Policy 1 – Tumor Models
Version 2.0
Approval Date: 1/22/07, 1/16/13

Purpose – The purpose of this policy is to provide information about common tumor models in rodents, monitoring of animals in cancer studies, and limits regarding maximum allowable size of tumors.

Background - This policy includes: 1) tumors induced by injecting cells/tumor fragments into animals (eg. xenograft or allograft models), 2) spontaneous, naturally occurring tumors (eg. geriatric tumors or thymoma in NOD-SCID mice), and 3) chemically induced tumors in mutant mice (eg. Cre-lox mice).

abbreviations:
BCS = body condition score

Policy –

1. **Pathogen testing of tumor cell lines**: All rodent or human cells/tumors injected into rodents must be tested for infectious agents according to Policy 6 (Cell Line Usage and Rodent-Derived Biological Products).

2. **Tumor injection site**: Tumor injection site(s) should be chosen so not to interfere with normal bodily functions such as walking, eating, drinking, defecation, or urination. The recommended site is on the flank, half-way between elbow and iliac crest (see below). Sites involving sensory functions, such as the eye, should be avoided. Intramuscular (IM) implantation should be avoided as growing tumor causes muscle distention and pain. Use of inhalation anesthetic prior to cell injections is recommended for safety of personnel. Tumor injection site(s) must be disinfected using 70% alcohol before injection. Refer to Policy 19 (Fluid Administration and Collection) for determining the appropriate volume and needle size to be used for each species.

3. **Pieces of tumors**: Usually delivered subcutaneously through a large-bore needle called a trocar. Because of the large diameter of a trocar (≤16ga), more than momentary pain is associated with their use. Therefore, all procedures involving trocars are considered minor survival surgery by the IACUC. Animals MUST be under general anesthesia or have a local anesthetic agent applied at the trocar site for these procedures. Trocars will cause more damage to the skin compared to smaller gauge hypodermic needles, and skin closure (suture, staples, wound clips, surgical glue) may be
needed post-injection. Additionally, animals should be provided with analgesia for at least 12hrs postoperatively.

4. **Number of tumors injected into each animal:** Maximum of two tumor injections permitted for each animal.

5. **Frequency of monitoring:** All animals involved in tumor studies must be monitored for tumor size, pain, and distress at least three times per week by qualified laboratory personnel. Animals that are approaching humane endpoints (i.e. tumor diameter ≥1.0cm (mice) or BCS ≤2) must be monitored daily, including holidays and weekends.
   a. **Tumor measurement:** tumor size must be determined at least weekly.
   b. **Body weight measurement:** BSC is recommended and must be performed at least weekly.

6. **Analgesics:** Any animal determined to be in pain or distress (evaluated by appearance, behavior, or clinical signs) must be provided with analgesics.
   - Withholding analgesics must be scientifically justified and approved by the IACUC prior to the initiation of the study.

7. **Euthanasia:** The following conditions require euthanasia:
   a. Animals develop significant tumors unrelated to the experimental studies
   b. Tumors exceed maximum allowable size:
      i. **Mouse:** single tumor with diameter of ≥1.5cm, two tumors with diameter of ≥1.0cm (each)
      ii. **Rat:** single tumor with diameter of ≥3.0cm, two tumors with diameter of ≥2.0cm (each)
   c. Volume ≥1700mm³ (mouse) or ≥3400mm³ (rat); use the following formulas to calculate volume (based on tumor shape):
      i. **Spherical:** \((\text{width}^2 \times \text{length}) / 2\) [citation 3]
      ii. **Ellipsoid:** \(\pi/6 \times (\text{length})^2 \times (\text{width})^2 \times (\text{height})\) [citation 4]
   d. Tumors interfere with walking, eating, drinking, urination, or defecation
   e. Tumors result in BCS ≤1.5 (Policy 5, Body Weight Loss)
   f. Ulceration, infection or necrosis of tumors
   g. Animals show clinical symptoms described in Policy 3 (Humane Endpoints)
   h. Any animal evaluated by appearance, behavior, or clinical signs to be in pain or distress (unless pre-approved by IACUC)

Any exceptions to this policy must have prior IACUC approval

References -