

Trends in Animal Research

Increased concern for animals, among scientists as well as the public, is changing the ways in which animals are used for research and safety testing

by Madhusree Mukerjee, *staff writer*

There is no question about it: the number of animals used in laboratory experiments is going down. In the U.K., the Netherlands, Germany and several other European countries, the total has fallen by half since the 1970s. In Canada, mammals have largely been replaced by fish. The figures for the U.S. are unclear. The U.S. uses between 18 and 22 million animals a year, but exact numbers are unknown for roughly 85 percent of these—rats, mice and birds. Primate use has stayed constant, whereas the use of dogs and cats is down by half since the 1970s.

No one reason accounts for the decline, but several factors are obvious. In 1975 the animal-rights movement exploded onto the scene with the publication of *Animal Liberation* by the Australian philosopher Peter Singer. The book's depiction of research, and a series of exposés by suddenly vigilant activists, threw a harsh spotlight on scientists. In the following years, public perceptions of animals became increasingly sympathetic. Dian Fossey, Jane Goodall and other ethologists related to an enthralled audience tales of love, sorrow,

jealousy and deceit among primates. Although not so popular with scientists, such anthropomorphic views of animals fueled the passage of laws regulating experimentation.

And the scientists have changed. Those entering the biomedical profession in recent decades have imbibed at least some of the concerns of the movement, if not its ideals; many are willing to acknowledge the moral dilemmas of their craft. Some experiments that were applauded in the 1950s would not be done today, because they would be deemed to cause too much suffering. Oftentimes biotechnology is allowing test tubes to be substituted for animals. And a few researchers, cognizant that only their expertise can help reduce the need for animals, are avidly seeking alternatives. All these efforts are bearing fruit.

The Philosophers

The underlying force behind these changes appears to be society's evolving views of animals. These perceptions owe a great deal to philosophy and to science—and very little to reli-

gion. The Bible is unequivocal about the position of animals in the natural order: God made man in his image and gave him dominion over all other creatures. And although Hinduism and Buddhism envisage a hierarchy of organisms rather than a sharp division, their influence on the animal-rights movement is limited to vague inspiration and vegetarian recipes. The real roots lie in secular philosophy. In 1780 the English barrister Jeremy Bentham asked what "insuperable line" prevented humans from extending moral regard to animals: "The question is not, Can they reason? nor, Can they talk? but, Can they suffer?"

The question became more poignant in 1859 with the advent of Charles Darwin's theory of evolution. The theory provided a scientific rationale for using animals to learn about humans, and Darwin endorsed such use. But he also believed in an emotional continuum between humans and animals and was troubled by the suffering that experimentation could cause. This dichotomy inspired clashes between animal lovers and experimenters in 19th-century England, culminating in the 1876 British

The Evolution of Animal Use in Research

1822 **British anticruelty act** introduced by Richard Martin (holding donkey). He later founded the RSPCA



ROYAL SOCIETY FOR THE PREVENTION OF CRUELTY TO ANIMALS

1859 **Charles Darwin** publishes the theory of evolution

THE ORIGIN OF SPECIES

BY MEANS OF NATURAL SELECTION,

OR THE

PRESERVATION OF FAVOURED RACES IN THE STRUGGLE FOR LIFE.

By CHARLES DARWIN, M.A.,

CORBIS-BETTMANN

1866

Henry Bergh founds ASPCA in U.S.



CORBIS-BETTMANN

Cruelty to Animals Act regulating animal experimentation. But the phenomenal success of medicine in the next century made the animal-protection movement recede into the background.

It rebounded in the 1970s, with Singer's attack. A philosopher in the utilitarian tradition of Bentham, Singer holds that in all decisions the total amount of good that results—human and animal—should be weighed against the suffering—human and animal—caused in the process. Not that to him the interests of humans and animals have equal weight: life is of far greater value to a human than, for example, to a creature with no self-awareness. But if there is something one would not do to, say, a severely incapacitated child, then neither should one do it to an animal that would suffer as much. Ignoring the interests of an animal just because it is not human is, to Singer, "speciesism," a sin akin to racism. Invoking the connections between humans and the great apes, Singer, Goodall and others have issued a call for these creatures, at least, to be freed from experimentation.

Although Singer started the modern animal-rights movement, it takes its name and its most uncompromising ideas from Tom Regan's *The Case for Animal Rights* (University of California Press, 1983). Regan believes that all humans and most animals have inherent rights, which he describes as invisible "no trespassing" signs hung around their necks. They state that our bodies may not be transgressed, no matter how much good might thereby result. Regan does not equate humans with animals—to save survivors in a lifeboat, a dog could be thrown overboard before a human would—yet he states that animals cannot be experimented on, because

they are not merely means to an end.

