



Humane Killing of Livestock Using Firearms

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Introduction

In all livestock production systems, no matter how well they are managed, there will be times when animals have to be humanely destroyed in order to protect their welfare. In most cases, these animals will be casualties which have not responded to treatment, or emergencies (animals with serious physical injuries or in acute, unrelievable pain). The latter may occur: on-farm; in transit; in markets, lairages or collection centres; or as a result of accidents on the public highway, at racecourses, shows or exhibitions.

Used properly, firearms provide one of the quickest and most effective methods of humane killing of livestock. This publication has been written for all those, particularly veterinary surgeons, knackermen, slaughtermen, farm staff and police firearms officers, who may be directly or indirectly involved with the killing of large farm animals. It covers the humane destruction of cattle, sheep, pigs, deer, goats and horses, using humane killers, handguns, rifles and shotguns, discharged at close quarters, i.e. within 25 centimetres of the target – the animal's head. All of these weapons fire free projectiles (single bullets or shot-charges) and their use is intended to kill the animals outright, with no need for further action on the part of the operator. This has definite advantages in certain situations where exsanguination or pithing would be undesirable or inappropriate.

These guidance notes explain how free projectiles kill animals, describe how the equipment should be used and maintained, and highlight the associated animal welfare and operator safety implications arising from the use and misuse of such equipment. It is strongly recommended that instruction and training should be sought from a qualified and experienced operator before any person attempts to kill an animal using any weapon which discharges free projectiles. It is also recommended that, on the first few occasions at least, newly-trained operators work under experienced supervision, although it is recognised that this may not be possible in the case of extreme emergencies.

As well as the moral and ethical responsibilities associated with the humane destruction of animals, it is incumbent upon owners and operators of firearms to keep them properly maintained and secured at all times in the interests of personal and public safety.

Please do not read further if you feel you may be negatively affected by the content.

Important Points About This Website

This guide is intended to instruct operators in the proper and humane use of firearms for the slaughter and killing of cattle, pigs, sheep, goats, deer and horses. In order to safeguard the welfare of the animals to be killed, it is necessary for the guide to be both thorough and illustrated. As such, some people may find some of the descriptions and graphics upsetting. Please do not read further if you feel you may be negatively affected by the content.

All firearms are potentially lethal. You are advised to read the safety section of these notes with particular care. If you are in any doubt as to any aspect of the operation of this type of equipment, you should consult the manufacturer. In no circumstances can the Humane Slaughter Association (HSA) accept any liability for the way in which firearms are used, or any loss, damage, injury or death caused thereby, since this depends on circumstances wholly outside the HSA's control.

The HSA aims to provide up-to-date and accurate information. If you have suggestions for improving any of the material included in this guide please let us know at info@hsa.org.uk or using the contact details provided at the HSA website.

A paperback version of this guide (published 2005) is also available to purchase at a cost of £5 (including postage). Contact the HSA for further details.

Killing with Free Projectiles

The purpose of discharging a firearm from close quarters at an animal's head is to kill the animal instantly. The free projectile, which may be a bullet or a charge of lead shot, achieves this by destroying the part of the brain which controls breathing and other vital functions: the medulla oblongata (the brain stem). In the split second prior to this, the projectile should also pass through the cerebral cortex (upper brain) and the cerebrum (mid-brain), causing extensive damage and destruction (Figure 1). This damage, in addition to the concussive effect of the impact of the projectile, will render the animal instantaneously insensible and the subsequent destruction of the brain stem will prevent any possibility of recovery.

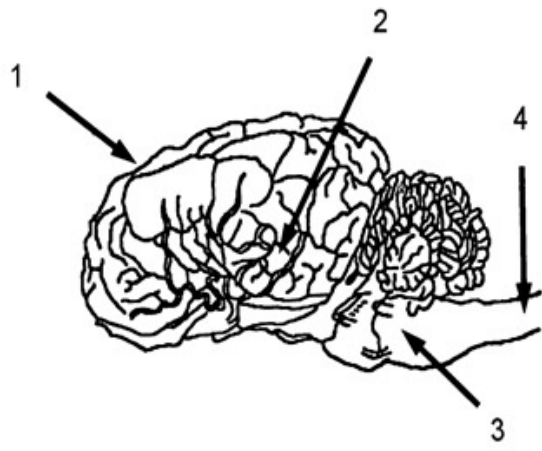


Figure 1: Lateral view of a mammalian brain
 Key: Upper brain/cerebral cortex (1), Mid-brain/cerebrum (2), Brainstem/medulla oblongata (3), Spinal cord (4)

Physiological Principles

The physical principle behind killing with free projectiles is the transfer of high levels of kinetic energy (the energy of movement) in an extremely short time from the projectile to the animal's brain. If the correct type of projectile is used, the resulting damage should be sufficient to kill the animal outright. Kinetic energy (KE) is a product of half the mass (m) of an object and the square of its velocity (v). It is expressed by the following formula:

$$KE = \frac{1}{2}mv^2$$

The effect of the above relationship on the muzzle energy of a projectile is shown in Table 1. Muzzle energy is expressed in joules (J), mass is expressed in kilograms (kg) and muzzle velocity in metres per second (ms⁻¹). In these examples the mass of the projectile in both cases is 5.51g and the muzzle energy required for an effective kill is 200 J.

Table 1 Relationship between mass, velocity and muzzle energy of a free projectile

	Muzzle velocity of free projectile	
	275ms ⁻¹	200ms ⁻¹
Mass of projectile	5.51g (0.00551kg)	5.51g (0.00551kg)
Muzzle energy (KE = $\frac{1}{2}mv^2$)	208 J	110 J

It can be seen from Table 1 that a decrease of a little over 25 percent in muzzle velocity reduces the muzzle energy by nearly 50 percent, leaving it well below the effective kill level. Therefore, it is imperative to use a sufficiently powerful charge to propel the projectile at the optimum velocity. Any factor which impairs the velocity of a projectile, such as an underpowered charge, will have the effect of reducing its muzzle energy, with consequent implications for animal welfare.

