately active; moves a little, but mainly stays quiet on its perch; preens.
- 2 Awake but quiet; stays quiet on its perch, does not preen, and looks around.
- 3 Very quiet; sleeps on its perch or stands on the floor; does not preen.
- 4 Obvious decreased reaction; stands or lies on the floor and appears lethargic or asleep.
- 5 No reaction; lies on the floor; and does not react to any stimuli.

Evaluation of a fracture pain model in domestic pigeons (*Columba livia*)

by Desmarchelier, Marion; Troncy, Eric; Beauchamp, Guy ; Paul-Murphy, Joanne R; Fitzgerald, Guy; Lair, Stephane
American journal of veterinary research, 03/2012, Volume 73, Issue 3



Figure 1—Photograph of an incapacitance meter modified for birds. For each measurement, domestic pigeons (*Columba livia*) were placed on a perch composed of 2 separated sections, each linked to a scale to measure weight bearing on each limb.



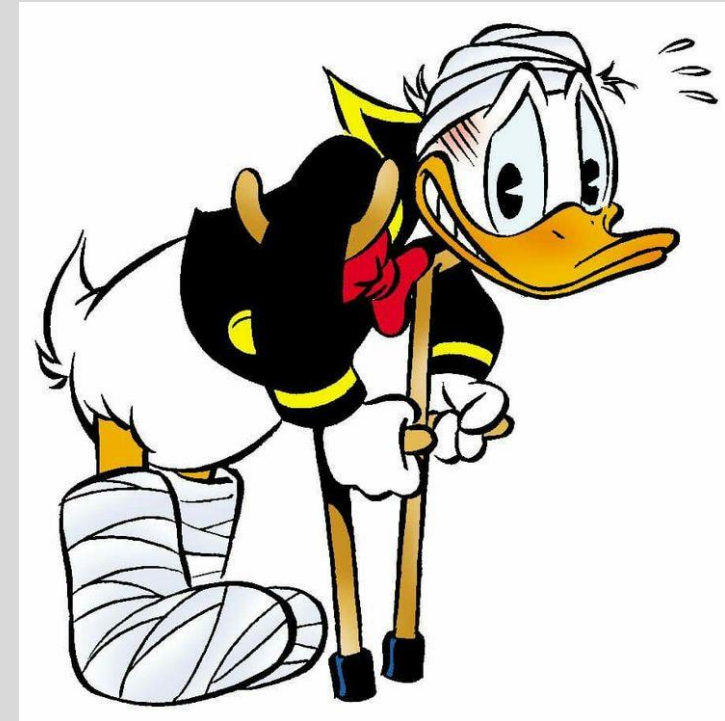
Initial Triage

- Collect Thorough History
 - Observation
 - Complete Physical Exam
 - Efficiency/Quiet/Low Stress/Keep 'em Covered
 - Identify Problems
 - Plan & Execute
 - Err on Side of Analgesia
 - Observation
-