Many other philosophers have lent their voices to the animals, but few have come to the aid of researchers. One who did so, Michael A. Fox, author of *The Case for Animal Experimentation* (University of California Press, 1986), later declared himself convinced by his critics and became an advocate for animals. Attempts to refute Singer and Regan usually involve pointing to morally relevant criteria that separate humans from animals. Raymond G. Frey of Bowling Green State University has written that animals cannot have interests, because they cannot have desires, because they cannot have beliefs, because they do not have language. Regan counters that a dog may well believe "that bone is tasty" without being able to formulate the phrase and that a human infant would never learn to speak unless it could acquire preverbal concepts to which it could later assign words, such as "ball."

Another supporter of research, Carl Cohen of the University of Michigan, has argued that rights are not inherent: they arise from implicit contracts among members of society, and they imply duties. Because animals cannot reciprocate such duties, they cannot have rights. This argument meets with the retort that infants and the mentally ill cannot fulfill such obligations either but are not left out of the realm of rights: Why omit animals? (One response is that human rights are based on characteristics of "typical" humans, not on borderline cases, prompting animal advocates to ask what these special qualities are—and so on and on.)

Some research proponents also note that nature is cruel: lions kill zebras, cats play with mice. Evolution has placed humans on top, so it is only natural for us

to use other creatures. This argument, which some say elevates "survival of the fittest" to a moral philosophy, falls prey to a proposition called the naturalistic fallacy. To paraphrase the 18th-century philosopher David Hume, what "is" cannot dictate what "ought to be." So natural history may well illuminate why human morals evolved into their present form, but humans can transcend their nature. One animal advocate declares: "Killing and eating [meat] is an integral part of the evolution of human beings. Not killing and not eating [meat] is the next step in our evolution."

Many philosophers fall into the troubled middle, arguing for interests or rights to be ordered in a hierarchy that allows some uses of animals but bars others. Such distillations of animal-liberation ideas have been finding their way into legislation. The U.K., Australia, Germany and several other nations require a utilitarian cost-benefit analysis to be performed before an animal experiment can proceed. And in November 1996 the Netherlands passed into law the statement that animals have "intrinsic value": they are sentient beings, entitled to the moral concern of humans.

The Public

Not that, of course, all the Dutch are vegetarians. Rational argumentation may have influenced public opinion, but as Harold A. Herzog, Jr., a psychologist at Western Carolina University, remarks, the average person's stance on animal issues remains wildly inconsistent. In one survey, questions phrased in terms of rats yielded a far more pro- vivisection outcome than those mentioning dogs. Jesse L. Owens, a neuroscientist at the University of Alaska, protests

ILLUSTRATION OF SCROLL BY LAURIE GRACE

1876

British Cruelty to Animals Act regulates animal experimentation



1885

Louis Pasteur (at patient's right) develops rabies vaccine



1891

Diphtheria antitoxin produced (serum is being drawn from a horse)

Tetanus antitoxin found



SCIENTIFIC AMERICAN

SCIENTIFIC AMERICAN

OLIVER MECKES Photo Researchers, Inc.

that medical research is “the only use of animals that is essential” and like other researchers is bewildered by people who eat meat and in the same gulp condemn experimentation.

Not surprisingly, the animal-liberation movement has coincided with society’s becoming increasingly distant from farms—and shielded from the reality behind dinner. Those who grew up on farms often see animals as objects to be used, whereas those who had pets tend to express more sympathy. One line along which attitudes divide is gender. In all countries surveyed, women are more pro-animal and antivivisectionist than men, and three quarters of American animal-rights activists are women. Also noticeable is a generation gap. Surveys by Stephen R. Kellert of Yale University find that those who are older or less educated are more likely to see animals as resources, whereas those who are younger or more educated tend to view animals with compassion.

Public support of animal experimentation, though higher in the U.S. than in Europe, has been slowly declining. In 1985, 63 percent of American respondents agreed that “scientists should be allowed to do research that causes pain and injury to animals like dogs and chimpanzees *if* it produces new information about human health problems”; in 1995, 53 percent agreed. Even in disciplines that have traditionally used animals, the trend is unmistakable. A survey by Scott Plous of Wesleyan University finds that psychologists with Ph.D.’s earned in the 1990s are half as likely to express strong support for animal research as those with Ph.D.’s from before 1970. (Part of this result comes from the increased presence of women, but there is a significant drop among men as well.)

Opposition to animal experimentation is often said to derive from antisci-

ence sentiments, aggravated by poor public knowledge of science. But according to a 1994 survey led by Linda Pifer of the Chicago Academy of Sciences, negative attitudes toward animal experimentation in the U.S. correlate only weakly with lack of knowledge about science. And in Belgium, France and Italy, for instance, greater scientific literacy is connected with an increased rejection of animal experimentation.

Sociologists agree that opposition to vivisection derives primarily from sympathy for animals. Almost all animal rightists are vegetarians; many are “vegans,” eschewing milk, eggs, leather and other animal products. “My philosophy of living as softly on the earth as I can is my life,” one activist told Herzog. In striving to cause the least suffering possible, these individuals labor under a heavy moral burden that sits lightly on the rest of us. Some activists have indulged in threatening researchers, breaking into laboratories or even arson. But the number of such illegal acts, listed by the U.S. Department of Justice, dropped from about 50 a year in 1987 to 11 in 1992. (More recent figures are unavailable but are believed to be small.)

