

The Use of Animals in Research and Teaching at Cornell

*advancing human
and animal health
through the safe,
humane, and judicious
use of animals*



“Cornell University regards the use of animals in research and teaching as essential to continued progress in science, engineering, medicine, agriculture, and education. We also consider it essential to devote all resources necessary to adhere to the highest ethical standards of animal care and use.”

**—Biddy Martin,
Cornell University Provost**



A Message from Cornell University's Chief Veterinarian

This brochure is written to give you a better understanding of why and how Cornell scientists use animals in their research and teaching. I recognize that members of the public have a special interest in these activities. I hope the information presented here answers your questions.

The knowledge scientists gain from studies involving research animals contributes to saving the lives of humans and animals and brings advances in the diagnosis and treatment of the major diseases—from cancer, heart disease, and diabetes to birth defects, neurological disorders, and emerging infectious agents.

The faculty acknowledges the seriousness of using animals in pursuit of scientific discovery. Researchers carefully consider all alternatives, but the current state of basic biological knowledge often still requires that scientists must rely on living systems for credible results. The vast majority of research animals are bred solely for this purpose.

The clinical health and behavioral well-being of animals used in research and teaching are guaranteed by an interlocking set of state and federal laws and guidelines to which Cornell must comply. Cornell strives to go beyond the requirements and guidelines to ensure the clinical and behavioral well-being of research animals. The Cornell University Institutional Animal Care and Use Committee—of which two members are drawn from the Ithaca community and are not affiliated with the university—reviews and monitors animal research to help ensure compliance with these regulations. The Cornell Center for Animal Resources and Education (CARE) and Laboratory Animal Services, with its staff of specially trained veterinarians and technicians, assists the faculty in meeting their legal and ethical responsibility for providing the most humane care possible.

Please consult the web sites listed at the end of this brochure for more details or contact my office directly by phone at 607-253-4378 or by e-mail at care@cornell.edu.



Michele Bailey, DVM, MRCVS, DACLAM
Associate Vice Provost for Research Animal Resources
Director, Laboratory Animal Services

Promoting human health through animal research

Scientists have housed animals for study at Cornell since shortly after the university opened in 1868. A century ago, one of the original areas of study in the new College of Agriculture was how to improve the egg-laying capacity of chickens.

Success in breeding chickens that produce an egg every day has brought an unexpected finding. Chickens spontaneously develop ovarian cancer of the same type as women. Watching tumors grow in chicken ovaries offers today's Cornell scientists an unparalleled view of the factors that can promote (and protect against) this most deadly form of reproductive-system cancer.

One of the newest animals involved in research at Cornell is an inch-long native of India—the zebra fish. This simple-to-care-for fish is making it possible for scientists to figure out the cause of cleft lip, a birth defect that deforms the face and hinders the speech of one child out of every 1,000 born around the world.

How can a tiny fish shed such light on a seemingly unrelated problem? Zebra fish fertilize their eggs in plain view. What's more, the eggs themselves are transparent, so from the moment of conception, researchers can track the development of each cell. Cornell scientists have discovered a startling fact: cells that will form the face of the fish originate in the crown of the head and migrate forward. Presuming that human face cells migrate in the same fashion, scientists will be able to design experiments to see how exposure to substances (drugs, alcohol, and pesticides, for example) during pregnancy interfere with the cells that form the face of a newborn child.

Assuring humane care

Humane care and appropriate treatment of research animals is a priority at Cornell.

Institutions using animals for research and teaching must establish and maintain standards and safeguards protecting the health and well-being of the animals. Institutions failing to do so will risk losing federal and state research grants and may face criminal prosecution. But beyond regulations and proscriptions detailed in such federal laws as the Animal Welfare Act of 1966 (as amended in 1990) and the Health Research Extension Act of 1985, Cornell is committed to treating animal research subjects with care and dignity. Cornell has a stringent set of closely monitored university policies to that end.

