Animal Euthanasia

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INTRODUCTION

Euthanatizing agents are commonly categorized into three main categories: inhalant agents, noninhalant pharmacologic agents, and physical methods. The inhalant agents include anesthetic gases, ether, cyclopropane, nitrous oxide, halothane, methoxyflurane, enflurane, isoflurane, nitrogen gas, and hydrogen cyanide gas. They are administered to the animal via a closed chamber, container, or face mask. The noninhalant agents include injectable pharmacologic agents. The preferred route of administration of the noninhalants is by intravenous injection. Physical methods of euthanasia include the use of the captive bolt pistol, gunshot, cervical dislocation, decapitation, electrocution, microwave irradiation, and rapid freezing. The "1993 Report of the AVMA Panel on Euthanasia" (Citation 002) is frequently referred to the veterinary and biomedical community and provides guidelines for recommended euthanatization methods by animal group and species.

Personnel administering an euthanatizing agent must know: 1) whether the agent is appropriate for the species, 2) what route, dose or concentration the agent should be administered, 3) if the agent may result in fear behavior, struggling, or vocalizations, 4) if the animal shows signs of experiencing pain, 5) how rapidly the agent results in unconsciousness, 6) if the agent causes tissue changes, 7) the technical skills for appropriate administration, and 8) if the agent is economical. If the animal is a pet, personnel must also address the emotional needs of the owner. Has the pet owner been informed of alternatives? Has the owner received a complete explanation of the euthanasia procedures? Should the owner be present during euthanasia and should family members be allowed to view the body afterwards?

This Special Reference Brief (SRB) was designed for use by veterinarians, shelter personnel, pet owners, researchers, agriculturists, and zoologists. Bibliographic citations on euthanatizing methods for a variety of animal species in different circumstances are listed. The citations include references from professional journals and books. Selected citations were included from 1981 to present and citations are arranged in chronological order from the most recent to least recent.

This brief is provided for convenience in obtaining access to published material on animal euthanasia. No attempt has been made by the authors or advisors to dictate which method or under what circumstances euthanasia should be performed. That issue remains the responsibility of the professional personnel in each circumstance subject to animal needs, facilities, and the concerns for animal welfare and the reduction in animal suffering. Utilization of this reference list, however, will provide an opportunity to base decisions on published scientific information.
If references are available from the National Agricultural Library Collection (NAL), their call numbers are given. Document delivery information is provided in bulletins 15 and 16 on the Agricultural Library Forum (ALF) for patrons who wish to obtain references through NAL.

The authors wish to express appreciation to Dr. Charles E. Short, Professor of Anesthesiology, at the College of Veterinary Medicine, Cornell University, Ithaca, NY, for his thoughtful insights and review of the initial draft of this special reference brief.


004 Euthanasia. Committee on Pain and Distress in Laboratory Animals; Institute of Laboratory Animal Resources (ILAR); Commission on Life Sciences; and National Research Council. Recognition and Alleviation of Pain and Distress in Laboratory Animals National Academy Press, Washington, DC; 1992, pp. 102-116. NAL call number: SF996 5R43 Descriptors: dogs, cats, ferrets, rabbits, rodents, primates, birds, amphibians, fish, reptiles, methods.


NAL call number: 41.8 V641
Descriptors: animal welfare, legislation, euthanasia.

NAL call number: 41.8 R3224
Descriptors: stun, pistol, animal welfare.

ISSN: 0033-8419.
Descriptors: tetracaine, ammonium compounds, amides, drug combinations, T-61.

010  Veterinarians as members of the humane community.
NAL call number: 41.8 Am3
Descriptors: professional standards, animal welfare, United States, ethics.

NAL call number: aS21 D27S64

NAL call number: aQL55 B36
Descriptors: information resources, euthanasia regulations, methods, multi-species.

013  Recognition and alleviation of pain and distress
NAL call number: Videocassette no. 968
Descriptors: animal welfare, veterinarian, study end points.

014  On the use of T-61 for euthanasia of domestic and
NAL call number: QL55 A1L3
Descriptors: rabbits, dogs, EMG, ECG, end-tidal CO₂, consciousness, butyramide.

NAL call number: QL55 I5
Descriptors: animal welfare, laboratory animals, chamber.

