VISUAL
NEUROSCIENCE

# THE HUMANE CARE AND USE OF ANIMALS

*Statement regarding the care and use of animals, approved by the American Physiological Society and by the Society for Neuroscience, April 1984, and adopted by Visual Neuroscience.*

"Continued progress in many areas of biomedical research requires the use of living animals in order to investigate complex systems and functions because, in such cases, no adequate alternatives exist. Progress in both basic and clinical research in such areas cannot continue without the use of living animals as experimental subjects. The use of living animals in properly designed scientific research is therefore both ethical and appropriate. Nevertheless, our concern for the humane treatment of animals dictates that we weigh carefully the benefits to human knowledge and welfare whenever animal research is undertaken. The investigator using research animals assumes responsibility for proper experimental design, including ethical as well as scientific aspects.

"The scientific community shares the concern of society at large that the use of animals in research should conform to standards that are consonant with those applied to other uses of animals by humans. Most of the more specific sections of this document were formulated with respect to research using warm-blooded vertebrates. As a general principle, however, ethical issues involved in the use of any species, whether vertebrate or invertebrate, are best considered in relation to the complexity of the species' nervous system and its apparent awareness of the environment, rather than physical appearance or evolutionary proximity to humans.

"*Factors that relate to the design of experiments.* The primary factor used to evaluate humane treatment in animal research is degree of distress or discomfort, assessed by anthropomorphic judgments made by reasonable and prudent human observers. *The fundamental principle of ethical animal research is that experimental animals must not be subjected to avoidable distress or discomfort.* This principle must be observed when designing any experiment that uses living animals.

"Although most animal research involves minimal distress or discomfort, certain valid scientific questions may require experimental designs that inevitably produce these effects. Such situations, while uncommon, are extremely diverse and must be evaluated individually. It is critical that distress and discomfort be minimized by experimental design. It is also important to recognize that there is no difference between distress and discomfort that may be inherent in a valid experimental design and that which may occur as an unintended side effect. It is therefore incumbent on the investigator to recognize and to eliminate all *avoidable* sources of distress and discomfort in animal subjects. This goal often requires attention to specifics of animal husbandry as well as to experimental design.

"Invasive procedures and paralytic drugs should never be employed without benefit of anesthetic agents unless there is a very strong scientific justification and careful consideration is given to alternatives. Advances in experimental techniques, such as the use of devices chronically implanted under anesthesia, can offer alternative approaches. If these are not feasible, it is essential to monitor nociceptive responses (for example, recordings of EEG, blood pressure, and pupillary responses) that may indicate distress in the animal subject, and to use these as signals of the need to alleviate pain, to modify the experimental design, or to terminate the experiment.

"When designing research projects, investigators should carefully consider the species and numbers of animals necessary to provide valid information, as well as the question of whether living subjects are required to answer the scientific question. As a general rule, experiments should be designed so as to minimize the number of animals used and to avoid the depletion of endangered species. Advances in experimental methods, more efficient use of animals, within-subject designs, and modern statistical techniques all provide possible ways to minimize the numbers of animals used in research. This goal is completely consistent with the critical importance of replication and validation of results to true progress of science.

"*Factors that relate to the conduct of experiments.* Research animals must be acquired and cared for in accordance with the guidelines published in the *NIH Guide for the Care and Use of Laboratory Animals* (National Institutes of Health Publications No. 80-23, Revised 1978). Investigators must also be aware of the relevant local, state, and federal laws. The quality of research data depends in no small measure on the health and general condition of the animals used, as well as on the specifics of experimental design. Thus, proper animal husbandry is integral to the success of any research effort using living animal subjects. General standards for animal husbandry (housing, food quality, ventilation, etc.) are detailed in the *NIH Guide*. The experienced investigator can contribute additional specifics for optimum care for particular experimental situations, or for species not commonly encountered in laboratory settings.

"Surgery performed with the intent that the animal will survive (for example, on animals intended for chronic study) should be carried out, or directly supervised, by persons with appropriate levels of experience and training, and with attention to asepsis and prevention of infection. Major surgical procedures should be done using an appropriate method of anesthesia to render the animal insensitive to pain. Muscle relaxants and paralytics have no anesthetic action and should not be used alone for surgical restraint. Postoperative care must include attention to minimize discomfort and the risk of infection.

"Many experimental designs call for surgical preparation under anesthetic agents with no intent that the animal survive. In such cases, the animals ordinarily should be maintained unconscious for the duration of the experiment. At the conclusion of the experiment, the animal should be killed without regaining consciousness and death ensured before final disposition.

"Certain experiments may require physical restraint, and/or withholding of food or water, as methodological paradigms. In such cases, careful attention must be paid to minimize discomfort or distress and to ensure that general health is maintained. Immobilization or restraint to which animals cannot be readily adapted should not be imposed when alternative procedures are practical. Reasonable periods of rest and readjustment should be included in the experimental schedule unless these would be absolutely inconsistent with valid scientific objectives.

"When distress and discomfort are unavoidable attributes of a valid experimental design, it is mandatory to conduct such experiments so as to minimize these effects, to minimize the duration of the procedure, and to minimize the numbers of animals used, consistent with the scientific objectives of the study."

# VISUAL NEUROSCIENCE

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**Introduction.** This section begins on page 3 and should clearly state the objective of the research in the context of previous work bearing directly on the subject. An extensive review of the literature is not usually appropriate.

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*All experiments involving human subjects must be conducted in accordance with principles embodied in the Declaration of Helsinki (Code of Ethics of the World Medical Association). Experiments involving animal subjects must conform to the principles regarding the care and use of animals adopted by the American Physiological Society and the Society for Neuroscience. The editor may refuse papers that provide insufficient evidence of adherence to these principles.*

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as shown by Herrick (1948)
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Herrick, C.J. (1948). The Brain of the Tiger Salamander. Chicago: University of Chicago Press.

*Chapter in an edited book*

Bonds, A.B. & DeBruyn, E.J. (1986). Inhibition and spatial selectivity in the visual cortex: The cooperative neuronal network revisited. In Models of Visual Cortex, ed. Rose, D. & Dobson, V.G., pp. 292–300. Chichester, England: John Wiley & Sons.

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