



Part 1 Destruction of animals

Chapter 1 Introduction

If an outbreak of a transboundary animal disease or other serious disease occurs and a stamping-out policy is adopted for its control and eradication, it may be necessary to destroy a large number of animals. It is essential that these animals are speedily and humanely slaughtered and are indeed dead before disposal of carcasses commences. Speed is of the essence once the disease has been confirmed because, in most situations, the live animals will continue to produce and possibly disseminate the disease pathogen. An experienced veterinarian should be present during destruction. There is likely to be considerable public interest, at least initially, in the destruction of animals. Positive media coverage concerning animal welfare will reflect favourably on staff and increase community support for the eradication campaign.

The destruction of large animals poses the biggest concern in this regard. They may have to be destroyed individually in public view with firearms, humane killers (captive-bolt pistols) or other means.

Officers in charge must be aware of the impact that animal destruction will have on all personnel involved. They must quickly acquaint themselves with the skills and experience of all assistants and brief and train them accordingly. Furthermore, they must be aware that some people will be unable to handle the mentally and physically stressful environment likely to be encountered.

Where possible, the livestock owner and his or her family should not be present during the slaughter process, as they may experience considerable distress. Counselling and welfare should be made available if needed.

The policy regarding compensation for destroyed animals should be communicated clearly to owners before destruction is attempted. Destruction of animals without adequate compensation of owners is likely to meet with serious opposition and at worst result in large-scale illegal movement of animals and/or their products. Payment of compensation at market-related prices is the only way to ensure owner cooperation and the success of the eradication campaign.

What animals should be slaughtered will depend on the disease in question and the epidemiological circumstances. In some non-emergency diseases, e.g. bovine tuberculosis, slaughter of individual infected animals only may be necessary.

For emergency diseases, one of two options is usually selected:

- If animals in the infected zone are not well controlled and there is a serious risk of further rapid spread of the disease or spillover to feral or wild animals or if inadequate resources are available for surveillance and imposition of quarantine and movement controls, it may be expedient to slaughter all animals in the infected zone or in specific areas of the zone.
- If animals are well contained on farms and resources are available for surveillance and imposition of quarantine and movement controls, the best decision would probably be to slaughter only animals on known infected farms and dangerous-contact premises.

This decision will depend on the mode of disease transmission; it will be different for diseases capable of airborne dissemination over distances and those requiring direct contact.

Chapter 2 Organization of destruction

ACTION PLAN

Planning is essential to ensure that the task of destruction is carried out efficiently and not impeded by lack of resources. An action plan should be drawn up in consultation with owners or agents and appropriate officials. The procedures below should be followed.

The veterinary officer should undertake the tasks listed below.

- Discuss the situation with affected farmers and village leaders, briefing them on what is going to happen, including the method of compensation.
- Consult with the farm owner/manager and/or village leaders to establish:
 - farm layout, facilities and equipment;
 - the number, species and location of animals to be destroyed;
 - the destruction technique to be used;
 - the time-frame for commencement and completion of animal destruction.
- Decide on the methods and facilities needed for safe, humane and efficient destruction of the animals.
- Advise the team leader of immediate resources needed to move and secure animals in preparation for destruction.
- Consult with the officer in charge (OIC) of the disposal team if different from the destruction team, determine the disposal method and site; if necessary, identify centrally located carcass disposal sites as close as practicable to the site of destruction.
- Draw up a concise written plan for approval, including:
 - destruction method(s);
 - destruction site(s);
 - order of destruction;
 - personnel required;
 - facilities and equipment needed.
- Make a diagram of the infected property (IP) or dangerous-contact premises (DCP), including details of the destruction operation.
- Make sure that there is a complete inventory of animals to be destroyed on the property, not delaying destruction because there has been no agreement on valuation; where possible, all animals should be valued before destruction; where there is no prior agreement on valuation, provide close supervision to ensure that all the animals are available for destruction.
- Seek authority to destroy in terms of the law(s) pertaining to control of animal diseases when there is a delay in reaching agreement on valuation with the owner or his/her agent; delay may endanger the success of the operation and result in negative perceptions of animal disease control activities.
- Request livestock owners to assemble, confine and restrain their animals the day before the destruction team starts operations.
- Ensure that animals not to be destroyed, including domestic pets, are confined well away from the destruction site.
- Send a team into the surrounding countryside to assess the presence of free-roaming or unrestrained susceptible animals.
- Arrange for teams to be sent to round up, shoot or poison such animals where they are; helicopter shooting by trained marksmen may be the only option, in which case proper disposal of carcasses is essential, as the animals may already be infected.
- Arrange for any necessary support services, such as police and army personnel, to be made available.

Before commencing destruction, the team leader should carry out the tasks below.