NAL call number: HV4731 G73
Descriptors: injection site, physical restraint, chemical restraint, laws, administration.

NAL call number: 41.8 P882
Descriptors: animal welfare, laws, animal health, destruction of animals.

NAL call number: QL55 A1L33
Descriptors: inbred strains, induced chemical ataxia, carbon dioxide, chloroform, ether.

NAL call number: SF601 A47
Descriptors: residues, T-61, toxic substances, gas chromatography, mass spectrometry.

020 Euthanasia of small animals with nitrogen, comparison with intravenous pentobarbital. Quine, J.P.; Buckingham, W.; and Strunin, L. The Canadian Veterinary Journal 29(9):724-726 (September 1988).
NAL call number: 41.8 R3224
Descriptors: dogs, cats, rabbits, pentobarbital, nitrogen, animal welfare.

021 Euthanatizing agents. Hatch, R.C. Veterinary
NAL call number: 41.8 V641
Descriptors: educational standards, technological advances.

NAL call number: HV4731 H85
Descriptors: animal protection laws, shooting, stunning, cervical dislocation, electrocution, anoxia, asphyxia, chloroform, CO₂, nitrogen, hydrogen cyanide, pentobarbital, cats, deer, ferrets, mink, hedgehogs, otters, rodents, whales, dolphins, crustaceans, reptiles, amphibians.

NAL call number: 410.9 P94
Descriptors: laboratory animals, defining euthanasia.

NAL call number: QL55 L274
Descriptors: freezing techniques, carcass disposal, electrocution, anesthetics.

NAL call number: HV4701 A34 1985
Descriptors: animal welfare, pain, neurotropic drugs, drug combinations, rats, dogs, cats, literature review, horses, adverse reactions.

NAL call number: HV4764 C62
Descriptors: technical training of personnel, methods of injection, physical restraint and handling, ketamine, acepromazine, xylazine, sodium pentobarbital.
NAL call number: SF996.5 L33
Descriptors: mammals, birds, reptiles, amphibians, fish, physical methods, inhalants, parenteral methods.

Descriptors: sedation, nitrous oxide, halothane, anaesthesia, euthanasia.

NAL call number: 472 N21
Descriptors: carbon dioxide toxicity.

NAL call number: QL55 A1L33
Descriptors: halothane, isoflurane, methoxyflurane, nitrous oxide, T-61, chloral hydrate, pentobarbital mixtures, undesirable agents-strychnine, magnesium sulfate, potassium chloride, hydrocyanic acid.

NAL call number: QL55 A1L33
Descriptors: laboratory animals, drug pharmacodynamics, Claude Bernard, strychnine, hypoxia, carbon monoxide poisoning, decompression chambers, reduction of suffering.
NAL call number: SP601 J62
Descriptors: learning, animal welfare, cadaver, euthanasia.

NAL call number: Videocassette no. 967
Descriptors: transport, identification, housing, care, proper euthanasia.

NAL call number: SF411 A57
Descriptors: veterinary education, animal experiments, euthanasia, professional ethics.

NAL call number: HV4701 S43
Descriptors: animal welfare, workers, training, hospice.

NAL call number: 41.8 V641
Descriptors: educational standards, technological advances.

NAL call number: QL55 L274
Descriptors: freezing techniques, electrocution, anesthetics.

NAL call number: HV4764 C62
Descriptors: shelter, licenses and permits, technician training, technician stress, legislation, animal welfare.
NAL call number: HV4764 C62
Descriptors: shelter, technical training of staff, societies, animal welfare, interest groups, communication, education.

NAL call number: QL55 A1L33
Descriptors: central nervous system, ideal agent, education, client-veterinarian interaction.

HUMAN/ANIMAL BOND

Descriptors: pet death, grief, mourning.

NAL call number: SF406 A5
Descriptors: pet death, understanding grief, counseling.

Descriptors: grief, pet death, emotion.

In extremis, pets fare better than people. (They have the right to euthanasia.) Agate, C. The Los Angeles Times 111:B7 (August 4, 1992). ISSN: 0458-3035.
Descriptors: ethics, legislation, terminally ill.

NAL call number: SF601 P76
Descriptors: oncology, pets, psychological effects, emotion, euthanasia.

NAL call number: SF601 P76
Descriptors: pets, euthanasia, pain, psychological effects.