Physiological Effects

When an animal is correctly killed with a shot to the head with a free projectile, be it a bullet or lead shot, it will collapse immediately, stop breathing and may bleed profusely from the entry wound, the mouth and/or the nose. There may or may not be immediate exaggerated tonic activity of the muscles, or the carcass may appear completely relaxed. After a lapse of up to one minute, the carcass may start to twitch and, in some cases, convulse quite violently (especially pigs). This is normal in an animal which has been shot correctly. If in any doubt as to the effectiveness of the shot, check the abdomen for absence of rhythmic breathing and the eye for absence of corneal reflex, before deciding if it is necessary to shoot the animal again. The convulsions will start to subside after a time (up to one minute) and eventually cease, leaving an initially limp carcass which will then, in due course, go into rigor mortis.

Indicators of an effective shot:

- Animal collapses immediately and stops breathing
- Carcass can be tonic or relaxed
- A fixed, glazed expression in the eye
- No corneal reflex
- Convulsions may occur after a lapse of up to one minute

Ballistics

The science of projectiles and firearms is defined as 'ballistics' and it can be divided into three distinct categories: internal, external and terminal. Internal ballistics is concerned with what happens within a time span of about two milliseconds, from the impact of the firing pin or striker, to the exit of the bullet or shot-charge from the muzzle end of the barrel. External ballistics is concerned with the flight of the bullet or shot-charge after leaving the barrel. Terminal ballistics deals with that which takes place when the bullet or shot-charge strikes the target.

When using firearms to kill animals at close quarters, it is the terminal ballistics that are most relevant. During the short period of interaction between a projectile and its target, the projectile will undergo some degree of distortion or disintegration and the target will be pierced and subsequently damaged. The amount of distortion and ensuing damage is dependent upon the mass of the projectile, its design and construction, its striking velocity, the angle of incidence and the nature of the target.

It is very important to appreciate that whatever weapon is chosen to carry out the killing of the animal, that weapon is only the means of delivery. It is the projectile discharged from the firearm which kills the animal, or not, as the case may be. Bullets or shot-charges used for humane destruction must have the properties which enable them to transfer sufficient energy to concuss the animal instantaneously, penetrate the skull to a level beyond the brain stem, and distort sufficiently to destroy much of the brain, brain stem and upper spinal cord.

For these reasons, the ideal ammunition is one which expands upon impact and dissipates its energy within the brain cavity. The ideal performance of an expanding bullet is achieved when the nose material peels back upon itself to form the classic 'mushroom shape' at the correct depth of penetration in the animal's head. This expansion must be achieved without the bullet breaking up or suffering an unacceptable degree of weight loss. The expanded bullet should also utilise its potential for tissue destruction at the optimum point of penetration, to cause maximum destruction in the internal area containing the mid-brain and brain stem. At the same time, however, the bullet should not over-penetrate and cause consequent danger to objects or persons beyond the intended target.

Ammunition must:

- Concuss
- Penetrate
- Distort
- Destroy

Equipment

The use of free projectiles for the slaughter or killing of animals is not limited to the single shot, free-bullet humane killer, as widely used by veterinary surgeons and knacker men. Other types of handguns (adapted or otherwise), rifles and shotguns can also be used with equal effect. Often, the use of a shotgun may be preferable to other methods for both animal welfare and operator safety reasons. Indeed, where emergencies arise on farms, shotguns are often more readily available than any other weapon.

The most commonly used equipment includes:

- Humane killers (specifically manufactured/adapted, single-shot weapons and 'Bell Guns' of various calibres)
- Shotguns (12, 16, 20, 28 bore and .410)
- Rifles (.22, .243, .270, .308)
- Handguns (various calibres from .32 to .45)

Legislation

Legislation controlling firearms differs across the world. Operators must ensure that they operate within the bounds of relevant national legislation. Contact your local authority for information before obtaining or using any firearm.

Humane Killer

A purpose-made, single-shot weapon, which has a chamfered muzzle and vented barrel to facilitate its use with the muzzle end of the barrel in full contact with the target.

There are two types of purpose-made humane killers; the Greener 'Bell Gun' (no longer available new, but still widely used; originally manufactured in .310 calibre, but many have now been converted to .32); and the single-shot pistol (usually .32 calibre).

Both can be operated in full contact with the target and fire a single, round-nose, lead bullet which will kill outright conventional farmed animals of all sizes. Certain types of humane killer can only be used in full contact with the animal's head, because they feature a double safety action which requires the muzzle to be pressed against the target in order to overcome an internal safety device and put the breech block into contact with the firing pin. The most common of these is the Greener 'Safti-Killer' (originally manufactured in .22 and .310 calibres, many have now been converted to .32).

The single-shot pistol resembles a traditional handgun, but differs in that it has no magazine and the muzzle is chamfered and vented to facilitate shooting when in full contact with the target. It is held and operated with one hand; this allows the operator to restrain the animal, if necessary, while shooting. The Greener 'Bell Gun' requires two hands to operate, but it is favoured by some users, especially when killing horses.

When using humane killers it is of utmost importance to use only the specially loaded ammunition for killing animals at close range (round-nose, lead bullets, available from the manufacturers and specialist gunsmiths). Anything else may increase the chances of the projectile not penetrating adequately; or passing through the animal without killing it, and posing a grave danger to the operator and anyone nearby. It is very important to ensure that if the bullet should pass out of the animal's body it will not ricochet off concrete walls or floors. Hence, great care must be taken to get the direction of the shot correct when inside buildings.

