



# Use of Animals in Biomedical Research: Understanding the Issues

Over the years, scientists have solved medical problems, cured diseases, and developed vaccines—all by using animals in biomedical research. An important issue, the use of animals in biomedical research, has come under attack by people who seek to portray research as inhumane and wasteful. Knowing the facts surrounding the use of animals in research can help determine the outcome of the debate as well as decide how soon cures will be found for deadly diseases such as cancer, heart disease, and AIDS—all of which affect millions of people around the world.

## Why Do We Need Biomedical Research?

To answer this, we must first understand what “biomedical research” is. Looking at a breakdown of the terms according to the Webster’s Dictionary, we find “bio” meaning “life or living organism,” “medical” meaning “healing; pertaining to the science, study, or practice of medicine, or the art of healing diseases,” and “research” meaning “careful, patient, systematic, diligent inquiry or examination in some field of knowledge, undertaken to establish facts or principles”.<sup>1</sup> In simplified terms, we can understand from these definitions that biomedical research is the search for ways to heal living organisms such as humans and other animals.

Every person in the United States has benefited from the results of biomedical research. Through biomedical research, scientists strive to better understand the causes of disease; to develop new drugs, vaccines, or procedures to prevent or treat diseases; and to test the safety of products we use every day of our lives. Through the similarities between humans and laboratory animals, we have learned much information about our bodies and how they work. We continue to learn more and are now able to apply that knowledge not only to humans, but to our pets, wildlife, and other animals.

Due to medical research, life expectancy in the United States has improved dramatically, from an average of 49 years in 1900 to 69.3 years in 2004.<sup>2</sup> By 2030, projections suggest one in five Americans will be 65 or older, and the number of people aged 85 and older—currently the fastest growing segment of the older population—could exceed 10 million.<sup>3</sup> The increase in the number of older Americans is mostly due medical advances that have been based on animal research.

## Why Are Animals Used?

Each year more than 20 million animals are used in biomedical research projects, with more than 90 percent of them being mice, rats, and other rodents. Of the other animal species, about 65,000 dogs, 23,000 cats, and 55,000 primates were used for research purposes in the United States between October 1, 2003 and September 30, 2004, according to the U.S. Department of Agriculture.<sup>4</sup> In most cases, these animals are specifically bred for research purposes and are purchased from animal breeders.

Laboratory animals have organs and body systems similar to humans and other animals. In many cases, they are susceptible to the same diseases that affect humans. Because of this, the data derived from research on these animals can be applied directly to humans and to other animals as well. While not all biomedical research involves the use of animals, animals are essential in many areas.

The short life span of research animals allows scientists to study them throughout the entire life cycle—and even through several generations—within a short period of time. Also, using laboratory animals in scientific studies allows researchers precise control over the animals’ environment (light, temperature, ventilation, etc.) to ensure that the animals are healthy and thus keep experimental variables to a minimum. Healthy, well cared-for, adequately housed animals are necessary to produce accurate research results.

## Number of Americans Affected by Diseases

| <i>Disease/illness</i>       | <i>Number</i>   |
|------------------------------|-----------------|
| Cardiovascular disease       | 61.8 million    |
| Hypertension                 | 50 million      |
| Deafness/hearing disorders   | 24 million      |
| Sickle Cell Anemia           | 70,000          |
| Cataracts                    | 20.5 million    |
| Diabetes                     | 17 million      |
| Leukemia/Lymphoma            | 680,000         |
| Alcoholism                   | 14 million      |
| Arthritis                    | 40.5 million    |
| Alzheimer’s disease          | 4 million       |
| Schizophrenia                | 2 million       |
| AIDS                         | 850,000         |
| Multiple Sclerosis           | 400,000         |
| Cystic Fibrosis              | 30,000          |
| Sudden Infant Death Syndrome | 7,000 each year |



## What Benefits Have Come From Medical Research Using Animals?

In the late 1940s, polio crippled and killed thousands of people around the world every year. Polio reached a peak in the United States in 1952, with over 21,000 paralytic cases. After a vaccine was developed in the late 1950s and early 1960s, polio was brought under control and practically eliminated as a public health problem in industrialized countries. Today, the disease has been eliminated from most of the world; only 16 countries worldwide have cases of polio in limited areas.<sup>5,6</sup> Today's children routinely receive a vaccine that provides a lifetime of protection from the disease. Children are also immunized against typhus, diphtheria, whooping cough, smallpox, and tetanus. Untold millions of people around the world are healthy adults because of these vaccines, which were made possible through animal research.