Many animal experimenters are also animal lovers. Surveys by Harold Takooshian, a sociologist at Fordham University, reveal that biomedical researchers have the same mixed feelings about animals and animal research as does the general public. (The groups that gave animals the lowest rating and vivisection the highest were farmers, hunters and the clergy.) Thomas M. Donnelly, a veterinarian at the Rockefeller University’s animal center, also runs a shelter to which he takes cats that are no longer needed for research. Almost all the toxicologists and pharmacologists at a 1996 meeting on alternatives to animal experimentation had experience with us-

ing animals and were moved enough by it to seek substitutes. Scientists choose to use animals because they feel it is the only way to help humans. Donald Silver, who did cancer studies on mice at Sloan-Kettering Hospital in the 1970s, recounts that whenever he had doubts about his work, he had only to think about the terminally ill patients in the children’s ward.

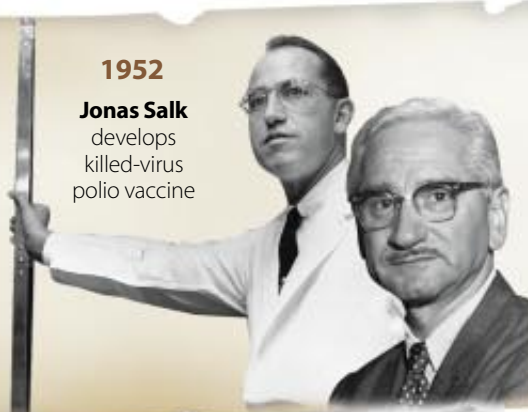
The Scientists

Of course, scientists’ perceptions of animals have evolved as well. In the early 20th century Darwinian worries about emotions were dispelled by the rise of behaviorism. Because thoughts cannot be measured, but behavior can, practitioners such as C. Lloyd Morgan and, later, B. F. Skinner sought to describe animals purely in terms of their responses to stimuli. Bernard Rollin, author of *The Unheeded Cry* (Oxford University Press, 1989), argues that at some point, the animal psyche went from being impossible to measure to being non-existent. The test of a good theory, “Morgan’s canon,” required all actions to be interpreted in terms of the lowest psychological faculties possible. In practice, this meant that a rat would not be feeling pain even if its “writhes per minute” were being used to test the efficacy of an analgesic. Its neurochemistry was merely inducing a physiological reflex.

“We were taught as undergraduates not to think of animals as other than stimulus-response bundles,” asserts Melanie Stiassney, an ichthyologist at the American Museum of Natural History. “The dogma is you can’t credit them with feelings.” In turn, it is often thought undesirable for a researcher to have feelings about the animal under study: emotions can impair professional judgment and also make it hard to perform cer-



1951
Christine Stevens
founds Animal Welfare Institute in U.S.



1952
Jonas Salk
develops killed-virus polio vaccine

1954
Humane Society of the U.S.
founded

1953
Albert Sabin
develops live, attenuated polio vaccine

UPI/CORBIS-BETTMANN

UPI/CORBIS-BETTMANN

tain procedures. Arnold Arluke, a sociologist at Northeastern University who studied animal laboratories from 1985 to 1993, reports that some technicians were deeply disturbed when a playful dog or a roomful of mice had to be put down. Such distress was officially discouraged and therefore kept secret. But after being “burned” by the death of a favorite animal, laboratory workers learned to avoid emotional connections with the creatures.

The resulting dissociation, which is often likened to that of a surgeon from a patient, allows a researcher to function with a minimum of stress. But given the emotional separation, a scientist may not realize when an animal is in pain—especially if the very existence of pain is in doubt. Nowadays, many researchers are aware of dissociation and seek objective ways to detect distress. And animal pain has come into its own. At a 1996 meeting on the *Guide to the Care and Use of Laboratory Animals*—a collection of guidelines that all researchers funded by the National Institutes of Health have to follow—veterinarian Gerald F. Gebhart of the University of Iowa stated that the pain-sensing apparatus is the same throughout the vertebrate kingdom and offered this rule of thumb: “If it hurts you, it probably hurts the animal.”

Increasingly, animal experimenters try to balance scientific imperatives with humaneness. Keith A. Reimann, a veterinarian at Harvard University’s animal facility, does AIDS-related research in monkeys. He insists that a macaque be euthanized as soon as it becomes sick, even if additional information might be gained by following the course of the illness. Franz P. Gruber of the University of Konstanz in Germany, who serves on a board overseeing animal experimentation, says his committee does not allow “death as an end point”—studies

in which the animal dies of the disease or procedure being studied. Instead the committee works with the researcher to define a stage at which the creature can be put out of its misery.

One area of concern to American veterinarians involves paralytic drugs. These agents immobilize an animal for surgery, for six or more hours at a time; anesthesia, however, may wear off in an hour or two. A few researchers are reportedly reluctant to administer additional anesthetics for fear that an overdose could kill the animal before the experiment is over, leading to a loss of data. But without such “topping up,” the animal may become conscious during the operation and not be able to convey, by twitch or cry, that it is in agony. And some scientists object to using painkillers because they do not want to introduce a new variable into the experiment.