- Move animals to the centre of the IP or to areas most remote from other susceptible animals, including wild animals.
- Brief the destruction teams, then supervise and coordinate their activities.
- Ensure that:
 - destruction takes place away from public view if possible;
 - destruction facilities, methods and working conditions are consistent with personal safety;
 - destruction is humane and that no animal is removed for disposal until it is dead;
 - destruction teams receive adequate rest and meal breaks.
- Make every effort to avoid damage to property; damage must be drawn to the attention of the owner/manager, recorded and reported promptly.
- Check all destruction against the authorized inventory, to ensure that all variations are accounted for (e.g. births and natural deaths) and that all animals scheduled for destruction have in fact been destroyed.
- Provide a situation report for the team leader at the end of each day.
- Advise the team leader of resource requirements for the next 48 hours.

- Advise the appropriate officer/s immediately destruction has been completed, so that other tasks, such as disinfection, can be started without delay; carcasses and the destruction area should be sprayed with disinfectant as soon as destruction is complete.

SELECTION OF DESTRUCTION SITE

The factors that need to be considered in selecting a destruction site are:

- facilities available on site;
- additional facilities and equipment required;
- animal security;
- proximity of the disposal site and ease of access;
- safety of personnel;
- acceptability to the owner/manager;
- safe and secure means of transporting carcasses to the destruction site;
- likelihood of damage to property and services;
- protection from public view.

ORDER OF DESTRUCTION

The order of destruction will be determined by the veterinary officer in charge of the operation. Normally the order will be:

- affected animals;
- their direct contacts;
- other susceptible animals in order of epidemiological importance.

In foot-and-mouth disease, pigs should be destroyed before other species.

Fractious and potentially dangerous animals, such as bulls, sows with litters and boars should be destroyed first.

Chapter 3 Methods of destruction

Methods of destruction of animals are set out below. Rabid or suspect rabid animals should be shot in the heart with a firearm to preserve the brain, which is the best diagnostic specimen, and to avoid contamination of personnel with potentially infective brain or saliva. Animals with bovine spongiform encephalopathy (BSE) or scrapie should not be shot through the head, as brain tissue is required for diagnostic testing.

FIREARMS (RIFLES AND GUNS)

Ensure compliance with any firearm licensing requirements, including the use of trained and approved operators for rifles and guns.

Part of the preparation process for an emergency disease outbreak is to ensure that firearms operators experienced in shooting livestock can be contacted at short notice. The following aspects of firearms safety should be considered:

- All firearms are potentially hazardous.
- When shooting at short range in stockyards, relatively low-velocity hollow/soft-point ammunition should be used. Solid-point ammunition should be avoided, because the projectiles can leave the target at high velocity, which is dangerous to personnel in the area. Hollow point ammunition disintegrates when entering the target, more effectively destroying brain tissue. (For details see relevant species in Chapter 4.) When paddock shooting, use high velocity, hollow/soft-point ammunition.
- Persons other than the shooters and assistants should be cleared from the area or should stand well behind the shooters. The line of fire must be chosen to prevent accidents or injury from stray bullets or ricochets.
- To provide maximum impact and the least possibility of misdirection, the range should be as short as circumstances permit.

- Although the humane killer pistol and captive-bolt pistol are designed to be pressed firmly on the head before being discharged, it is not safe to do this with a standard rifle or pistol.
- Always notify police before using firearms near populated areas.

Advantages of using firearms

The advantages of firearms are:

- clean kills in the hands of experienced operators;
- handling individual animals is not necessary;
- destruction of animals from a distance;
- firearms and ammunition are readily available;
- many people are proficient in their use.

Disadvantages of using firearms

The disadvantages of firearms are:

- they are potentially dangerous;
- they are unsuitable for use close to populated areas.

CAPTIVE-BOLT PISTOLS

Captive-bolt pistols are an acceptable alternative to firearms where animals are sufficiently restrained, provided that the team understands that animals may be stunned rather than killed. They must be competent to know when an animal is only stunned and trained and equipped to kill such an animal immediately after stunning.



FIGURE 1

Captive-bolt pistol

Provided that animals are properly restrained and that the slaughter team is aware that animals may be stunned but not killed, the captive-bolt pistol is an alternative to firearms.

Blank cartridges for the captive-bolt pistol are colour coded according to the amount of charge they contain. It is essential that manufactures' recommendations should be followed regarding blank cartridges for different farm animals. The most widely used is the "Cash Special", a single shot .22 calibre captive bolt similar to a revolver. It uses three different loads:

- pink: 1 grains (weaners);
- purple: 2 grains (sheep);
- green: 3 grains (cattle, boars).

Regular maintenance of the captive-bolt pistol is essential for efficient stunning.

When using a captive-bolt pistol, more than one operator can work in the same area with safety. Spare weapons and parts should be on hand.

Advantages of captive-bolt pistols

The advantages of captive-bolt pistols are:

- operator safety, as there is no free projectile;
- both pistols and ammunition are readily obtainable;
- ease of use;
- operators do not need to be expert shooters; they must, however, be trained in correct placement of the pistol against the head in the different species.