Diabetes is another example of the importance of biomedical research. In the United States, 7% of the population (more than 20 million people) have diabetes. Over 1 million new cases of diabetes are diagnosed each year, and based on death certificate data, diabetes contributed to nearly 225,000 deaths in 2002 alone.<sup>7,8</sup> Without insulin treatments to regulate their blood sugar levels, many more diabetics would die. Dogs were crucial to the research that identified the cause of diabetes, which led to the development of insulin. Recently, researchers have developed insulin pumps to replace injections, and current transplant research offers the hope that diabetes can be cured.

The importance of animal research to those suffering from heart and circulatory diseases cannot be overlooked. According to recent estimates, one in four U.S. adults has high blood pressure, which can cause strokes, heart attacks, and heart disease, and nearly one-third of them don't know it. Research involving animals has helped identify the causes of high blood pressure and develop more effective drugs to control the problem. Other research has resulted in treatments for strokes and heart attacks that save thousands of lives and reduce recovery time. Dogs have been especially important to researchers who developed open-heart surgery, pacemakers, and heart transplants. These techniques have revolutionized the therapy for people who have severe heart disease.

In spite of the remarkable medical progress during the last century, there is still much work to be done. As the average life span increases, more people will develop diseases that

## Animal Contributions to Research

|                         |   |
|-------------------------|---|
| Armadillos.....         | Vaccine for leprosy.  |
| Cats.....               | Studies of AIDS, eye and ear disorders, and the nervous system.   |
| Chinchillas .....       | Studies on middle ear infections and hearing loss.  |
| Dogs.....               | Coronary bypass surgery; artificial heart valve insertion; pacemaker implantation; hip and other joint replacement surgery.   |
| Ferrets.....            | Viral diseases such as influenza.   |
| Fish .....              | Studies of vision, liver cancer, bacterial diseases, temperature regulation, and skin tumors.   |
| Guinea Pigs.....        | Nutritional studies such as vitamin C deficiency.   |
| Lobsters.....           | Study of motor coordination diseases such as syphilis and Parkinson's disease.  |
| Mice.....               | Studies of cancer, aging, AIDS, immunology, and genetics; embryo transfer techniques in humans and domestic and endangered animal species.  |
| Nonhuman Primates ..... | Treatments for polio and Rh disease; studies of HIV and AIDS, cancer, heart disease, neurological disorders, and infectious diseases such as malaria.   |
| Opossums .....          | Studies of the central nervous system, immune system, and bacterial endocarditis.   |
| Pigeons.....            | Study of coronary heart disease.  |
| Pigs.....               | Burn treatments; development of the CAT scan; human heart valve replacements.   |
| Rabbits.....            | Corneal transplants; drugs that lower blood cholesterol and help stop the development of hardening of the arteries.   |
| Rats.....               | Studies to find treatment for paralysis caused by nerve damage; product safety tests; causes of some cancers; effects of nutrition on aging; understanding tissue rejection following transplant surgery. |
| Sheep.....              | Development of the arteriovenous shunt and testing of a device that assists lung functions in infants soon after birth.   |
| Slugs.....              | Studies of the short- and long-term memory.   |
| Woodchucks .....        | Liver cancer and hepatitis B.   |

primarily affect the elderly—Alzheimer's, Parkinson's, and certain types of cancers.

There is much to be learned about new diseases such as AIDS. And millions of people around the world suffer from other incurable diseases such as cystic fibrosis, multiple sclerosis, muscular dystrophy, and genetic birth defects. Researchers are trying to learn the causes of and the cures for these diseases.

