

Euthanasia by Hypoxia Using Nitrogen.
A review after four years of operation involving 20 500 animals.

DEAR SIR:

In 1975 the board of directors of the Calgary Humane Society requested an investigation into various methods of euthanasia and I was invited to advise on the selection of an acceptable technique.

The new method was to meet certain criteria that the directors felt were important to the Calgary operation. These criteria were:

- a) The technique should be painless.
- b) The device chosen should eliminate handling of individual animals thus reducing the dangers inherent in restraining wild, vicious or injured animals. Such a unit for euthanasia without the need for handling the animals should also lessen the psychological feeling of remorse and blame often found in the staff who must do the killing.
- c) It should be nonhazardous to personnel.
- d) Easily learned by new employees to reduce the required training period.
- e) Reasonably economical to operate.

The method which most closely satisfied these requirements was a device which produced hypoxia by replacing the air in the chamber by flushing with nitrogen, an inert nontoxic gas, as described by Fitch *et al* (1). The nitrogen flushing device, consisting of a nitrogen control panel¹ and three fiberglass cabinets², was purchased and installed. From October 1975 to September 1979, approximately 20 500 cats and dogs were destroyed in these chambers. The fiberglass chambers were replaced in 1980 with new aluminum cabinets constructed at the Southern Alberta Institute of Technology (SAIT).

The experience of induced anoxia in man is in sequence as follows: "reduction in powers of logic, discrimination and judgment, proceeding to a diminished visual and auditory acuity, decreased sense of touch and position.

This is followed by muscular weakness and then unconsciousness. Since no distressful sensations are reported, the entire experience appears to be comfortable and even rather pleasant" (2).

When animals are placed in the chamber and the nitrogen gas turned on, they display an initial period of apprehension, curiosity, withdrawal or disregard, depending on the nature and accumulated experiences of the individual. During this period they follow a moving finger or respond to a tap on the window, indicating that they are conscious and probably feeling no uncomfortable sensation. When the oxygen level reaches 1.5%, within approximately 70 seconds after starting the flushing out process, the animals exhibit hyperpnea for approximately ten seconds and then collapse. During these ten seconds they fail to respond to a tap on the window. Following the period of collapse there may be howling, opisthotonus or repetitive locomotor activity, sometimes accompanied by defecation and urination. Death occurs about one minute after initial collapse when respiration ceases.

A series of tests were further carried out to determine if the experience of death by anoxia produced pain or fear. Animals were rendered unconscious in the chamber, then taken out and allowed to recover. They were then replaced in the chamber and observed for increased signs of anxiety. One cat went through this procedure three times and in no case did the animal display fear of the chamber.

Newborn kittens and puppies are resistant to death by anoxia. They may be rendered unconscious using an anoxic method for euthanasia as easily as adults, but they fail to die. They have been adapted in their uterine environment to relatively low oxygen concentrations. The procedure adopted by the Calgary SPCA is to render

newborn kittens and puppies unconscious employing the nitrogen flushing technique, following this T-61³ is injected intracardially.

Economy of operation is an important factor for a humane society, always subjected to the constraints of public donations. The cost of euthanasia, discounting capital cost of equipment, is about ten cents per kilogram, thus an average cat of 4 kg would be euthanized for forty cents, and a 10 kg dog, for one dollar. Cost will vary depending on the amount of nitrogen required to flush the air out of the chamber which is dependant on the numbers of animals to be destroyed at one time, and the oxygen they consume from the time the chamber is closed and sealed before the nitrogen flushing begins.

As with almost all methods of euthanasia, acceptance of hypoxia using nitrogen flushing to replace oxygen is not universal, and doubts and misunderstandings exist. The staff responsible for euthanasia at the Calgary Humane Society is instructed in the basic physiological principles of the technique, and are made aware of the controversies, advantages and disadvantages of the various methods. Acceptance of the technique at the Calgary Humane Society has been good and the tensions and emotions frequently associated with mass euthanasia appear to be minimal.

J. P. QUINE, D.V.M.
Bowbank Farm Ltd.
P.O. Box 116
Cochrane, Alberta.

References

1. FITCH, J., P. HALL and R. HERIN. Nitrogen inhalation as a method of euthanasia in animals. Report on Colorado State University Project 9 172, funded by the American Humane Association, Denver, Colorado. Fort Collins: Dept. of Physiology and Biophysics, College of Veterinary Medicine and Biomedical Sciences. 1974.
2. LAMBERTSEN, C.J. Anoxia, altitude and acclimatization. *In* Medical Physiology. 13th Ed. V.B. Mountcastle, Ed. pp. 1 554-1 545. St. Louis: C.V. Mosby Co. 1974.

¹Snyder Mfg. Co., Denver, Colorado.

²Clark-Cote Ltd., North Bay, Ontario.

³Hoechst Pharmaceuticals, Montreal, Quebec.