



**Report on the  
Welfare of Farmed Animals  
at Slaughter or Killing  
Part 2: White Meat Animals**

**May 2009**

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Hilary Benn MP, Secretary of State, Department for Environment, Food and Rural Affairs, England

Richard Lochhead MSP, Cabinet Secretary, Rural Affairs and Environment Department, Scotland

Elin Jones AM, Minister, Department for Rural Affairs, Wales

May 2009

Dear Secretary of State, Cabinet Secretary and Minister

I have pleasure in submitting the Council's Report on the Welfare of Farmed Animals at Slaughter or Killing Part 2: White Meat Animals.

This Report is wide-ranging and considers the welfare of poultry (and other white meat species) in the last few hours of their lives up to the moment of slaughter or killing. Thus it deals with the experiences of poultry during catching and loading on the farm, the journey to the slaughterhouse, the wait in the lairage, unloading from transport containers, stunning and finally slaughter or killing. Since over 800 million poultry are killed annually in Great Britain, there is a strong moral imperative to ensure that welfare is a prime consideration at all these stages.

The Report also covers other circumstances in which poultry are killed, i.e. during routine culling on the farm, when flocks are killed to control disease during an emergency and when chicks are unwanted at the hatchery. It also addresses licensing and training of slaughtermen, legislation and its enforcement, and equipment design and approval since these also affect welfare.

The Report sets out six principles for humane slaughter and killing. There will be minimal pain, suffering and distress when these are adopted. The responsibilities of slaughtermen and other workers are grave and the need for training and compassion is paramount.

The Council's advice to the Government is based on a wealth of scientific knowledge and practical experience, not only of its members but also of many within the poultry and its allied industries, scientists, veterinarians and others concerned about poultry welfare. I have no doubt at all that implementation of this Report's recommendations will lead to significant improvements in the welfare of poultry at slaughter or killing.



Professor Christopher Wathes  
Chairman  
Farm Animal Welfare Council



## **EXECUTIVE SUMMARY**

This is the second report by the Farm Animal Welfare Council (FAWC) dealing with the Welfare of Farmed Animals at Slaughter or Killing. This Report deals specifically with animals with white meat, namely meat chickens (broilers), laying hens, turkeys, ducks, geese, gamebirds and rabbits.

This summary introduces the major themes and conclusions contained in the Report.

### **Principles of humane slaughter**

Slaughter or killing is the final event in a farm animal's life. The following principles must be observed if slaughter or killing of poultry or rabbits is to be humane with minimal pain, suffering and distress:

- i. All personnel involved with slaughter or killing must be trained, competent and caring
- ii. Only those animals that are fit should be caught, loaded and transported to the slaughterhouse
- iii. Any handling of animals prior to slaughter must be done with consideration for the animal's welfare
- iv. In the slaughterhouse, only equipment that is fit for the purpose must be used
- v. Prior to slaughter or killing an animal, either it must be rendered unconscious and insensible to pain instantaneously or unconsciousness must be induced without pain or distress
- vi. Animals must not recover consciousness until death ensues

When assessing an animal's welfare, FAWC uses the Five Freedoms as guidelines. Council is particularly concerned about instances of poor welfare, especially the intensity and duration of any suffering. Where there are indications of poor welfare, the more animals that are affected the more serious the problem.

The throughput of many poultry slaughterhouses is high. The necessity of mechanising slaughter to deal with the huge numbers of animals required by the market is not necessarily a welfare issue in itself. However, it is FAWC's view that this scale can lead to animals being treated as commodities rather than sentient beings.

### **Catching, loading and transport**

FAWC has long been convinced that humane catching and loading on the farm before considerate transport to the slaughterhouse are integral to good welfare at slaughter. The Report therefore examines welfare during the various stages of the journey from the farm to the slaughterhouse.

Many people have responsibilities for the welfare of birds up to the moment of slaughter or killing and their responsibilities should be clearly defined and understood.

An assessment of a bird's fitness to be caught and to travel is crucial. It is clear that birds which cannot stand or walk should be culled on the farm, but any birds that are severely lame and/or are showing signs of pain should not be loaded. There should be clear guidance for poultry farmers, catching teams and transporters on the fitness to travel of poultry.

Effective training and supervision of catchers are of crucial importance to the welfare of the birds. FAWC has particular concerns about catching and handling of fracture-prone end-of-lay hens.

Animals should be slaughtered as close to the farm as possible. In addition to the journey time being as short as possible, more attention should be paid to the quality of the journey.

