

EUTHANASIA

Optimal Criteria

Before reviewing various euthanasia methods, some of the more important criteria which must be satisfied in order that a given method be accepted, are as follows:

1. Speed and reliability of inducing unconsciousness and death.
2. Painless: no distressing physiological and/or psychological side-effects (e.g. convulsions or hypoxia and struggling) before unconsciousness.
3. Aesthetic — no disturbing effects on personnel.
4. Safety to personnel, environment.
5. Equipment and efficiency variables — easy to maintain, “failsafe” controls.
6. Ease of application, “fail safe” technique — operator efficiency factor.
7. Cost — of equipment, installation, maintenance, drugs, etc.
8. Time/efficiency of personnel per animal euthanized.
9. Method of restraint (or capture) — evoking minimal distress prior to administration of euthanasia and unconsciousness.
10. Age and species limitations.
11. Health limitations — if animal is sick, pregnant, emaciated.
12. Specific requirements for certain contexts and conditions, e.g. portability for use in the field; problems of capture/restraint of free roaming animals (feral, stray, etc.).
13. Local/national legal restrictions.
14. Minimal handling of animals from holding area to euthanasia point.

All methods considered suitable for euthanasia should be evaluated in relation to the above criteria and variables: no one method may be ideal for all circumstances.

Physical Methods

Shooting

Shooting has long been used for the killing of individual dogs and for the routine killing of small numbers. Where larger numbers have to be killed, the bleeding tends to prove offensive to the staff and there is no known case of the method being used in major pounds or shelters. The method, however, when properly employed is without doubt a quick and painless way to cause death in dogs and cats. Provided the aim is accurate and the animal does not move its head, unconsciousness will immediately result from the brain damage. Breathing stops as a result of the brain damage but the heart continues to beat until it is deprived of oxygen as a result of respiratory arrest.

Carding (1972) has recommended immersion of the animal in water immediately after unconsciousness has been produced by shooting. This procedure not only causes a more rapid death but reduces the unaesthetic effect of the bleeding and would make the method more practical where larger number of dogs are involved. For tropical countries there is the

added advantage that leaving the bodies in water slows down decomposition and reduces the consequent odors.

For emergency killing, it is feasible to use shotguns of 12 bore or 20 bore, or calibre .22 rifle or revolver. For regular use the captive bolt stunner as used in the slaughter of meat animals is the weapon of choice, especially one of the smaller, lighter models. With this instrument there is no danger from stray bullets.¹

In the case of the captive bolt stunner the target is the midpoint between the eyes and the base of the ears but a little off center to avoid the bony ridge. The muzzle of the stunner should be held firmly against the head and pointed in line with the spine and not towards the lower jaw.

When using this method routinely it is convenient to have a ring at, or near, floor level. The leash can then be passed through the ring and gentle, sustained pressure will pull the dog's head to the ground where it can be held firmly while aiming. With practice, one operator can work alone without assistance except with occasional difficult dogs.

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Decompression

Decompression chambers were first introduced for killing dogs about 1950 in the U.S.A. Pioneer work was conducted for the American Humane Association by Dr. Richard Bancroft who utilized his experience in the fields of aviation physiology, including hypoxia and decompression problems in high altitude flying.

The basis for the work on killing dogs was that decompression due to low ambient air pressures without extra oxygen can lead in humans to a painless and rapid loss of consciousness resulting in death if the low pressures were maintained. There is, sometimes, even a sense of euphoria in man as sensory awareness begins to fail (Bancroft, 1960).

The apparatus consists of a chamber, usually cylindrical because of the greater strength of this form, connected with an air vacuum pump similar to those used for petrol/gas pumps.² Animals to be killed are placed in a cage which can be wheeled to the chamber and inserted easily. The door is closed and has an air-tight seal.

Recommended procedure for the most commonly used apparatus (Euthanair)³ is to switch on the motor after adjusting the valves on the chamber. When the pressure has been reduced to the equivalent of 55,000 feet, the pump automatically stops. Instructions are to set the timer to last

¹Personnel using such weapons should not only be well trained in the use and safety of firearms, but should also be carefully screened for psychological/emotional health and stability. In some U.S. cities, animal control officers wear firearms for personal protection and undergo rigorous screening and training before being allowed to carry and use any firearm.

²Specified as 7½ HP, 3 phase, 60 cycle motor.

³Euthanair Company, 5156 Southridge Avenue, Los Angeles, California.

for 10 minutes for adult animals and 20 minutes for aged, sick or young animals. After this period, the pressure may be returned to normal by opening the appropriate valve. Before the animals are removed and checked to ensure they are dead, the pump is to be turned on for one minute to remove odors.