Purpose-made humane killers are designed to be used in full contact with the animal's head. However, in practice some animals will move if contact is made. If this should happen, fire from as close as possible, preferably within 5 centimetres.

It is possible to obtain multi-shot humane killers which have been crudely adapted from standard weapons, e.g. 9mm, .38 Special and .357 Magnum. The modifications have often proved to be inadequate, therefore the HSA recommends that these types of weapon should not be used.

Shotgun

A long-barrelled, smooth-bore gun, normally used for discharging small shot at modest ranges.

Shotguns are the most common weapons found on farms. Often used for control of wild animals and game shooting, they are a very effective means of killing all species of farm animals in an emergency and, if used properly, are equally effective and much safer than rifles and handguns. They should be used from a short distance (5-25cm from the target).

For all conventionally farmed livestock species, a 12, 16 or 20 bore shotgun may be used with No. 4, 5 or 6 bird-shot; (a 28 bore or .410 can be used if nothing larger is available, but should not be used on mature bulls, or pigs weighing over 100kg). The muzzle should be held from 5-25cm from the animal's forehead, aiming down the line of the neck into the main bulk of the body. On no account must the muzzle of a shotgun be held directly against the animal's head, as this could result in a burst barrel and severe injury to the operator. Ordinary sized bird-shot is capable of inflicting massive injuries when it strikes as a compact mass. When used correctly the shot, in effect, strikes the skull as a single, large-calibre missile measuring approximately 2.0cm in diameter (when using a 12 bore). This has considerable initial penetrating power, due to its relatively high velocity and mass. However, once inside the skull, the pellets within the shot-charge will separate and disperse within the brain cavity, killing the animal outright. Contrary to common belief, the use of a shotgun does

not blow the animal's head off; there is a relatively small entry wound, but the brain is completely destroyed (see Figure 2). This is a much safer and usually much more readily available method than using a free bullet.

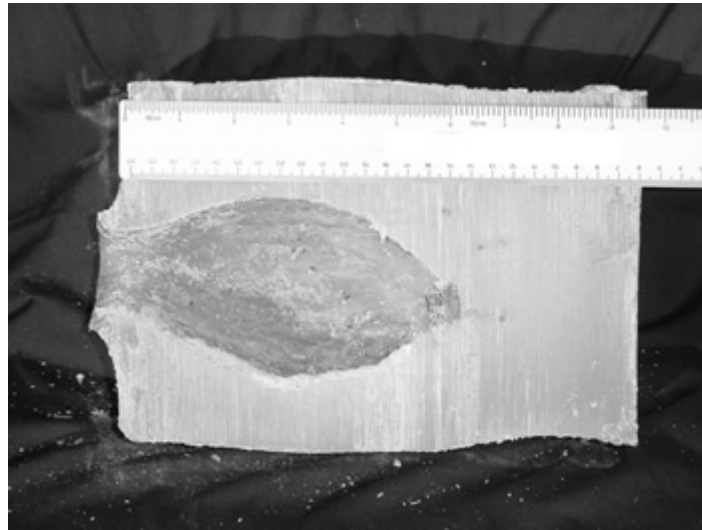


Figure 2 Effect of 16 bore shotgun blast from a distance of two inches

In the hands of a competent operator, the shotgun is probably the best piece of equipment available for the humane destruction of most large animals.

In exceptional circumstances (e.g. an agitated bovine in an open space which cannot be approached safely), shotguns can be used to kill large animals from a distance. In such cases, shotguns with open-choke barrels are used in conjunction with special cartridges loaded with solid slugs (N.B. in the UK such use is subject to additional certification and may only be carried out by specially trained and licensed personnel, usually police officers).

Rifle

A small bore, long-barrelled gun, usually fired from the shoulder, the bore of which has been scored with spiral grooves to impart spin on the bullet.

Rifles are capable of driving a bullet of a given mass at a greater velocity than would be the case for a handgun. They are, therefore, extremely dangerous and should only be used as a last resort. The most common rifles in use on farms are general purpose .22 inch rim-fire, telescope sighted .22 inch centre-fire, .243 inch centre-fire and larger bore centre-fire weapons. The .22 inch rim-fire are usually used for vermin control (rats and rabbits) but can be used effectively, when loaded with the correct ammunition, to kill young cattle, horses, sheep, deer*, goats, and pigs up to 100kg, when shooting from a short distance (from 5-25cm away). However, they do have limitations in that there is no margin for error in respect of position and angle of incidence.

If a **.22 inch rim-fire rifle** is to be used for killing livestock, the muzzle should be held from 5-25cm away from the animal's forehead and aimed down the length of the neck into the main bulk of the body; on no account must the muzzle of a rifle be held directly against the animal's head, as this will result in severe injury to the operator. Always use a round-nose, lead bullet; if there is any doubt about the ammunition available, call in outside help, e.g. a knackerman. The same precautions for operator safety apply as for the free-bullet humane killer. These weapons fire a bullet with a muzzle energy of approximately 145J only: therefore they should never be used in an attempt to kill aged animals with very hard skulls, such as boars, bulls and rams.

The **larger calibre, centre-fire rifles** are more specialised weapons, often used for shooting deer. They offer greater projectile velocities and subsequent kinetic energies than the common .22 inch rim-fire, and as such they do not fall into the categories of weapon which can be used at close quarters. These weapons can effectively kill all sizes of cattle, horses, sheep, goats, deer and pigs, but they should only be used from a suitable distance, in an outdoor location with a safe backdrop, and by an expert marksman. They come into their own where an injured animal cannot be approached, but is in a suitable environment to be shot safely from a distance.

