

### BOX 2.2 Ethical Considerations for Animal Use

Using animal models in biological research is necessary to make conclusions about a fully functional, living organism. However, using animals is also a privilege, and scientists deciding to use animal models must consider many ethical considerations. These ethical concerns are not solely the responsibility of the individual scientist; the use of animals must also be justified to animal oversight committees that exist to maintain the welfare of research animals. Each institution has an **Institutional Animal Care and Use Committee (IACUC)** that must approve protocols involving animals and ensure that the research is justified. Furthermore, granting agencies and many scientific journals now require that scientists state that all animal protocols are approved by their institution's IACUC.

When using animals in experiments, distress must be minimized and the potential benefits to humans must be maximized. Animal welfare guidelines throughout the world are based on the principles proposed by Russell and Burch in *The Principles of Humane Experimental Research* (1959), commonly referred to as the three Rs:

**Replacement:** If there is any way to do the research without using animals, it should be done. This includes using computational modeling and cell culture methods. In the case of behavioral research, modeling is obviously impossible without actually performing the behavioral task. However, another component of replacement is the use of “less-sentient” animal species: choosing to study invertebrates rather than vertebrates, or mice rather than monkeys, etc.

**Reduction:** Use the minimum number of animals to obtain scientifically valid data. If possible, use the same animals for multiple experiments. Also, investigators should perform mathematical analyses to determine the minimum number of animals required to provide enough statistical power to obtain significant results.

**Refinement:** Procedures must minimize distress and pain and enhance animal well-being. This guideline is also important for the consistency and interpretability of experimental results. For example, stress has numerous effects on physiology that can confound results.

Following these guidelines is standard practice for developing animal protocols and justifying research goals.

## Choosing an Appropriate Behavioral Paradigm

Whether investigating a commonly studied behavior or developing a new behavioral paradigm from scratch, a scientist should consider many factors when preparing to use an assay. First and foremost, the assay must be quantifiable, with the ability to measure discrete, easily observable variables. For example, consider an experiment in which a scientist wishes to measure drinking behavior between two groups of rodents. The scientist has many potential variables to measure: the total volume of liquid consumed, the rate of