Cornell requires that scientists who receive federal funding for animal research must adhere to standards and practices delineated in the 118-page *Guide for the Care and Use of Laboratory Animals* published by the Institute of Laboratory Animal Resources of the National Research Council. The guide, written by a collaboration of research scientists, veterinarians, and laypersons representing the public's interest in animal welfare, details do's and don'ts of veterinary care (surgery, analgesics, anesthesia, and euthanasia methods), housing conditions (including food, water, sanitation, temperature, humidity, lighting, and drainage), and a physical environment that promotes psychological well-being (exercise and companionship). Similarly, the care of agricultural animals is detailed in the

Guide for the Care and Use of Agricultural Animals in Agricultural Research and Teaching, published by the Federation of Animal Science Societies.

Inspectors from the New York State Department of Health and the U.S. Department of Agriculture conduct unannounced inspections at least once a year to assure compliance.

Cornell also voluntarily participates in a rigorous peer review evaluation conducted by the Association for Assessment and Accreditation of Laboratory Animal Care International (AAALAC), an independent non-profit organization that is dedicated to the "responsible and humane use of animals in science" around the world. Every three years, AAALAC site visitors comb through every venue where animals are housed or used at Cornell as well as all of the records that relate to their care and feeding. In its latest reevaluation, in March 2004, AAALAC International called Cornell's care and use of animals "exemplary."

How are animals used?

Before any animals can be acquired for use in research and teaching at Cornell, the lead researcher ("principal investigator" in academic parlance) or faculty member must submit a detailed scientific justification of their use as part of a formal "Protocol Review Form for the Use of Live Vertebrates in Research, Teaching, or Demonstration" to the Cornell University Institutional



Cornell Research Benefits Animal Health

Many of the studies using animals at Cornell have resulted in significant benefits to animal health. Over the years, scientists at the College of Veterinary Medicine have protected animals against infectious and hereditary diseases. They have developed vaccines, such as for canine parvovirus; diagnostic tools, including a genetic test to determine carriers of canine eye disease and the ELISA test for detecting feline coronavirus; and methods of controlling the spread of pathogenic organisms among the major food-producing animals: cows, chickens, and hogs. New testis grafting techniques preserve the genetics of endangered species.





Animal Care and Use Committee (IACUC). This protocol describes everything that happens to an animal from the outset of a proposed experiment until its conclusion. The protocol must be approved by the IACUC and is required by peer-reviewed professional journals for publication of research results.

All individuals named on a protocol must undergo IACUC training a minimum of every five years. In addition to technical information, the training sets forth ethical principles and guidelines for practicing humane care and euthanasia. The veterinary staff offers additional species-specific training as well.

Mandated by federal law in 1983, the IACUC oversees Cornell's animal program, facilities, and procedures. Its members—a veterinarian, a biosafety officer, an animal care technician, at least five faculty members (one nonscientist minimally), and at least two individuals with no Cornell affiliation—review the status of each animal and the areas in which they are housed and used at least twice a year. The IACUC has the authority to stop an experiment at any time if the committee feels that the health and welfare of an animal is at risk.

Veterinarians from the Cornell Center for Animal Resources and Education (CARE) routinely visit animal facilities to work with the investigators and animal care staff. CARE veterinarians have specialized training and experience in the clinical care of animals used in science and teaching and advise researchers on the most humane way to practice analgesia, anesthesia, and surgery. They are available twenty-four hours a day, seven days a week as needed, to examine and treat animals when necessary. In addition to these interventions, they conduct visits approximately once a month.

As an added safeguard, animal care technicians, who care for the animals every day, are trained by CARE veterinarians to spot any signs of injury, ill health, or abnormal behavior and to alert a CARE veterinarian immediately if they find any irregularity. A whistleblower section of the federal Animal Welfare Act decrees that “no facility employee, committee member, or laboratory personnel shall be discriminated against or be subject to any reprisal for reporting violations to any regulations or standards under the Act.”

Which species?

Rodents, fish, birds, amphibians, and reptiles account for the vast majority of the animals used in research and teaching at Cornell. Other species include cockroaches, mosquitoes, rabbits, dogs, woodchucks, cats, and agricultural animals.

How many animals? As few as possible

Only 10 percent of all research conducted at Cornell involves animals—the same percentage of studies that employ human subjects.