Available Options

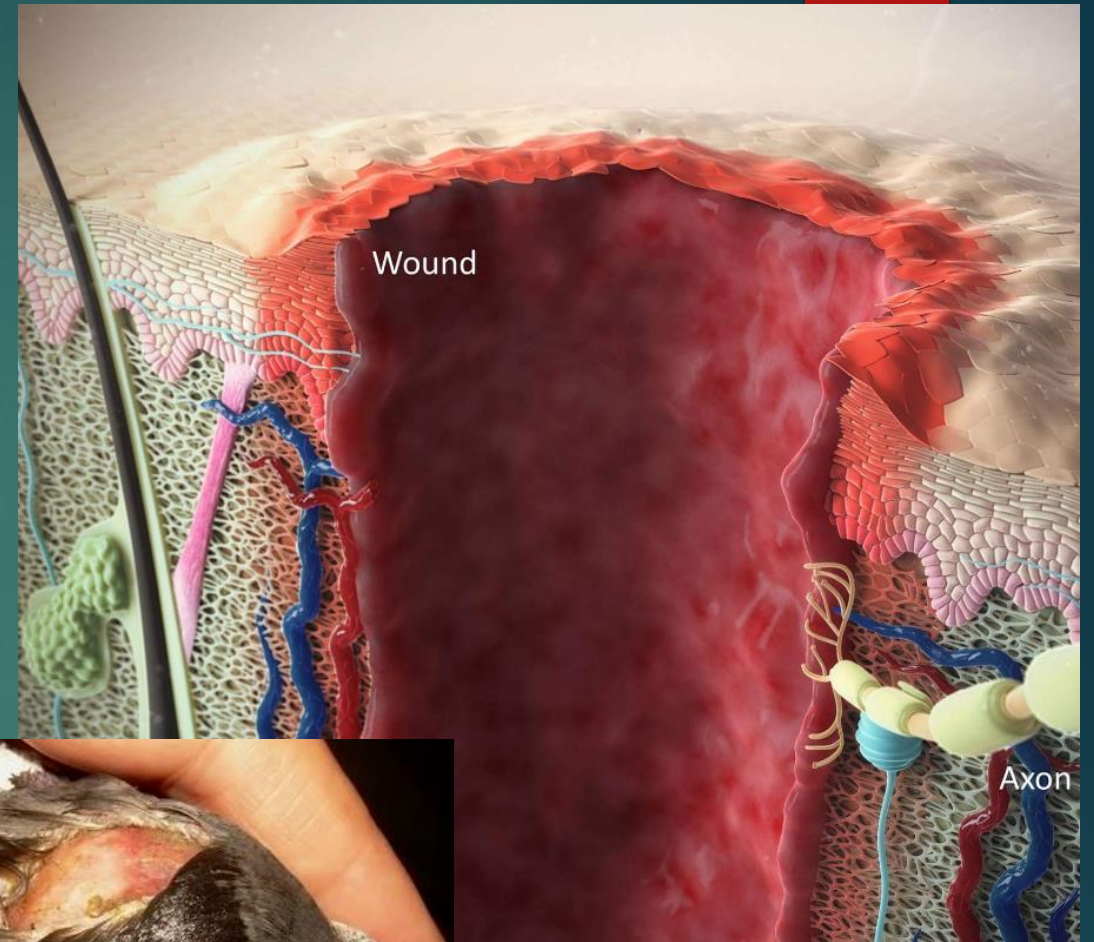
- Physical
 - Bandaging
 - Wrapping/Splinting/Stabilizing
- Chemical (Medicinal)
 - Drug Classes
 - Synergism
- Complimentary/Adjunctive
 - Physical Therapy
 - Cold Laser
 - Acupuncture



Physical: Bandaging

▶ Wound Pain

- ▶ Exposed/Damaged Nerves
 - ▶ Initial Trauma + Chronicity
 - ▶ Capture/Restraint/Exam
 - ▶ Cleaning
 - ▶ Debridement
 - ▶ Bandaging
 - ▶ Re-exposure to Air
 - ▶ Continued Wound Management
 - ▶ Infection
 - ▶ Self-Trauma



Physical: Bandaging

Ideal Bandage:

- ▶ **Cover/Protection**
- ▶ **Keep Moist***
- ▶ **Prevent Infection**
- ▶ **Promote Tissue Growth**

Mitigating Pain:

- ▶ Decrease Stressors
- ▶ Non-Adherent Bandages
- ▶ Gentle Touch: Cleaning/Debriding
- ▶ Gentle Topicals
- ▶ +/- Anesthesia
- ▶ Pain Meds Prior to Changing