*in England and Wales, under the Deer Act 1991, it is illegal under any circumstances to shoot deer with a rifle of less than .240 calibre. Anyone doing so may be liable to prosecution.

Handgun

A small, short-barrelled, rifled firearm, which can be held and fired with one hand.

There are two important points to remember when using a general-purpose handgun to humanely kill animals. First, the muzzle must never be placed in direct contact with the target: shoot from a distance of 5-25cm and aim down the length of the neck into the main bulk of the body. Second, make sure that the ammunition is suitable for the task: most commercially available handgun ammunition is of the 'wadcutter' type and is loaded for target shooting. Although this type of ammunition is used by some individuals for shooting animals, it is not suitable and it should be replaced immediately with round-nose, lead bullets (see Ammunition section). The same precautions for operator safety apply as for the free-bullet humane killer.

Note

In the UK, some handguns are exempt from the general ban on their ownership brought in under the Firearms (Amendment) Act 1997. An exemption is granted provided the guns are used solely for the humane destruction of animals and that this purpose is clearly stated on the individual's Firearm Certificate. In an effort to reduce the potential for criminal use, some licensing authorities may put pressure on the operator to have the capacity of the magazine or cylinder reduced to one or two shots. The HSA recommends that owners of such weapons hand them in to the local police authority and equip themselves with a purpose-built .32 humane killer. Such a weapon should come supplied with the correct ammunition.

Silencer

Silencers, also known as 'sound moderators', can be used in conjunction with some models of humane killers and handguns. The attachment of a silencer significantly increases the length of the barrel, and the weight and balance of the weapon. These physical changes can have practical implications for the operator, making the use of the weapon more difficult in some circumstances.

For example, increasing the length of the barrel makes it less easy to position the instrument at the correct angle, especially when short people are trying to shoot larger horses.

Silencers are most effective on some older models of humane killers, and on semi-automatic handguns. However, they do not significantly reduce the report when used on revolvers or humane killers which have been adapted from revolvers. This is because a sizeable proportion of the propulsive gas escapes around the front end of the cylinder and is not contained within the barrel of the gun. There is also some evidence to suggest that silencers can reduce the muzzle velocity (and subsequently the muzzle energy) of the ammunition. It may be better not to use a silencer for very large and/or aged bulls, rams or boar.

Ammunition

The type of ammunition used for killing animals is critical. It must have sufficient energy to immediately concuss the animal and penetrate far enough to destroy the vital areas of the brain which control breathing and circulation.

Bullethead Ammunition

In most cases where animals have not been killed effectively by a free-bullet weapon, the wrong type of ammunition has been used. Commonly the problem is due to using underpowered ammunition designed for use in target shooting, which therefore fails to penetrate; or to using copper-jacketed ammunition which over-penetrates without distorting enough to cause sufficient damage to the brain. The best way to avoid these problems is to use only a purpose-made humane killer in conjunction with the manufacturer's recommended ammunition. Broadly speaking, ammunition for humane killers should comply with the following criteria:

- Have a minimum calibre of .32 inches
- Generate a minimum muzzle energy of at least 200J
- Be round-nose, lead bullets to facilitate penetration and distortion

Bullethead ammunition for all calibres of firearm is commercially available. Much of this 'commercial' ammunition is intended for target shooting at relatively short distances and is of the type known as 'wadcutter'. Bullets in this category have a flat nose with a raised edge to facilitate cutting a neat hole in a paper or cardboard target and, as such, they are not suitable for the humane killing of livestock. Different types of commercially available ammunition are compared with the standard Cash Humane Killer ammunition in Table 2. Those with a muzzle energy less than 200J are not recommended for killing large or aged animals.

Table 2 Comparison of muzzle energies for different types of commercially available handgun ammunition

Cartridge/Calibre	Bullet/Shot weight (grain (grams))	Muzzle velocity (ms ⁻¹)	Muzzle energy (Joules) <i>measured</i>
.32 S&W Long*	98 (6.35)	215	155
.38 S&W	146 (9.46)	209	203
.38 Short Colt	125 (8.10)	223	203
.32 ACP Accles and Shelvoke	85 (5.51)	274	217
.38 Long Colt	150 (9.72)	223	237
.38 Special	158 (10.24)	230	271
.38 Special + P	158 (10.24)	279	399
.44 S&W Special	246 (15.94)	230	420

*Ammunition used in a converted .310 Greener 'Bell Gun'. The shaded area indicates the standard ammunition loaded for the .32 Cash Humane Killer. Any ammunition generating a muzzle energy significantly less than this is not recommended for the humane destruction of large animals.

Shotgun Ammunition

Shotgun charges differ from those used in free-bullet weapons, in that the mass discharged comprises a number of lead or steel balls (commonly known as 'shot'), as opposed to a single, heavy projectile. Shotgun cartridges differ according to their intended use, and the number, size and weight of the individual shot differs according to the type of cartridge. In a standard 12 bore cartridge, the total weight of the shot-charge is normally 30g, whatever the size of the shot contained within it. The range is: from 6 balls, each weighing 5g, in LG (buckshot); to 630 balls, each weighing 0.05g, in No.9 shot. The most common cartridge in general use is No.6 shot, which in a 12 bore cartridge contains 287 balls, each weighing 0.1g.

In normal use, the shot cartridge is fired at a distant, moving target (up to 40m away). The shot leaves the muzzle of the shotgun as a dense charge but quickly starts to separate and form a wide 'pattern' into which, it is intended, the target will fly or run. When a shotgun is discharged at very close quarters to the subject, as is necessary for the humane destruction of livestock, the pattern does not have time to start to develop before the shot-charge impacts on the target. Therefore, the shot effectively strikes as a solid mass at high velocity, with the resultant high kinetic energy which is required to penetrate the skull and destroy the contents of the brain cavity. A comparison of the muzzle energies of different sizes of shotgun cartridges is shown in Table 3.