When animals are involved, every effort is made to keep their number as low as possible without jeopardizing scientific

validity. There are financial as well as ethical considerations. Investigators must pay for the care of their animals from research budgets, and that can get expensive. Maintaining mice amounts to 35 percent of a project's budget, for example, and care of the chickens involved in the ovarian cancer studies costs \$1,000 per month. Shortcuts would be counterproductive; when scientific research involves animals, reliable results depend on superior animal care.

In the College of Veterinary Medicine, where some animals are used for teaching, the total number has been reduced significantly over the past decade. Plastic models help illustrate the principles of fracture repair. Students practice incisions, dissections, and suture on purchased pigs' feet. And stuffed animals stand in for the real thing for teaching how to drape parts of the body in preparation for surgery.

The most common surgical procedure performed by a veterinarian—neutering and spaying—is performed on cats from humane society shelters. After a day's recuperation, these animals return to the shelter, more attractive for adoption with their neutering done.

The IACUC ensures that a project meets the criteria of “scientific merit” as defined in the *U.S. Government Principles for the Utilization and Care of Vertebrate Animals Used in Testing, Research, and Training*: “Procedures involving animals should be designed and performed with due consideration of their relevance to human or animal health, the advancement of knowledge, or the good of society.”

The versatile mouse

Small, easy to care for, and a prolific breeder, the mouse is a versatile research subject. For example, mice become elderly in a year or two, making them perfect for studies on the aging process. Further, transgenic mice (those with a non-native gene) offer unprecedented insights into ways that individual genes function. Scientists can turn off specific genes or parts of genes (in what they call a “knock-out mouse”) or enhance the function of a gene (in a “knock-in mouse”), then watch for consequences.

In the field of cancer alone, Cornell scientists are using such mice to perfect optical biopsies that will detect disease without removing tissue, determine what changes in cells to cause them to proliferate into tumors, and understand how breast cancer metastasizes into lung cancer. Other studies involving transgenic mice focus on diseases such as tuberculosis and the influenza virus. Others investigate cognitive processes such as social recognition and memory. Some studies attempt to broaden our basic understanding of metabolic processes such as the secretion of insulin and the processing of vitamins and nutrients, while other research aims to perfect tests that can safeguard the public from tainted food and drinking water.

Why are mice so valued as laboratory animals? Scientists theorize that shortly before dinosaurs became extinct about 75 million years ago, mice, rats, and humans inherited genes from a common mammalian ancestor. Around 90 percent of the estimated 25,000 to 30,000 genes in a rodent have counterparts in humans, making rodents ideal models for studying human disorders. We know that Alzheimer’s and other neurodegenerative diseases attack neurons, cells that communicate between the body and the brain, but we don’t know why. Cornell scientists trying to understand why a strain of mutant mice had unusual coat color have found that the brains of these animals show the same kind of tissue degeneration—with fluid-filled holes where gray matter should be—present in human neurodegeneration. This finding may lead to a breakthrough.

Other scientists at Cornell are studying rats to gauge the impact of early childhood lead exposure. Recent experiments have shown that even short-term, early exposure to lead produces lasting impairments in learning and in the ability to sustain attention in rats. What’s more, although the performance of all rats was disrupted by making a wrong choice (in learning tasks), the disruption produced by an error was significantly greater for the lead-exposed rats than in controls. This suggests that the poorer performance of lead-exposed individuals in various cognitive tasks is not only due to learning and attention problems but also due to a problem in dealing with the affective or emotional response of making mistakes.



Frequent questions about animal research at Cornell

1. Why can't computer models replace animals in teaching and research?

Living organisms are complex almost beyond imagining. Because computer models can be built only with known variables, the activity of many thousands of proteins, for example, would need to be thoroughly understood before a computer simulation could be built. Even an action as seemingly simple as a horse jogging is composed of so many sophisticated movements that no computer simulations are detailed enough to demonstrate a normal gait, let alone an impaired one. The only way scientists can study the development of a disease is to watch it develop in a living organism. Likewise, there's no substitute for the real thing in imparting hands-on skills to prospective surgeons.

