

in this regard, since it can isolate specific aspects of the whole animal.

Therefore, the search for alternatives is essentially a search for new techniques. These may not provide immediate answers to still-unsolved questions about the causes and mechanisms of human disease, but they can be less expensive and more efficient as testing and research tools.

Laboratory animals are used for many purposes including education, screening of toxic products, basic research and general toxicology. This report will cover the use of alternatives in the screening of toxic products and general toxicology, which account for about 20-30% of all animals used in biomedicine, and some of the other areas in which improvements are possible.

A. ALTERNATIVE METHODOLOGIES

The theoretical goal of persons concerned with the rights and welfare of animals used in research is the ultimate elimination of animal experiments. This can be accomplished by developing and perfecting alternatives in research and testing to replace traditional methods and practices that use live animals exclusively. Although such development is only beginning, a number of alternative tests and methodologies are currently available that are at least as reliable and inexpensive as the animal techniques they replace.

Cell Culture

The cells are separated and cultured in a single layer or suspension by supplying them with nutrients similar to those needed by the tissues within the animal. These cultures, grown at body temperature, need a complex growth medium which usually requires the addition of blood serum. They also require a solid support (not liquid) on which to grow. This permits the cells to multiply to densities similar to the parent tissue *in vivo* (in the living animal). Many cell lines can be cultured again and again through many generations to produce specific cell types and pathological cell lines (for example, cancerous cell cultures).

Cell cultures are used extensively in the following:

- The manufacture and growth of viruses.
- The synthesis of immunoglobulins (proteins synthesized by the body to impart immunity), hormones and other biological products.

The cell culture is possible because it creates and controls a totally synthetic chemical and physical environment conducive to the growth and reproduction of cells. Employing that known environment, the scientist can easily study cell processes such as metabolism, hormone secretion, nerve organization and the mechanics of inheritance without being concerned with complex and unknown variables in the whole animal. It is used in the study of the disease process at the cell level, and how these cells can provide information not easily obtained from the living animal. Some of these study applications include:

- Inheritance-based disorders or diseases.
- Diagnosis before the appearance of pathological symptoms.
- Development of medical treatment and therapy.
- Identification of pathogenic (disease-causing) bacteria and other infectious organisms.
- Drug development and screening.
- Vaccine production.
- Immunity and cancer.
- Toxicity testing.