The system is certainly capable of killing animals and sometimes without evidence of distress. Gauges are often inaccurate and seals may leak and should be checked frequently. The person operating it has to be well trained and skilled in using and understanding this equipment. After the costs of purchase and installation, the running costs are negligible. There is no danger to personnel.

In the early days, a number of decompression units were installed in animal shelters in Canada, but within a few years most were withdrawn from use. The method has not been adopted in Europe, but in Japan, the apparatus is being introduced into some city dog pounds. An imported Euthanair apparatus was installed at the shelter of the Japan SPCA, Tokyo, about 1962. Use of an autoclave to kill laboratory animals has been reported from Italy by Barber (1972).

There has been much controversy about the degree of suffering caused by decompression. The two sides have been polarized into those who claim that rapid decompression is a satisfactory way of producing painless death in all animals and those who insist that considerable distress may be caused to a significant proportion of animals killed.

The confusion is well illustrated by the fact that the 1968 report of the AVMA Euthanasia Panel withheld approval of what is termed explosive decompression until definitive studies had been made to determine whether pain was caused during the process. Without apparently any such studies having been made, the 1972 report of another AVMA Euthanasia Panel was satisfied that the same technique (but now referred to more accurately as rapid decompression) was satisfactory.

There are two particular factors of fundamental importance about which no data appear to be available. They are:

1. At what altitude equivalents do cats and dogs lose consciousness and/or pain perception?
2. What is the optimum rate of decompression for dogs and cats?

According to protagonists of the method, it may be assumed that dogs lose consciousness and collapse 40-60 seconds from the start of decompression in an apparatus capable of simulating an altitude of 55,000 feet in 45 seconds. Death will then follow without any painful sensation (AVMA, 1972). No authority is quoted for this conclusion with regard to dogs or cats.

Doubts about the humaneness of rapid decompression have been expressed over many points but those which seem most pertinent include the following:

Effects of hypoxia

There is a wide variation in humans over the effects of hypoxia ranging from the extremes of euphoria to apprehension and very marked hyperventilation. Armstrong (1961) records a case which shows that in some humans hypoxia can cause considerable distress and warns that rapid induction of anoxia can cause the sensation of suffocation.

Young animals are much more resistant to the effects of hypoxia than adults. Loss of consciousness is therefore delayed and also death. Recommended procedure is to hold young animals for a double period at 55,000

feet while newborn puppies and kittens should be placed in a special unit and taken to an altitude equivalent of 65,000 feet or more. The most important sequela is that young animals are more likely to remain conscious of the painful mechanical effects of decompression than adults.

Mechanical Effects of Decompression

Pain in the middle ear

Humans rapidly learn to equalize the pressure inside and outside the middle ear by forcing open the Eustachian tube directly, or by swallowing. Matthews (UFAW) states that laboratory animals undergoing even slow decompression demonstrate their inability to equalize the pressures by scratching at their ears. He adds that when anesthetized cats were decompressed so that no voluntary equalization could take place, the damage to the ears was severe. In an experiment, however, in which two dogs were decompressed and then recompressed, examination of the ears at both stages showed that damage to the middle ear occurred only during recompression (AHA, 1964). Upper respiratory infections often involve the Eustachian tubes to an extent where inflammation prevents adjustments to equalize the pressure in the middle ear. Virus infections involving the upper respiratory tract are very common in cats and are common in dogs. In both species they are a frequent reason for owners to seek destruction of their pets. Stray animals in animal shelters also have a high incidence of such infections which are often overlooked; sick and healthy pets are usually destroyed indiscriminately where there are no alternatives other than decompression.

Pain in the sinuses

With upper respiratory infections blocking off the entrances to the sinuses, pain in these areas could be acute.

Abdominal pain

This would arise in an unknown percentage of cases as a result of expansion of gas trapped in the intestinal tract. (Sudden reduction of the atmospheric pressure to about one-fifth its normal value will result in a six-fold increase in volume of any trapped gases). With this likelihood, and the untold reactions described in the paragraph above, there is growing concern over the humaneness of the decompression method in the U.S. especially since there are less debatable and variable alternatives. If there is less than 1% incidence of painful side effects either demonstrated or suspected, and if it is not practical to separate those animals that are more likely to suffer under rapid decompression — and euthanize them more humanely — this method should not be considered humane. Alternative methods should be instigated until further research has removed all doubt as to the potential inhumaneness of this method.

