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University of Texas at Austin

Institutional Animal Care and Use Committee

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TITLE	The 3 R's in Animal Research		
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The University of Texas at Austin endorses three important animal use concepts known widely as the "Three R's": Replacement, Reduction and Refinement. The purpose of these concepts is to minimize animal use and pain or distress while still achieving critical scientific objectives leading to advances in health and medicine. IACUCs look at the researcher's adherence to these three concepts when making their decision to grant approval for animal work. It is important to apply these concepts to the submission of an animal use protocol.

Replacement: Replacement refers to methods that avoid using animals. The term includes absolute replacements, as well as relative replacements. Practical examples of replacement are:

- Use of cell culture to replace animals for the testing of therapeutic compounds
- Use of computer software to model pharmacokinetics of drugs
- Use of immunological assays to replace animal-based bioassays
- Use of animals on a lower phylogenetic scale

Reduction: Reduction is simply reducing the number of animals used. Examples of reduction include:

- Using the minimum number of animals to obtain statistically significant data.
- Performing multiple studies simultaneously so that the same control group can be used for all the experiments.
- Sharing tissues with other investigators so that additional animals are not needed.
- Designing experiments so that animals serve as their own controls, when scientifically appropriate.
- Using newer instrumentation that improves precision and reduces the number of animals needed per data point.

When considering how to reduce animal use, investigators must find a balance between causing more pain or distress on fewer animals and causing less pain or distress in more animals. For instance, if an investigator proposes to double the number of minor surgical procedures on animals so that fewer animals are used, the increased pain and distress experienced by the remaining animals may not be justified by a simple reduction in animal use. This is a difficult area, and you should seek advice from a UT-Austin veterinarian or IACUC as needed.

Refinement: Refinement refers to changing experiments or procedures to reduce the potential for pain or distress in those animals that must be used. Refinements in anesthesia, surgery, analgesia, and many research procedures occur frequently. Examples of refinements include:

- Using anesthetics that allow more rapid induction and reduced recovery times.

- Using more appropriate analgesics that provide extended pain relief postoperatively, and require less frequent administration.
- Improving blood collection or injection techniques, so that they cause less tissue damage or distress, or which require less restraint.
- More sensitive analytical methods that require smaller sample sizes.
- Improved surgical techniques that minimize trauma and the length of anesthesia.
- Refining experimental technique may be achieved by reading scientific literature, or consulting with a veterinarian. Methodology evolves and it is important to see if the methods specific to the studies have been improved.