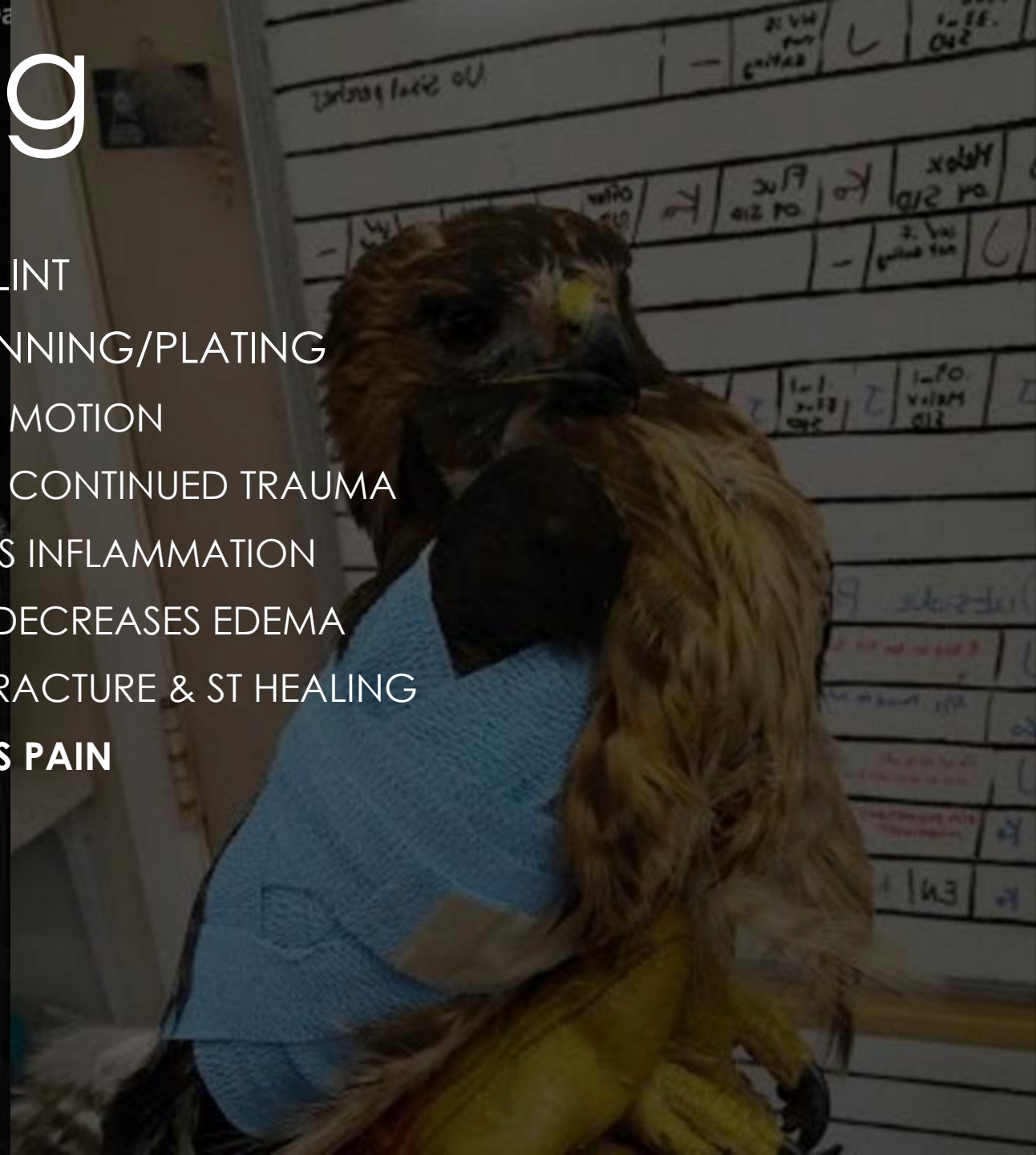
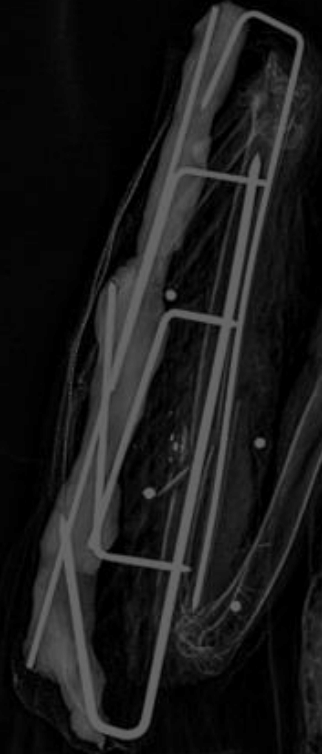
Physical: Stabilizing