Compassionate feelings for animals also influence studies, although researchers rarely admit to such unscientific, if creditable, motivations. When asked about their choice of species subjects, for example, three neuroscientists—working on monkeys, rats and frogs, respectively—replied unhesitatingly that it was determined by the scientific question at hand. But later in the conversation, the frog experimenter confided that he, personally, could not work on “a furry animal,” and the rat experimenter said he would not work with a cat or even with a rat in a more painful protocol.

The Three Rs

Scientists’ concern for animals first became visible professionally in the 1950s, when the behavioristic paradigm came under attack. British zoologist William M. S. Russell and microbiologist Rex L. Burch published *The Principles of Humane Experimental Technique*

(Methuen, London, 1959), in which they put forth the “three Rs.” This principle sets out three goals for the conscientious researcher: replacement of animals by in vitro, or test-tube, methods; reduction of their numbers by means of statistical techniques; and refinement of the experiment so as to cause less suffering. Although they took some decades to catch on, the three Rs define the modern search for alternatives.

Starting in the 1960s, humane organizations and governments began to fund studies in alternative methods. European governments, especially, have invested considerable resources. For the past 15 years, Germany has been giving out about \$6 million a year in research grants alone; the Netherlands spends \$2 million a year (including overheads for its alternatives center). The European Center for the Validation of Alternative Methods, a body set up in 1992 by the European Commission, requires another \$9 million annually. In the U.S., governmental interest has been comparatively low; the National Institute of Environmental Health Sciences (NIEHS) is now offering \$1.5 million worth of grants a year, for three years. And industry provides the \$1 million a year that the Center for Alternatives to Animal Testing (CAAT) at Johns Hopkins University disburses in grants. (Although 15 federal agencies have recently formed the Interagency Coordinating Committee for Validation of Alternative Methods, this venture is as yet unfunded.)

All this effort has yielded a variety of means for reducing animal use. Statistical sophistry, for example, is allowing the classical LD50 (or lethal dose 50 percent) test for acute toxicity to be eliminated. This test requires up to 200 rats, dogs or other animals to be force-fed different amounts of a substance, to determine the dose that will kill half a

1959

William M. S. Russell and Rex L. Burch state **three Rs** of animal experimentation

**REPLACE
REDUCE
REFINE**

1966

Animal Welfare Act (AWA) passed in the U.S.



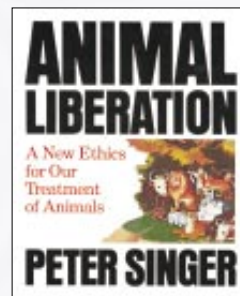
1969

Dorothy Hegarty founds Fund for the Replacement of Animals in Medical Experiments in U.K.

1970

Amendments to AWA cover warm-blooded animals and require pain relief

1975



Peter Singer publishes animal-liberation philosophy

COURTESY OF NEW YORK REVIEW OF BOOKS

group. Although in vitro alternatives are still far away—because the mechanisms underlying toxicity are poorly understood—protocols currently accepted worldwide call for a tenth the number of animals. The Organization for Economic Cooperation and Development, for example, asks for between three and 18 animals to be used: if the substance kills the first three, it need be tested no further.

Another unpleasant procedure is the LD80 test for vaccines. Experimental animals are vaccinated against a disease; they and a control group are then exposed to it. The vaccine passes only if at least 80 percent of the experimental group remains healthy and if 80 percent of the control group dies. Again using statistics, Coenraad Hendriksen of the National Institute of Public Health and the Environment in the Netherlands found a way of testing diphtheria and tetanus vaccines that requires simply checking the level of antibodies. Apart from greatly reducing the suffering, it uses half the number of animals.

“Data mining”—the sifting of mountains of information for relevant new findings—has also proved astonishingly helpful. Horst Spielmann of ZEBET, the German center for alternatives to animal testing, surveyed decades of industry data on pesticides and concluded that if mice and rats prove sensitive to a chemical, it does not have to be tested on dogs. Spielmann anticipates that 70 percent of the dog tests can be dispensed with. Klaus Cussler of the Paul Ehrlich Institute in Langen, Germany, reviewed data on the “abnormal safety test” for vaccines (called the “mouse and guinea pig safety test” in the U.S.), which involves vaccinating mice and guinea pigs and watching for untoward reactions. Their findings led to the test being dropped for vaccines checked in other

standard ways. “It was so senseless,” Cussler shakes his head.

In 1989, after observing that production of monoclonal antibodies in mice with tumors causes much suffering, ZEBET funded industry research into test-tube alternatives. Consequently, the antibodies, used in cancer therapy, are now rarely manufactured in mice in Europe (although mice remain the norm in the U.S.). Production of polio vaccines is another success story. In the 1970s the Netherlands used 5,000 monkeys a year; now kidney cell cultures from just 10 monkeys provide enough vaccine for everyone. Hormones or vaccines manufactured in cell cultures are also purer than those made in vivo (that is, in the animals themselves), so each batch need not be tested as before for safety and efficacy.

