Anesthesia and Analgesia

Anna Goodroe DVM DACLAM

Anesthesia and Analgesia

- Routinely utilized for clinical and research procedures

- Adaptions for marmosets
  - Small size
  - Elevated metabolic rate
  - Pharmacokinetics and dynamics

- Current trends in drug selection for sedation, anesthesia, and analgesia

Anesthesia and Sedation

- **Anesthesia**: state of temporary induced loss of sensation or awareness
  - Sedation < general anesthesia < surgical general anesthesia

- Drug Selection
  - Inhalant
  - Injectable

Injectable Anesthesia Regimens

- **Single drug**
  - Ketamine
    - 20-40 mg/kg IM, sedation
    - 40-50 mg/kg IM, general anesthesia
  - Alfaxalone
    - 5-7 mg/kg IM, sedation
    - 7-15 mg/kg IM, general anesthesia
  - Reduced doses can be utilized IV

- **Combinations**
  - Ketamine 10-20 mg/kg IM
    - Midazolam 0.1-0.4 mg/kg IM
    - Acepromazine 0.1-0.5 mg/kg IM
    - Dexmedetomidine 0.02-0.03 mg/kg IM
    - Xylazine 1-3 mg/kg IM
  - Alfaxalone 4-10 mg/kg IM
    - Ketamine 20-30 mg/kg IM
    - Midazolam 0.3-0.5 mg/kg IM
  - Ketamine 30-40 mg/kg IM
    - Alfaxalone 2-4 mg/kg IM
  - Propofol 2-4 mg/kg IV
    - CRI 0.6-1.0 mg/kg/min
    - CRI 0.3 mg/kg/ min + fentanyl 10-20 ug/kg/h
  - Midazolam 0.5 mg/kg, butorphanol 0.5 mg/kg, medetomidine 0.05 mg/kg IM

Bakker *et al. BMC Veterinary Research* 2013, **9**:113
http://www.biomedcentral.com/1746-6148/9/113

BMC Veterinary Research

RESEARCH ARTICLE Open Acces

Comparison of three different sedative-anaesthetic protocols (ketamine, ketamine-medetomidine and alphaxalone) in common marmosets (*Callithrix jacchus*)

Jaco Bakker[1*†], Joost J Uilenreef[2†], Eva RJ Pelt[2], Herbert PM Brok[1], Edmond J Remarque[3] and Jan AM Langermans[1]

fMRI in the awake marmoset: Somatosensory-evoked responses, functional connectivity, and comparison with propofol anesthesia

Junjie V. Liu[a,1], Yoshiyuki Hirano[a,2], George C. Nascimento[a,3], Bojana Stefanovic[a,4], David A. Leopold[b,c], and Afonso C. Silva[a,*]

Inhalant Anesthesia Regimens

- Isoflurane or Sevoflurane

- Provision
  - Mask
  - Endotracheal tube

Intubation

An alternative method of endotracheal intubation of common marmosets (*Callithrix jacchus*)

A A Thomas, M C Leach and P A Flecknell

Anesthetic Gas Delivery

Intravenous Access

Physiological Monitoring

- Muscle tone
- Temperature
- Heart rate and rhythm
- Hemoglobin saturation with oxygen
- Blood pressure
- Respiratory rate, rhythm, and effort
- End tidal carbon dioxide
- Blood gas analysis

