1) BVA is the national representative body for the veterinary profession in the United Kingdom and has over 17,000 members. Our primary aim is to represent, support and champion the interests of the veterinary profession in this country, and we therefore take a keen interest in all issues affecting the profession, including animal health and welfare, public health, regulatory issues and employment matters.

2) The Goat Veterinary Society (GVS) is a division of BVA and has approximately 300 members, including veterinary surgeons with a specific interest in goat health and welfare, but also has a significant “non-veterinary” membership including owners and farm personnel from across the entire spectrum of goat keeping in the UK.

3) The Veterinary Public Health Association (VPHA) is a division of BVA and is committed to the protection of the consumer and the environment as well as to the promotion of animal welfare. VPHA currently has over 300 members many of whom work as Official Veterinarians in slaughterhouses dealing with both public health and animal welfare issues.

4) We welcome the opportunity to contribute to FAWC’s call for information on the welfare of goats at time of killing. As experts in goat health and welfare, and public health respectively, BVA fully supports the answers provided by GVS and VPHA as detailed below. We look forward to the detailed review of animal welfare implications of the various circumstances in which goats may be killed and any methods used.

5) Question 1: What is the landscape of the goat industry as a whole? What is the landscape of the goat industry as a whole: i.e. size of commercial dairy, meat and hair sectors; goat breeds kept in the UK; extent of smallholder and pet ownership, and how does this affect the choices and practices regarding when, where and how goats are killed?

The total UK goat population is estimated to be around 104,000 (2017) [2.9% increase on 2015]. However, it is important to recognise that this may be an underestimate as many pet goats may not be registered with Defra. Herd / holding average size is <10, but this figure can be misleading as at the opposite end of the scale there are around 100 herds with >100 goats, and these 100 herds contain approximately 60% of the total population.

These larger herds are predominantly in the dairy sector, and GVS understands from the Food Standards Agency, that in England and Wales there are reported to be approximately 120 dairy farms holding approximately 45,000 goats (as will be registered regarding food production/hygiene). This figure is made up as follows:
• 42 farms with herd size 50 goats or less
• 29 farms with herd size 51 - 200
• 17 farms with herd size 201 - 500
• 21 farms with herd size 501 – 1000
• 12 farms with over 1000

Within the dairy sector, the average breeding lifespan is approximately 6 years, resulting in 3 – 4 pregnancies (6 – 9 kids born / dam).

**Goat breeds kept in the UK**

It is estimated that there are between 15,000 and 20,000 commercial meat goats in the UK – these will be predominantly Boer, Boer X, and dairy surplus males and cull does.

Within the fibre sector true numbers are scarcer – but it is thought that there are between 5000 and 7000 angora and cashmere goats. The remainder are kept as pets, for hobby purposes and breeding pedigree goats and at public attractions.

For further information about goat breeds in the UK, the [British Goat Society](https://www.britishgoats.org) is a useful resource.

**Nature of goat keeping/ownership**

Unlike other farm animal sectors within the UK – there is a very wide range of reasons why goats are kept, from at one end the “commercial sector” typified by the dairy goat sector, when killing and culling policies will be dictated by the commercial value of the individual goat and / or the aspiration of the owner regarding disease control policies with regards to endemic diseases. At the other end of the spectrum are the goats kept purely for pleasure – in which the “value” of the goat can be akin to that of a “family pet” – when euthanasia will be very much a last resort – often influenced by a diminishing quality of life. Between these two extremes fit the other sectors – often bridging between the two – eg. a pedigree herd of goats will have a monetary value, particularly if of proven high-quality stock, but are also “much loved” – such that the balance of decision making with regards to euthanasia / disease control can be blurred.

This same disparity in goat ownership will also have a strong influence on how and where a goat’s life will be ended. Commercial goats will invariably be directed down the recognised routes of abattoir, knackers / fallen stock centres, hunt kennels etc – whereas when there is a strong human bond, it is more likely that a veterinary surgeon will undertake euthanasia by means of intravenous barbiturate – and not the more graphic and potentially upsetting (for the owner) methods available.

One specific issue the commercial dairy goat sector has is euthanasia of the now decreasing number (as meat market outlets are identified) of male kids, the majority
of which will be killed on farm—see Q3 response and Appendix 1 supplementary information.

6) **Question 2:** Numbers of goats going to commercial slaughterhouses and those killed elsewhere. Extent of non-stun and different stun methods at the time of slaughter. FAWC has recently completed a study on on-farm killing methods, including goats, but it would be useful to have an idea of the relative scale of on-farm killing and commercial slaughter, which the previous study did not focus on.

