University Animal Care Committee Standard Operating Procedure		
Document No: 10.1	**Subject: Pain Management in Rats**	
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Location: Queen's University

Responsibility: Principal Investigators, Research Staff, Veterinary Staff

Purpose: The purpose of this Standard Operating Procedure (SOP) is to describe methods for assessing and treating pain in rodents.

1. Introduction and Definitions:

- Based on the definition of pain from the American College of Laboratory Animal Medicine (ACLAM), pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage, and should be expected in an animal subjected to any procedure or disease model that would be likely to cause pain in a human.
- It is generally agreed that pain adversely impacts the welfare of animals and uncontrolled pain is a variable which can confound the interpretation of experimental results.
- Procedures expected to cause more than slight or momentary pain (e.g., pain in excess of a needle prick or injection) require the appropriate use of pain-relieving measures unless scientifically justified in an approved animal use protocol (AUP).

Abbreviations: Animal Care Services **ACS**, Principal Investigator **PI,** subcutaneous **SC**, intravenous **IV**, intraperitoneal **IP,** intramuscular **IM**, per os **PO,** per rectum **PR**

2. Procedures:

a) Clinical Assessment of Post-Procedural Pain

- The most reliable signs of pain and distress in rodents are changes in animal behaviour. It is important that the animal user has a good knowledge of species-specific and individual behaviour as well as a baseline assessment of each individual animal.
- All animals should be observed initially from a distance so their natural behaviour is not inhibited. This should be followed by a closer examination.

- Frequency of observation should be procedure specific, but not less than once per day.
- Contact veterinary staff if any changes in animal behaviour are observed.
- Common clinical signs of pain and distress include:
  - Reduced level of spontaneous activity
  - Hunched posture
  - Decreased grooming
  - Porphyrin secretions (ocular/nares)
  - Dull-eyed/pale eyes (if albino)
  - Piloerection
  - Reduced food/water intake
  - Increased aggressiveness when handled
  - Sunken eyes/dehydration
  - Squinty eyes

b) Management of Pain:

- Non pharmacological considerations:
  - Providing appropriate housing, handling and restraint as well as using appropriate experimental techniques can support pain management.
  - Fluid and heat therapy are generally provided for rodents displaying signs of pain.
- Pharmacological considerations:
  - If not contraindicated by the experimental protocol, preemptive, multi-modal analgesia should be used. For example, administration of a combination including an opioid, non-steroidal anti-inflammatory (NSAID), and a local analgesic.
  - Pre-emptive analgesics, which are given prior to a painful stimulus are generally considered to be more effective, often decreasing the amount of anesthetic required (anesthetic sparing).
  - Multimodal analgesia utilizes the synergistic effects of different drug classes and mechanisms.
- Local anesthetics:
  - Local anesthetic should be infiltrated at the site where the painful stimulus will be induced:

Local Analgesics	Dose	Duration	Notes
Lidocaine	2 mg/kg	30 – 60 minutes	- Due to acidic nature, dilute 3:1 with sodium bicarbonate injectable solution for a conscious rodent - If administered in an anesthetized patient, dilution with sodium bicarbonate is not necessary - Fast onset of action with moderate duration - Lidocaine with epinephrine is not recommended for rodents
Bupivacaine	2 mg/kg	4 – 7 hrs.	As above with the exception: - Slower onset of action versus lidocaine but longer duration
Lidocaine/bupivacaine	Up to 2mg/kg each for total dose	Up to 7 hrs.	- Combination allows for rapid onset with longer duration

General Analgesics

Analgesic	Dose	Route	Frequency
Acetaminophen	100 – 300 mg/kg	PO	4hr.
Meloxicam	1 – 2 mg/kg	SC, PO	24hr.
Buprenorphine* HCl	0.01 - 0.05	SC, IP	4 – 6 hrs.
Buprenorphine* sustained release (SR)	1.0 – 1.2 mg/kg	SC	48 –72 hrs.

*** Buprenorphine may cause pica (the ingestion of non-food substances) in rats. Full strength stock Bup-HCl solutions (but not Bup-SR) can be diluted with sterile saline to a final concentration of 0.03 mg/mL prior to administration.**

References:

Fish RE, Brown MJ, Danneman PJ, Karas AZ. Ed. (2008) Anesthesia and Analgesia in Laboratory Animals 2nd Ed. Academic Press, New York

SOP Revision History:

Date	New Version
February 16th, 2012	SOP Created
January 28th, 2016	Triennial Update
February 29th, 2019	Triennial Update
February 28th, 2022	Triennial Update
November 27th, 2024	Triennial Update – new format. Removed drugs no longer being used. Removed the COI. Cleaned up the flow of the SOP.