The "bends"

Pain caused by the nitrogen bubbles forming in the blood and in the body tissues will occur in humans after about 10 minutes at 35,000 feet but sooner at higher altitudes. With the rapid decompression technique this condition is only likely in cases of faulty apparatus or procedure when unconsciousness is delayed.

“Boiling” of body fluids

This effect occurs in humans at about 63,000 feet and pain is likely to result from air embolism and “vapour locks” in blood vessels. The condition is most likely to occur in newborn puppies and kittens, which, it has been recommended by protagonists, should be subjected to the equivalent of about 65,000 feet.

Other factors

There is no evidence to decide whether dogs and cats when they collapse are conscious or not. Neither is it known whether, under the conditions of rapid decompression, there is loss of perception to pain before loss of consciousness.

When dogs collapse, it is not known to what extent they are immobilized and unable to respond to pain. This point becomes of importance if consciousness and perception of pain are maintained beyond the point of collapse.

Vocalization becomes progressively difficult at higher altitudes near the point where the painful mechanical effects of decompression arise (Armstrong, 1961).

Reference has already been made to the variability of the effect of hypoxia on humans. It seems unwise, therefore, to apply human experience directly to other species. Dogs differ not only from the average human, but among themselves, while cats present other differences.

Attention also has to be given to the known and suspected differences in effect of rapid decompression on sick animals (especially those with upper respiratory infections, present or recent) compared with the healthy, and on newborn, young and aged animals compared with the average adult.

Thomsen (1972) in an extensive and objective review of rapid decompression euthanasia concludes that:

(1) Rapid decompression is not the horribly cruel and inhumane method of disposing of surplus dogs and cats that it is frequently pictured as being. But decompression also does not deserve the following description, taken from an actual publication: “Absolutely no suffering . . . there is no pain . . .” Nor the following, taken from a statement by a committee of scientists: “. . . a most humane method . . . produces unconsciousness and death without any painful sensation. The animals are completely unaware of any . . . internal organ changes which may occur.” Such categorical statements reflect either ignorance or bias.

(2) Rapid decompression definitely is not a humane method of euthanasia for some animals, nor for any animals if the chamber is not properly constructed and operated. Animals below four months of age, and those that are diseased, particularly in such a way as to make them subject to sinus and inner ear infection or difficulty in clearing the Eustachian tubes, definitely should not be decompressed. Yet, once the chamber is installed, there is a tendency to use it for all animals, and not to have an alternative method readily available for those animals for which the method is definitely unsuitable.

Thomsen also makes some additional cogent observations. Schelkopf’s (1958) theses research concluded with the statement that “it is presumptuous to state that animals during decompression do or do not suffer pain.” Thomsen states that animals are conscious and capable of feeling pain for 30

seconds-2 minutes. Also with the decompression effect on the lungs, they would be unable to display any distress vocally. Armstrong et al. (1961) noted that some human beings experience distress rather than euphoria, which is commonly believed by proponents of this method, to be experienced by animals undergoing decompression. More important is the fact that human studies are hardly comparable to the high (explosive) rate of decompression (55,000 feet in 60 seconds) used to euthanize animals. The rate of decompression is of critical concern: Thomsen, (op cit) concludes that: “despite all of the experiments that have been performed, nobody really knows what speed would result in the least pain and discomfort for different animals.”

Summary

The advantages of simplicity, lack of hazard, and cheap running costs have had an appeal to operators of many pounds and shelters in the U.S.A. and these appear to have outweighed doubts about the humaneness of the method.

There are sufficient grounds for doubt to recommend that no sick dogs or cats, even if there are only mild signs of present or recent upper respiratory infections, and no animals under about four months old should be killed by rapid decompression. Since this recommendation presupposes that an attendant will have the time and normal degree of concern to separate these categories of animals from the normal, and since there may be no alternative arrangements for giving, for example, injections of barbituates, recommendations such as these will not be heeded in many cases.

It seems reasonable to sustain strong doubts about the absence of distress in young, sick and aged animals and to harbour further doubts about normal animals in view of the variability of effects on humans and the lack of data on dogs and cats.

