

	<h1 style="margin: 0;"><u>ULAM</u></h1> <p style="margin: 0;">Unit for Laboratory Animal Medicine</p>	<p style="margin: 0;">Standard Operating Procedure</p>
<p style="margin: 0;">Title: Tumor burden scoring system</p>		
<p style="margin: 0;">Responsible Division: ULAM</p>		<p style="margin: 0;">Author: A. Wathen</p>
<p style="margin: 0;">Date: 19 January 2006</p>	<p style="margin: 0;">Version: 3</p>	<p style="margin: 0;">Page: 1 of 3</p>

A. PURPOSE:

1. To establish a guideline for a tumor burden scoring system to be used for animals inoculated with neoplastic cells or toxic agents.

B. DEFINITIONS:

1. **BCS:** Body Condition Score on a scale of 1-5.
2. **Moribund:** Clinically irreversible condition leading inevitably to death.
3. **Cachexic:** General weakness.
4. **Ascites:** Accumulation of excess fluid in the abdomen.
5. **Metastasis:** Spread of cancer.

C. RESPONSIBILITY: Principal Investigators and their laboratory personnel who inoculate animals with neoplastic cells and/or toxic agents

D. PROCEDURES:

Optimally, studies are terminated when animals begin to exhibit clinical signs of disease if this endpoint is compatible with meeting the research objectives. Such endpoints are always preferable to death or moribundity as endpoints since they maximize animal welfare and minimize pain and distress. Efforts should be made to minimize pain and distress experienced by animals used in research. Checklists and/or scoring sheets may be helpful in ensuring appropriate observations are made, consistently interpreted, and properly documented.

For those protocols that include morbidity as an endpoint or those that include animal procedures that have the potential to cause adverse sequella, the following should be addressed:

- 1) Criteria that establish when the endpoint has been reached.
 - a. Evaluation of five aspects of an animal's condition including: body weight, physical appearance, measurable clinical signs, unprovoked behavior and response to external stimuli (1).
 - b. Clinical observations, including: changes in general appearance, skin and hair, eyes, nose, mouth and head, respiration, urine, feces, and locomotion (2).
 - c. Clinical signs, depending on severity and duration, that may constitute an endpoint include, but are not limited to:
 - i. Rapid weight loss
 - ii. Diarrhea, if debilitating
 - iii. Progressive dermatitis
 - iv. Rough hair coat, hunched posture, lethargy or persistent recumbency
 - v. Coughing, labored breathing, nasal discharge
 - vi. Jaundice and/or anemia

- vii. Neurological signs
- viii. Bleeding from any orifice
- ix. Self-induced trauma
 - x. Any condition interfering with eating or drinking (e.g. difficulty with ambulation)
 - xi. Excessive or prolonged hyperthermia or hypothermia
- d. Additional signs in neoplastic studies that may constitute an endpoint include, but are not limited to:
 - i. A tumor burden greater than 10% body weight.
 - ii. In an adult mouse, a mean tumor diameter exceeding 20mm, or in an adult rat, a mean tumor diameter exceeding 40mm.
 - iii. Tumors that ulcerate and become necrotic or infected.
- e. Any animal found unexpectedly to be moribund, cachectic, or unable to obtain food or water.

Criteria for Humane End Points for In Vivo Tumor Studies:

To better assess tumor burden, a scoring system will be used for animals that are inoculated with neoplastic cells or toxic agents (3). This should serve for all tumors, metastases, and for ascites production. Animals will be graded on size of tumor (mm), degree of necrosis, hydration, mobility, weight loss or gain, and overall appearance.

1. **General Appearance (includes skin, orifices, and posture)**
 - (0) Normal (BCS = 3)
 - (2) Not well groomed, less active, normal posture and gait
 - (3) Skin or hair coat in poor condition (scruffy), less active, decreased signs of grooming (BCS = 2)
 - (6) Skin or coat in poor condition, dehydration (skin turgor), emaciated, inactive (BCS = 1)
 - (19) Moribund or severely cachectic
2. **Tumor size/Degree of Necrosis**
 - (0) Tumor very small (≤ 7 mm length)
 - (4) Tumor small with some necrosis/ulceration (≤ 7 mm length)
 - (9) Tumor necrotic (7mm-17mm in any two dimensions)
 - (12) Tumor large (≥ 18 mm in any two dimensions), or severe abdominal distension ($\geq 10\%$ or original body weight increase)
3. **Weight Loss**
 - (0) No weight loss or gain from pre-inoculation weight
 - (9) Weight loss 5-10% or weight gain from tumor burden 0-5%
 - (12) Weight loss 10-15% or weight gain from tumor burden 6-9%
 - (18) Weight loss $\geq 20\%$ or weight gain $\geq 10\%$

Score	Action
0-7	Routine daily monitoring.
8-13	Daily monitoring. May put food on cage bottom and/or give SC or IP saline.
14-17	Consult veterinary staff. Consider euthanasia.
>18	Euthanize immediately.

Title: Tumor burden scoring system		
Date: 19 January 2006	Version: 3	Page 3 of 3

E. REFERENCE DOCUMENTS:

1. Morton and Griffiths (1985), Veterinary Record 116:431-43
2. Montgomery (1990), Cancer Bulletin 42:230-237
3. Dr. Liang Xu and Dr. Marc Lippman permitted the use of their previously described tumor burden scoring system standard operating procedure.