The [Milking Goat Association](#) estimate that 90% of cull goats are killed through approved commercial slaughterhouses, and it is likely that other goats going for slaughter for human consumption will follow a similar route.

Most “surplus” dairy male kids will be killed on farm. Cull goats in the commercial sector may be despatched on farm or via fallen stock collection.

GVS has no information on stun vs. non-stun slaughter in slaughterhouses. However, we would anticipate that the figure for non-stun goat meat may be comparatively higher than other species due to the higher consumption of goat meat amongst some religious communities.

7) **Question 3:** Are male kids from the dairy goat sector killed at an early age or reared for meat? Is there sufficient demand for goat meat to sustain rearing males from the dairy sector for meat? Is there a market for kid meat, and if yes are meat goats also killed as kids?

There is a growing and potentially increasing demand for goat meat, and a significant proportion of male kids born on commercial units are reared for meat production rather than being killed at an early age. Many of these are sold early in life to move to a dedicated meat goat rearing unit. In 2005, GVS member Kathy Anzuino undertook a survey on commercial dairy goat farms in the UK. Twenty-three farms out of the 24 visited as part of the nationwide survey were routinely killing many of their male goat kids as they had no market outlet for them. Only one of the twenty-four farms had a market outlet for all of their male kids. This farm was small, comprising 85 goats. An additional eight farms had a market for some of their male kids. Three of these farms were selling kids to be reared for meat. Five of these farms had a market for rearing some of their males for breeding purposes (unpublished data).

However, GVS understands that a current study being undertaken jointly by the Milking Goat Association and the University of Bristol gives a more encouraging picture, and we assume this information could be made available. We understand that of 46 commercial farms surveyed, 75% were rearing some or all their kids.
With regard to the killing of surplus male kids, in 2004/2005, GVS undertook what is now a very historical (and anonymous) survey of their commercial dairy goat members, this survey (un-published) stated that:

- 11 farms used a blow to the head with a hard object such as a metal pipe;
- 2 farms – the veterinary surgeon injects kids with barbiturates;
- 3 farms were shooting kids using a rifle;
- 2 farms were using a captive bolt;
- 3 farms were gassing kids with carbon monoxide;
- 1 farm was using chloroform

It must be emphasised that this survey was undertaken 13 years ago and that the situation particularly with the unacceptable methods has moved forward. The Humane Slaughter Association has been trialling a compressed air captive bolt type stunner / killer similar to the method used on turkeys. GVS also understands that a scientific study on the use of the Cash Poultry killer as an effective stun / kill method in kids has been completed and is being drafted for publication by Andy Grist.

In large commercial herds, the fact that goats are seasonal breeders means that on any one day during kidding, large numbers of kids may need to be euthanised. As dedicated stockmen and women the majority of commercial dairy goat farm personnel do not like having to euthanise young kids, so having a ‘person-friendly’ method is vital to consider as well as animal welfare. See Appendix regarding possible use of CO2.

Currently, the major wholesale food chains do not stock goat meat, with demand mainly increasing in farmer markets, gourmet restaurants and via internet sales. For dairy male rearers, it is can be a fluid market depending on the economics at the time, many giving up because they cannot make sufficient economic return. Some, however, are making a success of it.

From a FAWC perspective, it may be worth focussing on increasing the demand for goat kid meat, thus reducing the need for on farm slaughter and disposal of surplus male kids. Goat meat has a reputation as a healthy meat alternative in comparison to other red meats. It is low in fat, cholesterol, calorific energy and saturated fat (50% lower in fat than beef and around 40% lower in saturated fat than chicken). The meat comparison (per 3 oz. (85 g) roasted meat) shown in the table 1 below was produced by USDA (United States Department of Agriculture).

| Table 1 Composition of meat of various species (per 3 oz. / 85 g). Source: USDA Calories |
|---------------------------------|-------------|-------------|-------------|-------------|-------------|
| GOAT                            | 122         | 2.58        | 0.79        | 23          | 3.2         |
| BEEF                            | 245         | 16.0        | 6.8         | 23          | 2.0         |
| PORK                            | 310         | 24.0        | 8.7         | 21          | 2.7         |
| LAMB                            | 235         | 16.0        | 7.3         | 22          | 1.4         |
| CHICKEN                         | 120         | 3.5         | 1.1         | 21          | 1.5         |
8) **Question 4: How and where are cull dairy goats killed and for what purpose?**
Within the commercial dairy sector, 90% of cull goats on commercial farms are killed through approved commercial slaughter houses and a significant proportion of these will enter the human food chain.