Disadvantages of captive-bolt pistols

The disadvantages of captive-bolt pistols are:

- they usually only stun larger animals such as cattle over one-year old, sows, boars, billy goats and rams, which must then be pithed or bled (see Pithing, below) to ensure death;
- some animals have to be individually restrained;
- they are relatively slow, especially when destroying large numbers of animals.

Humane killers that work on the same principle as the captive bolt but destroy a larger amount of tissue are a better option.

PITHING

Pithing is the process of destroying nervous tissue in the region of the brain stem to ensure the death of the animal. It is usually done by inserting a rod through the hole made by the captive-bolt in the head or by severing the spinal cord between the atlas and axis, the first and second bones of the neck.

Pithing unstunned animals is not an acceptable method of destruction as it is inhumane. It is essential on animals that have been stunned only, for example when captive-bolts are used on larger animals.

Pithing is also a safety measure to prevent workers being struck by the involuntary movements of a stunned animal.

Pithing is preferable to exsanguination, or bleeding out, which could release infectious material and make working conditions slippery and dangerous.

OTHER PHYSICAL METHODS

Dislocation of the neck

This may be suitable for poultry and smaller laboratory animals. Suitable methods are by burdizzo, bone cutters, secateurs or manually. Burdizzos are particularly useful when large numbers of poultry with strong necks, such as geese and duck, are to be destroyed.

Electrocution

Electrocution is used widely in abattoirs but is not suitable for field use.

Decompression

This method is now regarded as unacceptable.

Exsanguination

Exsanguination combined with stunning or neck dislocation is a humane method of destruction of sheep and goats when performed by an experienced operator. It is undesirable, however, because released infectious material makes the destruction site slippery and dangerous.

GASEOUS AGENTS

Carbon dioxide

Carbon dioxide is the method of choice for destroying most poultry species when large numbers are involved and for many laboratory animals.

Animals must be exposed to an atmosphere of at least 30 percent carbon dioxide to ensure loss of consciousness and then at least 70 percent carbon dioxide to ensure death.

To achieve this, animals may be placed in an air-filled container into which carbon dioxide is allowed to flow so that concentration rises to a minimum of 70 percent for at least 3 minutes. An optimum flow rate is one that will displace 20 percent of the chamber volume per minute. Animals may be left in the container until *rigor mortis* ensues or they may be removed once unconscious and killed by cervical dislocation or exsanguination. Exposure of up to 20 minutes may be necessary to ensure death; this will be even longer in neonatal or juvenile animals, which are tolerant of carbon dioxide. They may require 30 minutes exposure or longer.

Alternatively, the container may be filled with the carbon dioxide/air mixture before animals are placed in it, in which case anaesthesia is said to occur more rapidly (20 seconds to unconsciousness, compared to 70 seconds). Some workers have suggested, however, that this technique is more stressful.

If cylinders of carbon dioxide are not available, dry ice may be used. This is placed in the bottom of a deep container under a gauze floor, in such a way that there is no direct contact with the dry ice. Animals are then placed in the container and left there until unconsciousness or death ensues.

The use of a 70 percent carbon dioxide/30 percent oxygen mixture is said to decrease the discomfort of hypoxia before the onset of anaesthesia and narcosis. This will complicate the procedures, however, by requiring additional cylinders of oxygen and reducing valves.

Carbon dioxide is safe and easy to use as long as it is used in a well ventilated area.

Gaseous anaesthetic agents

These agents, which include halothane, enflurane and isoflurane, can be used to produce anaesthesia and death. Halothane at concentrations greater than 4 percent can produce anaesthesia and cardiac arrest in 90 seconds. These agents can be used in exactly the same way as carbon dioxide, piped into a container with a carrier gas such as oxygen or poured onto cotton wool and placed under gauze at the bottom of a deep container. There should be no direct contact between the animal and the liquid anaesthetic.

The major disadvantages are that these agents are expensive and should only be used in a well ventilated room or, preferably, in a fume cupboard. Prolonged exposure, even at low concentrations, may be detrimental to the health of personnel. As with carbon dioxide, animals may be left in the anaesthetic chamber until dead or may be removed once unconscious and killed by one of the physical methods or by injection of an overdose of barbiturate as detailed below.

Ether is not recommended. Induction of anaesthesia is slow and stressful, as the high concentrations of the vapour necessary to produce unconsciousness are irritant to skin and mucous membranes. Ether is also hazardous to personnel because of its explosive properties during use and when disposing of carcasses.

Hydrogen cyanide gas

Hydrogen cyanide gas is a highly effective method of destroying poultry. Human safety considerations restrict its use, however, and it is not recommended.

Carbon monoxide

Carbon monoxide can be used to destroy poultry. It is readily available from car exhaust but unleaded petrol produces less than super petrol and the fumes must be cooled. Human safety considerations restrict its use.