NAL call number: SF601 P76
Descriptors: treatment, emotion, dog, cat, neoplasm, euthanasia.

NAL call number: 41.8 Am3
Descriptors: cat, dog, shelter employees, emotion.

NAL call number: SF601 P76
Descriptors: grief, pet death, euthanasia, children, counseling.

NAL call number: SF601 P76
Descriptors: communication, therapy, costs, euthanasia, dog, cat.

Descriptors: ethics, society, policy.

NAL call number: SF601 P76
Descriptors: pets, choices, pain, emotion, euthanasia.


Descriptors: ethics, legislation, animal welfare, jurisprudence.


Descriptors: survey, perceived role, training.


Descriptors: emotion, pets, ethics.


Descriptors: veterinary education, animal experiments, euthanasia, professional ethics.


Descriptors: attachment, human-pet bonding.


Descriptors: cat, client's response to witnessing euthanasia.


Descriptors: professional standards, animal welfare, United States, ethics.
Descriptors: veterinary practice, public relations, pets, euthanasia.

NAL call number: 41.8 Am3
Descriptors: dogs, ethics, decision making, alternatives, shelter, client-veterinarian relationships, ethics.

NAL call number: 41.8 V641
Descriptors: dog diseases, behavior, aggression, decision to euthanatize, coping with the blind pet.

NAL call number: SF981 C64
Descriptors: owner support, when to euthanatize, attachment, medical advice, options, case history, dog.

NAL call number: HV4701 S43
Descriptors: animal welfare, workers, training, hospice.

NAL call number: SF756.4 V47
Descriptors: dogs, veterinary practice, euthanasia, attachment behavior.

Descriptors: pets, man, psychology, euthanasia.

069 The veterinarian as a counselor - handling pet owner grief. Olson, D. and Greene, L. Veterinary Reports 1(3):10,12 (1988).
Descriptors: pets, veterinary practice, owner grief.

070 Euthanasia: Helping clients cope with the decision and
NAL call number: SF406 A5
Descriptors: emotional attachment, reasons for requesting euthanasia, decision making, clients presence during euthanasia.

NAL call number: 41.8 Am3
Descriptors: clients, pets, euthanasia on demand, medically necessary euthanasia, editorial.

NAL call number: 41.8 V6425
Descriptors: stages of grief: denial, anger, depression, resolution, decision making, client relations.

NAL call number: 41.8 M69
Descriptors: bereaved pet owners, dying pets, decision to euthanatize, understanding, sensitivity, attachment, financial burden.

NAL call number: SF601 V523
Descriptors: attitude, animal care, discussion groups, grief.

NAL call number: SF411.47 P48
Descriptors: meeting clients needs, communication between client and veterinarian, decision making, grief, separation and loss, human psychology.

NAL call number: SF411.5 D9
Descriptors: animal welfare, mortality, euthanasia, pain,
NAL call number: SF411.5 D9
Descriptors: bonds, emotions, euthanasia, veterinarian's responsibilities.

NAL call number: SF411 5N48
Descriptors: pets, number of animals euthanatized, counseling owners, euthanasia decision, veterinary survey.

NAL call number: 41.8 M69
Descriptors: case report, poodle, explanation of euthanasia procedures, clients options, client responsibility.

NAL call number: SF985 F4
Descriptors: emotional attachment, veterinarian-client relationships, anticipated loss of pet, relieving suffering, owner support, owners presence during euthanasia.

RODENTS AND RABBITS

NAL call number: 442.8 L62
Descriptors: plasma glucose, triglyceride, cholesterol, insulin, glucagon.

Descriptors: EEG, comparison to anesthesia effects, brain, pain perception.


089 Role of leukocyte depletion in noncholinergic bronchoconstriction of guinea pigs. Lai, Y.L.; Reinhart, P.G.;
NAL call number: QP121 A1R4
Descriptors: guinea pig, exsanguination, capsaicin injection.

NAL call number: 410.9 P94
Descriptors: FSH, decapitation, corticosterone, luteinizing hormone, prolactin.

Descriptors: Sprague-Dawley rats, substantia nigra, hippocampus, corpus striatum.

NAL call number: QP901 E8
Descriptors: decapitation, pharmacology, receptors.

NAL call number: 442.8 B5236
Descriptors: radioactivity, time-dependent changes, hydrolysis.

