Institutional Animal Care & Use Program - UTEP	
Title: Scoring & Endpoints in Tumor Studies in Rodents	
Policy#: 012	**Date in Effect**: 11 December 2014
Version #: C	**Rev Date**: 23 March 2020 27 January 2025
In Effect ☒ **Rescinded** ☐	**Date Rescinded**:

A) RESPONSIBILITIES

1) It is the responsibility of all Principal Investigators and their laboratory personnel who inoculate animals with neoplastic cells and/or toxic/chemotherapeutic agents using animals in research at The University of Texas at El Paso (UTEP) to abide by this policy.
2) Deviations or the use of less stringent endpoints from this policy must be justified and approved by the Institutional Animal Care and Use Committee (IACUC).

B) APPLICATION

This policy establishes guidelines for a tumor burden scoring system to be used for rodents inoculated with neoplastic cells or those developing spontaneous tumors.

C) BACKGROUND INFORMATION

The *Guide for the Care and Use of Laboratory Animals* (the *Guide*, NRC 2011) states that tumor models require special consideration of humane endpoints (p. 27). This policy provides detailed descriptions of procedures to be followed unless alternate procedures have been outlined in an IACUC Protocol Application. If an investigator wishes to deviate from the approved policy, all changes must be outlined and justified in the protocol application (approval of the protocol indicates approval of the deviation from the policy for that project only).

D) PROCEDURES

1) Subcutaneous Tumors (visually monitored)
    a) Prior to the approximate time when tumor growth becomes evident, animals are monitored on a periodic basis. The frequency will depend on how soon tumor growth becomes evident following injection. In most cases, once a week should be adequate. If the approximate time of tumor growth is not known, the animals

in the initial group are very carefully monitored *(i.e.*, every other day). The frequency of monitoring must be outlined in the protocol.

b) Once tumor growth has been identified, animals are monitored at least twice weekly. Some tumor lines will require daily checks. It is best practice to maintain records of tumor measurements. Frequency of measurement is dependent on tumor volume doubling time and overall animal condition. The frequency of monitoring must be outlined in the protocol.

c) Death is not an acceptable endpoint. Therefore, the monitoring frequency is such that animals are euthanized as soon any ONE of the following signs develop;

(1) Total tumor burden approaches 15% of the animal's body weight (Figure 1). The burden is additive for animals with multiple tumors.

(2) Tumor size must not exceed 20mm (2.0cm) in any direction in an adult mouse and 40mm (4.0cm) in adult rats (Figure 1)

(3) Body Condition Score (BCS) <2/5 (Figure 2)

(4) Tumor(s) that interferes with locomotion, eating or drinking

(5) Necrotic tumors, unless scientifically justified

(6) Presence of ulcerated tumor*

*Animals with ulcerated tumors must be euthanized unless an exemption is approved in the protocol. The exemption must be scientifically justified and should include a plan for increased monitoring frequency and clearly defined endpoints. For animals exhibiting ulcerated tumors whereby an exception is granted, the total tumor burden cannot exceed 1gm or 5% body weight, whichever is less, if they are asymptomatic.

2) Internal or Orthotopic Tumors (cannot be visually monitored)

a) Prior to the approximate time when tumor growth begins, animals are monitored on a periodic basis. The frequency will depend on how soon tumor growth begins following injection. Monitoring should range from daily to weekly. If the approximate time of tumor growth is unknown, the animals in the initial group are very carefully monitored (at least every day is recommended). The frequency of monitoring must be outlined in the protocol.

b) Once the animal exhibits signs that can be attributed to the tumor, the animal needs to be monitored with increased frequency. The frequency will depend on the rate of growth, organ affected, and type of tumor. This frequency must be outlined in the protocol.

c) Death is not an acceptable endpoint. Therefore, the monitoring frequency is such that animals are euthanized as soon any ONE of the following signs develop;

(1) Total tumor burden approaches 10% of the animal's body weight (percentage depends on the tumor's internalized location – higher limit needs justification provided in protocol

Individual tumor weights calculated (Geran's Formula): Weight in mg = (length × width$^{2)}$/2. [(5)]

(2) Lethargy

(3) Animal unable eat, drink or ambulate

(4) Respiratory distress or abnormal respiratory pattern

(5) Body Condition Score (BCS) <2/5

E) REFERENCES

1) U.S. Department of Health and Human Services. (2011). *Guide for the care and use of laboratory animals* (8th ed.). National Institutes of Health. https://grants.nih.gov/grants/olaw/guide-for-the-care-and-use-of-laboratory-animals.pdf

2) Ullman-Cullere, M. H., & Foltz, C. J. (1999). Body condition scoring: A rapid and accurate method for assessing health status in mice. *Lab Animal Science, 49*(3), 319-323.

