University of Michigan
ULAM

Pain Assessment in Rats

What if you see …?

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Analgesics must be administered as outlined in the UCUCA-approved protocol. When "as needed" analgesics are specified, animals must be monitored for signs of pain, and treated accordingly.

Listed below are easily identifiable indicators of pain in rats. This is neither a comprehensive nor specific list, and as such, other observations should be taken into account when assessing pain status in rats. **Please contact ULAM veterinary staff** for additional assistance with identification and/or treatment of pain.

Appearance

(A) Interpretation of **facial expression** can be used to qualify pain. Below are images of rats who show varying levels of pain.

Not present "0" | **Present** "1" | **Pronounced** "2"

Orbital Tightening
Rats in pain display a narrowing of the orbital area, manifesting as either (partial or complete) eye closure or eye "squeezing"[1]

Orbital Tightening

Nose/Cheek Flattening
Rats in pain display successively less bulging of the nose and cheek, with eventual absence of the crease between the cheek and whisker pads[1]

Nose/Cheek Flattening

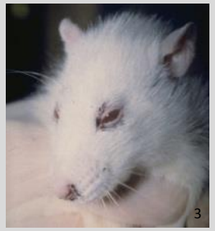
Ear changes
The ears of rats in pain tend to fold, curl and angle forwards or outwards, resulting in a pointed shape. The space between the ears may appear wider[1]

Ear Changes

Whisker change
The whiskers of rats in pain move forward (away from the face) from the baseline position, and tend to bunch, giving the appearance of whiskers standing on end[1]

Whisker Change

(B) Rough hair coat and **porphyrin staining** are indicators of **lack of grooming**, which is indicative of pain and/or stress.



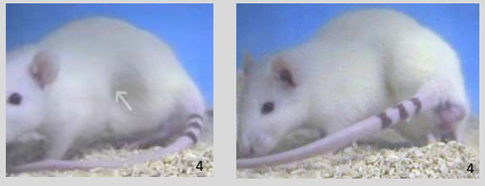
Porphyrin staining
Porphyrin (a red-brown pigment) is a normal secretion produced by the tear gland around rat eyes. When the animal is not grooming, the pigment builds up around the eyes, nose, and on the fur.

Behavior

(C) When rats are experiencing abdominal pain, they may demonstrate the following **abnormal behaviors**:

Cat-like Back Arching
The animal arches its back upwards; this looks like normal cat stretching, but is abnormal in rodents.

Writhing
Lateral contortion of the flank abdominal muscles[2]. It may look like the animal is "sucking in" its stomach.



Twitching
A short-lived involuntary muscular contraction of any body part[2].

No image available

References

1. The Rat Grimace Scale images and accompanying descriptions are borrowed verbatim from: Sotocinal SG, Sorge RE, Zaloum A, et al. 2011. The Rat Grimace Scale: A Partially automated method for quantifying pain in the laboratory rat via facial expressions. *Molecular Pain* **7**: 55.

2. Behavioral indicators from: Roughan JV, and Flecknell PA. 2001. Behavioural effects of laparotomy and analgesic effects of ketoprofen and carprofen in rats. *Pain* **90** (1): 65-74.

Roughan JV, and Flecknell PA. 2005. Training in behavior-based post-operative pain scoring in rats – An evaluation based on improved recognition of analgesic requirements. *Applied Animal Behaviour Science* **96** (3-4): 327-342.

3. Porphyrin staining image from: Humane Endpoints in laboratory animal experimentation: Eye crusting ('Red tears') (rat): www.humane-endpoints.info

4. The behavior images are borrowed directly from videos on: Newcastle University. 2014. Assessing the Health and Welfare of Laboratory Animals. "An Introduction: Recognising Post-Operative Pain in Animals:" http://www.ahwla.org.uk/site/tutorials/RP/RP01-Title.html