### **Welfare in the lairage**

Responsibility for assessing animals on delivery to the slaughterhouse lies with the slaughterhouse operator, the Official Veterinarian and the Poultry Welfare Officer. If birds are delivered with welfare problems, it should be clear to all involved what action should be taken.

The lairage must be of a suitable size, layout and design to protect birds from adverse environmental conditions and be adequately ventilated. Birds waiting in the lairage or on vehicles should be monitored regularly, and the time spent in the lairage kept to a minimum by careful scheduling.

### **Live shackling**

Live shackling may cause considerable pain and distress, which are likely to be exacerbated when heavy birds or fracture-prone, end-of-lay hens are shackled. Staff working on the shackle line have a vital welfare role and should be competent and well trained. While improvements to existing systems should be made in the short and medium term, FAWC would welcome the end of pre-slaughter inversion and live shackling in the long term.

### **Stunning and killing**

Animals are stunned before slaughter to render them insensible to pain and distress during neck cutting and bleeding. The two main methods of rendering birds insensible to pain and distress are electrical stunning, which causes immediate unconsciousness that lasts until death, and controlled atmosphere systems in which the progression to unconsciousness is more prolonged.

The Report addresses the complex nature of both types of system and seeks solutions to concerns about the effectiveness of stunning and the time to insensibility. Recommendations include replacement of constant voltage with constant current electrical stunning to ensure that each bird receives the minimum current for an immediate and lasting stun, as well as the use of sufficient current applied at low frequency to stun and kill birds by inducing cardiac arrest. This delivers certainty that the birds' welfare cannot be affected after the stun. With regard



to controlled atmosphere systems, the Council recommends that gas mixtures used elsewhere in Europe should be allowed in Great Britain; further research and development of controlled atmosphere systems for poultry should be done to develop systems for small slaughterhouses; and slaughterhouse operators should comply with the legal requirement that there is a means of visually monitoring birds that are in the chamber.

## **Slaughter**

The interval between the stun and the neck cut should be as short as possible to ensure that death by loss of blood takes place without any possibility of a return to consciousness. This would be further assured by cutting both carotid arteries, which is considered an essential requirement when stunning methods are used that may enable animals to recover consciousness.

Recommendations are made in the Report for humane culling, private slaughter and slaughter or killing on the farm. The Report also addresses slaughter without pre-stunning.

## **Mass killing for emergency disease control**

Outbreaks of avian influenza during the study offered the opportunity for FAWC to advise on the welfare implications of mass killing for the purposes of disease control.

Birds caught up in disease outbreaks or restrictions should be viewed as individual sentient beings and must not be subject to avoidable suffering. Contingency plans for disease control must address welfare issues, while allowing for human health considerations. Availability of competent catchers and slaughter teams is essential.

## **Licensing and training**

The skill and performance of the slaughterman are crucial to good welfare. A slaughterman's licence issued for life, without re-assessment of competence, is clearly wrong. The Official Veterinarian plays a central part in the licensing system and FAWC is convinced that the training, accreditation and enforcement roles of the Official Veterinarian do not sit comfortably together.

Animal welfare at slaughter must form an integral part of the training of any person working in a slaughterhouse. The role of the Poultry Welfare Officer is crucial to the identification and monitoring of welfare issues; it is essential that this role and its functions are set out clearly and that adequate and accessible training is available.

## **System of approval for slaughterhouse equipment**

Mechanisation of poultry slaughterhouses increases the need for a system of approval for live bird handling and stunning systems and for slaughter equipment. Equipment upon which birds' welfare depends must be effective for the purpose it is used.



## PART I - INTRODUCTION

1. The Farm Animal Welfare Council (FAWC) was established in 1979. Its terms of reference are to keep under review the welfare of farm animals on agricultural land, at market, in transit and at the place of slaughter; and to advise British Governments, including the devolved administrations, of any legislative or other changes that may be necessary. The Council has the freedom to consider any topic falling within this remit.

2. This is the second of two reports dealing with the Welfare of Farmed Animals at Slaughter or Killing. This Report deals specifically with the welfare implications of slaughter and killing of farmed white meat species (meat chickens, laying hens, turkeys, ducks, geese, gamebirds and rabbits). The scale of farming of these species is substantial: approximately 839 million fowl (including meat chickens and end-of-lay hens), 15 million turkeys and 17 million ducks and geese are killed in Great Britain each year. While this Report is primarily concerned with poultry, rabbits and farmed gamebirds are also covered.