Until reliable data are obtained about the effects of rapid decompression on a significant number of dogs and cats this method cannot be recommended as a form of euthanasia at this state. It is a method of killing which is of proven efficiency, despite occasional reports of alarming defects in apparatus. Faulty valves, gauges and leaking seals necessitate constant monitoring and maintenance. Strict regulations to prevent operators from overloading the chamber with animals and providing separate cages for non-related animals are not always consistently enforced. The main appeal of this method is that the operator simply wheels the caged animals into the chamber, closes the door, sets the timer and pushes a button: the impersonal, mechanical method reduces contact with the animals and indirectly “protects” the operator from seeing the animal die. Such aesthetic and psychological considerations aside, the mechanical “distance” between the operator and the animals may lead to negligence and indifference, which, combined with the high risk of mechanical failure, makes constant supervision a necessary but difficult to enforce imperative.

Research Proposals

1. Does the recommended procedure of rapid decompression cause distress to dogs or cats in any categories?
2. What modifications can be introduced to present procedure to eliminate or reduce distress in any category of animals?

More tests (to add to the AHA study by Fitch et al.) need to be made to obtain electroencephalograms, electrocardiograms and arterial blood pressure readings from a substantial number of animals (and in various states of health) undergoing rapid decompression. Such physiological measures may tell us with some accuracy as to when the animal becomes unconscious, but they can never indicate if and how much the animal is experiencing pain prior to unconsciousness. Since the latency before unconsciousness may be over one minute for some animals and hyperventilation and struggling or “freezing” in a strange, confined place may mask or confound overt behavioral pain and distress reactions to an observer, further research and techniques are needed. There is no clear evidence yet that healthy animals do not suffer under decompression prior to unconsciousness.

The possibility that a two-stage decompression procedure may be more humane, warrants evaluation. Decompression to 40,000 feet in 30 seconds would render the animals unconscious and at this altitude, extreme pressure changes in the body which might cause pain, would be less than at 55,000 feet. Once unconscious, decompression could be raised to this level to insure a painless death.

The following statement from D. J. T. Kalberer is a pertinent conclusion to this review of decompression killing:

“As one versed in the field of decompression sickness, I can say that the pathogenesis of shock is acute dybarism by simulated high altitude still remains controversial. To give an indication of the clinical picture concerning the suffering experienced by animals subjected to “explosive” decompression, I quote from a research paper of mine, which appeared in the journal *Aerospace Medicine*, Vol. 40, page 1071, 1969. “Shortly after decompression, animals exhibit difficulty in breathing (“chokes”), begin scratching, show little motor activity, and, in most instances, die within minutes (up to 15). For a few seconds preceding death, the animals jump about erratically, have severe respiratory distress with hiccough-like spells, twitch, fall on their backs, gasp several times, and expire. In some instances you can even get enlarged abdomens due to gaseous distension of the gastrointestinal tract. These facts are the result of well controlled research experiments which had to be carried out so that this Nation could safely land men on the moon. This work was done also in an effort to make undersea exploits safer. It is evident that these animals are subjected to a painful and grotesque last few seconds of life where in some cases the process can last several minutes. . . . It is not possible for me to agree with the statement that the Euthanair machine or any other high altitude decompression chamber is more “expedient” for destroying large numbers of animals, as too often animals have different responses to simulated high altitude conditions. . . . I am in absolute agreement with members of the Humane Society of the United States, and the many veterinarians who are of the opinion that the injection of a barbiturate, namely sodium pentobarbital, is a far more humane method of euthanasia than is the high altitude chamber method.”

References

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Electrocution

Electrocution has been used widely to kill dogs and sometimes cats since about 1920 and, in most cases, the animals were killed singly. The simplest technique was to clip electrodes on the front and back parts of the body and connect them to the domestic power supply.

In Britain there were at least four special electrocution cabinets in use for dogs and cats in 1926 when doubts began to arise about the humane-ness of the method. Evidence of severe pain was arising from humans who survived accidental electrocution. In 1928-29 the Nobel laureate, Professor A. V. Hill, reported that the cabinets were likely to cause great pain although this would be masked by muscular paralysis. Principal users of these cabinets ceased to use them by 1930 although some were brought back into use again later (Hume, 1935).

In 1937 the standard CECAM electrocution cabinet gained the approval of the Euthanasia Committee of the then National Veterinary Medical Association (now British Veterinary Association). Many of these units were manufactured for use in Britain and abroad during the course of the next two decades.

The apparatus was effective in killing dogs without causing apparent distress but the results of American research were adding force to those who continued to have doubts. Their fear was that the quiet, relaxed, supposedly unconscious or dead animal was, in fact, fully conscious and in agony for some time before unconsciousness and death supervened.

Pioneer research by Simpson and Derbyshire (1934) and Sugar and Gerard (1938) had demonstrated two important points:

1. A small electric current passing through the body prevents normal respiration and causes death from asphyxiation.
2. A larger electric current passing through the body causes ventricular fibrillation.