- ▶ Pain Associated with Fractures
- ▶ Nerves
 - **Initial vs Continued Trauma**
 - Surrounding Soft-Tissue Damage
 - Periosteal Disruption
 - Inflammation/Edema
 - Joint Damage/Cartilage Disruption
 - Bodily Compensation



Physical: Stabilizing

- ▶ WRAP +/- SPLINT
- ▶ SURGICAL PINNING/PLATING
 - DECREASE MOTION
 - DECREASE CONTINUED TRAUMA
 - DECREASES INFLAMMATION
 - PRESSURE DECREASES EDEMA
 - ALLOWS FRACTURE & ST HEALING
 - **DECREASES PAIN**



Medicinal: Opioids

▶ μ, κ, δ -Receptors

- Large Species Variation
- Maybe Higher % of κ
- Opioid Drugs Affect Different Receptors in Different Ways

▶ **Butorphanol**

▶ κ Agonist, Weak μ Antagonist

▶ **Buprenorphine**

▶ Partial μ Agonist

▶ **Hydromorphone**

▶ Pure μ Agonist

▶ **Nalbuphine**

▶ κ Agonist, Partial μ Antagonist

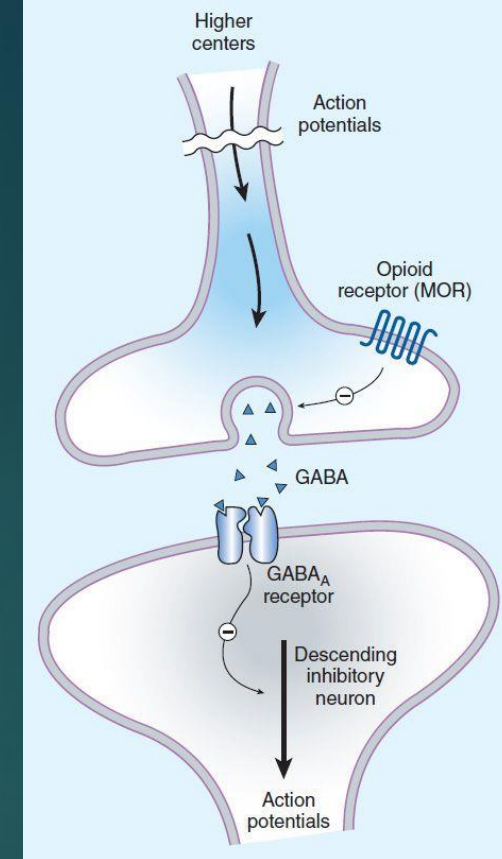
▶ **Tramadol**

▶ Partial μ Agonist, Weak κ and δ Agonist, Other

▶ **Gabapentin***

▶ Complicated and Not Fully Understood

▶ **Agonist vs. Antagonist**





Medicinal: Opioids

- ▶ **Butorphanol: 1 - 4 mg/kg IM q 1 to 3 hours**
- ▶ **Buprenorphine: 0.25 – 0.5 mg/kg IM q6h**
- ▶ **Hydromorphone: 0.6 mg/kg IM q6h; Class II**
- ▶ **Nalbuphine: 12.5 mg/kg IM q 3 hours; Not Controlled, \$\$\$\$\$**
- ▶ **Tramadol: 5-30 mg/kg PO q 12 hours; Best as Multi-Modal**
- ▶ **Gabapentin: 10 to 80 mg/kg PO BID-TID; Safe, Bitter Taste**

Medicinal: NSAIDs

▶ COX Inhibition?

