

# Record of a panel discussion on "Euthanasia"

held at "Nordiska Forskarkurser: Laboratory Animals and Medical Research", Uppsala 1981-08-12-21, by *Jörgen Carstensen, Krister Iwarsson, Örjan Zetterqvist*

The basic for the discussion was the Report of the AVMA Panel on Euthanasia (Ref. 1) and the introduction given by Dr Krister Iwarsson, Huddinge, Sweden. During this introduction, reference was also given to a monograph on "animal anaesthesia" by Colin J. Green (Ref. 2) in which euthanasia is defined as "the killing of an animal with a minimum of physical and mental suffering".

## INTRODUCTION

The choice of method of euthanasia may depend on *whether the animal is required for experiments after death or not*. In the former case methods, which interfere with the investigation by altering the tissue or compound under study, cannot be used, even if classified as humane. Thus, in addition to the *animal welfare*, the *purpose of the experiment*

has to be properly considered. An aspect, which may further limit the choice of humane methods is the *safety of personnel*. In addition to this, some methods may be less suitable, due to factors such as high costs, lack of adequate training of personnel, emotional effects upon observer or operator, and restricted access to certain drugs, due to national rules.

## GENERAL COMMENTS

The problems with euthanasia of animals were thoroughly discussed from the following points of view:

1. How to minimize or avoid physical and mental stress of the animal until unconsciousness/death occurs?
2. How to fulfil the responsibility of animal welfare from a legal, as well as from an ethical point

Forsidebilledet viser den nøgne, thymusfrie rotte rnu/rnu fra Rowett Research Institute, Aberdeen.

Mutanten dukkede op i 1975; i de følgende år er den via kejsersnit overført til status og har siden bredt sig vidt omkring.

rnu/rnu kan spille en vigtig rolle i biomedicinske forsøg. Der er flere, karakteristiske egenskaber lig med den nøgne mus. På grund af dens størrelse kan den have visse fordele i studier, bl. a. hvor der er tale om kirurgiske indgreb.

Et område, hvor rnu/rnu finder anvendelse, er i parasitologiske studier på grund af dens immunodeficiens og dens robusthed.

I tumorforskningen kan den nøgne rotte med tiden finde en vis anvendelse, ligeledes i immunologiske forsøg.

Yderligere information kan fås hos Michael Festing, MRC, G.B.

K. E. M.



of view, without risking the motive of the animal experiment?

3. How to optimize the safety of personnel?
4. How to avoid aesthetically unpleasant procedures?

#### 1. *Animal welfare*

Any change imposed upon an animal may be a stress. Consequently, a change of the environment of animals selected for euthanasia should be kept at a minimum. However, euthanasia ought usually not to take place in the holding room, nor in the presence of other animals, since apprehension may be transferred from one animal to the other. Whenever possible, "any blood which escapes from one animal during euthanasia should be cleaned up and the area washed before another animal is brought in" (ref. 2).

Training in physical methods should be done on dead animals. A "humane" method may be inhumane in the hands of personnel without expertise.

The method used should induce unconsciousness rapidly, and before or at the same time as hypoxia is induced. Thus, drugs with curariform effects and other compounds which paralyse the respiratory muscles before unconsciousness occurs, or electrocution when electrical current does not pass through the brain, should not be used without initial anaesthesia.

Disposal of the animal should wait until rigor mortis occurs. Alternatively, the deeply unconscious animal should be bled, e.g. by cutting major vessels.

Euthanasia of a pregnant animal calls for special attention due to the

fact that fetuses may be less sensitive than the mother to the euthanizing agent.

#### 2. *Purpose of the experiment*

For obvious reasons, a particular method of euthanasia, although humane, may be impossible to use in certain types of experiments. For instance, carbon monoxide and hydrogen cyanide, which react with heme-containing proteins, cannot be used if the animal is to be used for the study of e.g. respiration of tissues. Carbon dioxide cannot be used if the pH of the tissues should be kept within physiological limits during the experiment. Barbiturates may interfere with metabolic studies on liver. Electrocution, stunning followed by exsanguination, or even dislocation of the neck, may interfere with studies on brain tissue. Therefore, the selection of the method of euthanasia will have to be considered also from the scientific point of view.

#### 3. *Safety of personnel*

The safety of personnel may be incompatible with some methods of euthanasia. Carbon monoxide would require a series of precautions, such as special equipment and thorough training. Hydrogen cyanide may in general be too dangerous to use. The use of ethyl ether is prohibited by law, in some countries, for personnel safety reasons.

