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A review of trends in animal use in the United States (1972 – 2006)

Jodie Kulpa-Eddy[1], Margaret Snyder[2] and William Stokes[3]

[1]U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Animal Care
[2]U.S. Department of Health and Human Services (DHHS), National Institutes of Health (NIH), Office of the Director, Office of Extramural Research, Office of Extramural Programs
[3]DHHS, NIH, National Institute of Environmental Health Sciences, National Toxicology Program Interagency Center for the Evaluation of Alternative Toxicological Methods

Corresponding author: Jodie Kulpa-Eddy
U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Animal Care
4700 River Road, Unit 84, Riverdale, Maryland, USA 20737
jodie.a.kulpa-eddy@aphis.usda.gov

Abstract
In the United States, research facilities have been required to report information on the numbers of animals used since 1972. These numbers include animals used for experimentation, teaching and testing purposes. This session will present data collected by the U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Animal Care, that show the numbers of animals reported has decreased by almost one-third during this time period. It will include a discussion of the trends noted and provide possible explanations; for example: regulatory changes, developments in research and the implementation of alternative methods.

Keywords: laboratory animals, alternatives, animal usage

Introduction

The Animal Welfare Act (AWA), passed by Congress in 1966, gave enforcement authority to the U.S. Department of Agriculture (USDA). The 1970 amendment to the AWA required the USDA to submit an annual report to Congress regarding its efforts in this area. In 1971, the USDA began requiring research facilities to annually submit information regarding the numbers of animals used in research or experimentation.

A research facility is defined as "any school (except an elementary or secondary school), institution or organization, or person that uses or intends to use live animals in research, tests or experiments…" (US Code, 2004). This includes various businesses and activities such as pharmaceutical companies, universities, hospitals, biotechnology firms, contract testing laboratories and government facilities. The AWA includes a legal definition of "animal" that is different from the dictionary definition. It excludes invertebrates, cold-blooded species (fish, amphibians, reptiles) and certain warm-blooded animals used in specific activities (rats, mice and birds, bred for use in research, and farm animals used in agricultural research). An "animal", according to the legal definition, is "any live or dead dog, cat, monkey (nonhuman primate mammal), guinea pig, hamster, rabbit or other warmblooded animal…" (USDA, 2004).

The earliest USDA reports to Congress, from 1973 to 1978, consisted of the number of experiments involving pain (1973) or the number of animals experiencing pain as a result of the research conducted on them (1974-1978). The reasons given for this outcome was that "almost all instances of unrelieved pain occurred during research, development, or quality control of health products. Tests with animals are required in some instances to obtain data to keep such products safe, pure and effective. Other occasions for unrelieved pain were safety tests that protect users of chemical products, and experiments involving electroanesthesia, mild electric shock or decompression." (USDA, 1974)

In the late 1970s, two additional reporting categories were mandated, as it was the practice of the research community at that time to report them, and they provided more meaningful information. Category "C", the number of animals used in experiments that involved no pain or distress, captures those activities which by their very design, are not likely to produce pain or distress in an experimental animal. Category "D", the number of animals used in experiments with

accompanying pain or distress that was alleviated by the use of drugs, captures those activities where the protocol design has incorporated refinement techniques (one of the "3 R's" of alternatives). Category "E" remains as the number of experimental animals that experienced pain or distress as a result of the studies conducted on them. All of these categories are but one measure used to assure the public that proper attention is being paid to their concerns regarding the use of animals in research.

Results

A compilation of all of the available data, from 1973 to 2006, shows there has been a decline in the number of animals used in research, experimentation, teaching or testing: from just under 2 million in the 1970s and 1980s, to just over 1 million in 2006. This decline is evident in all three reporting categories.

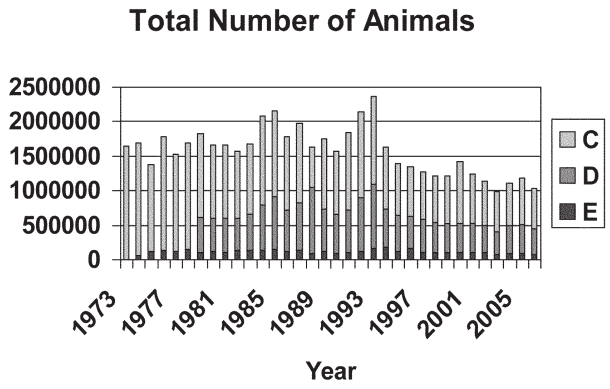

Fig. 1. (Total)

Some specific examples:

Dogs

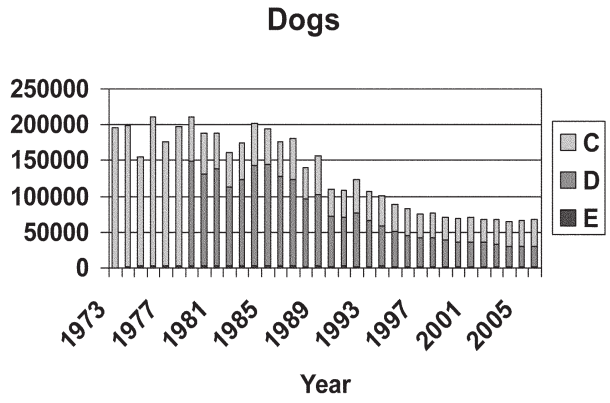

Fig. 2. (Dogs)

In this first example, the number of dogs used in research has declined drastically, from approximately 200,000/year to 66,000/year, and most of this decline is evident in category "D", the number of animals used in research where the accompanying pain was minimized or alleviated. One of the contributing factors to this decline is the fact that dogs are no longer widely used for teaching purposes (Ammons, 1995; Hansen, 2002). Dogs were once utilized for medical education, primarily in physiology and pharmacology courses and in teaching surgical skills. However, the use of human cadavers and manikins as surgical models, and more importantly, advancements in the development of computerized simulators, have replaced the use of the dog in these specific curricula. By 1994, only 77 of the 125 accredited U.S. medical schools used live animals for teaching purposes; today only 12 schools still report doing so (Mangan, 2007).