3) National Research Council (US) Committee on Recognition and Alleviation of Pain in Laboratory Animals. (2009). *Recognition and alleviation of pain in laboratory animals* (Ch. 5, "Humane endpoints for animals in pain"). National Academies Press. https://www.ncbi.nlm.nih.gov/books/NBK32660/

4) National Research Council (US) Committee on Recognition and Alleviation of Pain in Laboratory Animals. (2009). Recognition and alleviation of pain in laboratory

animals (Ch. 5, "Humane endpoints for animals in pain"). National Academies Press. https://www.ncbi.nlm.nih.gov/books/NBK32660/

5) Hollingshead, M. G. (2008). Antitumor efficacy testing in rodents. JNCI: Journal of the National Cancer Institute, 100(21), 1500–1510. https://doi.org/10.1093/jnci/djn351

6) Peterson, C. M., Thomas, D. M., Blackburn, G. L., & Heymsfield, S. B. (2016). Universal equation for estimating ideal body weight and body weight at any BMI. *American Journal of Clinical Nutrition, 103*(5), 1197–1203. https://doi.org/10.3945/ajcn.115.121178. Erratum in *American Journal of Clinical Nutrition, 105*(3), 772. https://doi.org/10.3945/ajcn.116.151985

Figure 1: Mouse Tumors (25g animal)

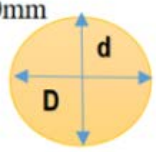
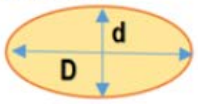
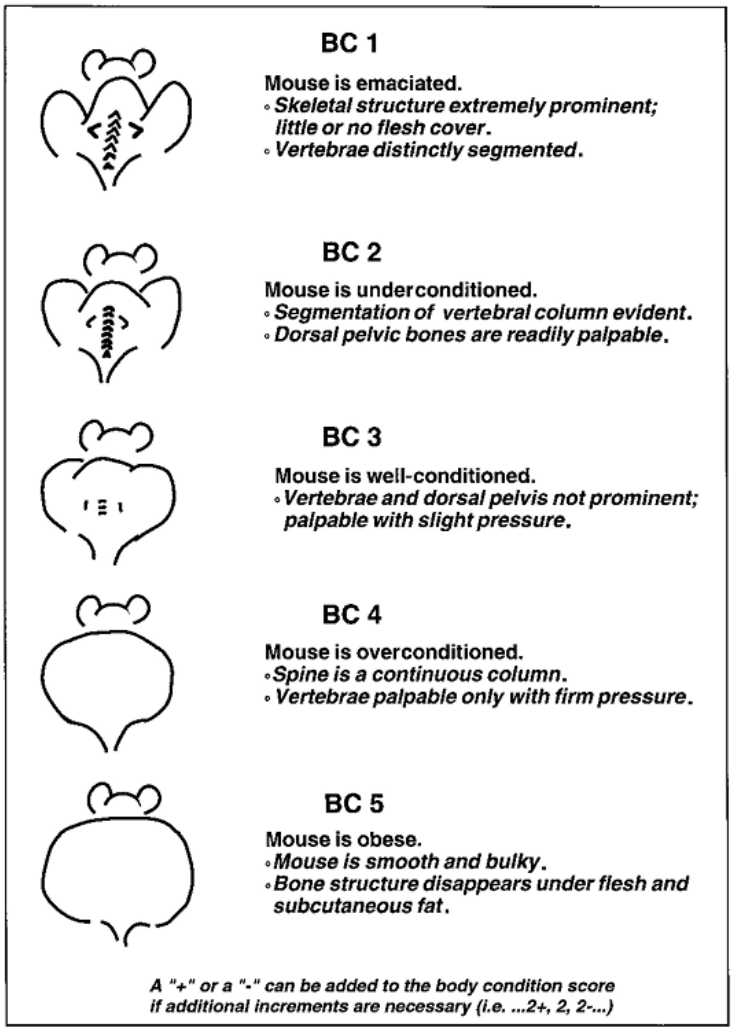
Tumor examples	Mass of Tumor (mg) Tumor volume= d^2 x D/2	Meets Criteria for end point?
d=20mm D=20mm 	20^2 x 20/2 =4000mm^3 or 4g Mean tumor size=20mm Tumor burden=4g/25g=16%	Yes-exceeds 15% body weight and mean tumor size 20mm
d=15mm D=25 mm 	15^2 x 25/2 =2812mm^3 or 2.8g Mean tumor size=20mm Tumor burden=2.8g/25g=11%	Yes-mean tumor size 20mm

Figure 2: Body Condition Scoring



Review History	
Revision Version:	**Revision Date**:
A	11 December 2014
B	23 March 2020
C	27 January 2025