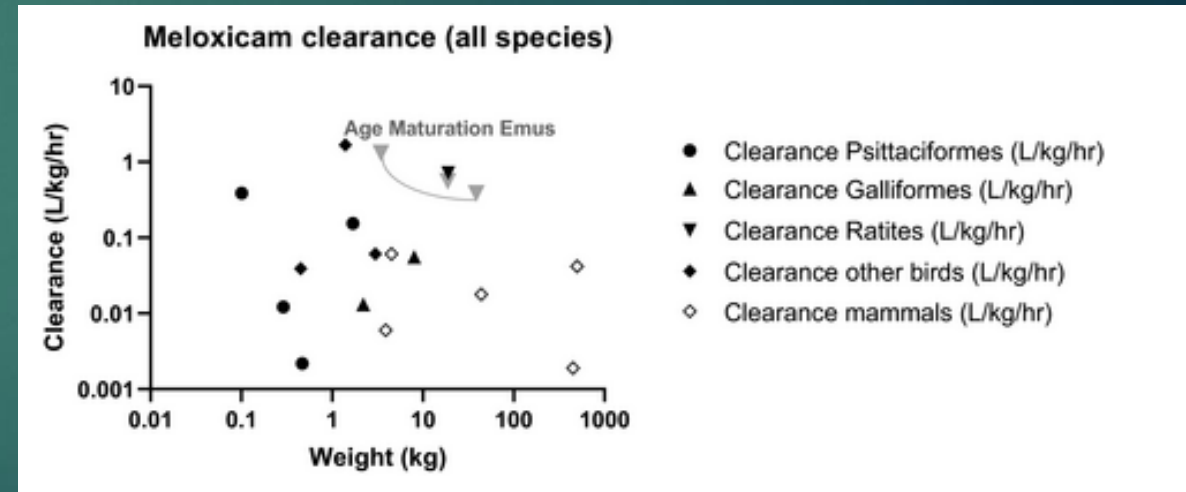
- Prostaglandin and Thromboxane
-  Inflammation
- Antipyretic
- Antithrombotic
-  Pain

▶ COX-2 Selective

- **Meloxicam**
- Celecoxib

Dosage Range:

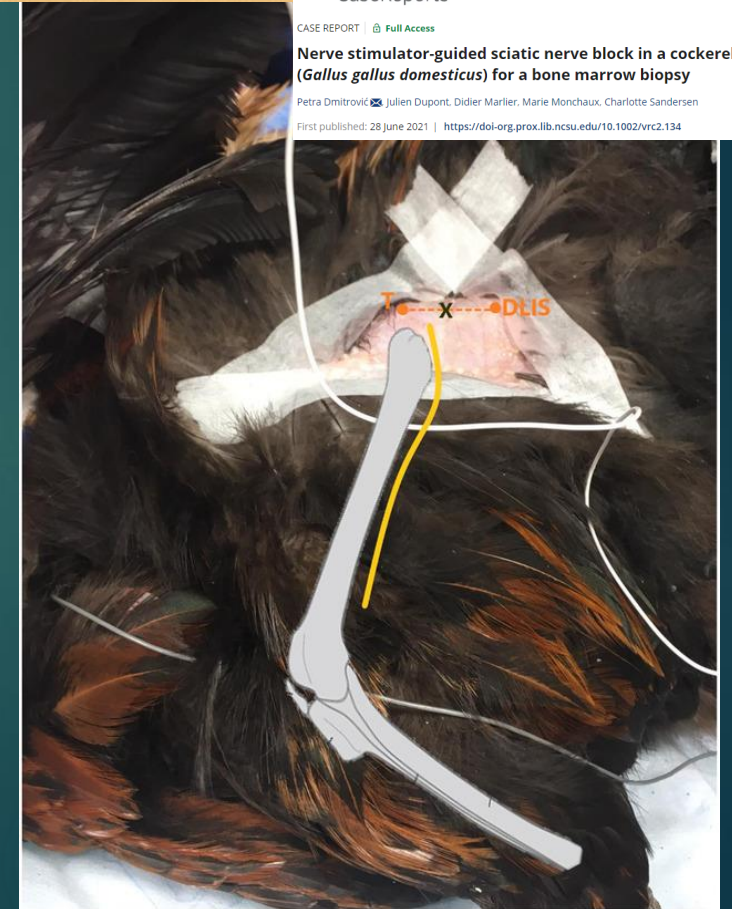
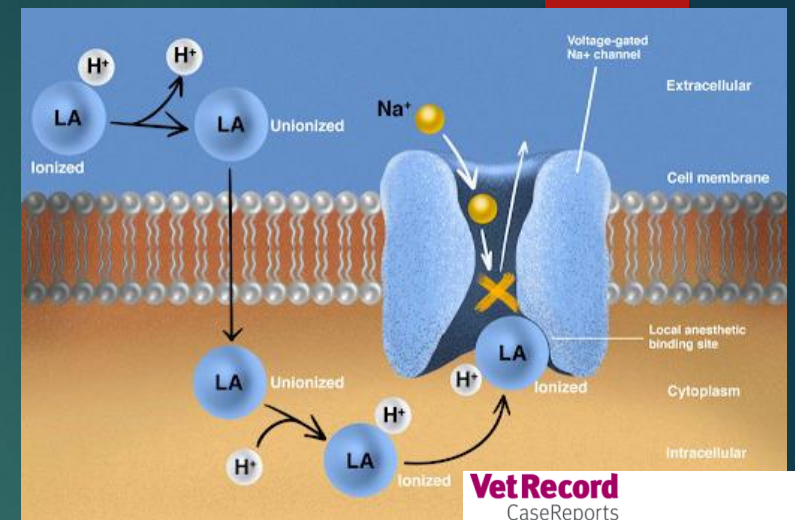
0.50 to 2.0 mg/kg PO q12 to 24 hours