Rabbits

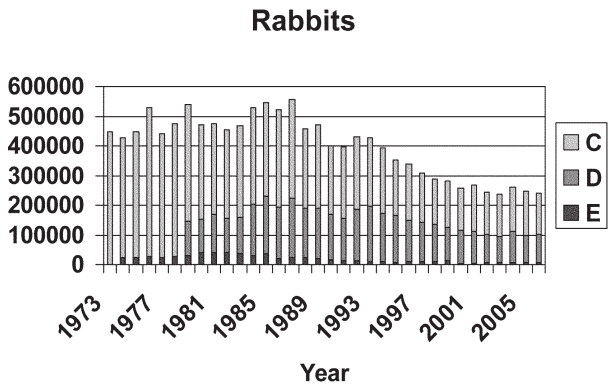

Fig. 3. (Rabbits)

In this example, the number of rabbits used in research has declined by almost half, from approximately 450,000/year to 240,000/year. This is especially evident in Category "E", the number of animals experiencing pain or distress, which has decreased from approximately 25,000/year to 6,000/year. One of the contributing factors to this decline was the recognition that a reduced number of animals could be used to conduct regulatory-required dermal and ocular irritancy tests (Talsma, 1988; Bruner, 1992; Derelanko, 1993). It had been the standard practice to use six animals per test. However, statistical analyses showed the number could be reduced by half (to three animals per test) with only a slight reduction in overall accuracy of the results.

Guinea Pigs

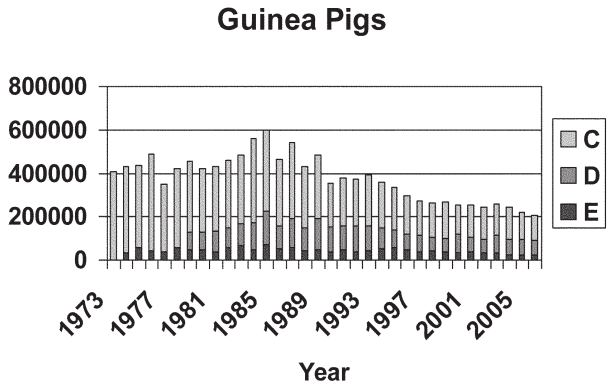

Fig. 4. (Guinea Pigs)

This final example shows the number of guinea pigs used in research has declined by over half, from approximately 450,000/year to 205,000/year. One of the contributing factors to this decline was the regulatory acceptance of a refined testing method. Guinea pigs are the standard animal model for the occluded patch test (Buehler test) for skin sensitizers. In the early 1990s, it was recognized that the mouse Local Lymph Node Assay (LLNA), using an early and more humane endpoint, provided equivalent results for the chemicals tested (Kimber, 1990). The Interagency Coordinating Committee on the Validation of Alternative Methods (ICCVAM) reviewed this method in 1998, and concluded the LLNA was a valid alternative to currently accepted guinea pig test methods (ICCVAM, 1999a). The LLNA was recommended by ICCVAM and accepted by regulatory agencies in 1999 as an alternative to the guinea pig test for allergic contact dermatitis.

Discussion

It must be recognized these data do not reflect the entire universe of animal usage in research in the U.S. The predominant research species, as reported by other national and international authorities, include laboratory mice, laboratory rats and fish. None of these species are included in the U.S. annual reporting requirements, and the extent of their usage is unknown in this country.

It must also be realized there are certainly other contributing factors to these decreases as well. For example, several *in vitro* tests have been evaluated as replacements for the rabbit dermal corrosivity test (ICCVAM, 1999b, 2002). Economic considerations and changes in curriculum or curriculum focus are other reasons given for discontinuing the use of animals for teaching purposes. Healthier and more consistent breeding of animals reduces the number needed to account for variation among individuals.

However, although the number of animals reported has decreased, the number of registered research facilities over the same time period has remained fairly stable and the amount of funding for research has increased dramatically. Therefore, we conclude the trend in the U.S. has been to replace, reduce or refine animal use in research as improved technology, valid statistical analyses and regulatory acceptance allow.

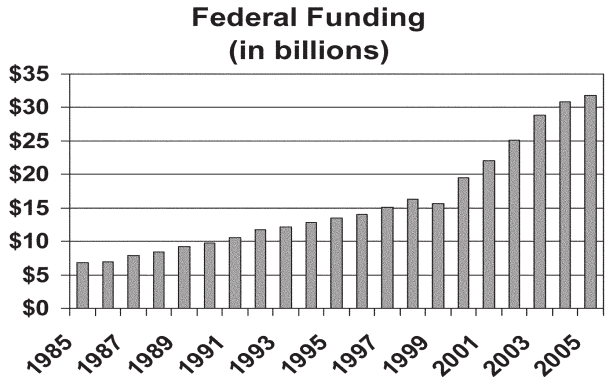

Fig. 5. (Funding)

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