PACUC Guidelines

Humane Endpoints for Research, Teaching and Testing Animals

The Guide for the Care and use of Laboratory Animals 8th edition states the following concerning humane endpoints for research, teaching and testing animals. "While all studies should employ endpoints that are humane, studies that commonly require special consideration include those that involve tumor models, infectious diseases, vaccine challenge, pain modeling, trauma, production of monoclonal antibodies, assessment of toxicologic effects, organ or system failure, and models of cardiovascular shock.

The Guide for the Care and Use of Laboratory Animals 8th edition also gives the following definitions:

Experimental endpoint – the experimental endpoint of a study occurs when the scientific aims and objectives have been reached.

Humane endpoint – the humane endpoint is the point at which pain or distress in an experimental animal is prevented, terminated or relieved.

Humane endpoints should be selected based on their ability to accurately and reproducibly predict or indicate pain and or distress, imminent deterioration, or death. The selection of appropriate humane endpoints requires detailed knowledge of the impact of the procedure on the animal to allow for intervention before unpredicted distress or pain develops. To develop humane endpoints for a particular Purdue Animal Care and Use Protocol (PACUC) protocol, the principle investigator should describe the clinical progression that a particular animal or group of animals could experience as a result of experimental manipulation or spontaneously occurring disease. Endpoints that will address this progression may coincide with the experimental endpoint of the project but must also include criteria for removing an animal from a study prior to the experimental endpoint.

Purdue Animal Care and Use Protocols that include morbidity, a diseased state, as an endpoint or that include animal procedures that have the potential to cause pain and/or distress must address the following as applicable to the PACUC protocol being submitted:

- Rapid or progressive weight loss of more than 20% of the body weight
- Loss of body condition - especially in studies where loss of body condition may occur without loss of weight ie animals with large tumors. See attachment for example of body condition scoring of mice and rats.
- Unrelenting/unresolved diarrhea
- Dehydration determined by an increase in skin tenting, sunken eyes and weight loss
- Abdominal swelling and/or ascites
- Progressive dermatitis and/or self induced trauma
- Rough hair coat/poor grooming
- Hunched posture

- Lethargy, an inability to stand or loss of righting reflex
- Respiratory symptoms such as labored breathing, nasal discharge, coughing, or cyanosis
- Ataxia, progressive paralysis or paresis, head tilt/circling or any other severe neurological symptom
- Any condition interfering with daily activities ie eating, drinking, ambulation etc.
- Prolonged increase or decrease in body temperature
- Abnormal vocalization/aggressive behavior upon handling
- Infection unresponsive to treatment
- For aquatic species additional signs could include scoliosis, emaciation, significant skin lesions, exposure of muscle or other tissue
- Other signs judged by experienced veterinary staff to be indicative of a moribund condition (hemorrhage, icterus, anemia, anuria)

In studies involving neoplasia, additional endpoints may include but are not limited to:

- A tumor burden greater than 10% of the animal's body weight where the density of the tumor is estimated to be 1.030g/cm^3. For an adult mouse, a tumor would be allowed to grow to mean diameters of 2.0 cm. For an adult rat, a tumor would be allowed to grow to mean diameters of 4.0 cm. Formulas for determining tumor volume are detailed in references at the end of this document.
- Tumors that ulcerate and become necrotic or infected
- Tumors that interfere with normal functions such as eating, ambulating, eliminating.

In studies involving genetically modified animals:

- Genetically modified animals may display phenotypes that are expected or unexpected.
- **Expected** phenotypes that may impact the health and welfare of the animals should be included in the PACUC protocol to alert animal care staff as to expected conditions the animals may display and to appropriate care for these animals. PACUC protocols should also include endpoints for these animals.
- **Unexpected** phenotypes that may impact the health and welfare of the animals must be reported to the Laboratory Animal Program veterinary staff and be provided with appropriate veterinary treatment, be monitored for deteriorating condition if treatment would impact the research project or be euthanized if found to be moribund, unable to obtain food or water, or cachectic. If the unexpected phenotype impacts the experimental results, the animal should also be euthanized.
- A plan should be in place for monitoring these animals both before and after any changes in the animals condition arises. This should include providing appropriate care if needed and increasing the level of monitoring as is necessary to provide treatment or euthanasia as appropriate.