Castineiras D, Armitage L, Lamas LP, De Baere S, Croubels S, Pelligand L. Perioperative pharmacokinetics and pharmacodynamics of meloxicam in emus (*Dromaius novaehollandiae*) of different age groups using nonlinear mixed effect modelling. *J Vet Pharmacol Therap.* 2021; 44: 603–618. <https://doi.org/10.1111/jvp.12923>

Medicinal: Local Anesthetics

- ▶ Act Through Binding/Blockage of Voltage-Gated Na⁺ Channels
 - ▶ Halt Wave of Depolarization
- ▶ General Uses:
 - ▶ Nerve Block
 - ▶ Local Line
 - ▶ Splash Block
 - ▶ Topical
- ▶ Anecdotal Evidence of Toxicity
 - ▶ Mostly Neurologic Symptoms
- ▶ Limited Evidence of Efficacy



Complimentary/Adjunctive Therapies

- ▶ Physical Therapy
- ▶ Focused Massage Therapy
- ▶ Thermotherapy/Cryotherapy
- ▶ Cold Laser
- ▶ Acupuncture

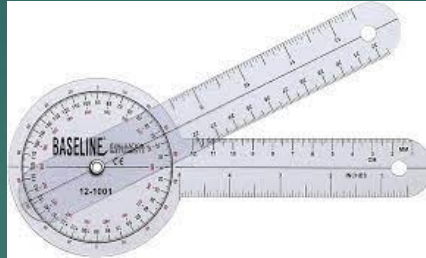
▶ Considerations with Wildlife Species?