Methyl bromide

Methyl bromide is effective at killing poultry but operator safety requirements restrict its use. There are people trained in its use in all agriculture departments. It is also virucidal. Environmental concerns

are now restricting its use.

INJECTABLE AGENTS

An overdose of any of the barbiturates can be used for euthanasia, ideally by the intravenous route in large animals; the intracardiac or intraperitoneal route may be preferable in smaller animals. Destruction of cats, rabbits and some birds by intraperitoneal sodium pentobarbitone may be accompanied by an excitement phase. Animals should be confined and handled with extreme care. Specific euthanasia solutions are available (sodium pentobarbitone 325 mg/kg). This should not be used by the intrathoracic, subcutaneous or intramuscular route as at this concentration it is extremely irritant to tissues. Pentobarbitone at concentrations normally employed for anaesthesia may also be used but larger volumes will be required.

If the animals are excitable or vicious, other drugs can be administered to calm them. These drugs, such as tranquillizers, analgesics or depressants such as ketamine, opioids or xylazine, can be given by the subcutaneous or intramuscular route. An overdose of barbiturate can then be given intravenously to kill the animal.

These agents are restricted by law and must only be used by a veterinarian or under veterinary supervision.

Chapter 4 Destruction of various species

The preferred methods of destruction of various domestic species and the factors that determine the selection are set out below.

CATTLE AND BUFFALO

Under most circumstances, cattle and domesticated (water) buffalo will be mustered into yards and shot. In extensive areas where 100 percent musters cannot be achieved, unmustered animals will be paddock shot, after first mustering as many as possible.

Captive-bolt pistols are most suitable when animals can be adequately restrained (see Captive-bolt pistols, p. 10). Injectable agents may be most suitable for small numbers of calves.

Frontal method

The firearm should be directed at the point of intersection of lines taken from the base of each horn (or equivalent position in polled animals) to the opposite eye, aiming at the spine (Figure 2a). For bulls or older animals, the bullet should enter about 1 cm to the left or right of this point and hard point/jacketed ammunition may be necessary. Small calves may be shot just behind the nuchal crest (poll) in the mid-line, aiming directly at the muzzle (Figure 2c). Alternatively, a captive-bolt pistol using cartridges may be used.

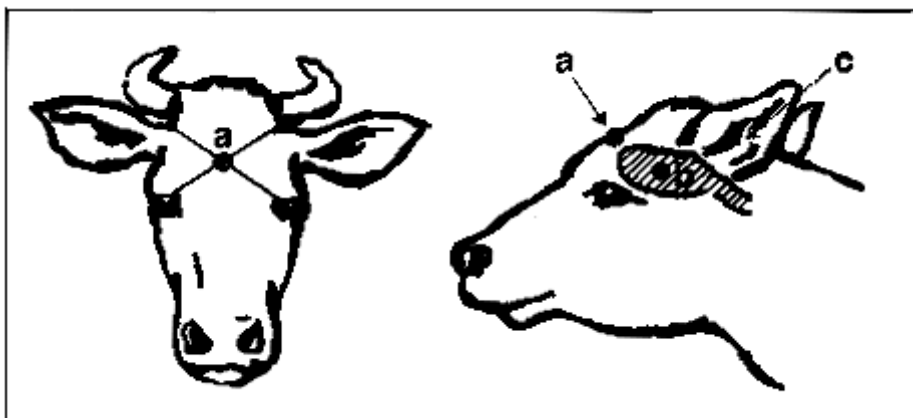


FIGURE 2

Humane destruction of cattle: (a) recommended position for frontal method (suitable for firearm or captive-bolt pistol); (b) recommended position for temporal method (only suitable for firearms); (c)

recommended position for small calves.

Temporal method

This is only suitable for firearms. The animal is shot from the side so that the bullet enters the skull midway between the eye and the base of the ear. The bullet should be directed horizontally (Figure 2b).

Shooting in yards

Ideally, only personnel who have had previous experience in this type of work should undertake the task. If such personnel are not available, the task may be allocated to police or army marksmen. They should be fully briefed on humanitarian and safety aspects of destruction before commencing yard shooting. Only hollow/soft point ammunition should be used. The minimum calibre should be .22 magnum; maximum calibre should be .44 magnum (240 grain) or .375 (250 grain).

Operate from a top rail, preferably in a small yard. It is not practical to shoot in a crush unless dealing with very small numbers and the crush is equipped with a side opening gate, in which case a captive-bolt pistol should be considered.

Paddock/extensive area destruction

Shooting from helicopters is usually the most effective method of destroying unmusterable cattle. Appropriate civil aviation authority approval may be needed before rifles may be used from helicopters. This should be carried out only by experienced, trained personnel with current proficiency in this type of operation. Untrained personnel should undergo a training course and pass a practical and written test at its conclusion before shooting from a helicopter. Minimum recommended calibre is .308 soft point with semi-automatic rifles such as the M14, SLR or MIA.