3. In this second Report, we refer to our first report on the Welfare of Farmed Animals at Slaughter or Killing – Part One: Red Meat Species (2003)<sup>1</sup> where there are common issues relating to equipment approval, licensing of slaughtermen, legislation and enforcement and staff training, for example. We also reinforce some of the messages from our first report where they are also relevant to white meat species at slaughter or killing.

4. In FAWC's report on the Welfare of Poultry at the Time of Slaughter (1982), Council set out its belief that the suffering and distress caused to poultry could be reduced if:

- i) poultry slaughterhouses, and the operations carried out in them, are planned with the welfare of the live birds in mind;*
- ii) all machinery and equipment function effectively;*
- iii) all machinery and equipment are frequently inspected, kept in good working order and always adjusted to the type of bird being handled;*
- iv) adequate training and supervision are provided for personnel working with live birds so that consideration for living creatures is maintained.*

These principles still hold true and we will seek to develop them further in this Report.

5. The 1982 FAWC report also made a number of recommendations aimed at improving the welfare of poultry at slaughter. Many of these were implemented through legislation, a Code of Practice, allocation of responsibility for monitoring and enforcing legislation to the Official Veterinarian (formerly the Official Veterinary Surgeon), and improved industry practices, while relevant research has also been undertaken. There are, however, a few recommendations from that report that were not acted on, for example, a mandatory, national scheme of approval for stunning and killing equipment: Government favours a voluntary scheme since a mandatory scheme would require EU-wide consent.

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<sup>1</sup> Hereafter referred to as the Red Meat Slaughter report

## **FAWC's philosophy**

6. Animals are kept for various purposes and in return their needs should be provided for. Farm animals are recognised as sentient beings in the Treaty of Rome (1957) and the Treaty of Amsterdam (1997). We have a moral obligation to each individual animal that we use. This obligation includes never causing certain serious harms to farm animals and, when deciding on our actions, endeavouring to balance any other harms against benefits to humans and other animals.

7. Achievement of high standards of animal welfare requires awareness of animal needs and both caring and careful efforts by all who are involved in the supervision of farmed animals. It requires skilled and conscientious stockmanship, responsible, planned and effective management, appropriate living conditions, and considerate handling, transport and humane slaughter. General guidelines as to what those who use animals should provide in order to avoid suffering and other harms, are contained in the Five Freedoms:

**Freedom from hunger and thirst**, by ready access to fresh water and a diet to maintain full health and vigour

**Freedom from discomfort**, by providing an appropriate environment including shelter and a comfortable resting area

**Freedom from pain, injury or disease**, by prevention or rapid diagnosis and treatment

**Freedom to express normal behaviour**, by providing sufficient space, proper facilities and company of the animal's own kind

**Freedom from fear and distress**, by ensuring conditions and treatment which avoid mental suffering

8. When assessing any welfare problem, it is necessary to consider the extent of poor welfare, the intensity of suffering and its duration. Welfare assessment concerns individual animals; however, where there are indications of poor welfare, we consider that the more animals that are affected, the more serious is the problem.

9. In order to ensure the provision of useful advice about the welfare of farm animals FAWC takes a broad approach. It takes account of established science, new developments, the practical experience of those involved in the farming industry, and of those involved in other aspects of food production. In making its recommendations, FAWC aims to consider all relevant views and to balance human benefit with a concern to ensure that the animal's interest remains to the fore.

10. Knowledge based on scientific studies of the welfare of animals is increasing rapidly. The term 'animal welfare' is employed frequently in scientific and legal documents and in public statements. In our view, welfare encompasses the animal's health and general physical condition, its psychological state and its ability to cope with any adverse effects of the environment in which it is kept.

11. In a number of places in this Report we make recommendations for changes to slaughter systems and practices over the short, medium and long term. Some recommendations we consider to be actionable straight away, while others will take longer because of the changes required in legislation, the need for further research and development or the scale of any investment by Government and industry. FAWC seeks incremental changes to industry practices that are achievable and sustainable.

### **General issues relating to slaughter and killing**

12. Slaughter and killing are defined in the Welfare of Animals (Slaughter or Killing) Regulations 1995: “*slaughter, in relation to an animal, means causing the death of the animal by bleeding*”; and “*killing, in relation to an animal, means causing the death of the animal by any process other than slaughter*”.