2. Can experiments involving laboratory animals harm the environment?

Not with the kind of precautions taken at Cornell. The very few experiments that involve infectious pathogens are conducted only in a facility with an appropriate biosafety level. Liquid waste, such as water used for sanitizing, is disinfected and then put down a sanitary sewer. Solid waste that is not incinerated, such as red biohazard bags containing used syringes, is shipped off campus for disposal as regulated medical waste. At the conclusion of such experiments, animals are humanely

euthanized. All research at Cornell involving biological agents or toxins must have a protocol approved by the Institutional Biosafety Committee in addition to an approved animal protocol.

3. Are lost or stolen pets used as laboratory animals?

No. All animals used in teaching and research must be acquired legally, following detailed regulations. With the exception of a small number of donated animals (usually large animals such as horses), all of the research and teaching animals are bred solely for that purpose and acquired through licensed vendors.

4. Don't most laboratory animals live a life of pain and suffering?

No. Ninety-nine percent of the animals used in research and teaching at Cornell experience no pain or distress or receive appropriate pain-relieving drugs.

5. What happens to the animals when experiments are completed?

All transgenic animals (those to whom a non-native gene has been introduced) are humanely euthanized. Other animals may also be humanely euthanized as part of the research, to examine tissue, for example. Dairy cows involved in nutrition studies or horses used for teaching demonstrations are returned to the dairy herd or put back in pasture.

6. Is cloning being done at Cornell?

Currently, there are no research projects at Cornell that will lead to cloning whole animals, but this depends on faculty initiatives. Cornell researchers in the past have helped develop and refine techniques for artificial insemination, *in vitro* fertilization, embryo transfer, and gene transfer.

7. Does anyone profit from the use of research animals at Cornell?

As an educational and research institution, Cornell's mission is to share the fruits of its research for the public good. When a patentable discovery (intellectual property) arises from research, ownership of the patent rights resides with the university. Cornell may license use of patented discoveries to other interested parties including nonprofit agencies, philanthropic foundations, and government agencies that can assist the university in distributing the invention for the greatest good. A license also may be given to a business such as a pharmaceutical firm for commercial development and distribution. Proceeds, if any result, go to the inventor, the university, and the relevant college under an established formula. Revenue from the licensing of intellectual property arising from animal research is modest and is generally used to fund further research. Studies conducted at Cornell focus on agriculture, the environmental sciences, biomedical engineering, veterinary medicine, the life sciences, and psychology, including basic biology and behavior. Cornell scientists do not conduct cosmetic testing.



Here on Campus

The Cornell Center for Animal Resources and Education (CARE)—part of the Vice Provost for Research's office—is located in the College of Veterinary Medicine. Headed by the official university veterinarian, it is a group of veterinarians, veterinary technologists, and support staff responsible for the welfare of animals used in research and teaching at Cornell. The head of CARE is board certified by the American College of Laboratory Animal Medicine (ACLAM)—a specialty recognized by the American Veterinary Medical Association. This certification indicates completion of specialized training in the care and use of animals used in science and teaching. Other staff have degrees in veterinary medicine and have received extensive training and experience in the field.

To learn more about the services provided to researchers by CARE go to www.research.cornell.edu/care.

The web site for the American College of Laboratory Animal Medicine is www.aclam.org.

All Cornell faculty members, post-doctoral fellows, graduate students, undergraduates, and research personnel involved in the care and use of animals in research and teaching and department heads where such work takes place are required to familiarize themselves with and follow university policy regarding the ethical standards for animal care. This nineteen-page policy can be found at www.univco.cornell.edu/policy/CURA.for.html.

The entire protocol review form filled out by every principal investigator can be seen at www.research.cornell.edu/IACUC.

To learn more about other organizations committed to safeguarding the welfare of animals used in research and teaching, see these web sites:

Association for Assessment and Accreditation of Laboratory Animal Care International: www.aaalac.org

Foundation for Biomedical Research: www.fbresearch.org

National Association for Biomedical Research: www.nabr.org

American Association for Laboratory Animal Science: www.aalas.org

Americans for Medical Progress: www.ampef.org

New Jersey Association for Biomedical Research: www.njabr.org

Massachusetts Society for Medical Research: www.msmr.org

Pennsylvania Society for Biomedical Research: www.psbri.org