- ▶ Stress!!!!
- ▶ Extra Time
- ▶ Physical Manipulation
- ▶ Cost/Benefit

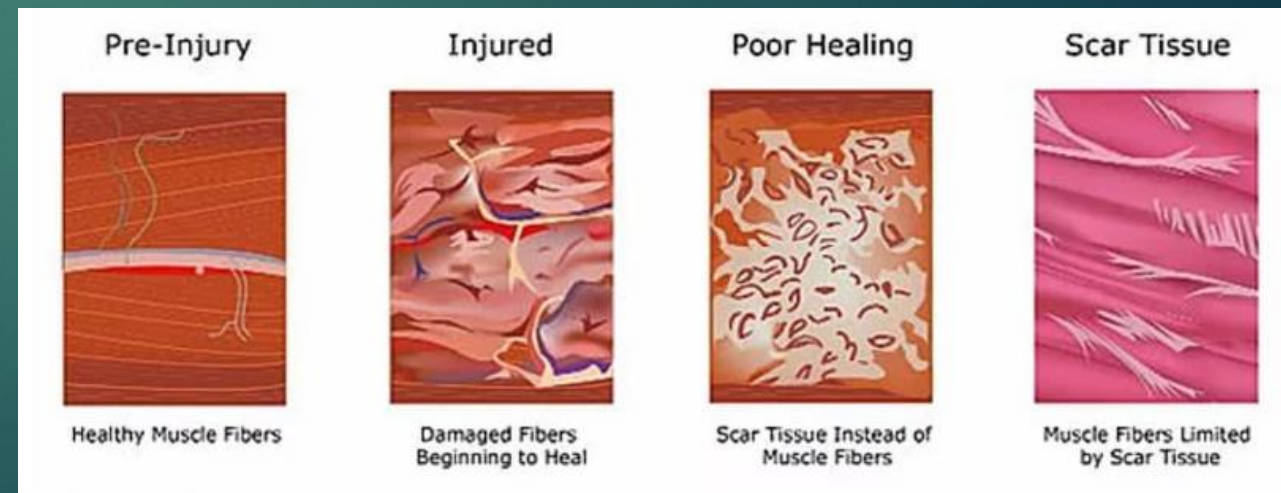


C/A Therapies: Benefits

- ▶ Physical Therapy
 - Return to Function
 - Scar Tissue Remodeling
- ▶ Focused Massage
 - Inflammation/Edema Reduction
 - Scar Tissue Remodeling
- ▶ Thermotherapy
 - Vasodilation/Tissue Healing
- ▶ Cryotherapy
 - Decreases Inflammation / Hypoxic Damage



	Cold	Heat
Pain	↓	↓
Spasm	↓	↓
Metabolism	↓	↑
Blood Flow	↓	↑
Inflammation	↓	↑
Edema	↓	↑
Extensibility	↓	↑



C/A Therapies: Benefits

- ▶ Cold Laser
 - Inflammation Reduction
 - Improved Circulation/Wound Healing
 - Reduced Pain
 - Touch Free/Speedy
- ▶ Acupuncture
 - Dry Needling
 - Aqua
 - Electro
 - Dr. Tara Reilly Explained it Better;)

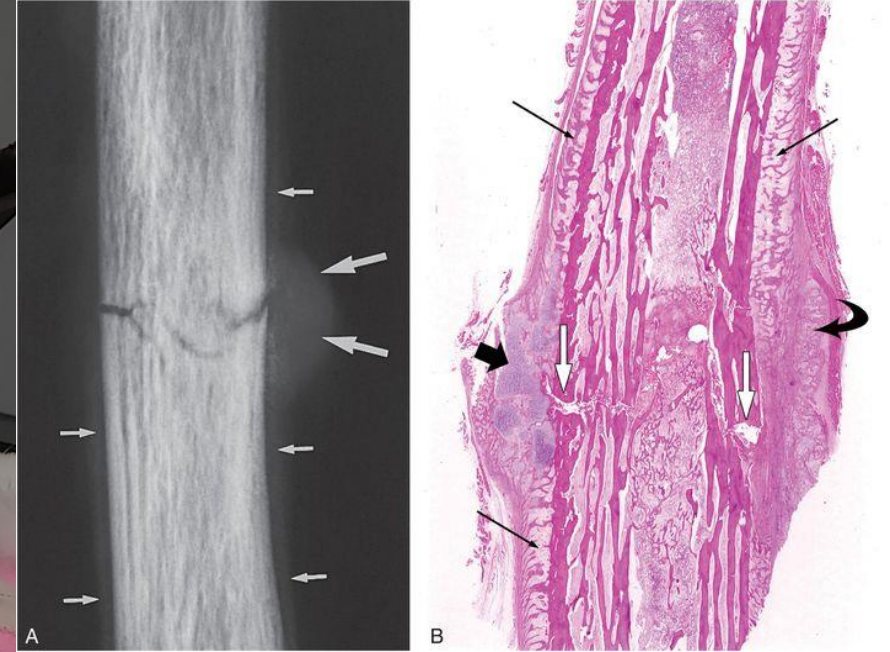






Long Term

- ▶ We Fixed it!....
- ▶ Chronic Pain But Gets By?
- ▶ What is Releasable?
- ▶ Nerve Healing/CFP
- ▶ Exercise/Self PT
- ▶ Stress
- ▶ Time