In 1993 the Department of Transportation became the first U.S. agency to accept in vitro tests, for skin corrosivity. The traditional test requires placing a substance on a rabbit’s shaved back to see how far it eats in. The test’s replacement uses reconstructed human skin or a biomembrane such as Corrositex—testimony to the role played by venture capital in finding alternatives. Several cosmetics manufacturers have entirely eliminated animal testing: they rely on in-house substitutes or use ingredients that have been tested in the past.

As yet, most researchers in the basic sciences see little hope of replacing animals. They stick to reduction or refinement, such as using an animal lower on the phylogenetic tree. The next spate of cuts in animal use, Spielmann predicts, will come in the field of medical education, for which alternative teaching tools have been devised. British surgeons, in fact, have not trained on animals since the 1876 act banned such use; instead they practice on human cadavers and

later assist experienced surgeons in actual operations. In the U.S., more than 40 of the 126 medical schools do not use animals in their regular curricula.

The most significant change has been in mind-set. Since 1985 in the Netherlands, every scientist starting research on animals has been required to take a three-week course. They learn hands-on procedures, proper anesthesia, specifications of inbred strains and so on—as well as the three Rs. First the students design an animal experiment; then they are asked to find ways of answering the same question without animals. The resulting discussion and hunt for information induces a new way of thinking. “It gives them time for reflection,” says Bert F. M. van Zutphen of Utrecht University, who pioneered the course. “It’s of utmost importance. To know how far I can go for my own conscience.”

The Laws

Another source of change in scientists’ attitudes has been legislation. In the U.S., laws tend to derive from isolated incidents. The Animal Welfare Act of 1966—the federal law regulating animal use—came into being because of Pepper, a Dalmatian believed by its owners to have been stolen and sold to a lab, and a *Life* magazine article depicting starving dogs in dealers’ pens. Perhaps the most significant change came in 1985, in the wake of two exposés involving primates. In Silver Spring, Md., macaques belonging to Edward Taub of the Institute for Behavioral Research were found to be chewing on their limbs, to which the nerves had been cut. And in 1984 videotapes from the University of Pennsylvania Medical Center displayed laboratory personnel mocking baboons whose heads had been smashed in dur-

1981



Center for Alternatives to Animal Testing founded in U.S.

JOHNS HOPKINS SCHOOL OF PUBLIC HEALTH

1985

Amendments to AWA

result from Silver Spring, Md., and Pennsylvania primate exposés



COURTESY OF NATIONAL PRESS BOOKS

1992

European Center for the Validation of Alternative Methods

founded



1996

Second World Congress on Alternatives held in the Netherlands

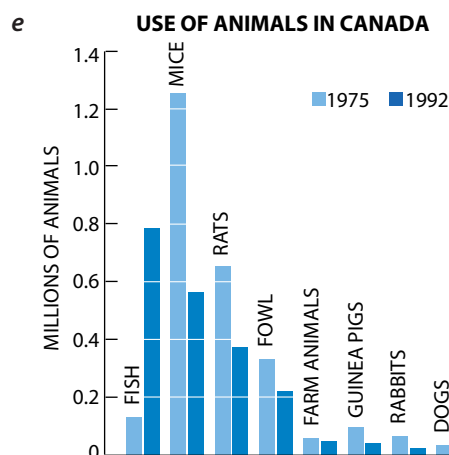
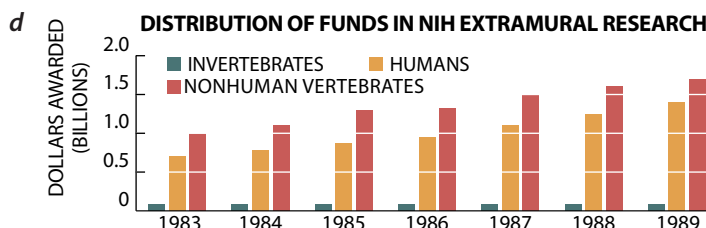
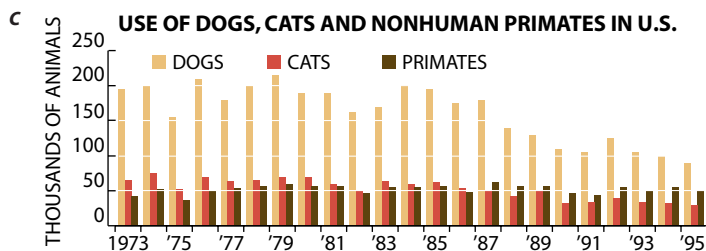
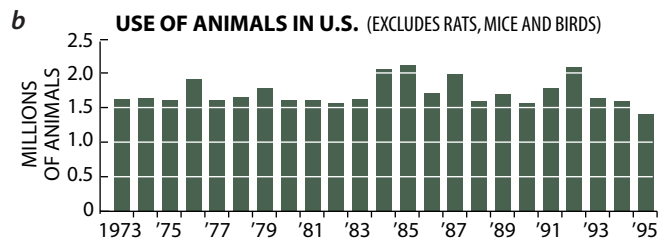
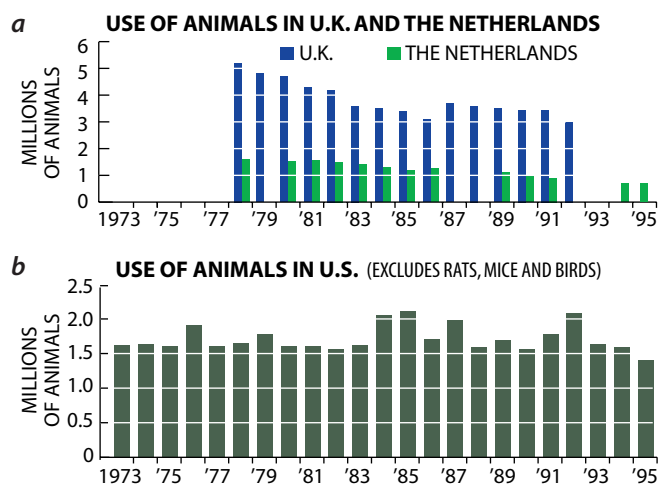
1993