Descriptors: subcellular effects, synaptic vesicles, synaptic and non-synaptic plasma membranes, degradation.

NAL call number: 410.9 P94
Descriptors: rabbit, rat, decapitation, pentobarbital.
overdose, anesthesia overdose, CO₂, methoxy-flurane, ether.

NAL call number: 41.9 C333
Descriptors: kidney, liver, muscle, stress.

NAL call number: 410.9 P94
Descriptors: dislocation, methoxyflurane, pentobarbital, halothane, carbon dioxide.

NAL call number: 410.9 P94
Descriptors: rat, antidiuretic hormone, brain.

NAL call number: aQL55 B36
Descriptors: information resources, euthanasia regulations, methods, multi-species.

NAL call number: 396.8 B52
Descriptors: hamster, rat, rabbit, mouse, guinea pig, cytochrome p450, drug metabolizing enzyme.

NAL call number: 442.8 L62
Descriptors: substance p, neurekinin, neuropeptide y, rat, neurotensin.
NAL call number: RM1 A73
Descriptors: gerbil, guinea pig, mouse, decapitation, normobaric hypoxia, KCN-induced death.

NAL call number: Videocassette no. 967
Descriptors: transport, identification, housing, care, proper euthanasia.

ISSN: 0165-5728.
Descriptors: catecholamines, Freund's adjuvant, myelin basic protein, 6-OHDA.

NAL call number: 410.9 P94
Descriptors: intramuscular, tissue damage, strain differences, Sprague-Dawley.

Descriptors: abstract, mouse model, animal experiments.

Descriptors: chloralose, pentobarbital, heart.
NAL call number: 442.9 So1
Descriptors: rats, pituitary gland, LH-FSH releasing hormone.

NAL call number: QP501 B474
Descriptors: 5-HI postmortem changes.

NAL call number: 41.8 AU72
Descriptors: intraperitoneal injection, effects on central nervous system, inexpensive agent, advantages to use.

NAL call number: QL55 A1L33
Descriptors: inbred strains, induced chemical ataxia, carbon dioxide, chloroform, ether.

NAL call number: SF601 A47
Descriptors: residues, T-61, toxic substances, gas chromatography, mass spectrometry.

NAL call number: QL55 A1L33
Descriptors: carbon dioxide, inexpensive, nonexplosive, portable chamber, anesthesia, hypoxia, unconsciousness.

Descriptors: dogs, rabbits, motoric collapse, corneal reflex, auditory evoked potential, electroencephalogram, cerebral death.

Descriptors: inhalant, CO2, behavioral response, histopathology, gradual induction.

Descriptors: central nervous system, ECG, EEG, blood pressure, muscle contractions, histological examinations.

Descriptors: EEG activity, anesthesia, stunning, AVMA panel, catecholamine release, glycogen liver content, metabolic regulation studies.

Descriptors: epinephrine, norepinephrine, dopamine, P-creatine, liquid nitrogen.

NAL call number: QL55 I5
Descriptors: nitrogen gas, distress, rabbits, rodents, CO$_2$.

122 Euthanasia of small laboratory animals. Battisti, G.A. Laboratory Animal Science 34(3):228 (June 1984).
NAL call number: 410.9 P94
Descriptors: carbon dioxide, nitrogen, rats.

123 The rate of decline in resistance to anoxia of rabbits, dogs, and guinea pigs from the onset of viability to adult life. Glass, H.G.; Snyder, F.F.; and Webster, E. American Journal of Physiology 140:609-615 (1944).
NAL call number: 447.8 Am3
Descriptors: neonates, oxygen-deprived, nitrogen, asphyxia, fetal responses.

FARM ANIMALS AND HORSES

NAL call number: TX373 M4
Descriptors: research abattoir, commercial abattoir, carcass evaluation.

NAL call number: 41.8 V641
Descriptors: veterinary medicine, drug administration, dosage, somulose, arnoids, cellulose, chloral hydrate.

NAL call number: 47.8 AM33P
Descriptors: poultry, euthanasia alternative, early cleavage, fertilized ova.

NAL call number: 41.8 V643
Descriptors: loss of consciousness, loss of posture, eye closure, convulsions, 2% oxygen.

NAL call number: 41.8 V641
Descriptors: poultry, abattoirs, welfare.