13. Death can be defined as the cessation of the vital functions of an animal. In animal welfare terms, this point should be reached either instantaneously or after the animal has first been rendered unconscious by another means. The method of rendering the animal unconscious should also be achieved without causing avoidable pain, suffering and distress.

14. There will always be ethical issues when an animal is killed, whether it is for food or as part of disease control, for example. These issues are not within the scope of this Report but we have considered how best welfare can be protected once the decision has been made to kill an animal. Current legislation requires that the method of slaughter or killing itself must not cause any avoidable excitement, pain or suffering to any animal. But slaughter or killing may only be the final event in a sequence of equally or more stressful events in the animal’s life. In this Report we consider all stages of the process leading to slaughter or killing from catching on the farm, loading, transport and delivery to the slaughter plant, pre-slaughter handling and stunning to slaughter or killing. For white meat species especially, the early elements of the slaughter process are integral to good welfare.

15. For slaughter or killing of an animal to be humane with minimal pain, suffering and distress then the following principles that must be observed. They apply to all methods and stages of slaughter or killing up to the moment of death, as appropriate.

- i) All personnel involved with slaughter or killing must be trained, competent and caring
- ii) Only those animals that are fit should be caught, loaded and transported to the slaughterhouse
- iii) Any handling of animals prior to slaughter must be done with consideration for the animal’s welfare
- iv) In the slaughterhouse, only equipment that is fit for the purpose must be used
- v) Prior to slaughter or killing an animal, either it must be rendered unconscious and insensible to pain instantaneously or unconsciousness must be induced without pain or distress
- vi) Animals must not recover consciousness until death ensues

## *Recommendation*

16. *The principles of humane slaughter and killing must be observed whenever poultry and other white meat species are slaughtered or killed.*

17. Scientific and practical assessments of animal welfare in relation to the events up to slaughter or killing encompass physiological and behavioural responses, changes in the brain, injury or bodily malfunction, which separately or collectively show the extent to which the animal is coping. Although a single measurement may indicate that welfare is poor, welfare assessment should use a range of measures.

18. Evaluation of the effectiveness or otherwise of different stunning, slaughter or killing methods also relies on a range of indicators, for example, the time taken to induce unconsciousness, the duration of unconsciousness and the time to death. Observations of consciousness, sensibility to pain and death are also used to monitor the effectiveness and humaneness of stunning, slaughter and killing.

19. There are several methods of slaughter or killing for poultry that do not render the birds instantaneously unconscious, e.g. gas killing, neck dislocation and slaughter without pre-stunning. Because unconsciousness is not instantaneous, it is vital that the period up to its induction is free from avoidable pain or distress to protect the welfare of the birds.

20. When cattle, sheep and other red meat species are slaughtered, they are treated as individuals and, by comparison with poultry, in relatively small numbers. At several stages during the study, we noted that the throughput of many poultry slaughter systems was very high, over 10,000 birds per hour in some cases. The necessity of mechanising the slaughter process is not necessarily a welfare issue. However, we consider it could lead to animals being treated as commodities rather than individual sentient beings. When part of a large group, the welfare of an individual bird may be seen as less significant. People working in abattoirs should be aware that they are dealing with sentient animals in their daily work and be adequately trained in order to carry out their work compassionately and competently.

21. A failure in a high throughput system has the ability to impact negatively on the welfare of a large number of individual animals. When this is expressed as a proportion of the whole group, the impact can be lost. Effective monitoring and surveillance by plant managers, Poultry Welfare Officers (PWOs) and the Official Veterinarian (OV) is vitally important to ensure that the birds' welfare is not compromised.

22. A wide variety of stunning and killing systems are used for poultry and none is ideal. The design and operation of slaughterhouses should specify processes that, if properly applied, provide the best possible welfare outcomes for all birds.

23. Many small slaughterhouses have a low throughput and may use different methods and equipment to those employed in large poultry slaughter plants. Some on-farm and off-farm

premises operate for only part of the year, servicing the seasonal trade in poultry. Regardless of their size and methods employed, all slaughterhouses must treat animals in line with the principles of humane slaughter and killing, set out above.

24. Whenever new slaughterhouses are planned or existing slaughter plants are modernised, the objective should be to ensure the highest standards of welfare. Best practice should be employed at each stage of the slaughter process for the type and size of birds involved.