9) **Question 5: Fitness to travel to slaughter and welfare during transport issues for goats.**
As with other farmed species within the UK, there are strict regulations to comply with regarding both fitness to travel and welfare during transport and these regulations apply across the entire sector, both for commercial and pet. The majority of goats will be disbudded in the UK, however special care must be taken when transporting and handling horned animals to protect goats from each other and to prevent injury to personnel involved.

GVS suggests that Chris Dodds of the Livestock Auctioneers Association may have data on the numbers of goats moving through markets and destined for slaughter.

10) **Question 6: Slaughterhouse lairage welfare issues, e.g. separation of horned and non-horned individuals.**
Whilst the majority of commercially kept goats in the UK will be disbudded, we agree that this is an important issue and there should be suitable separation between horned and non-horned individuals.

11) **Question 7: Are restraint and handling systems currently used in slaughterhouses appropriate for goat welfare, e.g. are lamb handling systems in slaughterhouses used for goats and are they a suitable fit for goat anatomy and behaviour?**

Overall, lamb handling systems tend to be used for goats and in particular for non-stun slaughter. The use of a V restrainer to handle goats is not a suitable method because the longer legs of goats will often come into contact with support mechanisms. Where handling systems use races etc then this is not a problem.

Mechanical restraint of goats for slaughter without prior stunning will normally use the existing process and equipment in place for sheep. Dependant on the method this will have a varying range of problems as the system will have been designed for sheep. V restrainers are widely used and, as aforementioned, are not suitable for goats. There are other restraint mechanisms which seem to work with goats but require them to be placed on their side. Sheep tend to accept this but goats do not respond well to such an intervention.

12) **Question 8: What are the main methods of stunning and killing different ages and breeds in the slaughterhouse and the welfare implications?**
In the slaughterhouse older kids or adult goats are stunned. Small kids are normally killed on farm and the recent FAWC opinion “On farm killing” has covered the methods used. In the slaughterhouse the FBO may use either head only electrical stunning or a captive bolt. If used correctly, these are both suitable methods. However, concerns have been raised that slaughtermen do not take into account the presence of horns when using a captive bolt and the requirements in WATOK if using the captive bolt in the back of the head.

13) **Question 9: Is there farm assurance applied to the goat sectors and to goat slaughter and killing?**

We are aware that farms supplying all of the Goat Dairy Trade Association members adhere to farm assurance and welfare standards as part of the Goat Farmers (UK) Dairy Farm Assurance Scheme. This enables the farms to carry Red Tractor Accreditation, promoting high standards of quality, hygiene, welfare and environmental care under the stewardship of the Red Tractor logo.

14) **Question 10: How do smallholders and pet keepers access services to dispatch goats at end of life?**

We understand that most smallholders and pet keepers would make their local vet the first point of contact when needing to dispatch goats at end of life. Contact with services may also be made through local discussion groups, British Goat Society social media activity or by word of mouth in a specific locality.
Appendix 1 – Supplementary Information

1. Supplementary resources for members of local ethical review processes
   Good practice for humane killing, Research Animals Department, RSPCA 1st edition, February 2011

   “When selecting the best method of killing, the first priority should be the welfare of the animals concerned. The scientific requirements must obviously be addressed, otherwise the animals may be wasted, but the harms and benefits of using a method that may be less humane from the animals’ point of view should always be weighed very critically.
   The feelings of the people (usually animal technologists and care staff) required to kill animals also need to be taken into account; they may find some methods difficult to accept.”

2. Current HSA Accepted methods of dispatch of kids and lambs
   a. General GVS comments

   GVS believes these are mostly archaic, brutal or unsafe. They may be suitable for owner occupier farmers who do not have employees and may only need to dispatch occasional small numbers of animals.
   For larger numbers of animals where there are a number of employees on the farm these methods are ‘hard to sell’ to staff.

   b. Specific comments
   Heavy blow to the head followed by exsanguination.

   This method is considered on most farms to be excessively brutal and therefore inappropriate.
   Fostering a caring attitude towards livestock on the farm and then adopting such a method are diametrically opposed to one another.

   Small bore shotguns, rifles and humane killers (free bullet weapon)

   Inappropriate method in a farm environment with employed personnel on the grounds of safety of staff and animals with the risk of ricochet of pellets/bullets off hard surfaces and in the case of shotguns and rifles their storage at a work place is an issue.