#### 4. *Aesthetic methods*

A method for euthanasia that is aesthetically acceptable may be defined as "the method you can manage". This refers not only to technical skill but also to mental reactions. A person who, irrespective of long experience



reacts against say, the use of a rat guillotine, should *not* be forced to use this method. If such a method is still preferred from the point of view of animal welfare and purpose of the experiment, somebody else among the staff may be trained in the method.

## COMMENTS ON SPECIAL METHODS

In the following, the separate agents are discussed in the order listed in the Report of the AVMA Panel on Euthanasia (Ref. 1). For further comments, reference is given to this article. A thorough discussion of euthanasia is also found in the UFAW publication "Humane killing of animals" (Ref. 3), as well as in the book by Green (Ref. 2). In the chapter on Euthanasia, Green divides the methods into 1) physical and 2) chemical methods, and divides the latter into method using a) inhalational and b) injectable agents. The discussion found in the AVMA report follows the same classification, while the mode of action of euthanizing agents is divided into three categories, namely 1) hypoxic agents, 2) direct neuron depressing agents, and 3) physical agents. This latter classification may seem to be somewhat artificial, since hypoxia is the ultimate cause of death in all methods used. Nevertheless, the panel discussion on Euthanasia reported here, mainly followed the latter classification.

It should also be pointed out that the selection of the proper methods for individual species may be aided by the following list. A further discussion of methods from this point of view is found in Ref. 2 and 3.

### *Hypoxic agents*

1. Carbon monoxide  
Acceptable, provided a number of precautions are made (safety of personnel)
2. Hydrogen cyanide  
Other methods are preferred, due to safety of personnel
3. Drugs with curariform effects  
Condemned if used alone. Preceding anaesthesia is required
4. Rapid decompression  
Other methods are preferred, since it is not very well documented whether the method is humane
5. Nitrogen gas  
Not recommended, if given to conscious animals
6. Electrocution, when current does not pass the brain  
Should not be used, unless the animal has been made unconscious, for instance by electrocution through the brain

### *Direct neuron depressing agents*

1. Ethyl ether  
Stressful to the animals in most cases. Hazardous to personnel due to explosive risk. Although widely used, alternative methods should be considered. Its use prohibited in Norway for personnel safety reasons. (It may be pointed out that the risk of explosion is diminished if the accumulation of peroxides is prevented)
2. Other anaesthetic gases  
May be hazardous to personnel. Special precautions are required
3. Carbon dioxide  
Considered as suitable for mouse and rat, particularly if mixed with 30 % oxygen. Larger animals show various degree of apprehension before they get unconscious. Although widely used for pigs, an alternative method



may be preferable for these animals (Ref. 4)

4. Barbituric acid derivatives

A recommended method when the only purpose is to kill the animal. If, however, the animal model is to be used for experiments after death, for instance in investigations of the metabolism of certain drugs, other methods must be used

»Avlivningsvätska« (sv. for »Killing solution«), contains 57 g pentobarbitone and 286 g ethanol in water, added to 1000 ml

Has been used in Sweden as an alternative to barbiturates. Must not be given i.p., only by intracardiac or intravenous injection

5. Chloral hydrate

Not recommended

6. T-61

Composition: see Ref. 1

Not used in Sweden after 1977, since it contains curariform drugs. Not recommended

*Physical methods*

1. Dislocation of the neck

Often a rapid and painless method of euthanasia in mice and young rats. Also recommended for guinea-pigs, rabbits, young kittens, young puppies and birds

2. Decapitation

Although aesthetically offensive decapitation in guillotine is a rapid and inexpensive method for lab rodents, especially rats

3. Stunning followed by exsanguination

Aesthetically offensive but used by trained persons the method cause instant unconsciousness followed by death after animal is bled out

Head-blow

Limited to animals with thin skulls e.g. young kittens and rabbits

Electrocution through brain

Can be used in order to anaesthetize dogs before electrocution through the heart. Should not be used alone

Gunshot or captive bolt into brane

Used only in special situation, see for instance (Ref. 1)

4. Microwave irradiation or drowning

Should not be used without anaesthesia

References

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4. Hearing on pre-slaughter stunning held at the Swedish Meat Research Centre, Kävlinge, May 19, 1978, edited by S. Fabiansson and Å. Rutegård. Rapport från Köttforskningsinstitutet, Kävlinge, Nr 52, December 1978. Published by the Swedish Meat Research Institute, S-244 00 Kävlinge, Sweden.



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