### **Remit and method**

25. In 2003, FAWC commenced a review of the welfare of farmed white meat species at slaughter or killing. This followed on from publication in the same year of the Council's Report on the Welfare of Farmed Animals at Slaughter or Killing Part One: – Red Meat Animals. The remit of the review of white meat species was, however, widened to include catching, loading and transport of animals to the slaughterhouse as well as covering welfare from the time of arrival at the slaughterhouse until death. We have also taken into account slaughter and killing on-farm, mass killing for disease control and the disposal of day-old chicks. All slaughterhouse operations following death were excluded.

26. During the production of this Report, there were outbreaks of avian influenza in the U.K. These offered the opportunity to review in detail killing methods and other welfare issues related to these circumstances. Methods for killing large numbers of poultry on-farm for disease control were developing quickly while our investigation was underway and we have also considered the implications of current practices for welfare.

27. The Slaughter Working Group consulted extensively during its study, considered scientific evidence, and took oral and written evidence in relation to casualty slaughter and killing for disease control purposes. Members visited a wide range of slaughterhouses in Great Britain and Europe. In addition, meetings were held with invited experts from industry, research bodies and from other interested parties, including animal protection organisations and religious groups.

28. Those who gave evidence and information are listed at Appendix B and we should like to thank all who participated. In addition, we are grateful to those slaughterhouse operators who allowed us access to their premises and for the open and frank discussions we were able to hold with them and their staff.

29. Where we refer in this Report to "Government", we are addressing ourselves to the Department for Environment, Food and Rural Affairs in England, the Scottish Government's Rural Affairs and Environment Department, the Welsh Assembly Government's Department for Rural Affairs and other responsible Government Departments and Agencies.

## PART II - BACKGROUND

30. The majority of poultry that are killed in the U.K. originate on farms operated by large integrated companies. Most of these companies operate their own slaughterhouses: the number of slaughterhouses has fallen steadily over the last decade. Catching gangs may be composed of company or contracted workers, who catch and transport birds from company-owned or independent farms to the slaughterhouse. Slaughterhouses that operate seasonally, e.g. those processing turkeys and geese, are normally independent. Other small scale or seasonal farmers kill birds on-farm or transport them locally for slaughter in seasonal facilities. For end-of-lay hens and breeders, the process may be more fragmented with different operators responsible for the separate procedures of catching, transport and slaughter.

Number of approved/licensed poultry slaughterhouses in England, Scotland and Wales and annual poultry slaughtering (millions) in the U.K.

Year	Number of slaughterhouses approved or licensed for poultry				Annual poultry slaughtering (millions)		
	England	Scotland	Wales	G.B.	Fowl, including broilers and end-of-lay hens	Turkeys	Ducks and Geese
1997	131	10	15	156	796	36	18
1998	131	11	14	156	805	34	18
1999	119	11	12	142	816	29	19
2000	111	11	10	132	798	27	19
2001	116	11	10	137	819	26	22
2002	109	9	11	129	819	23	20
2003	111	9	9	129	840	21	20
2004	105	7	10	122	843	21	18
2005	98	6	7	111	864	19	19
2006	91	7	6	104	844	17	19
2007	89	4	6	99	839	15	17

Sources: Slaughterhouses - Food Standards Agency, Meat Hygiene & Veterinary Division; Slaughtering - Agriculture in the UK 2007, Defra.

31. There is only one slaughterhouse in Great Britain that is designated for the slaughter of rabbits for human consumption; it generally processes less than 10,000 animals per year. The Meat Hygiene Service (MHS) was unable to supply separate figures for gamebirds or quail slaughtered in poultry meat slaughterhouses, however, the vast majority of game-processing plants dress birds and rabbits that have been shot.

32. The Welfare of Animals (Slaughter or Killing) Regulations 1995 (as amended; WASK 1995) regulate animal welfare at slaughter or killing in Great Britain and implement the EU Slaughter Directive (93/119/EC). The European Food Safety Authority (EFSA) Scientific Panel on Animal Health and Welfare has produced Opinions on the welfare of the main and minor species at slaughter and killing that also inform the European Commission's stance. The World Organisation for Animal Health (OIE) has recently recognised its potential to provide global standards for animal welfare, albeit only in the form of guidance. Chapters on the welfare of



animals at slaughter for human consumption and when animals are killed for disease control, as well as on transport of animals by land and sea, are now included in the OIE Terrestrial Animal Health Code. The European Commission began a review of the Slaughter Directive during the preparation of this Report and FAWC sought out opportunities to feed its advice into this process. A proposal for a new Slaughter Regulation was issued in October 2008.