Shots aimed to destroy the brain are preferred but for practical reasons this is not generally possible with helicopter shooting, in which case heart/lung shots can be used.

The problem of rapid destruction of large numbers of cattle on intensive feedlots is not easy to resolve. The possibility of using a lethal oral agent in water or feed should be considered.

Technique for domesticated (Asian) buffaloes

As for cattle except:

- hard point/jacketed ammunition is preferable for large animals;
- for small numbers, when use of semi-automatic rifles is not critical, use heavier calibre or magnum rifles;
- frontal shooting: check the angle of impact, as a buffalo will often raise its nose.

SHEEP

The preferred method of destruction is by .22 rifles or captive-bolt pistols.

Hornless sheep

The top of the head (centre of upper forehead) is a suitable position, with the firearm or captive-bolt being aimed towards the animal's gullet. Alternatively, the weapon may be placed just behind the poll and aimed in the direction of the animal's muzzle. Both methods are illustrated in Figure 3.

Horned sheep

If using a captive-bolt pistol, the top-of-the-head position used for hornless sheep may not be suitable, in which case the weapon may be placed behind the poll and aimed in the direction of the animal's muzzle (Figure 4a). If using a firearm, shoot at a point in the middle of the face just above the level of the eyes, aiming towards the spine (Figure 4b).

- *Rams*: it may be easier to use .22 magnum rifle, depending on facilities. If captive-bolt is more practical, heavy duty cartridges should be used (see Captive-bolt pistols, p. 10).
- *Wethers/ewes*: sheep must be packed tightly as destruction proceeds. This can be achieved using light portable panels or mesh.

- *Newborn lambs*: these should be separated and given sodium pentobarbitone (intraperitoneal, 3–5 ml through automatic syringes).



FIGURE 3

Humane destruction of hornless sheep: recommended positions and direction of fire for captive-bolt pistol or firearm.

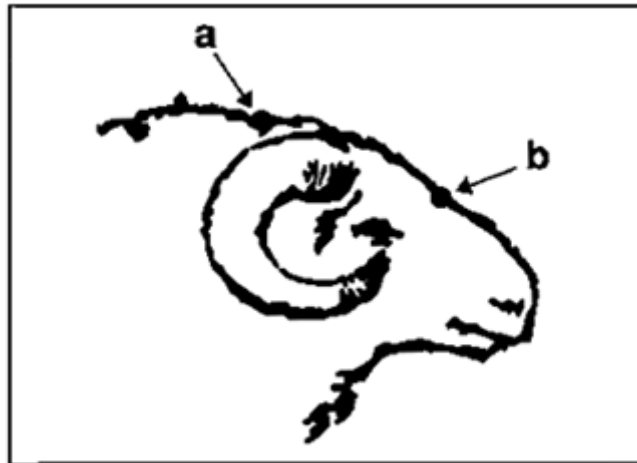


FIGURE 4

Humane destruction of horned sheep: recommended position and direction of fire for (a) captive-bolt pistol or (b) firearm.

PIGS

Pigs are particularly difficult to destroy. Captive-bolt pistols or heavy-calibre humane killers should be used for housed pigs to avoid the danger of ricochets. Housed pigs may be moved outside and destroyed with firearms. Sows with litters are particularly fractious and difficult to handle. Pigs in paddocks can be shot using firearms.

Use sodium pentobarbitone on unweaned pigs. Intraperitoneal injections of 3–5 ml of a suitable product using automatic syringes is satisfactory.

Frontal method

The captive-bolt pistol or firearm should be directed at a point about midway across the forehead and, for adult pigs, about 2 cm above the level of the eyes (Figure 5a).

Temporal method

This is only suitable for firearms. The pig is shot from the side so that the bullet enters the skull at a point midway between the eye and the base of the ear. The bullet should be directed horizontally into

the skull (Figure 5b). This method is preferred for adult pigs because of the heavier bone structure of the front of the skull.

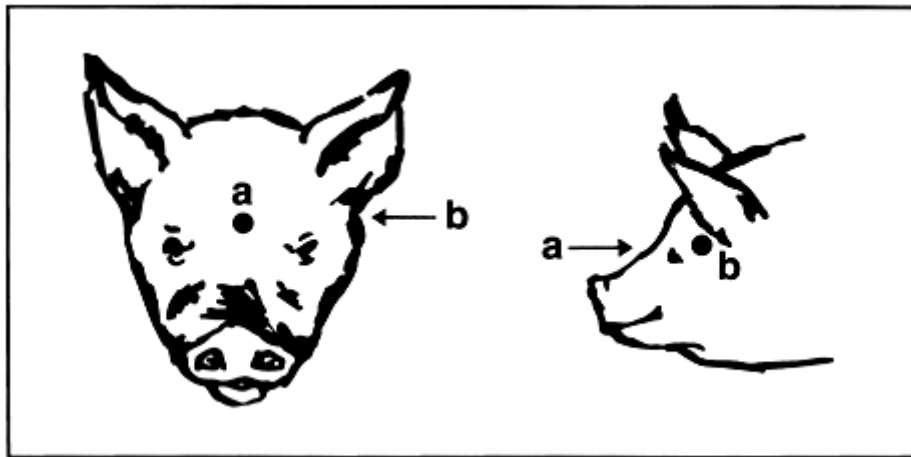


FIGURE 5

Humane destruction of pigs: recommended position and direction of fire for (a) frontal method (suitable for captive-bolt pistol or firearm) or (b) temporal method (suitable for firearm only).