   Captive bolt pistol

   Only stuns and staff generally averse to the pithing process.
3. HSA International Symposium 2015 16th-17th July at Zagreb, Croatia

Abstract: ASSESSMENT OF AVERSION TO CARBON DIOXIDE BY WEANED PIGS AND NEONATAL GOATS

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Our research team is exploring animal welfare implications of inhalant euthanasia methods for neonatal ruminants and swine. Gradual fill and two-step protocols are recommended for carbon dioxide (CO2) for humane induction of unconsciousness prior to death, but few details are provided for implementation. Furthermore, these recommendations are primarily based on forced exposure experiments that present challenges for interpreting outcomes associated with both distress and the dying process. We applied avoidance approach and conditioned place preference tests to “ask” neonatal goats and newly weaned swine about the aversiveness of different concentrations of CO2. A preference-testing device was custom designed with two connected chambers maintained at static gas concentrations. The control chamber maintained ambient air conditions (1% CO2); the treatment chamber maintained predetermined CO2 concentrations. Animals were individually trained to enter the treatment chamber to access a food reward after a period of feed deprivation, followed by the same procedures using different concentrations of CO2 (10%, 20% and 30%) in the treatment chamber. Tests concluded when loss of posture occurred or after a set test duration (goats: 10 min; pigs: 6 min). Animals experienced each of the CO2 treatments followed by 2 wash-out days with ambient air conditions. Behavioral outcomes were collected using live observations and video recordings. All goats (n=12) entered the treatment chamber during all CO2 treatments. During 20% and 30% CO2 tests, all goats consumed milk prior to and during ataxia. Loss of posture occurred within 83s to 271s of exposure. None of the goats displayed conditioned place avoidance on wash out days. Conversely, only 10 of 12 pigs entered the treatment chamber during CO2 treatments. Half of the animals exposed to CO2 exited the treatment chamber prior to loss of posture. However, pigs frequently moved between compartments on both training and test days, posing challenges for interpretation. For pigs that remained in the chamber during 20% and 30% CO2 tests, violent neuromuscular excitation was observed and resulted in tests terminated for ethical reasons. Surprisingly, no pigs displayed conditioned place avoidance of the treatment chamber on any of the wash out days. Our results suggest loss of consciousness using 30% CO2 is not aversive to neonatal goats. This experimental paradigm produced inconclusive results for newly weaned pigs, perhaps due to individual differences in sensory perception and foraging motivation.
Abstract: EVALUATION OF A NON-PENETRATING CAPTIVE BOLT TO EUTHANASE NEONATAL GOAT KIDS
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Manual blunt force trauma (BFT) is a common method of euthanasia for sick or excess kid goats. This practice is not well received by farm operators or industry and may vary in effectiveness, resulting in a call for a more standardised mechanical method. The objective of this study was to evaluate the effectiveness of a compressed gas powered non-penetrating captive bolt (BOCK Industries, Inc., Philipsburg, PA, USA) to euthanize goat kids within 48 hours of kidding. In experiment 1, 10 kids were anaesthetised then euthanized by placement of the device to the back of the head of the goat between the ears, with the kids jaw angled towards its chest. The severity of brain haemorrhage and skull fracture was assessed by gross anatomical examination. In experiment 2, 100 goat kids were euthanized using the same technique and brainstem reflexes and convulsions measured every minute for 15 minutes to assess insensibility, time of brain death and cessation of cardiac activity. A secondary method of euthanasia was used if immediate insensibility or cessation of cardiac activity within 15 minutes was not achieved. In experiment 3, seven goat kids were lightly anaesthetized and the electroencephalogram (EEG) was recorded to assess awareness following application of the non-penetrating captive bolt. In experiment 1, haemorrhages were observed close to the vital centres in the brainstem. In experiment 2, all goat kids were rendered immediately insensible without return to sensibility and cessation of cardiac activity occurred within an average of 8.4 minutes (range: min: 3.2 minutes; max: 16 minutes). One goat kid was euthanized using a secondary method because cardiac activity had not ceased within 15 minutes, but this animal did not return to sensibility within this time period. The non-penetrating captive bolt reliably caused immediate, sustained insensibility followed by death in goat kids. EEG confirmed that the non-penetrating captive bolt resulted in the immediate onset of EEG activity which was not compatible with awareness.