33. From 1st January 2006, new food hygiene regulations came into force in all EU Member States (Regulation (EC) 852/2004 on the hygiene of foodstuffs; Regulation (EC) 853/2004 on specific hygiene rules for food of animal origin; and Regulation (EC) 854/2004 on specific rules for the organisation of official controls on products of animal origin intended for human consumption). The hygiene regulations replaced 17 directives, including eight relating specifically to meat. Slaughterhouses must be approved by the Food Standards Agency (FSA) and monitored by the MHS, unless they have been granted exemptions.

34. Poultry slaughterhouses handling small quantities (<10,000 birds p.a.), which supply direct to the customer or to local retail outlets, do not need to be approved, but must still be registered with the FSA and are subject to Local Authority/Animal Health enforcement controls. This exemption is in line with previous requirements under which those premises processing less than 10,000 birds p.a. were not required to be licensed. A proportion of these non-approved slaughterhouses are inspected by Local Authorities, but the numbers of visits and results do not appear to be collected centrally.

35. The FSA has produced the Meat Industry Guide, which provides guidance on food hygiene legislation for food business operators, enforcement officers and policy makers. The Guide also identifies requirements of the slaughterhouse operator under the Welfare at Slaughter legislation.

36. FAWC is concerned about the MHS decision to cease publication of some slaughterhouse data; for example, the biennial animal welfare report that identified levels of compliance with legislation and trends within the industry has been discontinued. Council would welcome a resumption of the collection and publication of these welfare data.

37. Council Regulation (EC) No. 1/2005 on the protection of animals during transport and related operations came into force in England on 1<sup>st</sup> January 2007 under the Welfare of Animals (Transport) (England) Order 2006 (WATO 2006), and under similar legislation in Scotland and Wales. This legislation has implications for catching, loading and transport of poultry prior to slaughter and sets out responsibilities and requirements for training and competencies.

38. The recent Meat Chicken Directive (Council Directive 2007/43/EC) is set to be implemented in domestic legislation in 2010. It specifies certain growing conditions, including permitted stocking densities, and a requirement to monitor mortality and post mortem/reject data at processing to aid assessment of on-farm welfare. Defra and the devolved administrations are currently establishing a Statutory Instrument that will include monitoring of welfare outcomes, e.g. from data on cumulative mortality on the farm, the number of animals dead-on-arrival at the slaughterhouse (DOAs) and, in addition to the Directive requirements, FAWC hopes it might include the prevalence of injuries, pododermatitis, hock burn, and certain diseases.

39. A prescriptive approach to the slaughter methods allowed in the Welfare of Animals (Slaughter or Killing) Regulations 1995 is easier to enforce but may stifle innovation, such as the introduction of new methods of stunning, slaughter or killing. Legislation should be drafted in a way that promising developments can be readily authorised for commercial use after assessment of their effect on bird welfare. Authorisation would be facilitated by an approval scheme for new or modified equipment and processes that would clearly need to be supported by scientific evidence.

40. Consideration should be given to the regulation of stunning, slaughter or killing according to welfare outcomes. For such an approach to work satisfactorily, monitoring and control systems that identified welfare hazards would be needed and critical control points identified.

41. We were pleased to see the publication of updated guidance on the welfare of poultry at slaughter or killing (<http://www.defra.gov.uk/animalh/welfare/pdf/poultrywelfare.pdf>). Council would like to see this guidance converted into a statutory Code of Practice once the EU Slaughter Directive has been reviewed and any consequential EU legislation has been interpreted into domestic legislation.

42. During the consultation, representatives of the poultry industry expressed concerns about the industry's competitiveness when standards of welfare were raised. They questioned whether the costs of welfare improvements would be met by the market. FAWC is undertaking a study of the economics of farm animal welfare, which is likely to be published in 2010 and may answer some of these concerns.

43. In line with the principle that products should be derived from animals that have experienced satisfactory animal welfare throughout their life irrespective of their country of origin, we would not wish to see increased imports from third countries where standards of welfare are lower than those required in Great Britain or Europe. As our Report on the Welfare Implications of Farm Assurance Schemes (2005) recognised, assurance schemes have the ability, where legislation might not, to require the same standards of welfare in the production of livestock products sourced from home and abroad.

#### *Recommendations*

44. *Guidance on the welfare of poultry at slaughter or killing should be converted to a statutory Code of Practice, once current reviews of legislation and policy have been carried out.*

45. *Monitoring and control systems, including critical control points, based on welfare outcomes, should be in place to ensure effective regulation of welfare at slaughter or killing.*

## **PART III - WELFARE ISSUES**

### **Catching and loading on the farm**

46. Humane catching, loading and transport to the slaughterhouse are integral to good welfare at slaughter. Poultry are gathered and transported only a few times during normal farming. They are particularly susceptible to extremes of temperature and humidity that can be experienced when they are confined in crates during transport or at the lairage.

