



## Fact Sheet Alternative Methods in Biomedical Research

### **Can other research methods replace animals in research?**

Adjunct testing methods (non-animal models) are used in nearly all phases of biomedical research. In some research, however, these adjunct methods alone cannot provide scientists and researchers with the definitive assessment of how substances will interact in complex organisms. For ethical, regulatory, and scientific reasons compounds must be tested on living systems – made up of interrelated organs and organ systems – before they can be tried in human beings.

### **What other methods are used in addition to animals in research?**

Mathematical and computer aids as well as cell, tissue, and organ cultures are all useful in the preliminary stages of research. Mathematical models can improve an experiment's design and help predict an organism's response to varying levels of exposure to a particular chemical. Computer data banks offer the ability to share results with other researchers, which reduces test duplication. Culture tests can give some information about a compound, but cannot predict how it will affect a living system. The only way to get a complete picture of how a substance or procedure will affect a living system is to test it on animals. Some alternatives to animal testing are providing faster results at lower costs. These include bacteria and cell cultures, chemical tests, computer models, and advanced statistical methods. Utilization of these methods and better analysis of test results have helped to reduce the number of animals needed for many experiments. Researchers avoid the use of animals when it is possible to do so and they continue to search for alternative methods. However, the use of animals remains an essential part of biomedical science because nothing can substitute for the complex functions of the whole living animal. New drugs, vaccines, and surgical procedures must still be evaluated in animals before they can be used on human patients.

### **What steps do researchers take toward reducing the number of animals used or determining if they need to be used at all?**

It is the goal of all medical researchers to use as few animals as possible. Ultimately it would be ideal if the use of animals could be totally replaced by non-clinical methods. In the last 20 years, the number of animals used annually has decreased significantly and the search for validated alternatives continues. It is a common misconception that animals are used because they offer a "cheap alternative" to non-animal techniques. The reverse is in fact true. Research animals are very expensive to purchase, house, feed, and care for. Computers and laboratory equipment in the long run would be much less expensive, and much easier to care for.

All researchers subscribe to "The 3 's" – (Reduction, Refinement, Replacement). These are guideposts to lessen animal use in research, including product safety testing. In 1959, two British scientists, William M. S. Russell and Rex Burch, first described the "3 Rs" in *The Principles of Humane Experimental Technique*.

**Reduction** - Reduction refers to methods that result in fewer animals being used to acquire the needed information. For example, scientists are developing a number of in vitro tests to assess eye and skin irritation. In an in vitro test, scientists apply a substance to human or animal cells or tissues in a laboratory container rather than in a living animal. This reduces or, in some cases, *eliminates* the use of animals in eye and skin irritation safety evaluations. Overall, working for reduction means that fewer animals are being used in medical research. Scientists are now able to be more confident in the results that they have achieved. This confidence means that fewer animals are required to be sure that the results are valid.

**Refinement** - Refinement concerns the manner in which the animals are treated. This covers areas such as animal housing and veterinary care. The principle of Refinement ensures that if an animal is involved in scientific research, it is treated with care and respect. Refinements alter procedures to eliminate or minimize discomfort, including new and more effective anesthetics and analgesics, species-appropriate housing, and enrichment activities. Enrichment activities mean animals are housed in groups when possible, rather than individual cages, and play with materials similar to those found in their natural habitats. These activities alleviate boredom and enhance psychological well-being.

**Replacement** - Replacement means substituting conscious living higher animals with insentient material, including computer modeling, cell cultures, and in vitro (literally in glass - test tube) techniques. In some cases these techniques can replace some of the existing animal tests, but it will be many years before all animal tests will be made redundant by non-animal techniques. An exciting example of progress is that laboratories no longer use rabbits for pregnancy tests. In the past, technicians injected a urine extract from a woman into a rabbit and later tested the rabbit to see if the injection had caused the animal to ovulate; if so, the pregnancy test was positive. Imagine the numbers of animals used to determine pregnancy in a single year! Today, however, a simple test available in drug stores achieves the same result. In recent years there have been advances in non-animal techniques.