Feed one-third of the normal ration before commencement of destruction. Pigs will stay calmer and therefore be easier to handle. If slaughter is likely to be delayed, ensure sufficient feed is on hand.

- *Growers*: pack in tight; work round perimeter of yard, then climb in to finish balance of group. Pigs usually quieten as destruction progresses.
- *Sows*: do not yard too tightly, as they become upset if jammed and will start climbing on rails; work steadily; do not hurry. Use heavy duty cartridges in captive-bolt pistols (see Captive-bolt pistols, p. 10).
- *Boars*: use heavy-duty cartridges in captive-bolt (see Captive-bolt pistols, p. 10); if this is too difficult, use a .22 magnum rifle.
- *Small pigs*: use standard captive-bolt cartridges (see Captive-bolt pistols, p. 10). It is preferable to have small pigs caught and held over the rail of the yard while destroyed. A wheelbarrow can then be a useful means of conveyance to the front-end loader.

GOATS

Using either a captive-bolt pistol or firearm, aim the weapon to the skull behind the horns as shown in Figure 6. Aim in line with the animal's mouth.

Kids may also be shot from the front, as for cattle. This method is not suitable for mature goats, as the brain is located well back in the skull compared to other livestock. Sodium pentobarbitone is also appropriate.

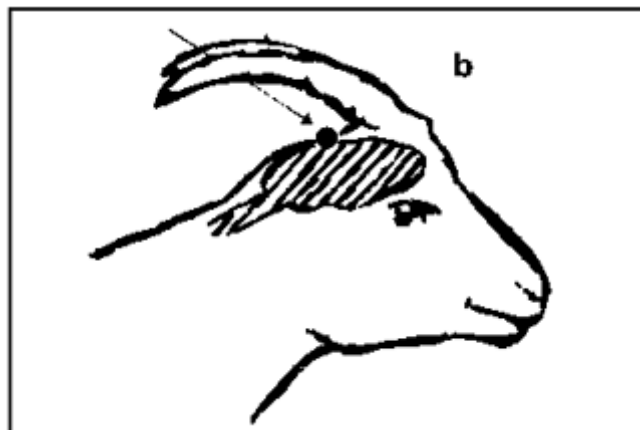


FIGURE 6

Humane destruction of goats: recommended position and direction of fire (captive-bolt pistol or firearm).

Newborn kids should be separated and given sodium pentobarbitone (intraperitoneal, 3–5 ml of a suitable product).

HORSES, DONKEYS AND MULES

These animals can be destroyed either by intravenous injections of euthanasing drug or shooting, as detailed below.

Frontal method

The firearm should be directed at the point of intersection of diagonal lines taken from the base of each ear to the opposite eye, aiming at the spine (Figure 7a).

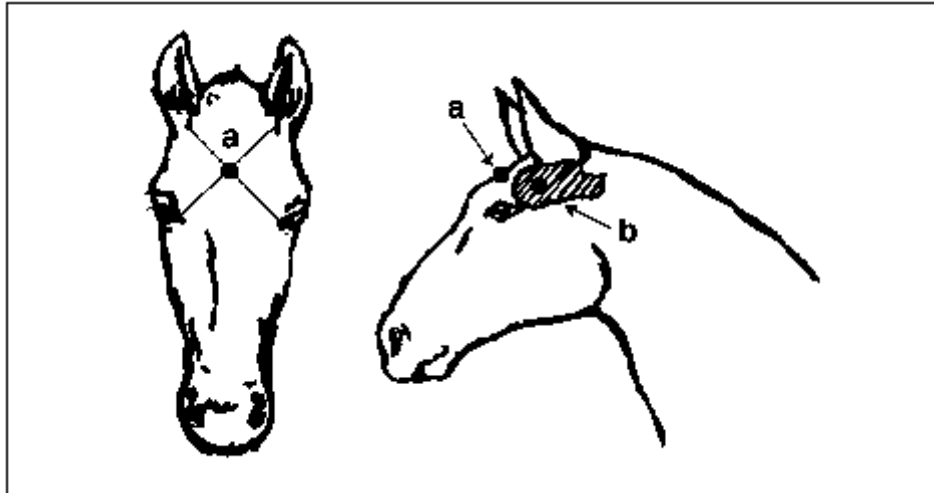


FIGURE 7

Humane destruction of horses: recommended position and direction of fire for (a) frontal method or (b) temporal method.