NAL call number: 280.38 F62
Descriptors: swine, welfare, euthanasia.

Descriptors: swine, curare, acepromazine, ketamine, intramuscular.

NAL call number: 41.8 V641
Descriptors: epileptiform activity, cardiac fibrillation, corneal reflex, gasping, brain stem, distress.

NAL call number: SF601 C66
Descriptors: diagnosis, shock, treatment, euthanasia.

133 Comparison of neck dislocation and percussion of the head on visual evoked responses in the chicken's brain. Gregory, N.G. and Wotton, S.B. The Veterinary Record: Journal of the
NAL call number: 442.8 G91
Descriptors: porcine serum, growth factor-I, 355-sulfate uptake.

NAL call number: 41.8 Am3
Descriptors: horse, methods, physiology.

NAL call number: SF911 V43
Descriptors: horses, foals, femoral neck fractures, femur head injuries, hip fractures, lameness, euthanasia.

NAL call number: HV4725 U5L4 1990
Descriptors: animal welfare, livestock, slaughter, law.

NAL call number: 41.8 Am3
Descriptors: methods, equine, costs, barbiturates, drawbacks.

NAL call number: SF911 V43
Descriptors: pain, abdomen, euthanasia, obstruction.

140 Cardiac muscle spasms after euthanasia. King, J.M.
NAL call number: 41.8 R312
Descriptors: visual evoked responses, pistol, manual insertion of bolt, trephined hole, cranium, brain tissues.

NAL call number: 41.8 Am3
Descriptors: horses, euthanasia, colonic diseases, pathology, pain, intestinal obstruction, pregnancy complications, puerperal disorders.

NAL call number: SF61 M35 1988
Descriptors: livestock farming, stress, animal behavior, animal welfare, legislation, disease control.

NAL call number: QL55 A1L33
Descriptors: inbred strains, induced chemical ataxia.

NAL call number: SF915 J6 1988
Descriptors: feed additives, tolerance, carcinogens, mutagens, teratogens.

NAL call number: 41.8 V641
Descriptors: horses, first aid, accidents, euthanasia,
sporting event.

NAL call number: QL55 A1L3
Descriptors: sheep, adverse drug effects, anesthetic, tetracaine, T-61.

NAL call number: 41.8 Am3A
Descriptors: ponies, Potomac horse fever, death, clinical signs, research proposals.

NAL call number: 41.8 V641
Descriptors: spontaneous and reflex behavior, vocalizations, narcosis, brain-stem death.

NAL call number: 41.8 Au72
Descriptors: cattle, swine, poultry.

NAL call number: SF601 V46
Descriptors: animal welfare, swine diseases, prevention and control, electricity.

NAL call number: SF601 V535
Descriptors: livestock, barbiturates, drugs, stunning, electrocution, cerebral cortex, hypoxia, hypercapnia, vocalization, escape behavior, aggression, urination, CO$_2$, barbituric acid derivatives, curariform drugs, gunshot, captive bolt, cervical dislocation.

153 Methods of euthanasia for poultry and food-producing animals. Trapp, A.L. and Taylor, R.F. The Veterinary Clinic
NAL call number: SF601 V535
Descriptors: barbituric acid derivatives, T-61, chloral hydrate, magnesium sulfate, strychnine, nicotine, curariform drugs, CO₂, electrocution, cervical dislocation, gunshot, captive bolt, decompression, recommended methods.

154 Energy requirements for the penetration of heads of domestic stock and the development of a multiple projectile.
NAL call number: 41.8 V641
Descriptors: calf, cattle, sheep, red deer, comparison with solid free bullet and captive bolt, brain damage, spinal reflexes.

NAL call number: 41.8 AU72
Descriptors: mortuary practice, Australia, gunshot.

NAL call number: 41.8 R312
Descriptors: bilateral severance, carotid artery, jugular vein, cerebral hypoxia, clonic convulsions, pupillary delation, exsanguination.

NAL call number: 41.8 R312
Descriptors: cortical responsiveness, carotid arteries, jugular veins, brain dysfunction.

NAL call number: SF600 C82 v.25
Descriptors: sheep, calf, pig, poultry, electrical stunning, concussion, unconsciousness, electro anesthesia, percussion, captive bolt, ethics.