In studies proposing death or moribundity as an endpoint

The moribund condition is defined as an irreversible condition leading inevitably to death. Signs of an animal displaying the moribund state include but are not limited to:

- A lack of responsiveness to manual stimulation
- A lack of mobility
- An inability or failure to eat or drink

Animal studies proposing death or moribundity as an endpoint should contain the following:

- What alternatives to death or moribundity as an end point were considered
- Why measures to relieve pain and or distress cannot be used if applicable
- The number of animals and justification for animals that will be allowed to reach moribundity or death as an endpoint
- If animals are not to be euthanized when reaching a moribund condition, what information will be gained by allowing them to proceed to death
- A plan must be in place for monitoring animals involved in experiments that lead to moribundity or death to include the frequency of monitoring. The frequency of monitoring should be at least once a day but more frequent as the above signs become apparent.
- Records must be kept of monitoring.

References:

NIH Guidelines for Endpoints in Animal Study Proposals revised 05/11/11.

Canadian Council on Animal Care (1998) Guidelines on Choosing an appropriate endpoint in experiments using animals for research, teaching and testing.

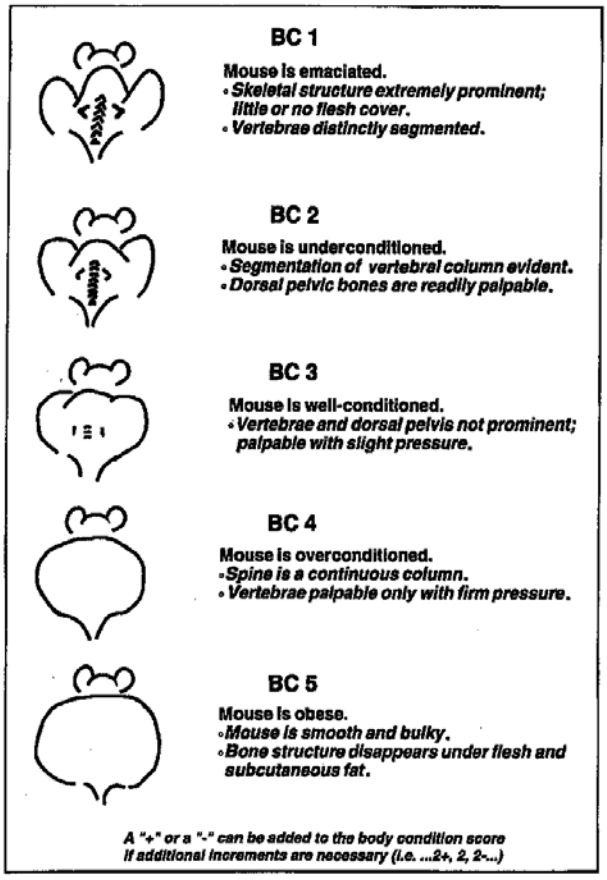
University of Pennsylvania. IACUC Guideline Rodent Tumor Production approved 04/27/10.

Euhus,D. M., Hudd, et al. Tumor Measurement in the Nude Mouse. Journal of Surgical Oncology 31:229-234 (1986).

Tomayko M. M., Reynolds C. P. Determination of subcutaneous tumor size in athymic (nude) mice. Cancer Chemother Pharmacol 24: 148-154 (1989).