Temporal method

The horse is shot from the side so that the bullet enters the skull midway between the eye and the base of the ear (Figure 7b). The bullet should be directed horizontally.

Recommended rifles for horses are .22 magnum (hollow point) or .44 magnum. Captive-bolt pistols are not recommended for horses, because some horses rear before the operator can withdraw the bolt or move out of danger. Horses in the public view can be exsanguinated humanely by severing the abdominal aorta *per rectum*.

Paddock/extensive area destruction

As for cattle and buffalo (see Cattle and buffalo, p. 15).

DEER

A firearm or captive-bolt pistol should be directed at the forehead where lines taken from the base of each ear to the opposite eye intersect (Figure 8a). The firearm should be fired horizontally into the forehead. If using a captive-bolt on adult bucks, heavy duty cartridges are necessary.

If the deer are disturbed when approached from the front, an equally effective method is to fire the instrument through the skull just behind the base of the antlers. The weapon should be aimed in line with the animal's muzzle (Figure 8b).

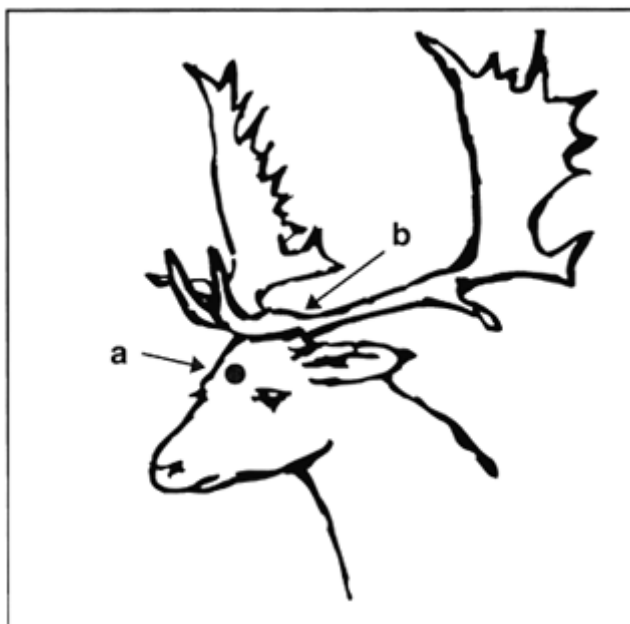


FIGURE 8

Humane destruction of deer: recommended position and direction of fire for (a) firearm or captive-bolt pistol or (b) alternative position for disturbed deer.

BIRDS

For small numbers of birds, for example fancy breeds or pigeons, the preferred methods are dislocation of the neck using burdizzos, bone cutters, secateurs or bare hands or intracardiac or intraperitoneal injection of sodium pentobarbitone.

For large numbers of birds in commercial poultry units, the preferred method is gassing with carbon dioxide. This method involves lining large garbage waste bins (skips) with plastic sheeting that forms a canopy over the top of the bin.

Birds can be caught using teams of 10–15 labourers. Experienced catching teams may be available. Chicks are easily caught under heaters and are transferred to skips in plastic garbage bins. Broilers on the ground are driven with a movable hessian wall to the catching area, where they are caught and placed directly into skips.

Caged birds are more difficult and progress is slower. Each catcher removes three or four birds from cages and carries them by the legs to skips.

Layers on perches are best caught at night or during low light, when they are quiet.

Carbon dioxide is transferred to the bottom of the skips through garden hose fitted to the top of the cylinders. The carbon dioxide should be decanted in bursts of 30–45 seconds. It is essential not to decant too quickly or the bottles will freeze when about half empty.

On average, half a 45 kg cylinder of carbon dioxide is needed for the 3 m³ skips and three or more cylinders for the 20 m³ skips. Carbon dioxide should be added at a rate sufficient to ensure that birds succumb before others are placed on top of them. Skips should be three-quarters filled with birds, sealed and transported to the disposal site. Care must be taken to ensure that no bird is still alive when dropped into the burial pit. Should this happen, birds must be immediately caught and humanely killed.

For humane destruction of farmed ostriches, birds should be restrained firmly and dispatched by captive bolt or injection of sodium pentobarbitone into the jugular vein.

DOGS

Injectable agents are the best method for destroying dogs that can be handled. Intravenous sodium pentobarbitone (40 mg/kg) is the ideal method. Intracardiac injections are favoured for puppies and

small dogs. Other drugs given subcutaneously or intravenously may be used initially, for example xylazine (2 mg/kg) or ketamine (20 mg/kg), if necessary using a tranquillizer gun. Once the dog is sedated, intravenous barbiturates can be used to kill the animal.