First World Congress on Alternatives held in the U.S.

The Numbers of Research Animals

Use of animals in European laboratories has been slowly declining (*a*). In the U.S., the available statistics (*b*) include primates, dogs, cats, guinea pigs, rabbits, hamsters and others but exclude rats, mice and birds—an estimated 17 million additional animals per year. Primate use is roughly constant, although the numbers of cats and dogs (*c*) is declining. (In many instances, dogs are being replaced by pigs, calves and other farm animals. These have been counted since 1990 but are not included in the chart.) The National Institutes of Health supports research into invertebrate models (*d*); however, funding has been increasing more steeply for vertebrate (and human) studies. In Canada, animal numbers (*e*) have hovered at around two million a year, but fish have replaced mammals in many areas, especially toxicology.

BRYAN CHRISTIE; SOURCES: USDA (a-c); NATIONAL CENTER FOR RESEARCH RESOURCES, NIH (d); CANADIAN COUNCIL ON ANIMAL CARE (e)



ing experiments on head trauma. The outcry following these revelations allowed Senator Robert Dole of Kansas to bring an amendment to the act. It established institutional animal care and use committees (IACUCs) at each facility using regulated animals and required laboratories to exercise dogs and to ensure the psychological well-being of primates.

The “well-being” clause can be considered an instance of the public’s imposing a scientific paradigm on scientists. An inspector from the U.S. Department of Agriculture, which administers the Animal Welfare Act, sought expert advice at that time on primate psychology. There was no such thing, he was told. Now, just 10 years later, primates have emotions. At the 1996 NIH meeting, Gebhart listed fear, anxiety, boredom, separation and isolation as conditions to which experimenters should attend in their subjects. And a few labs are even trying to enrich the lives of their rabbits.

The laws have generally had the effect of driving up the costs of animal research. Animal protectionists complain, however, that the Animal Welfare Act and its amendments invariably get diluted at the implementation stage. The act, for instance, refers to warm-blooded animals, but the regulations written by the USDA exclude rats, mice and birds. The agency says it does not have funds for inspecting the laboratories that use these creatures, which is true; animal welfarists, however, say the omission originally came from lobbying by the biomedical community. In 1990 humane organizations sued to have these animals included. Although they initially won, the suit was thrown out on appeal, on the grounds that animal protectionists have no legal standing; only those who are injured—that is, the rats, mice and birds—can bring a civil suit. Dale Schwindaman of the USDA has promised, however, to include these animals within the next five years.

Another controversy has to do with so-called performance standards. When writing regulations for the 1985 amendments, the USDA refrained, for example, from stating how many times a week the dogs had to be walked. Such specifics are referred to as engineering standards. Instead the agency allowed each facility to come up with its own plans for dog and primate well-being, the “performance” of which was to be evaluated. (Because these plans are kept in-house, and not with the USDA, the public cannot obtain them through the Freedom of Information Act.)

Researchers are enthusiastic about the flexibility of performance standards, whereas Martin L. Stephens of the Humane Society of the U.S. calls them “euphemisms for no standards.” USDA inspectors are divided. Some argue that the standards are vague and unenforceable. Among others, Harvey McKelvey of the USDA’s northwestern region says they let him use his judgment: “If I see



ANTIVIVISECTION POSTER attacks the rationales behind animal research.

an animal is bored with its toy, I can write that it needs a new one. I couldn't do that with engineering standards." The new NIH guide also embraces performance standards.

