

**Washington State University**  
***Institutional Animal Care and Use Committee***

**Guideline #8: Tumor Burden Guide**

**Approval Date: 12.2017**

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**A. Purpose**

To establish guidelines that will allow investigators and OCV veterinary staff to objectively evaluate the health and welfare of animals carrying spontaneous or experimentally-induced tumors and determine when euthanasia might be warranted to alleviate pain and distress associated with these tumors. The recommendations presented in this document are intended to augment, not supersede, guidelines presented in the WSU IACUC Policy for Humane Endpoints

Please refer to [IACUC Policy #8](#) for additional details regarding the use of this document.

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**B. General**

In using animal models for the study of cancer, it is typically necessary that the animals utilized experience tumor growth and possibly metastatic disease. The determination of humane endpoints should involve the PI and veterinarian and must be approved by the IACUC prior to the start of the study. To maximize data acquisition and minimize pain and distress, the animal's health and welfare needs to be continually and comprehensively assessed and documented as tumors and associated disease progress. The PI and/or research staff are responsible for monitoring the animals for endpoint criteria. OCV veterinary personnel can assist in the development and assessment of appropriate endpoints. Unanticipated adverse events require report to the IACUC and may require modification of the endpoints.

When assessing the general health of animals utilized in studies of cancer, the following clinical presentations warrant development of a management plan as they indicate diminished health status that may be associated with increasing tumor burden and metastasis:

1. Weight loss and decreasing body condition.
2. Hunched posture, Mobility or lethargy issues, lack of responsiveness, rough hair coat
3. Respiratory-associated symptoms such as increased respiratory rate, coughing, and nasal discharge
4. Icterus/Jaundice
5. Neurological signs such as circling or ataxia
6. Self-trauma
7. Difficulty with ambulation that might interfere with food and water acquisition
8. Ulceration and necrosis of visible tumors

**Immediate action would be warranted for these clinical signs:**

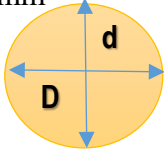
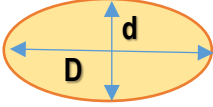
1. Distention of the abdomen with fluid or palpable mass resembling the size of a pregnant animal
2. Abnormal vocalization when touched or handled indicating severe distress
3. Labored breathing
4. Severe anemia (pale feet or ears or decreased packed cell volume)
5. Unresponsive to stimuli or moribund

**Criteria for Endpoints of Solid tumors (each listed as a standalone, not in addition):**

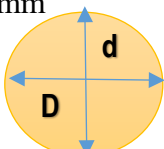
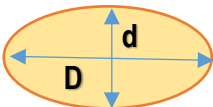
1. Tumor burden (combined burden if more than one mass present) is greater than 15% body weight (Figure 1& 2)
  - a. The weight reference is the weight of the animal on the day of tumor implantation
  - b. The mass of the tumor is calculated from the following formula-
    - i.  $\text{Mass (mg)} = \text{Tumor volume (mm}^3) = d^2 \times D/2$  where d and D are the shortest and longest diameter in mm, respectively.
    - ii.  $\text{Mass of tumor (g)} / \text{Weight of the animal (g)} \times 100 = \% \text{ of body weight}$  (see chart below)
2. Mean tumor diameter = or > 20mm in adult mice (~25g) or 40mm in adult rats (~300g) were  $\text{Mean} = (d + D)/2$ .
3. Ulceration, infection or necrosis of tumor.

**Examples of Solid Tumors in Rodents (how to calculate % body weight, mean tumor size, tumor burden)**

**Figure 1: Mouse Tumors (25g animal)**

<b>Tumor examples</b>	<b>Mass of Tumor (mg)</b> Tumor volume= $d^2 \times D/2$	<b>Meets Criteria for end point?</b>
d=20mm D=20mm 	$20^2 \times 20/2 = 4000\text{mm}^3$ 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 	$15^2 \times 25/2 = 2812\text{mm}^3$ or 2.8g  Mean tumor size=20mm  Tumor burden=2.8g/25g=11%	Yes-mean tumor size 20mm

**Figure 2: Rat Tumors (300g animal)**

<b>Tumor examples</b>	<b>Mass of Tumor (mg)</b> Tumor volume= $d^2 \times D/2$	<b>Meets Criteria for end point?</b>
d=40mm D=40mm 	$40^2 \times 40/2 = 32,000\text{mm}^3$ or 32g  Mean tumor size=40mm  Tumor burden=32g/300g=11%	Yes-exceeds mean tumor size 40mm
d=35mm D=50 mm 	$30^2 \times 50/2 = 22,500\text{mm}^3$ or 22.5g  Mean tumor size=40mm  Tumor burden=22.5g/300g=7.5%	Yes-mean tumor size 40mm