If a tranquillizer gun is not available, injection by any route will be too dangerous for some totally unmanageable dogs and for rapid or suspect rabid dogs. A lasso on a pole may be useful to help catch and control these dogs. Including a sedative (e.g. sodium pentobarbitone) in the food may be an appropriate preliminary to an injectable agent. Dogs may have to be restrained with muzzles or tape before destruction.

Some dogs will have to be shot through the heart.

CATS

Injectable agents are the best method for destroying cats. Intravenous or intracardiac sodium pentobarbitone (40 mg/kg) is the preferred drug. Alphaxalone (Saffan®) may be used as a preliminary. Intraperitoneal injections can cause excitation before death. Tranquillizer guns are not suitable for cats, because cats are small, fast-moving targets.

Animals that are not easy to handle may have to be put in a hessian bag, injected through the bag and left in a cage until dead. Alternatively, they can be placed in a plastic bag or box into which anaesthetic gases (including carbon dioxide) are piped, using oxygen as the carrier gas. Anaesthesia is usually quick and quiet but death may take some time - at least 20 minutes with carbon dioxide but less with some of the other anaesthetic gases. Once the animal is unconscious, it may be removed and killed with an overdose of barbiturate.

RATS, MICE, GUINEA PIGS

Any of the physical or chemical methods described above can be used in a laboratory. The method of choice, however, is carbon dioxide. Newborns are resistant to carbon dioxide and need prolonged exposure or a combination of carbon dioxide and cervical dislocation. If pentobarbitone is used, it should be given by the intraperitoneal route (rats and mice 100 mg/kg, guinea pigs 90 mg/kg).

RABBITS

Physical methods such as cervical dislocation should only be used by skilled personnel and only on rabbits less than 1 kg in weight. The preferred method for laboratory rabbits is intraperitoneal pentobarbitone 60 mg/kg. Intravenous barbiturate injections of the very concentrated barbiturate euthanasia solution into the ear vein are often painful and may be distressing. Standard anaesthetic solutions should therefore be used. Rabbits should be restrained, since an excitement phase may occur, especially if the intraperitoneal or intravenous injection is incorrectly administered.

Induction of anaesthesia with carbon dioxide, as described for birds and cats, is slow and animals appear to become apprehensive before unconsciousness supervenes. The method is therefore not recommended. Overdosing with other inhaled anaesthetic agents may be used.

PRIMATES

Chemical restraint by means of ketamine (20 mg/kg intramuscularly) followed by an overdose of barbiturate given by the intravenous or intracardiac route (50 mg/kg) is recommended for laboratory primates.

FISH

A sharp blow to the head followed by destruction of the brain has been recommended as a physical method of euthanasia. If chemical methods are preferred, an overdose of anaesthetic such as MS222 (tricaine methane sulphonate) can be used or carbon dioxide can be bubbled into the water. This should be followed by destruction of the brain.

CIRCUS AND ZOO ANIMALS

The assistance of a veterinarian with experience of handling and destroying circus and zoo animals should be sought. If none is available, the methods outlined above should be extrapolated to the various species.

Glossary

Ammunition

- **Hard point:** hard metal ammunition that passes through tissues cleanly but can leave the target at high velocity, causing danger to other people/animals in the area;
- **Soft/hollow point:** ammunition made of softer metal or with a hollow point that flattens on impact, causing greater damage to tissues; does not exit the target unless it fails to encounter bone or solid muscle.

Burdizzo: castrating pincers.

Captive-bolt pistol: humane animal killer; takes either a blank cartridge that delivers a knockout blow to the skull or a penetrating bolt that is driven a short distance into the brain; the operator does not have to be a marksman as the instrument is pressed firmly against the animal's skull before firing.



FIGURE 9

Movement restriction

Movement into and out of infected premises must be rigorously checked by quarantine and/or road barriers.

Disinfectant: an agent used to destroy micro-organisms outside a living animal.

Disposal: sanitary removal of animal carcasses and other infected material by burial, burning or some other process, so as to prevent the spread of disease.

Exsanguination: severe loss of blood.

Firearm: small arms weapon (gun or rifle).

Infected premises: a defined area, which may be all or part of a property, in which an exotic disease or its infective agent exists or is believed to exist; an infected premises is subject to quarantine and to eradication or control procedures.

Infected premises operations team: team appointed by the local disease control centre (LDCC) controller to coordinate/supervise operations at the infected premises.

Injection sites

- intracardiac: into the heart;
- intraperitoneal: into the peritoneal (abdominal) cavity;
- intramuscular: into muscle (the needle is passed deeply into the substance of a muscle before the fluid is injected);
- intrathoracic: into the thoracic (chest) cavity;
- intravenous: into a vein;
- subcutaneous: under the skin (hypodermic).

Nuchal crest: transverse bony ridge across the back margin of the roof of the vertebrate skull.

Poll: crown of the head.

Quarantine: legal restrictions limiting movement imposed on a place, animal, vehicle or other things.

Susceptible animals: animals that can be infected with the disease.