The animal care committees have empowered those scientists who wish to cut down on wastage and improve conditions for animals. "If you have an institution with conscientious people, the IACUC system works fairly well," says Ralph A. Meyer of Carolinas Medical Center. Cathy Liss of the Animal Welfare Institute in Washington, D.C., agrees that some committees do far better than the law. But there is concern about the remainder. In 1992 an audit of the USDA's enforcement activities by the Office of the Inspector General revealed that out of 26 institutions selected at random, 12 "were not adequately fulfilling their responsibilities under the act." Everyone agrees that enforcement is inadequate: at present, there are only 69 inspectors, who may not be able to visit each of the 1,300 regulated laboratories (and also animal dealers, transporters and exhibitors) every year.

As a result, the inspectors rely on whistle-blowers. "We need eyes out there," McKelvey explains. It might be an animal-rights activist who has infiltrated a laboratory: groups such as People for the Ethical Treatment of Animals (PETA) prepare detailed case histories that they

present to the USDA or the NIH. Or it might be a researcher or technician.

Still, the USDA can offer few reassurances to informants. A former member of the animal care committee at New York University Medical Center claims to have been fired in August 1995 for protesting irregularities in N.Y.U.'s labs and cooperating with the USDA's investigations. The university states that his position became redundant. But the scientist, along with an administrator who was also dismissed, is suing N.Y.U., as well as the USDA—which, he says, failed to provide whistle-blower protection. (The agency did fine N.Y.U. \$450,000 for assorted violations of the Animal Welfare Act.) Several USDA inspectors express frustration with their agency's provisions on informants. "We can't protect a whistle-blower," McKelvey says. "The regulation is weak."

Unlike civil-discrimination suits, which require only a concatenation of circumstances, the USDA needs to prove that the person was fired because of having blown the whistle.

Also controversial are the statistics on pain and distress provided by the IACUCs to the USDA. They indicate that in 1995, 54 percent of the regulated animals had no pain or distress, 37 percent had distress alleviated by painkillers, and only 8.8 percent suffered unalleviated pain or distress. The data have been widely criticized for being unreliable, because the USDA does not specify how to classify pain. Andrew N. Rowan of the Tufts University Center for Animals and Public Policy has noted that some rather painful procedures, such as toxicity testing or antibody production, are commonly placed in the nonpainful category. Although the USDA proposed a pain scale in 1987, it was withdrawn after objections by researchers.

There are difficulties with assessing animal distress. Nevertheless, many European nations, as well as Canada, Australia and New Zealand, have developed pain scales in which each procedure is assigned a grade. As a result, their reports are more informative. The Netherlands listed in 1995 that 54 percent of animals had minor discomfort, 26 percent had moderate discomfort, and 20 percent suffered severe discomfort.

A pain scale would make it easier for IACUCs to rate the suffering involved in different schemes for doing an experiment. At present, the committees are required to certify that the animal researcher has looked for alternatives and that the number of animals used is reasonable. Alan M. Goldberg of CAAT wishes that they would also evaluate the experimental design. "Right now, using method A, they check: Is it the right number of animals? They don't look at method B or C"—which could involve *in vitro* techniques. Nor—unlike committees in Germany, Australia and elsewhere—are they required to weigh the benefits of research against the suffering or to include representatives of animal-welfare organizations in the review process. (The IACUCs do have to include someone unaffiliated with the institution, but who fills that position is again a source of controversy.)

The Propaganda

Change in the U.S. has been slow and painful. Notwithstanding some evolution of practices, the ferocity of the attacks by the most fervent animal rightsists has led to a sense of moral outrage and an unwillingness to compromise—on both sides. Almost all activists insist that animal research is unnecessary; to them, investigators using animals are cruel and corrupt, consumed by a desire for ever more papers and grants. One antivivisection tract is entitled *Slaughter of the Innocent*, and the cover of another features splashes of blood. To animal liberators, the killing of more than six billion animals a year, mostly for food, represents a holocaust, and Adolf Hitler's doctors are proof that experimenters can be inhumane.

Many animal researchers, in turn, think of animal rightists as being brainless "bunny huggers" at best and dangerous fanatics at worst. Leaflets published by the American Medical Association represent the animal-rights position as equating humans with animals; a quote from Ingrid Newkirk of PETA, "A rat is a pig is a dog is a boy," is offered as evidence. (Newkirk claims her statement was "When it comes to feeling pain, a rat is a pig is a dog is a boy.")

In an essay entitled "We Can't Sacrifice People for the Sake of Animal Life," Frederick K. Goodwin, former head of the National Institute of Mental Health, has argued that the issue of animal rights threatens public health. In this vein, re-

search advocates sometimes portray proposals to control animal research as being attacks on human life. For instance, one organization advises this response to a query about experimentation on pound animals: "How would you feel if the one research project that may save your child's life was priced out of existence because pound animals were banned?" Some writers invoke Hitler as proof that animal advocates are antihuman: he was an animal lover who passed anticruelty laws in 1930s Germany.