Table 3 Comparison of muzzle energies for shotgun ammunition

Model	Shot weight (grain (grams))	Muzzle velocity (ms^{-1})	Muzzle energy (Joules) <i>calculated</i>
12 bore	463 (30)	434	2,825
16 bore	409 (26.5)	421	2,348
20 bore	355 (23)	421	2,038
28 bore	247 (16)	411	1,351
.410	139 (9)	405	738

Positioning

To result in an immediate kill, the bullet or shot-charge must be administered to the correct part of the skull. In most animals this is the frontal region of the head. The ideal sites and directions of impact differ between species according to certain physical features. When a free bullet is used, the bullet should ideally come to rest in the upper part of the spine; when a shotgun is used the pellets should disperse within the cranium, completely destroying the brain.

Cattle

In cattle, the brain is situated high in the head. The ideal point of penetration is in the middle of the forehead – at the crossing point of two imaginary lines drawn between the middle of each eye and the centre of the base of the opposite horn. This should give a position about 7cm, ± 1 cm, above a line drawn across the forehead at the back of the eyes. The shot should enter at right-angles to the skull (Figures 3 and 4).

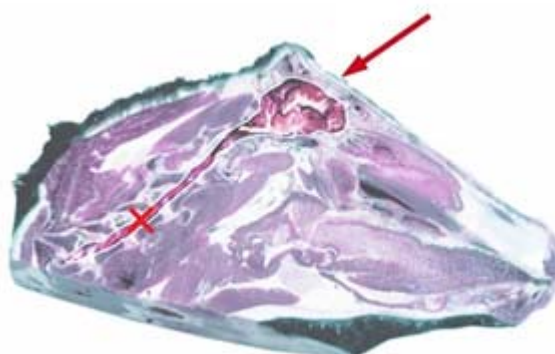
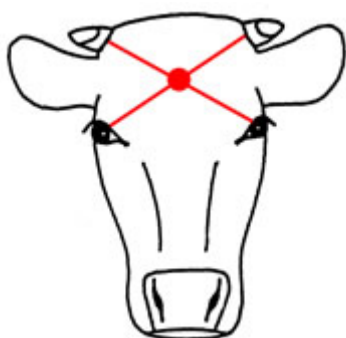


Figure 3 Cattle shot position **Figure 4** Commercial beast (2 years)

In calves the brain is relatively larger than in adult cattle, but the upper part is under-developed. The aiming point is slightly lower than for adult cattle, and the gun should be tilted back to obtain the correct angle of incidence to destroy the brain stem (Figure 5).

Mature bulls may have a hard, thick frontal bone, often covered in dense, matted hair (Figure 6). This combination can sometimes prove difficult to penetrate with small calibre projectiles and therefore a shotgun is a better option.



Figure 5 Infant calf (6 days)



Figure 6 Mature bull (9 years)

Deer

The deer's brain is situated high in the head. However, when shooting deer it must be remembered that antlers do not equate to horns in cattle. The ideal aiming point is in the middle of the forehead, at the crossing point of two imaginary lines drawn from the middle of each eye to the top of the opposite ear (Figure 7). In stags, this spot is found between the antlers. As with cattle, the angle of the shot should be directed through the brain stem (Figure 8).



Figure 7 Deer shot position

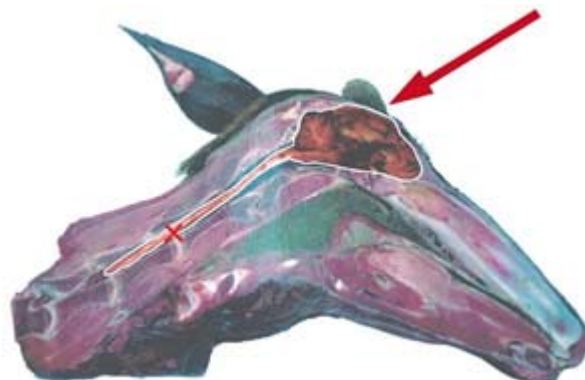


Figure 8 Stag (2 years)

Horses

In horses the brain is situated high in the head. The shot should be aimed in the middle of the forehead, but slightly higher than the position for cattle. Take two imaginary lines drawn from the middle of each eye to the base of the opposite ear; shoot the animal approximately 2cm above the point where they cross (Figure 9). The muzzle of the firearm should be slightly tilted so that the shot is directed through the cerebral cortex towards the brain stem (Figure 10). If a horse has been sedated prior to shooting and is holding its head in a lower than normal position, care must be taken to adjust the angle of the shot accordingly.



Figure 9 Horse shot position

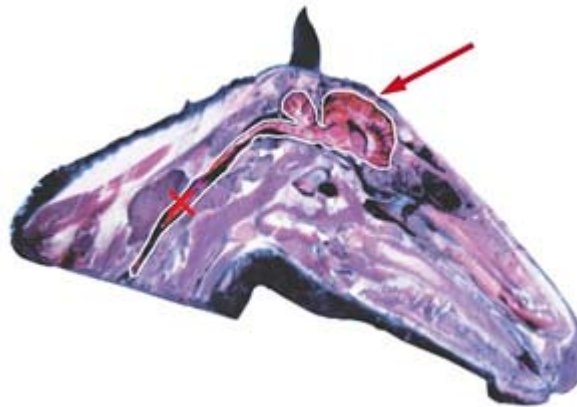


Figure 10 Colt (2 years)

Pigs

Pigs are among the most difficult animals to shoot. There are two reasons for this: first, the target area is very small and this problem can be exacerbated by the 'dish' (concave) face shape of certain breeds and in aged pigs; second, the brain lies quite deep in the head, relative to other species, with a mass of sinuses lying between the frontal bone and the brain cavity. The ideal site for shooting pigs is one finger's width above eye level, on the mid-line of the forehead, aiming towards the tail (Figures 11 and 12).