Poster Session:
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TOLERANCE OF CARBON DIOXIDE GAS BY NEONATAL GOATS

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Euthanasia methods for compromised or unwanted neonatal goats (kids) have received little scientific scrutiny, and inhalant agents have not been evaluated for ruminants. The objective of this study was to examine the aversiveness of carbon dioxide (CO2) to kids using approach avoidance and condition place avoidance paradigms. A preference-testing device was custom designed with two connected chambers maintained at static gas concentrations. The control chamber maintained ambient air conditions (1% CO2); the treatment chamber maintained predetermined CO2 concentrations. Twelve kids were individually trained for 6 consecutive days to enter the treatment chamber to access the milk ration, with ambient air in both chambers. After 5 minutes in the control chamber, a sliding door was opened to provide access to the treatment chamber. Kids received 10 minutes access to the treatment chamber, after which they were removed and returned to the home pen. During the testing phase, the same procedures were used with the treatment chamber maintained at one of three CO2 levels: 10%, 20% or 30%. Tests concluded when loss of posture occurred or after 10 minutes. Kids experienced each of the CO2 treatments, followed by 2 wash-out days with ambient air conditions. Behaviour collected using live observations and video recordings. All 12 kids learned to enter the treatment chamber to consume the milk ration. All kids entered the treatment chamber during all CO2 treatments. Ten kids tolerated 10% CO2 for 10 minutes without loss of posture; one left the treatment chamber at 8.5 min after consuming his full ration and one lost posture at 289s. During 20% and 30% CO2 tests, all kids consumed milk prior to and during ataxia. Loss of posture occurred within 83s to 271s of exposure. None of the kids displayed conditioned place avoidance on wash out days. These results suggest CO2 may be an acceptable method for euthanasia of goat kids.
4. THE EFSA APPROACH TO ASSESSING PROPOSALS FOR NEW STUNNING METHODS

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Council Regulation (EC) No 1099/2009 lays down rules for the killing of animals bred or kept for the production of food, wool, skin, fur or other products as well as the killing of animals for the purpose of depopulation and for related operations. A lawful application of modified or new stunning methods in the European Union must ensure a level of welfare at least equivalent to that associated with the methods already described in this Council Regulation on the protection of animals at the time of killing. The European Commission (EC) has recently received several studies in support of requests from member States for modified and new stunning methods (e.g. for waterbath stunning of poultry, low atmosphere pressure systems (LAPS) for stunning poultry, electrical stunning of small ruminants and modified atmosphere stunning of rabbits). The EC asked the European Food Safety Authority (EFSA) to provide scientific assessments of these studies. EFSA’s Animal Health and Welfare Panel (AHAW) developed a guidance document that defines the assessment process and criteria by which it assesses these studies. The first level is an eligibility assessment of the study. If this is fulfilled, the study is subjected to an assessment of reporting and methodological quality. The eligibility criteria are based upon the legislation and previously published scientific results. They focus on the intervention and the outcomes of interest, i.e. immediate onset of unconsciousness and insensibility or absence of avoidable pain, distress and suffering until the loss of consciousness and sensibility, and duration of the unconsciousness and insensibility (until death). As a final step in this first assessment phase, the methodological quality of the submitted study is evaluated. If the criteria regarding eligibility, reporting quality and methodological quality are fulfilled, a full assessment of the animal welfare implications of the proposed alternative stunning intervention, including both pre-stunning and stunning phases, and an evaluation of the quality, strength and external validity of the evidence presented is carried out. When generating supporting data for modified or new stunning interventions, the use of live animals should be minimised as stated in Directive 2010/63/EU on the protection of animals used for scientific purposes. Potential pain, distress and suffering of animals subjected to experimental investigations must be avoided and the principles of replacement, reduction and refinement (the 3Rs) when using animals for scientific purposes should be applied.
Comments to GVS from a non-veterinary member involved with the commercial dairy goat sector:

“Regarding CO2 there seems to have been reluctance on the part of HSA to even consider development of such a method on the grounds that kids would be averse to it. One could envisage a method whereby a small group of kids were placed in a dark and sufficiently airy container and left to go to sleep naturally, say 30 minutes. Considering that goat kids are 'natural hiders' this would be an entirely natural environment for them to be in. At that point the CO2 could be delivered in an appropriately pure form from a pressurised gas cylinder into the container, bubbling it though water to avoid irritation. This would provide a rising concentration and if an end point was scientifically established, there could be a timer fitted with fixed pressure at the inlet; low pressure cut-out sensors etc.”