Finding itself under moral—and sometimes physical—siege, the research community has often retreated behind electronic surveillance systems—and an ethical code that frequently denounces internal dissent as treason, "giving ammunition to the enemy." One scientist interviewed for this article said that if his criticisms became known, he would be fired. In 1991 two animal researchers, John P. Gluck and Steven R. Kubacki of the University of New Mexico, wrote a treatise deploring the lack of ethical introspection in their field. Gluck testifies that the article quickly changed his status from an insider to a distrusted outsider. Arluke's studies revealed an absence of discussion about ethics: in 33 of 35 laboratories, moral positions were defined institutionally. Newcomers were given to understand that senior scientists had answered all the difficult questions, leaving them little to worry about.

The insulation has made it difficult for changes in other branches of the life sciences—or from across the Atlantic—to filter in. Primatologists, for instance, have been discussing complex emotions in their subjects for decades. But many American experimenters still refuse to use the word "suffering," because it suggests an animal has awareness. Even the word "alternatives" is suspect; instead the NIH describes these as "adjuncts" or "complements" to animal research. Some researchers seem to regard the three Rs as an animal-rights conspiracy. Robert Burke of the NIH has stated: "To argue that we must refine our methods suggests that they are currently inadequate or unethical.... In my view, it is intellectually dishonest and hypocritical to continue to advocate the original three Rs as a goal for science policy. It is also, without question, dangerous to give our enemies such useful tools with which to pervert the scientific enterprise."

Of the 17 institutes included in the NIH, only the NIEHS has been active in researching alternatives. Following a di-

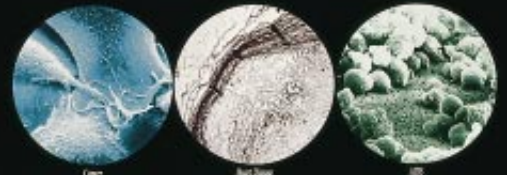
rective by Congress, the NIH awarded about \$2.5 million in earmarked grants between 1987 and 1989. But F. Barbara Orlans of the Kennedy Institute of Ethics at Georgetown University charges that the money did not constitute a special allocation for alternatives: 16 of the 17 grants went to studies that had traditionally been funded. (Like other public health agencies worldwide the NIH supports research into invertebrate, in vitro and computer models that are not billed as alternatives.)

In 1993 Congress directed the NIH to come up with a plan for implementing the three Rs. The resulting document, entitled "Plan for the Use of Animals in Research," is an overview of biomedical models, with some emphasis on nonmammalian systems. "The central message of the plan," explains Louis Sibal of the NIH, "is that scientists have to decide for themselves what the best method of solving their problem is." Whereas the European Union plans to cut animal use in half by the year 2000, a 1989 NIH report stated that animal use is not likely to decrease.

One arena in which the propaganda battles have been especially fierce is the classroom: both sides see dissection as the key to the next generation's sympathies. Animal advocates say dissection in schools is unnecessary and brutalizing and that the 5.7 million vertebrates (mostly wild frogs, but also cats, fetal pigs, pigeons and perch) used every year are procured in inhumane ways. Research advocates fear that without dissection, instruction will be inadequate, and fewer students will be attracted to or equipped for the life sciences.

In 1989, when the National Association of Biology Teachers (NABT) announced a new policy encouraging alternatives, it provoked a violent reaction. Barbara Bentley of the State University of New York at Stony Brook, for instance, denounced the monograph on implementing the policy as "an insidiously evil publication—evil because it is a barely disguised tract produced by animal rightists." An intense campaign followed, and in 1993 the NABT issued a new policy statement, warning teachers to "be aware of the limitations of alternatives." There is no high school dissection in most European countries.

If we stop animal research, who'll stop the real killers?



Without animal research we couldn't have put an end to polio, smallpox, rabies and diphtheria. Now, some would like to put an end to animal research. Obviously, they don't have cancer, heart disease or AIDS.

Foundation for Biomedical Research

FOUNDATION FOR BIOMEDICAL RESEARCH

MEDICAL NECESSITY of animal experiments is emphasized in a pro-research poster.

"It is possible to be both pro research and pro reform," Orlans says. She and others in the troubled middle have a simple message: the impasse must end. Animal liberators need to accept that animal research is beneficial to humans. And animal researchers need to admit that if animals are close enough to humans that their bodies, brains and even psyches are good models for the human condition, then ethical dilemmas surely arise in using them. But the moral burden is not for scientists alone to bear. All of us who use modern medicine and modern consumer products need to acknowledge the debt we owe to our fellow creatures and support science in its quest to do better by the animals. SA

Further Reading

- IN THE NAME OF SCIENCE: ISSUES IN RESPONSIBLE ANIMAL EXPERIMENTATION. F. Barbara Orlans. Oxford University Press, 1993.
- THE MONKEY WARS. Deborah Blum. Oxford University Press, 1994.
- THE ANIMAL RESEARCH CONTROVERSY: PROTEST, PROCESS AND PUBLIC POLICY. Andrew N. Rowan and Franklin M. Loew, with Joan C. Weer. Center for Animals and Public Policy, Tufts University School of Veterinary Medicine, 1995.
- More coverage of the animal-rights debate is available on-line at <http://www.sciam.com>