Animals benefit from biomedical research as well. Feline immunodeficiency virus (FIV) and feline leukemia virus (FeLV) infections are major causes of death in cats. In the U.S., it is estimated that 2–3% of all cats are infected with one or both of these diseases. A vaccine is available to prevent these diseases, but much additional work is necessary to explain these diseases and their treatment.

Sometimes research can have unexpected benefits. In 1978, there was a sudden, worldwide outbreak of a virus among dogs which caused vomiting, diarrhea, dehydration and, frequently, death. Researchers soon discovered that this disease, called canine parvovirus, was similar to the feline panleukopenia virus. Since a vaccine was already available for the feline panleukopenia virus, a vaccine for parvovirus was developed, tested, and made available for distribution within a year. Now recognized as one of the most significant success stories of modern veterinary science, the parvovirus vaccine checked the spread of the disease among adult dogs in the United States almost immediately. However, puppies between 6 and 16 weeks of age are still at significant risk of being infected by the virus, and further research is needed to protect pets of all ages.

### Putting It in Perspective

Some people argue that animal research should be stopped because of the pain inflicted on the animals. But most research projects either do not involve pain or the pain is alleviated with analgesic or anesthetic drugs. Researchers understand that pain causes stress for the animal, and this stress can seriously affect the results of the study. This argument also ignores the fact that both humans and animals suffer from diseases that cause years or even a lifetime of pain.

Other people argue that medical scientists already know enough; we need to use what we already know. But do we know enough about diseases such as cancer, heart disease, AIDS, and Sudden Infant Death Syndrome? If enough is known about these diseases, why are thousands of people dying from them each year?

Currently, an earnest struggle is being waged between those who are seeking to reduce pain and suffering through the judicious use of animal research and those who wish to eliminate all use of animals—not only for research, but also for food and as pets. In recent years, some groups have resorted to threats and even violence in efforts to disrupt important research. Laboratories have been broken into, animals have

been stolen, and scientific equipment and important research data have been destroyed.

Animal rights groups have attempted to distort the facts about animal research. They refuse to acknowledge the important contribution of this research and argue that no research using animals is justified. They claim that the medical community no longer supports the use of animals in research. Nothing could be further from the truth. The American Medical Association has several current policies that strongly emphasize its support for the humane use of animals in biomedical research in all institutions and research facilities.<sup>10</sup>

Animal rights groups grossly exaggerate the number of animals used in research. They claim the majority of research animals are primates and stolen pets. Yet, as previously stated, 90 percent or more of the animals used in research each year are mice, rats, and other rodents—cats, dogs, and other animals, such as hamsters, guinea pigs, rabbits, primates, and farm animals collectively make up the small remaining percentage of animals. This concern for our pets is being focused in the wrong direction. Millions of pets end up in animal shelters; according to the Humane Society of the United States, an estimated 3–4 million of these dogs and cats are killed each year because they are senselessly abandoned by their owners.<sup>11</sup>

Animal rights groups attempt to portray researchers as “mad scientists” who work with no supervision or control. But stringent controls are in place by the federal government through the Animal Welfare Act and its amendments, in place since 1966. Research laboratories where animals are used must meet strict federal, state and local requirements. Federal regulators routinely inspect laboratories to ensure that animals are adequately housed and cared for. In addition, many laboratories submit to additional voluntary inspection for accreditation through the Association for the Assessment and Accreditation of Laboratory Animal Care International (AAALAC).



Animal rights groups often portray researchers as mad scientists with no regard for the lives of animals. Much of their literature also has grossly exaggerated or false claims, including the notion that most research animals are primates or stolen pets.

Some people also argue that animal research is no longer necessary because modern technology can replace the use of animals. Researchers frequently use modern technology, such as computer models and tissue cultures, in their research. However, many factors affecting both human and animal lives can only be studied using research animals. The use of research animals has been and will continue to be essential to finding the causes and cures for many diseases.

It is essential that more people become involved in this debate because the health of the entire nation, even the world, will be affected by its outcome. We hope that you will encourage others to become informed about the vital issue of using animals in biomedical research. As you begin to understand the facts more fully, you will agree that the judicious use of animals in research offers the greatest hope of improving the lives of both humans and animals.