SHELTER EUTHANASIA AND CATS AND DOGS

164 Stalking a killer: The "disease" of euthanasia. Kahler, S. Journal of the American Veterinary Medical Association 201(7):973-975 (October 1, 1992). NAL call number: 41.8 Am3
Descriptors: domestic animals, population, density, United States.

165 The welfare of excess animals: Status and needs. 
NAL call number: 41.8 Am3 
Descriptors: dog, cat, population, reproductive suppression, United States, euthanasia.

NAL call number: 41.8 Am3 
Descriptors: cat, injection, liver.

NAL call number: 41.8 Am3 
Descriptors: ethics, education, euthanasia.

168 Coping with euthanasia: A case study of shelter culture. 
NAL call number: 41.8 Am3 
Descriptors: cat, dog, shelter employees, emotion.

NAL call number: 41.8 Am3 
Descriptors: euthanasia, spay, neuter, ethics.

NAL call number: 41.8 Am3 
Descriptors: ethics, policy, pharmacology, reproductive control, euthanasia.

NAL call number: 41.8 Am3 
Descriptors: dog, cat, options, shelter, euthanasia.
NAL call number: 41.8 Am3
Descriptors: legislation, euthanasia, nonprofit, licenses.

NAL call number: 41.8 Am3
Descriptors: animal welfare, cats, dogs.

NAL call number: SF914 74 1990
Descriptors: pre-euthanasia, considerations, methods, process, requirements, suppliers and education sources, small animals, wildlife.

NAL call number: 41.8 Am3
Descriptors: lidocaine, pentobarbital, euthanasia.

NAL call number: 41.8 Am3
Descriptors: animal welfare, veterinary medicine standards.

NAL call number: HV4701 S43
Descriptors: animal welfare, workers, training, hospice.

Descriptors: cat, dog, nutrition, aging.

NAL call number: HV4735 073
Descriptors: training of shelter personnel, obtaining sodium pentobarbital, carbon monoxide room, chloroform box, disposal,
verification of death.


acepromazine premedication, human, EEG, heart rate, serum cortisol, blood pressure.

NAL call number: HV4764 C62
Descriptors: dogs, shelter, animal welfare, injections, drugs, electrocution, cats, improper euthanasia methods, untrained staff, poor shelter conditions.

NAL call number: SF406 A5
Descriptors: pet animals, infectious diseases, vaccination, distemper virus.

NAL call number: HV4764 C62
Descriptors: dogs, distemper virus, vaccination, disease prevention.

NAL call number: 41.9 D23
Descriptors: exhaust gases, pentobarbital, barbituric acid.

NAL call number: 41.8 V641
Descriptors: dogs, administration and dosage of intravenous barbiturates, liver.

NAL call number: SF411 5N48
Descriptors: pets, number of animals euthanatized, counseling owners, euthanasia decision, veterinary survey.

193 Physiologic and behavioral evaluation of CO (carbon monoxide) euthanasia of adult dogs. Chalifoux, A. and Dallaire, A. American Journal of Veterinary Research


199  Secobarbital/dibucaine combination as a euthanasia agent
NAL call number: 41.8 M69
Descriptors: dosage, pawing, restlessness, gagging, vocalizations, stethoscopic examination, mean time to death.

00 The rate of decline in resistance to anoxia of rabbits, dogs, and guinea pigs from the onset of viability to adult life. Glass, H.G.; Snyder, F.F.; and Webster, E. American Journal of Physiology 140:609-615 (1944).
NAL call number: 447.8 Am3
Descriptors: neonates, oxygen-deprived, nitrogen, asphyxia, fetal responses.
WILDLIFE AND ZOO ANIMALS

Descriptors: mammals, birds, reptiles, amphibians, stress, restraint.

02 Euthanasia of mink (Mustela vison) by means of carbon dioxide (CO₂), carbon monoxide (CO), and nitrogen (N₂). Hansen, N.E.; Creutzberg, A.; and Simonsen, H.B. The British Veterinary Journal 147(2):140-146 (March/April 1991). NAL call number: 41.8 V643
Descriptors: mustelid, behavior, consciousness, inhalants.

Descriptors: horse meat contamination, liver, necropsy.

Descriptors: injection, M-99, dosages, carcass disposal.

