The University of Pennsylvania Institutional Animal Care and Use Committee (IACUC) has adopted the following guidelines and definitions regarding surgeries and biopsies with respect to research animals.

**Animal**

The definition of animal accepted by the IACUC is a hybrid of the Public Health Service Policy and the Animal Welfare Act and will not exclude any animal specifically covered by each individual document. The IACUC defines an “animal” as “Any live or dead, vertebrate animal (cold- or warm-blooded) used or intended for use in research, research training, education, experimentation, or biological testing or for related purposes.”

**Non-survival Surgery**

If an animal will be anesthetized so that tissues may be collected and the animal will then be euthanatized, the procedure is defined as non-survival surgery. An adaptation of this definition includes surgeries which involve the collection of vital organs (heart, lungs, brain, and blood following exsanguination or perfusion) under anesthesia, which will lead to the imminent death of the animal.

**Survival Surgery**

A surgery where an animal will be anesthetized so that non-vital tissues may be collected or altered and the animal will then be allowed to recover is defined as a survival surgery.

**Tissue Harvest**

If an animal will be euthanatized by an approved physical or chemical method of euthanasia for the collection of tissues (after the animal’s death), the procedure is defined as a tissue harvest.

**Surgery**

Surgery is defined as the creation of a novel opening in the body or of a pre-existing orifice that involves cutting with a scalpel, scissors, biopsy forceps, punch biopsy, laser, electrocautery, or direct tissue damage by cold (liquid nitrogen) or any comparable device or technique. Biopsies exceeding IACUC guidelines are considered surgeries.

**Procedure**

A procedure (with regards to a comparison to a surgery) is defined as the entering of a pre-existing orifice that does not involve cutting with a scalpel, scissors, biopsy forceps, punch biopsy, laser, cauterization, direct tissue damage by cold (liquid nitrogen) or any comparable device or technique. Biopsies less than or equal to IACUC guidelines (Table 1.) are considered procedures.

**Major Surgery**

Both the Animal Welfare Act and the Guide of the Care and Use of Laboratory Animals (hereafter referred to as The Guide) states that a “major surgery penetrates and exposes a body cavity or produces a substantial impairment of physical or physiologic function.”

- **Body cavity** is defined as the abdominal, thoracic, cranial, synovial, or bone marrow cavities, i.e. those chambers not immediately associated with the outside world.
- **Substantial impairment** is defined as the circumstance where the animal is not expected to be normal after a reasonable postoperative recovery period. Examples include, but are not be limited to those procedures permanently and significantly affecting ambulation, physiology, the immune system, and mentation.
Examples of a **major surgery** include, but are not limited to:
- Laparotomy, including laparoscopy.
- Thoracotomy.
- Craniotomy.
- Arthrotomy and joint replacement, excluding arthroscopy.
- Orthopedic procedures (e.g. limb amputation).
- Injury models (e.g. head trauma)
- Nerve/muscle transection.
- Eye surgery with corneal incision.
- Significant soft tissue transection.

Major surgeries require appropriate anesthesia, analgesia, sterile technique, wound closure (sutures, staples, tissue glue, and/or bandaging), postoperative wound care, and more extensive postoperative monitoring of the animal until healed and/or achieved a normal health status. The IACUC protocol or amendment must be clear in regards to whom is directly responsible for post-operative care, e.g. appropriately trained laboratory personnel or ULAR clinical staff.

**Minor Surgery**
The *Guide* states that a “minor survival surgery does not expose a body cavity and cause little or no physical impairment (such as wound suturing, peripheral vessel cannulation, ... castration, dehorning, repair of prolapses, and any procedure routinely done on an "outpatient" basis in veterinary clinical practice)."

Other examples of minor surgical procedures include, but are not limited to:
- Vascular cut-down approach to an artery or vein (e.g. jugular or femoral).
- Tissue biopsy not involving surgical exposure of a body cavity (e.g. skin, muscle, via endoscopy).
- Superficial biopsy involving a scientifically justified area larger than IACUC guidelines (Table 1.).
- Skin or subcutaneous implants.
- Surgical repair of a superficial injury.
- Arthroscopy.
- Oral surgery and tooth extractions not involving bone.
- Closed castrations.