Figure 11 Pig shot position

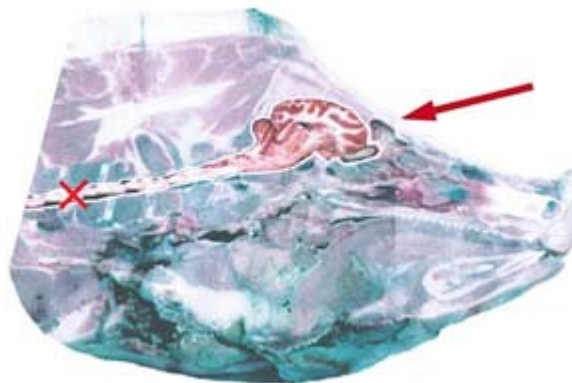


Figure 12 Bacon pig (6 months)

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Older pigs and exotic breeds, such as the Vietnamese Pot Bellied Pig, often have foreheads of thick bone and this can cause problems when using free-bullet humane killers, especially older .22 or .310 models. The bullet may become lodged in the sinuses and fail to penetrate the brain (Figures 13 and 14). Some older pigs, especially boars, may have a bony ridge running down the centre of the forehead; in such cases the muzzle of the humane killer should be placed slightly to one side of the ridge, aiming into the centre of the head. Because of the problems which might arise with adult pigs and exotics, it is recommended that where possible, they are destroyed by use of a shotgun (12, 16 or 20 bore). If a shotgun is used, the target area is the same as that for the humane killer; alternatively the animal can be shot through an eye, or from behind an ear, aiming toward the middle of the head. When using a shotgun, the muzzle should always be held from 5-25cm away from the animal's head.

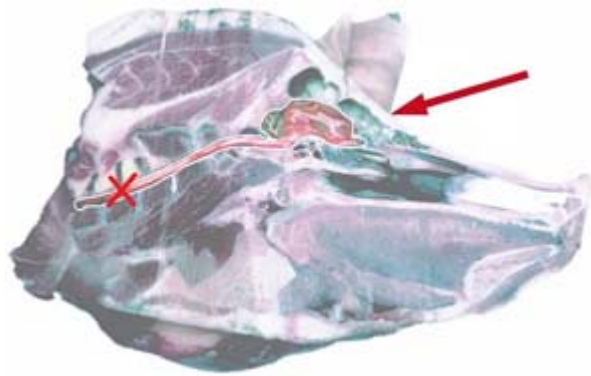


Figure 13 Adult sow (5 years)

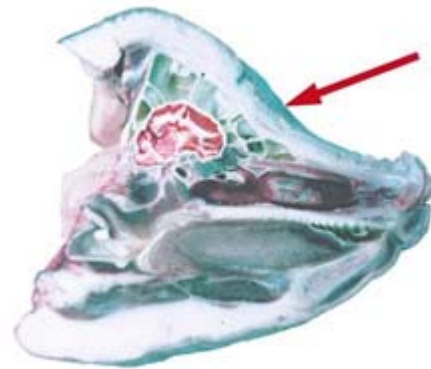


Figure 14 Vietnamese Pot Bellied (3 years)

Sheep and Goats

When shooting sheep and goats, the aiming point is on the mid-line, just above the eyes, directed down the line of the spine into the bulk of the body (Figures 15 and 16). In practice this can be quite difficult to achieve and a slight error in the angle of shot, or minor movement on the part of the animal, can result in a free bullet exiting from the animal's head or neck. In order to get this right when using a free bullet weapon, the animal's head must be in the normal position.

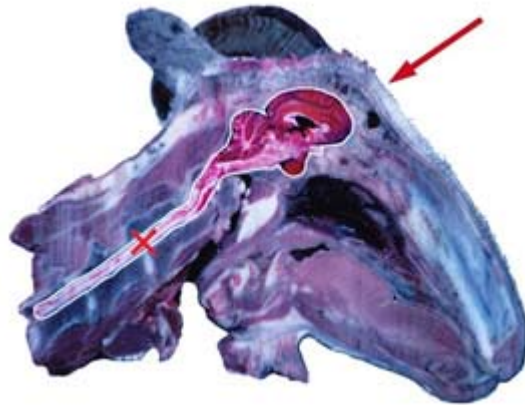
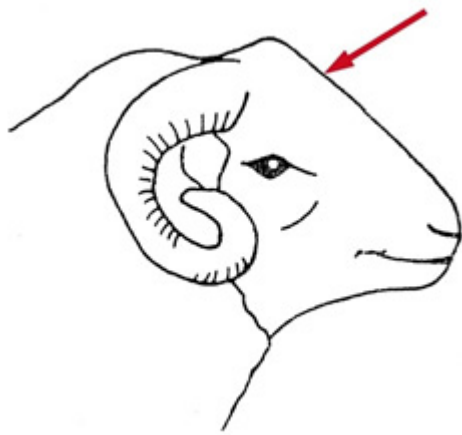


Figure 15 Sheep and goat shot position **Figure 16** Ewe (4 years)

Heavily horned sheep and goats can present a problem if a free bullet weapon is used. The mass of horn over the forehead can leave little or no target area: a shot between the eyes is too low and should not be used under any circumstances. Such animals can be shot from behind the poll (Figures 17 and 18). However, this is dangerous with a free-bullet weapon and, if undertaken, the animal should always be situated on soft ground. Where possible, a shotgun is recommended for this type of shot.