05 Controlling breeding in exotic animals letter. Scott, W.A. The Veterinary Record 122(18):448 (April 1988). NAL call number: 41.8 V641
Descriptors: zoo animal physiology, breeding, anthropomorphism, behavior, vasectomy, surgical or chemical castration, conservation, exhibition.

Descriptors: duck diseases, shooting, euthanasia, wild animals.

Descriptors: animal welfare, pharmacodynamics, synceros suxamethonium, hexamethonium, wild animals.
NAL call number: 413.8 AU4
Descriptors: inhalants, cervical dislocation, decapitation, microwave, T-61.

NAL call number: 410 J823
Descriptors: kill trapping, shooting, inhalants, thoracic compression, cervical dislocation.

NAL call number: 41.9 W64B
Descriptors: bovidae, equidae, cervidae, death, muscular diseases, restraint of animals, anesthesia, euthanasia, histopathology.

Descriptors: euthanasia techniques.

NAL call number: SF603 V4
Descriptors: birds, blood specimen collection, injections, intramuscular, intravenous, subcutaneous, review of techniques.

NAL call number: SF994.2 A1C5
Descriptors: postmortem procedures, barbiturate effects on tissue, T-61, hematologic samples.

NAL call number: 41.8 K67
Descriptors: elphantidae, modern and outdated methods of
euthanatization, Immobilon, gunshot, strangulation, poisoning.

NAL call number: 41.8 V641
Descriptors: calf, cattle, sheep, red deer, comparison with solid free bullet and captive bolt, brain damage, spinal reflexes.

NAL call number: 41.8 V641
Descriptors: convulsions, excitation, filtered exhaust gases, carbon monoxide, carbon dioxide, consciousness, electroencephalogram.

NAL call number: 41.8 V641
Descriptors: cetacea physiology, pentobarbital.

NAL call number: 41.8 T431
Descriptors: foxes, electrocution, slaughter, methodology, fur farming.

NAL call number: SF411 A57
Descriptors: American Association of Zoological Parks and Aquariums, euthanasia records, techniques, care in captivity, euthanasia as part of collection management.

Descriptors: legislation for protection of stranded species, Australia, capture, trapping, killing, parasites, disease, treatment and return of stranded species.
NAL call number: 41.8 T431
Descriptors: Rana catesbeiana, animal welfare.

NAL call number: 41.8 T431
Descriptors: Rana catesbeiana, Netherlands, methods.

NAL call number: HV4731 E97
Descriptors: reasons for killing, anaesthetic agent, poison, halothane, tricaine methanesulphonate, concussion, shooting, electrocution, hypothermia, hyperthermia, decapitation, exsanguination.

NAL call number: SF601 V523
Descriptors: stress, pain recognition, medullary collapse, TMS, benzocaine, decapitation, pentobarbitone, injection.

225  Practical Methodology Reptiles [videocassette] Davis, CA; University of California at Davis, School of Veterinary Medicine, 1988, 1/2" VHS, 35 min.
NAL call number: Videocassette no. 414
Descriptors: reptiles as laboratory animals, immobilization.

Descriptors: AVMA panel recommendations, Royal Society guidelines, IACUC roles, chemical anesthetics and formalin fixation.

227  Guidelines for the use of live amphibians and reptiles in
NAL call number: QL640 J6
Descriptors: AVMA panel recommendations, roles of IACUC, formalin fixation, gunshot, chemical anesthetics.

NAL call number: 41.8 N483
Descriptors: pain, animal welfare.

NAL call number: HV4701 A53
Descriptors: care in captivity, decapitation, inhumane killing method.

NAL call number: 41.8 R3224
Descriptors: animal welfare, respiration, heart rate, consciousness, behavior.

NAL call number: 41.8 Am3
Descriptors: decapitation, anoxia tolerance, reptilian ethology, reptilian anatomy and physiology, injectable anesthetics.

NAL call number: 41.8 V641
Descriptors: hypothermia, chloroform, inhumane.

NAL call number: 41.8 V641
Descriptors: decapitation, anoxia tolerance, abdominal injection, sodium pentobarbitone.

234  Euthanasia, necropsy technique and comparative histology
NAL call number: SF997.5 A45D57
Descriptors: slaughter, diagnosis, post mortem examination, pathology.
INVERTEBRATES

NAL call number: 41.8 V641
Descriptors: mortality, euthanasia, handling, transport.
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