47. Ideally, poultry should undergo an ante-mortem veterinary inspection on the farm before they are caught. Once the birds are disturbed by catching and loaded in crates, it is much harder to inspect them, either individually or as a flock. Currently, a supervising veterinarian does not usually inspect poultry before catching to certify that they are fit to travel. Instead, the farmer submits an ante-mortem production report (denoted as a Food Chain Information, FCI, report) to the Official Veterinarian at the slaughterhouse between 48 and 72 hours before the birds leave the farm; this report details the total mortality from placement, the mortality day-by-day over the preceding week and any disease, injury and treatment. The Official Veterinarian refers to this report when assessing the birds on arrival at the slaughterhouse.

48. The farmer should be in a position to state that birds are fit to catch. Although monitoring and inspection during catching are often difficult, farm staff should be present to ensure that catching is done to a satisfactory standard and that birds are subsequently fit to travel. The catching supervisor should be trained and competent to recognise signs of disease or injury that may render birds unfit to catch or travel.

49. Feedback from the slaughterhouse can be an incentive to improve welfare during catching and transport. Information about the number of damaged or injured birds should be fed back to the farmer, catchers and transporters by the slaughterhouse operator. The results of veterinary assessment during processing could also be included in any feedback.

50. Fitness to catch and to travel is an integral part of ante-mortem inspection. If the flock inspection determines that the flock is showing signs of ill health then catching and transport should not take place. Individual birds must be fit for catching and for travel, both in terms of their general health and ability to stand. As examples, end-of-lay hens with obvious injuries or birds suffering with painful lameness should not be transported. Birds that cannot stand or walk should be culled on farm. Likewise, those that are severely lame and/or in pain should be treated or culled and should not be transported.

51. Responsibility for the welfare of the birds at all stages needs to be clear amongst all involved, i.e. the farm's owner, manager and staff; the catching team's supervisor during catching; the driver once the birds are on the lorry; and the slaughterhouse's manager on the birds' arrival at the slaughterhouse. There should be a robust system of handover to ensure that all those involved are clearly aware of their responsibilities. Under WATO 2006 in England (and similar legislation in Scotland and Wales), drivers are responsible for ensuring that birds are fit to travel. If they do not assess the fitness of birds while they are being caught and loaded then the birds' fitness to travel must be taken on trust. There is potential for non-compliance with their legal responsibility if drivers have not been trained to assess the fitness of birds to travel.

52. We witnessed the catching of broilers. It is undoubtedly hard, physical work undertaken in difficult environmental conditions and mostly during anti-social hours. The workforce is often low skilled and/or transitory. Catching teams may be supplied on contract, although some larger companies employ (and train) their own teams. Training and supervision of catchers are of paramount importance to poultry welfare. FAWC considers that all those involved in catching poultry should be trained to recognise whether birds are fit to catch and to transport.

53. Manual handling of live poultry, including inversion, requires that staff are trained, competent and rested sufficiently to catch birds efficiently and humanely. Effective supervision is required at all times. FAWC's Report on Stockmanship and Farm Animal Welfare (2007) called for demonstrable competence to be shown by those handling animals. Current legislation requires that people handling animals during loading, unloading and transport are trained and FAWC considers that this legislative requirement should be extended to catching teams. We understand that the National Proficiency Tests Council is addressing the training requirements for catching and transport of poultry. The Humane Slaughter Association provides suitable material for training, e.g. a DVD on catching poultry.

54. Catching affects both poultry welfare and meat quality. There can be a tension between the catching teams' performance and cost and the expectations of the farmer and processor. Both in-house catching teams and contractors should be closely supervised and managed. The identity of the catching team should be recorded so that its performance can be monitored.

55. Broilers and end-of-lay hens are normally caught and carried by either a single or both legs. It is quicker to catch and carry a bird by one leg though this may not be best for the bird's welfare. With broilers the transport module can usually be brought into the poultry house close to where the birds are being caught, hence minimising the distance that they are carried whilst inverted. FAWC considers that even if birds are caught by one leg, they should then be carried to the transport module by two legs. All birds should be carried inverted for the shortest distance and time possible with smooth and careful movements to avoid unnecessary distress and wing flapping. Careful, effective planning and training should enable this to be achieved.