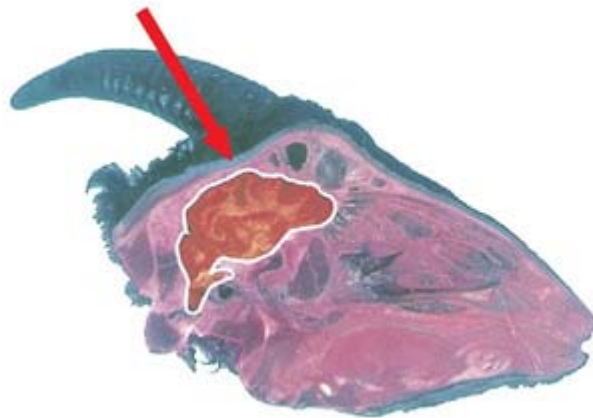
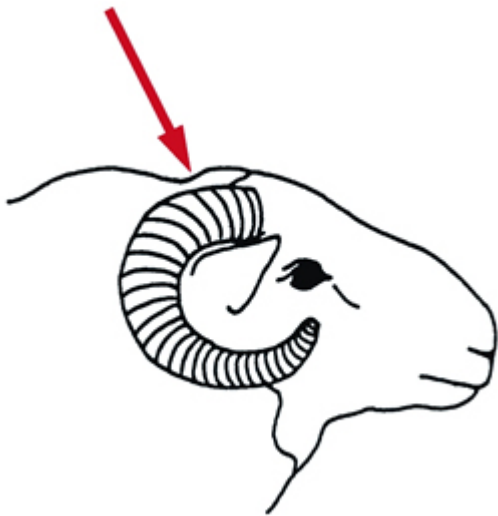


Figure 17 Heavily horned sheep and goats shot position **Figure 18** Billy goat (7 years)

Operation

When circumstances dictate that an animal should be killed, the person charged with carrying out that killing is likely to have both legal and moral responsibilities with regard to animal welfare and human safety. All animals which have to be killed for the purposes of routine slaughter or culling, or in order to end their suffering, must be dispatched without causing additional pain or distress. The circumstances in which animals require humane destruction can differ greatly; therefore different procedures and methods need to be available to kill them. Whatever method is used, it is most important that great care is taken by those involved not to cause any avoidable pain, suffering or distress. Things are less likely to go wrong if the correct preparation has been carried out. Before killing an animal the operator needs to ask the following questions:

- Does the animal need restraining? Is this possible? If so, which methods will cause the least distress to the animal and the least danger to the operator?
- Is the animal securely confined, e.g. in a pen from which it cannot escape?
- In the case of a large animal, e.g. bovine, horse or pig, can the carcass easily be moved from the spot where it will fall?
- What methods of killing are available? This may be a deciding factor in whether or not the animal is moved to a more suitable spot.

Handling and Restraint

Animals should always be handled with great care. In many cases where animals have to be killed to protect their welfare, the animals may well be recumbent or their movement limited by their injuries or situation. However, there will be some animals which will require restraining in order to facilitate safe and effective killing.

The following methods of restraint are suggested:

Pigs	Pass a rope around the upper jaw, behind the canine teeth. The pig will pull away from the operator, who stands in front of the animal. This ensures that the shot is being discharged directly away from the operator.
Sheep	Use a halter, or confine the animal in a narrow pen constructed of hurdles or gates.
Horses	Control with a head collar and lead rope, halter or bridle.
Cattle	Use a halter or confine the animal in a narrow pen constructed of hurdles or gates.

Should there be any doubt in the mind of the operator as to the correct target area, then it should be identified (see Positioning section) and, if possible, marked. This can be done using a spray marker, a felt pen, or in the case of a very dark-coated animal, French chalk.

Backdrop

When using a free-bullet weapon, it is most important that a suitable backdrop is present in order to stop the bullet, should it exit the carcass or should the target be missed. Suitable backdrops are manure heaps, hay or straw stacks, earth banks, etc. Make sure there is no 'dead ground' (hidden dips) between the target and the backdrop, from which people, vehicles or other animals may

emerge. If no backdrop is present, the area behind the target must be clear of roads and dwellings to a distance of 3,000m. A ricochet from a .32 humane killer bullet can travel in excess of 2,000m. All people present must stand behind the operator, who should aim the shot down the spine and into the body of the animal.

Exsanguination

Unless the carcass is to be used for human consumption, there is no necessity for it to be bled following shooting with a free-bullet weapon or shotgun. However, there may be profuse bleeding from the gunshot wound and the nose and/or mouth, due to the physical damage caused by the projectile. A thick, plastic bag can be placed over the head of the animal, immediately following shooting, in order to prevent large quantities of blood accumulating on the ground and to protect the sensibilities of any onlookers.

Checks

Having shot the animal, check that the shot has been effective. Look for an absence of rhythmic breathing and an absence of corneal reflex. After a lapse of up to a minute, the animal may start to twitch and, in some cases, convulse quite violently (especially pigs). This is normal in an animal which has been shot correctly. The foremost sign of an ineffective shot is a return to normal rhythmic breathing. This should not be confused with agonal breathing (occasional gasping), which is of spinal origin and indicative of a dying brain.