Final Thoughts

- ▶ Develop Recognition
- ▶ Swift/Thorough Triage/Stabilization
- ▶ Assume in the Best Interest of the Bird
- ▶ Multi-Modal Approach
- ▶ Modify as You Assess

References

Fousse SL, Golsen BM, Sanchez-Migallon Guzman D, Paul-Murphy JR, Stern JA. Varying Expression of Mu and Kappa Opioid Receptors in Cockatiels (*Nymphicus hollandicus*) and Domestic Pigeons (*Columba livia domestica*). *Front Genet.* 2020 Oct 15;11:549558. doi: 10.3389/fgene.2020.549558. PMID: 33193624; PMCID: PMC7593685.

Guzman, David Sanchez-Migallon, et al. *Anesthesia & Analgesia*. Avian Medicine, 3rd Ed. Jaime Samour, Elsevier, 2016, Pgs: 179-203.

Castineiras D, Armitage L, Lamas LP, De Baere S, Croubels S, Pelligand L. Perioperative pharmacokinetics and pharmacodynamics of meloxicam in emus (*Dromaius novaehollandiae*) of different age groups using nonlinear mixed effect modelling. *J Vet Pharmacol Therap.* 2021; 44: 603–618. <https://doi.org/10.1111/jvp.12923>

VetRecord CaseReports

CASE REPORT |  Full Access

Nerve stimulator-guided sciatic nerve block in a cockerel (*Gallus gallus domesticus*) for a bone marrow biopsy

Petra Dmitrović , Julien Dupont, Didier Marlier, Marie Monchaux, Charlotte Sandersen

First published: 28 June 2021 | <https://doi-org.prox.lib.ncsu.edu/10.1002/vrc2.134>

Evaluation of a fracture pain model in domestic pigeons (*Columba livia*)

by Desmarchelier, Marion; Troncy, Eric; Beauchamp, Guy ; Paul-Murphy, Joanne R; Fitzgerald, Guy; Lair, Stephane

American journal of veterinary research, 03/2012, Volume 73, Issue 3

9 August 2022

Recognition and Assessment of Pain-Related Behaviors in Avian Species: An Integrative Review

Nicole A. Mikoni, David Sanchez-Migallon Guzman, Erik Fausak, Joanne Paul-Murphy

[Author Affiliations +](#)

J. of Avian Medicine and Surgery, 36(2):153-172 (2022). <https://doi-org.prox.lib.ncsu.edu/10.1647/21-00008>

Jana E. Mazor-Thomas, Phyllis E. Mann, Alicia Z. Karas, Flo Tseng, Pain-suppressed behaviors in the red-tailed hawk (*Buteo jamaicensis*), *Applied Animal Behaviour Science*, Volume 152, 2014, Pages 83-91.

(Paul-Murphy, J. R., Sladky, K. K., Krugner-Higby, L. A., Stading, B. R., Klauer, J. M., Keuler, N. S., Brown, C. S., & Heath, T. D. (2009). Analgesic effects of carprofen and liposome-encapsulated butorphanol tartrate in Hispaniolan parrots (*Amazona ventralis*) with experimentally induced arthritis, *American Journal of Veterinary Research*, 70(10), 1201–1210. Retrieved Sep 23, 2022,

MJ Gentle, LN Hunter

Physiological and behavioural responses associated with feather removal in *Gallus gallus* var domesticus

Res Vet Sci, 50 (1) (1991), pp. 95-101



Veterinary Clinics of North America: Exotic
Animal Practice

Volume 26, Issue 1, January 2023, Pages 65-81



Pain Recognition and Assessment in Birds

Nicole A. Mikoni DVM^a,

David Sanchez-Migallon Guzman LV, MS, Dipl. ECZM (Avian, Small Mammal), Dipl. ACZM^b



, Joanne Paul-Murphy DVM, Dipl. ACZM, Dipl. ACAW^b