### Learn More

The publications and databases listed below, as well as the online catalogs and databases at a large community or university library, can be very useful in searching for more information on the use of animals in biomedical research.

**The Readers' Guide to Periodical Literature:** This index lists articles published in general interest magazines. It should be available at even the smallest branch library.

**Index Medicus:** This index is a bibliography of medical journals and lists a wide range of periodicals related to the field of medicine.

**Social Science Citation Index:** This index lists journals in the field of social science, such as psychology and sociology.

**Applied Science and Technology Index:** This index includes journals in the hard science fields, such as engineering, chemistry and physics.

**Biological and Agricultural Index:** This index contains listings from journals dealing with life sciences, such as animal science, biology and biochemistry.

**Google Scholar:** This freely accessible web search engine indexes full-text articles across an array of formats and disciplines.

**Web of Science:** This online academic database covers journals of science, technology, social sciences, and more.

Here are some topics to get you started:

- Animal Husbandry
- Animal Testing Alternatives
- Animal Welfare
- Animal Welfare Act
- Animals, Laboratory
- Animals, Research
- Animals, Treatment of
- Biomedical Research
- Diseases, Animal Models
- Diseases, Cures, Treatments

- Laboratory Animals
- Research, Biomedical
- Research, Laboratory Animals
- Institutional Animal Care and Use Committee (IACUC)

You may also want to search for individual species of animals such as rat, rabbit, nonhuman primate, etc.

### Additional Resources

- American Association for Laboratory Animal Science: <http://www.aalas.org>
- American Veterinary Medical Association: <http://www.avma.org>
- Americans for Medical Progress Educational Foundation: <http://www.AMProgress.org>
- American Welfare Act: [www.nal.usda.gov/awic/legislat/usdaleg1.htm](http://www.nal.usda.gov/awic/legislat/usdaleg1.htm)
- Association for Assessment and Accreditation of Laboratory Animal Care International: [www.aaalac.org](http://www.aaalac.org)
- Foundation for Biomedical Research: <http://www.fbresearch.org>
- Guide for the Care and Use of Laboratory Animals: [www.nap.edu/books/0309053773/html/index.html](http://www.nap.edu/books/0309053773/html/index.html)
- National Institute of Health, Office of Laboratory Animal Welfare: <http://grants.nih.gov/grants/olaw/olaw.htm>
- National Institute of Health Office of Science Education: <http://science-education.nih.gov/>
- PHS Policy on Humane Care and Use of Laboratory Animals: <http://grants.nih.gov/grants/olaw/references/phspol.htm>
- States United for Biomedical Research: [www.statesforbiomed.org](http://www.statesforbiomed.org)
- Toxicology Education Foundation and Society of Toxicology: <http://www.toxicology.org/publicoutreach/air/air.html>
- United States Dept. of Agriculture, Animal Care: [www.aphis.usda.gov/ac](http://www.aphis.usda.gov/ac)
- United States Food and Drug Administration: [www.fda.gov](http://www.fda.gov)

### References

1. Webster's Dictionary of the English Language.
2. World Health Organization: [www.who.int/en](http://www.who.int/en)
3. National Institute on Aging: [www.nih.gov/nia](http://www.nih.gov/nia)
4. United States Dept. of Agriculture: [www.aphis.usda.gov/ac](http://www.aphis.usda.gov/ac)
5. Cornell University Feline Health Center: [www.vet.cornell.edu/fhc](http://www.vet.cornell.edu/fhc)
6. UNICEF: [www.unicef.org/polio](http://www.unicef.org/polio)
7. American Diabetes Association: <http://www.diabetes.org/uedocuments/NationalDiabetesFactSheetRev.pdf>
8. National Diabetes Information Clearinghouse: <http://diabetes.niddk.nih.gov>
9. American Heart Association: [www.americanheart.org](http://www.americanheart.org)
10. American Medical Association: [www.ama-assn.org](http://www.ama-assn.org)
11. The Humane Society of the United States: [www.hsus.org](http://www.hsus.org)