Minor surgeries require appropriate anesthesia, analgesia, sterile technique, wound closure (if applicable, to include sutures, staples, tissue glue, and/or bandaging), postoperative wound care, and frequent postoperative monitoring of the animal until healed and/or achieved a normal health status. If post-operative care is necessary, the IACUC protocol or amendment must be clear in regards to who is directly responsible for post-operative care, e.g. appropriately trained laboratory personnel or ULAR clinical staff.

**Biopsy**
The removal of a piece of tissue from a live animal is known as a biopsy.

If the collection of tissue involves entering a body cavity, then the biopsy shall be considered a **major surgery** (e.g. liver wedge biopsy), as defined above. The exception is the use of transcutaneous Tru-cut® biopsy needles, fine needle aspirates, or similar techniques of collection samples of organs within a body cavity. Principal Investigators are encouraged to perform these types of biopsies being guided by ultrasonography.
If the collection of superficial tissue (e.g. skin) exceeds the guidelines set in Table 1, then the biopsy shall be considered a minor surgery (as defined above). Protocols or amendments requiring a biopsied tissue sample greater than those listed in Table 1 will require specific scientific justification and consultation with a ULAR veterinarian before approval by the IACUC.

The collection of a superficial biopsy may not necessarily require general anesthesia and may only require subcutaneous installation of a local anesthetic (e.g. bupivicaine). With appropriate wound care to prevent infection, biopsies may be allowed to heal by “second intention”, i.e. wound closure may not be necessary with appropriate and frequent cleaning of the area. Principal Investigators will consult with ULAR veterinarians regarding the best possible anesthesia and wound care for the specific biopsy technique.

Table 1. Dimensional skin biopsy guidelines to consider the skin biopsy a “procedure”. Exceeding these guidelines requires specific scientific justification and classification as a “surgery”.

<table>
<thead>
<tr>
<th>Species</th>
<th>Maximum single “round” biopsy diameter (mm)</th>
<th>Maximum total area of skin biopsies (cm²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mouse</td>
<td>5</td>
<td>0.20</td>
</tr>
<tr>
<td>Hamster, Gerbil</td>
<td>7</td>
<td>0.40</td>
</tr>
<tr>
<td>Rat, Guinea pig, Ferret</td>
<td>10</td>
<td>0.80</td>
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<tr>
<td>Rabbit, Cat, Dog, Primate</td>
<td>15</td>
<td>1.75</td>
</tr>
<tr>
<td>Sheep, Pig</td>
<td>20</td>
<td>3.25</td>
</tr>
</tbody>
</table>

Use of Analgesics in Surgeries and Procedures

The definitions of surgery, major or minor, procedure, or biopsy does not necessarily relate to whether that particular activity will require analgesics, but in general, the more invasive the surgery/procedure, the more potent, longer lasting, and more frequent dosing of pain medications will be required in order to keep the research animal in a pain-free state. The Animal Welfare Act requires that “activities that involve surgery include appropriate provision for pre-operative and post-operative care of the animals in accordance with established veterinary medical and nursing practices.”

It is the Principal Investigator’s responsibility to assign a pain category to the protocol (Form A, Section 1). The Animal Welfare Act defines a painful procedure as “any procedure that would reasonably be expected to cause more than slight or momentary pain or distress in a human being to which that procedure was applied, that is, pain in excess of that caused by injections or other minor procedures.” Barring specific, scientifically-based and published observations to the contrary, the Principal Investigator must consider the use of analgesics for any potentially painful procedure. The IACUC’s recommendation is for the Principal Investigator to consult with ULAR before protocol submission to determine an appropriate pain category and analgesic protocol compatible with welfare of the animal and the science of the protocol. Please refer to Guideline 15 for examples of species-based anesthetic and analgesic protocols. The IACUC will withhold approval on protocols with an inappropriate analgesia regime.

If there are any questions regarding this guideline and incorporating its tenets into the research protocol, then please contact the IACUC Director.