When there are different weapons available, the choice should be based on the following criteria:

- The age and size of the animal
- The species of animal
- The location of the animal (e.g. in a built up area or rural open space with a suitable backdrop behind the target)
- Accessibility of the target area
- Individual circumstances (e.g. on a solid floor or soft ground; inside or outside; road traffic accident or racecourse casualty; emergency slaughter or routine culling)
- Presence and safety of onlookers

Carcass Disposal

It is important that, when animals have been killed on-farm or in other situations outside the slaughterhouse, the carcasses should be disposed of properly and promptly. Apart from the obvious environmental, public health and disease implications, this is often also a legal requirement. Therefore, in addition to complying with the necessary firearms legislation and undertaking training to gain the skills required to kill animals humanely, the prospective operator should also have a carcass disposal procedure in place before killing an animal. However, it is recognised that this may not be possible in the case of an emergency. Also remember that if a large animal, a horse for example, is killed in a confined space such as a stable, the carcass must be removed promptly. If left for too long it will go into rigor mortis and will be difficult to remove.

Legislation regarding carcass disposal varies between countries. Operators should take care to ensure that they comply with relevant local and national laws.

Depending on the circumstances, the options for carcase disposal may include:
 Transport to an abattoir, making sure to comply with any relevant food hygiene legislation
 Collection by or delivery to a knackerman for disposal
 Collection by or delivery to a licensed incinerator

Other options available for carcase disposal on-farm include burial and incineration. Both options may be subject to national legislation, check with your local authority before proceeding to dispose of any carcasses on-farm using these methods.

Maintenance

Any weapon used for the humane destruction of animals should be correctly maintained, cleaned and oiled after use, even if has only discharged one shot.

Always follow the manufacturer's instructions.

The inside of the barrel should be thoroughly cleaned out and be free of any condensation. The outside of the gun should be cleaned and then a thin film of oil applied all over, using an oily rag. A drop of oil should be applied regularly to all moving parts, but avoid getting oil into the breech of any weapon.

Every six months, regardless of whether or not the weapon has been used, it should be taken out, inspected and thoroughly cleaned and lubricated. A logbook should be kept in the gun cabinet and, every time a weapon is used and/or cleaned, the details should be recorded and dated (Table 4). Similarly, a logbook should be kept in the ammunition cabinet and entries made for each type of ammunition, to record when it is bought and when it is used (Table 5).

Table 4 Example of entries in a gun cabinet logbook

Date	Details of weapon	Details of operation	Signed
25.02.13	Cash .32 Humane Killer	Two cattle destroyed at road traffic accident. Two shots fired. Gun cleaned.	J. Smith
02.03.13	Cash .32 Humane Killer	Three ewes destroyed at Mile End Farm. Three shots fired. Gun cleaned.	J. Smith
06.03.13	Greener Bell Gun	Horse destroyed for Mrs Jones. One shot fired. Gun cleaned.	T. Bond
07.03.13	Cash .32 Humane Killer	Gun overhauled, cleaned and returned to cabinet.	J. Smith

Table 5 Example of entries in an ammunition logbook

50 x .32 Humane Killer Ammunition, purchased 30.6.2012				
Date	Ammunition in stock	Ammunition used	Ammunition left in stock	Signed
25.02.13	50	2	48	J. Smith
02.03.13	48	3	45	J. Smith

Safety

All firearms are potentially lethal. It is essential that the safety and operating procedures recommended by the manufacturer are precisely followed, and that all operators are properly trained in safe operation and maintenance.

Get instruction from an experienced operator before using any firearm

Refer to the manufacturer's instructions for the correct loading procedure and the type of ammunition

Do not under any circumstances attempt to handle or operate firearms before reading and fully understanding the manufacturer's instructions for the particular weapon being used.

Safe Operation

- When receiving or handing over a firearm, always open the breech and make sure it is not loaded. Confirm this with any other parties present by turning the breech towards them and showing it as being empty before completing the transfer.
- During and on completion of the loading procedure, the muzzle of the weapon must at all times be kept pointing away, and at a distance, from the operator's or any other person's body.
- Once the weapon has been loaded, ensure that the safety catch is on until ready to shoot.
- When handling any firearm, never allow it to point at any part of your body or at any other person.
- Keep your finger off the trigger until you are actually aiming at the target and ready to shoot.
- When shooting smaller animals, ensure (if possible) that the subject is standing on soft ground and ensure that no part of your body (e.g. your foot) is underneath the animal.
- Rifles, shotguns and general-purpose handguns should never be discharged with the muzzle in direct contact with the target area. Such action could result in severe injury to, or the death of, the operator.
- In the unlikely event of a misfire, do not open the breech of the weapon for at least 30 seconds. Sometimes, slow primer ignition will cause a 'hang-fire' and the cartridge will go off after a short pause.
- If there is any reason to suspect that a projectile is obstructing the barrel, immediately unload the firearm and look through the bore. It is not sufficient to merely look into the

breech: ammunition may be lodged some distance along the barrel where it cannot easily be seen.

- Immediately report any faults in the operation of the equipment to the person responsible for maintenance (if applicable) and take the weapon out of service until the fault has been rectified.

Cleaning and Storage

- After each use, thoroughly clean the weapon before locking it away.
- Make sure that the weapon is unloaded before cleaning.
- When not in use, firearms and ammunition should be stored separately and locked away in approved storage cabinets.

Do not attempt to carry out cleaning and maintenance until you have made sure that the firearm is not loaded. Always lock firearms away immediately after use. Do not forget to secure the ammunition in a different location.

General points on safety:

- Always treat all firearms and shotguns as if they are loaded
- Do not climb trees or step over fences with loaded firearms
- Never carry any firearm in your pocket, purse or waistband: always use a pistol case or proper holster with a safety flap or strap
- Never pull a firearm towards you by the muzzle
- Never point any firearm, loaded or unloaded, at anything you do not intend to shoot
- Never leave a loaded firearm unattended or carry one in a vehicle
- Firearms and illness, alcohol or drugs do not mix