It was further suggested that consciousness could remain for 12 to 20 seconds after the onset of extremely painful fibrillation.

Between 1950 and 1954 both the Universities Federation for Animal Welfare and the British Veterinary Association (BVA) sponsored further research, the former by P.G. Croft (1952, 1953 & 1976) and the latter by T.D.M. Roberts (1954).

From this work it became apparent that to avoid pain during electrocution it is essential first to make the animal unconscious by passing a current directly through the brain, from side to side. Only after doing this, and checking that the classical electroplectic fit is produced, should the lethal current be passed through the whole body to bring about death from ventricular fibrillation and circulatory failure.

As a result of their studies the British Veterinary Association in 1954 condemned all existing methods of electrocution. These methods included:

1. Apparatus in which one of the electrodes is a metal collar or chain around the dog's neck.
2. Apparatus where the only electrodes are metal rods forming the floor of an electrocution chamber.
3. Apparatus where the electrodes are connected to the domestic power supply and clipped to an ear or the mouth and to a hind part part of the body.

In 1957 the Euthanasia Committee of the BVA laid down standards to which all electrocution cabinets must conform if they are to be regarded as humane. They include:

1. (a) That the unit be tested adequately to insure that the frequency of the alternating current received from the electrical "mains" be 50 or more cycles per second;
(b) that the unit delivers at least .05 amperes per second across the head to produce unconsciousness.
(c) that it delivers at least .05 amperes for 2 seconds through the thorax to fibrillate the heart; and
(d) that the total time for application of electrical current be limited to 3 seconds by a timing apparatus.
2. A satisfactory continuity tester be built into the circuits of the unit to show in advance that current is alternating and of subsensory strength but still adequate to meet the above requirements.
3. Ammeters be incorporated in each circuit to show that an adequate current is passed in each lead.
4. The unit be used only by a trained operator who would examine each animal immediately after shock to ensure that unconsciousness had occurred and that the heart had stopped. A subsequent examination should be made approximately 30 minutes later.

Electrocution of cats by any method had been condemned in 1954.

Detailed specifications for a cabinet for electrical euthanasia of dogs were drawn up by the British Standards 2909 (1957). Apart from defining the construction of the cabinet and ancillary equipment and a system of checks to be made, the following points were scheduled:

- Voltage should not exceed 250 volts
- Current should be between 0.5 and 5.0 amperes
- Stunning current through the ear electrodes to pass for .05 to 1.5 seconds
- Lethal current through the hind leg electrode to pass for 2 to 4 seconds
- It shall not be possible to apply the current through the leg electrode before the current between the ear electrode has ceased.

The only apparatus allegedly manufactured to these specifications has been the "Electrothanator" of which a considerable number have been sold in the United Kingdom and abroad.

It was widely believed that with a trained and sympathetic operator and with regular competent servicing and maintenance this complicated apparatus was capable of giving a humane death to dogs. However, the Panel on Euthanasia of the American Veterinary Medical Association, reporting in 1963, would not recommend the Electrothanator and made the following criticisms, some of them inherent to the method:

1. It is not a method for mass euthanasia because of the time required to deal with each dog (5 minutes).
2. It is not a method for a vicious, intractable dog.
3. The apparatus examined has not been well designed from a practical standpoint, i.e., the ear electrodes and leads may cross because the dog can turn its head, the salt solution in the shallow floor pan is messy and troublesome, the control switch is poorly designed and has had to be replaced in the test machine; the cabinet is not sturdy in construction.
4. In a general evaluation of electrocution as a method of euthanasia, it must be recognized that the electroplectic fit or convulsion produced by application of electric current will always be visually objectionable. The electroplectic convulsion consists of violent extension and stiffening of all legs with retroflexion of the head and neck plus respiratory arrest.

The Electrothanator was recommended by the leading authorities in Britain who believed that it complied with the standards laid down in BS2909. It was only in 1974 that the manufacturers were forced to admit that their apparatus did not conform to the standards and never had done so. The principal defect was that there was no allowance for a current to be passed directly through the brain to produce an observable electroplectic fit with unconsciousness before the lethal shock was directed through the whole body of the animal. Labeling of the control knobs suggested otherwise since the main control could be set first at the "stun" position and then at the "lethal" position, although current passing along the same routes in both cases.