Humane endpoints in laboratory animal experimentation – http://www.humane-endpoints.info/eng/

Body Condition Scoring in Mice and Rats



BC 1

Mouse is emaciated.
- ***Skeletal structure extremely prominent; little or no flesh cover.***
- ***Vertebrae distinctly segmented.***

BC 2

Mouse is underconditioned.
- ***Segmentation of vertebral column evident.***
- ***Dorsal pelvic bones are readily palpable.***

BC 3

Mouse is well-conditioned.
- ***Vertebrae and dorsal pelvis not prominent; palpable with slight pressure.***

BC 4

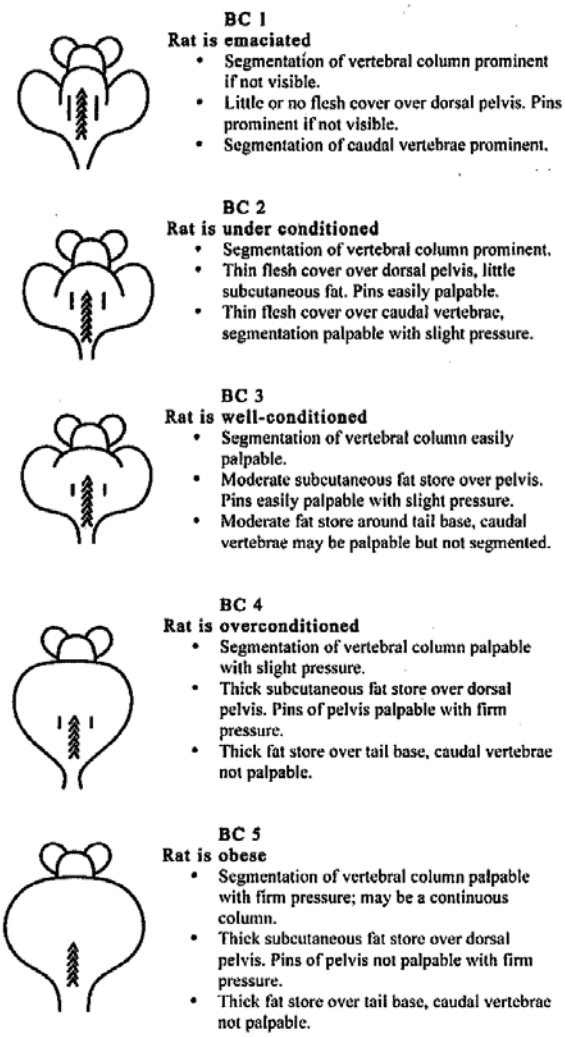
Mouse is overconditioned.
- ***Spine is a continuous column.***
- ***Vertebrae palpable only with firm pressure.***

BC 5

Mouse is obese.
- ***Mouse is smooth and bulky.***
- ***Bone structure disappears under flesh and subcutaneous fat.***

A "+" or a "-" can be added to the body condition score if additional increments are necessary (i.e. ...2+, 2, 2-...)

Ulman-Cullere M, Foltz C, 1999 Body Condition Scoring: A Rapid and Accurate Method for Assessing Health Status in Mice, LAS Vol 49 no 3 pg 319-323.



BC 1

Rat is emaciated
- Segmentation of vertebral column prominent if not visible.
- Little or no flesh cover over dorsal pelvis. Pins prominent if not visible.
- Segmentation of caudal vertebrae prominent.

BC 2

Rat is under conditioned
- Segmentation of vertebral column prominent.
- Thin flesh cover over dorsal pelvis, little subcutaneous fat. Pins easily palpable.
- Thin flesh cover over caudal vertebrae, segmentation palpable with slight pressure.

BC 3

Rat is well-conditioned
- Segmentation of vertebral column easily palpable.
- Moderate subcutaneous fat store over pelvis. Pins easily palpable with slight pressure.
- Moderate fat store around tail base, caudal vertebrae may be palpable but not segmented.

BC 4

Rat is overconditioned
- Segmentation of vertebral column palpable with slight pressure.
- Thick subcutaneous fat store over dorsal pelvis. Pins of pelvis palpable with firm pressure.
- Thick fat store over tail base, caudal vertebrae not palpable.

BC 5

Rat is obese
- Segmentation of vertebral column palpable with firm pressure; may be a continuous column.
- Thick subcutaneous fat store over dorsal pelvis. Pins of pelvis not palpable with firm pressure.
- Thick fat store over tail base, caudal vertebrae not palpable.

Hickman D, Swan M, 2010 Use of a Body Condition Score Technique to Assess Health Status in a Rat Model of Polycystic Kidney Disease, JAALAS Vol 49 No 2 pg 155-159.