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ORIGINAL ARTICLE

WILEY

Hypoxemia after single-shot anesthesia in common marmosets

Naho Konoike | Miki Miwa | Akiyo Ishigami | Katsuki Nakamura

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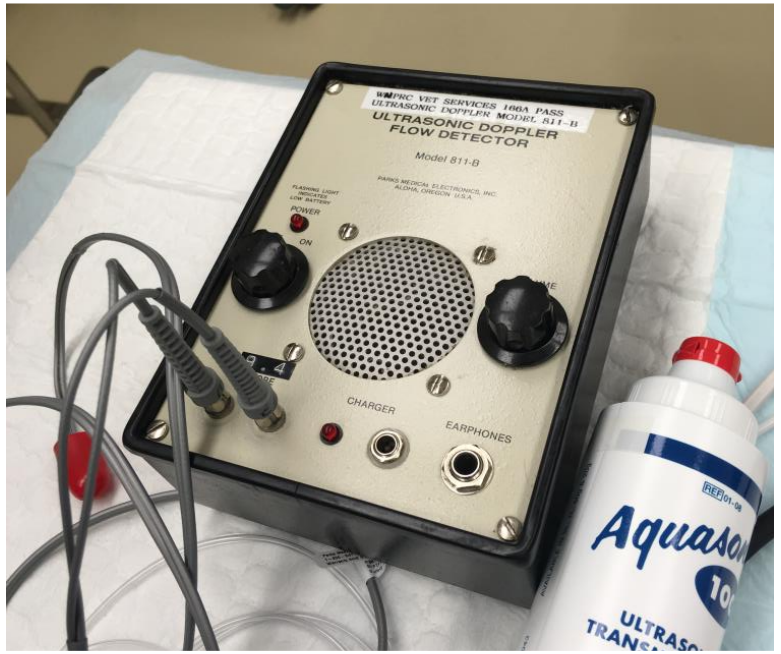

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Physiological Support

- **Intra procedure**
  - Thermoregulation
  - Hydration/ cardiovascular support
  - Position
- **Post procedure**
  - Recovery environment
  - Nutritional support
  - Symptomatic therapies

Recovery Environment

Nutritional

- **Palatable, energy dense, easy to consume**
  - Primary diet mixed with favored liquid
  - Alternative complete diet
  - Addition of favored food items

Supportive therapies

- Gastric acid reduction
  - Histamine receptor antagonists (ex famotidine)
  - Proton pump inhibitor (ex omeprazole)
  - Bismuth subsalicyclate (ie Pepto bismal)
- Nausea
  - Maropitant
- Gastric motility
  - Metclopramide
- Ulcer treatment
  - Sulcralfate

Analgesic Overview

- **Analgesia**: absence of pain in response to stimulation which would normally be painful

- Local anesthetics
- Non steroidal anti-inflammatory drugs (NSAIDS)
- Opioids
- Additional therapies

Local Anesthetics

- Tissue infiltration, topical application
- Lidocaine 2-4 mg/kg
- Bupivicaine 1-2 mg/kg

Non steroidal anti-inflammatory drugs (NSAIDS)

- Meloxicam 0.1-0.2 mg/kg q24h SC, IM, PO
- Keptoprofen 2-5 mg/kg q12-24h SC
- Carprofen 2.2-4.4 mg/kg q12-24h SC, PO
- Meloxicam SR 0.6 mg/kg SC

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Pharmacokinetics of 3 Formulations of Meloxicam in Cynomolgus Macaques (*Macaca fascicularis*)

Cassondra Bauer,[1,*] Patrice Frost,[1] and Stephen Kirschner[2]

Opioids

- Buprenorphine 0.005-0.02 mg/kg IM, SC q6-12h
- Buprenorphine SR
  - 0.03 mg/kg SC
  - 0.12 mg/kg SC
  - 0.15 mg/kg SC
  - 0.2 mg/kg SC
- Butorphanol 0.03-0.2 mg/kg IM
- Fentanyl 1 mcg/kg IV bolus followed by CRI 5-10 mcg/kg IV

Effects of buprenorphine, butorphanol or tramadol premedication on anaesthetic induction with alfaxalone in common marmosets (*Callithrix jacchus*)

Jaco Bakker[a], Sandra Roubos[b], Edmond J Remarque[c], Saskia S Arndt[b], Peter W Kronen[d,1] & Jan AM Langermans[a,1]

Additional Therapies

- Low-level laser therapy

Summary

- Adaptions to accommodate unique physiology
- Limited publications
- Communication is key

The Salk Institute for Biological Studies
Sean Adams
Mathias LeBlanc

Johns Hopkins University
Jessica Izzi
Eric Hutchinson

Biomedical Primate Research Center
Jaco Bakker

University of Utah
Mary Dickerson

WNPRC
Casey Fitz

University of Pittsburgh
Julia Klara Oluoch

University of California San Diego
Cory Miller

Massachusetts Institute of Technology
Monika Burns

NIMH
Krystal Allen-Worthington

SNPRC
Donna Layne Colon
Melissa De La Garza
Kathy Brasky

Central Institute for Experimental Animals
Erika Sasaki
Takshi Inoue

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