Defects were also noted in the procedures followed by even the most experienced operators in Britain. As noted by the AVMA Euthanasia Panel in 1963, the electroplectic shock is visually objectionable and operators were not keen to comply with approved procedures and check that

each animal went into shock after stunning and before the lethal shock was given.

A further complaint in the 1974 investigations was that several cabinets had been modified so that no third electrode was clipped to a hind leg. Instead, the dog stood on a metal tray to which water was added and this method defeated the objectives of having the maximum amount of current pass directly through the body to a hind leg.

These disclosures have resulted in assurances from the manufacturers that all apparatus in use, and future models, will be modified to conform with the British Standards 2909, in the most important respects, and operating procedures have been revised to comply with the recommendations. Prospects, however, of having exported units modified are not good in the short term.

This experience tends to support the caution shown by the AVMA Euthanasia Panel in 1963 and 1972. Although electrocution is capable of producing a painless death, the sophisticated apparatus and demands placed on a suitable operator do not allow a general recommendation even of approved apparatus for the electrocution of dogs.

To this day, mass electrocution of dogs by old systems, in which no attempt is made to pass a current first through the brain from side to side before passing a lethal current through the body, is still in daily use. Electrocution apparatus where current is passed from a neck collar to floor bars for killing groups of dogs at a time are still in use, for instance, in the municipal pounds of Kobe and Kyoto in Japan.

Roberts (1954) made two tests which showed the degree of distress caused when dogs are electrocuted without first being made unconscious by a direct brain current. In order to demonstrate the effects he had to avoid the paralysis which in normal circumstances prevents the dog from expressing its feelings. This was achieved in the following ways:

1. One dog was given the usual shock for one second which was sufficient to cause fibrillation but did not produce strong paralysis. When the current was switched off, the dog howled in pain for some 20 seconds before it died.
2. Another dog was given the standard shock but for only 0.5 seconds which was not sufficient to cause fibrillation and did not kill the animal. The dog, however, howled for 26 seconds and afterwards would not approach the investigators or the room which contained the machine.

The 1972 recommendation of the AVMA Euthanasia Panel to administer muscular paralyzing agents prior to electrocution does not meet with general animal welfare approval because of the apprehension and distress which can be caused to dogs so treated. The aim of this procedure was to avoid the unaesthetic appearance of the electroplectic shock for the sake of the operator. This is in contrast to the emphasis attached by British authorities that the operator must witness that each dog has such a shock before proceeding to give the lethal shock. The giving of a tranquilizer prior to electrocution would, on the other hand, benefit the dog by reducing anxiety.

Summary

Electrocution can be an efficient method of killing dogs without pain. This possibility has led to its being widely used in Britain and elsewhere by animal welfare societies and by local government authorities.

Although the criteria for the humane use of electrocution for killing dogs have been known for some 20 years, it appears that only during the last twelve months have these principles been properly applied anywhere.

The experience in Britain, in which the recommending authorities believed that the only available apparatus conformed to the recognized standards although the manufacturers knew well that it did not, is a caution to authorities in other countries which might consider recommending similar apparatus. For continuing confidence, each new unit needs to be examined by a competent person with subsequent regular inspections of both apparatus and procedures followed.

Without these provisos, and also without a trustworthy operator, the method of electrocution should not be encouraged.

Addendum

One major negative aspect of electrical euthanasia is the aesthetic/psychological effect on the operator. For this reason, individual personal (and possibly cultural) differences have led to considerable controversy over this method. Hence, for some, the easier "pushbutton" decompression method, giving more "mechanical distance" between the operator and the animals, is more acceptable. Either way, both electrical and decompression systems need constant monitoring and maintenance.

This aesthetic/psychological effect on the operator is an important variable to consider in the over-all acceptance of one method of euthanasia over another. The curare-like drug, succinylcholine chloride, for example, has gained considerable popularity for euthanizing pets in the U.S.A. The immediate paralysis and lack of overt distress in the animal gives the impression that this is a humane method but (as with electrocution) it is a wholly inhumane method. One U.S. Department of Agriculture veterinarian stated that he preferred succinylcholine over shooting for the mass slaughter of infected farm livestock, a practice which is still continued today and which demonstrates clearly how personal aesthetic/psychological considerations can only too often take precedence over the actual humanness of a particular method of euthanasia.

Recommendations for Research

There seems to be no indication for additional research into killing by shooting although wider dissemination of knowledge about the best procedures would be helpful.

Research proposals regarding decompression were made on page 9 and which could constitute Project I for further research.

Further research into electrocution does not appear to be worthwhile. Important factors identified more than 40 years ago have still not been generally adopted.

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