56. We have particular concerns about catching and handling of end-of-lay hens, especially where their bones are weak, e.g. due to osteoporosis. The risks of bone fracture or joint dislocation are also high with broiler breeders and free-range hens, while removal of hens from cages poses additional hazards from physical contact with the cage's structure and the long distances that the birds are carried to transport modules. The incidence of bone fractures of hens kept in enriched colony cages has been shown to be lower than for those kept in conventional cages.

57. The difficulties of catching end-of-lay hens in cages, barns or extensive systems, the long journeys to the small number of British slaughterhouses, and manual inversion and shackling before electrical stunning, are all factors that may compromise welfare. Although end-of-lay hens usually have little or no monetary value, they are sentient creatures with no less intrinsic value on welfare grounds than other poultry. In view of the weak bone strength of some end-of-lay hens, we conclude that they should only be caught and carried by two legs.

58. FAWC responded to a Defra consultation in 2006 on the use of controlled atmosphere systems outwith the slaughterhouse and the potential to kill end-of-lay hens on the farm.

Industry should consider adopting systems that allow end-of-lay hens to be killed or slaughtered *in situ*, obviating the need for live catching and transport.

59. There are different requirements for catching and handling larger, heavier birds, such as ducks, geese and turkeys. Ducks are often picked up by the neck and placed directly into transport modules, up to two per hand. Catchers should not be permitted to walk significant distances with ducks held by the neck. The Code of Recommendations for the Welfare of Livestock: Ducks states that ducks should not be carried hanging head downwards or by the legs alone, and that their weight should be supported, either by a hand placed under the body or the bird should be held either side of its body. Geese are often picked up with two hands supporting the body and placed in the same type of transport module used for ducks. Ducks will usually be able to stand in the module but geese will have to sit.

60. Small turkeys are usually caught and carried by holding the birds with a hand on either side of the body, covering the wings. Large turkeys should be picked up by one wing, close to the body, and by one leg. Firm control can elicit a passive response, while loose handling can result in wing flapping and kicking with potential for injury to the bird and its handler. Catchers may tire when large numbers of heavy turkeys are caught with the potential to cause poor welfare. Larger birds can be moved by droving to on-farm slaughter premises or walk-on trailers. Some transporters still use fixed crates on trailers for short journeys.

61. The design and maintenance of transport crates, particularly old designs with small top openings, may be factors in catching injuries suffered by birds. Since our 1990 Report on the Handling and Transport of Poultry, considerable improvements have been made in the design of modular systems, but there is still potential for injury if these are not maintained or used properly. The majority of birds are transported in modules, each with 8 or 10 plastic trays. Other modules may have hinged floors which drop down when each crate below is filled. Modules should be treated with care when being moved or loaded onto vehicles to avoid distress or damage to the birds. An assortment of other containers is often used for small scale or seasonal production. It is important that these are also of a suitable design and construction that reduce the potential for injury, pain and discomfort during transport.

62. Machines have been developed to catch and load broiler chickens. In our 1990 Report on the Handling and Transport of Poultry, we recommended that Government and industry should work toward the wider introduction of such machines. Commercial use has since demonstrated that it is possible to catch broilers mechanically with minimal injury or distress. However, practical considerations about handling and counting birds, some designs of British poultry houses and difficulties in cleaning and disinfection of the machines appear to have hampered the widespread introduction of mechanised catching in Great Britain, though not elsewhere within Europe. Improvements are being made to overcome these problems and we would encourage the poultry industry to keep abreast of any commercial developments.

63. Stocking rates for crates and modules are important in terms of potential heat stress and damage during transport. There is an optimal stocking rate which prevents birds from sliding or slipping during transport but allows effective air circulation. We endorse the guidance on maximum stocking rates for different types of poultry that has been provided under guidance to WATO 2006.

## *Recommendations*

64. *Catching, loading, transport and unloading are integral parts of the slaughter or killing of poultry and advice on these processes should be included in the Government's Guidance (and any future Code of Practice) on the Welfare of Poultry at Slaughter or Killing.*

65. *Industry should put in place robust procedures to ensure that poultry are fit to catch, load and transport. Responsibilities for the birds' welfare must be clearly defined at all stages from catching on the farm to slaughter or killing at the slaughterhouse.*

66. *Catching is an integral part of loading poultry for transport; the legal requirement for training those handling animals during transport should also apply to members of catching teams.*

67. *Industry should ensure that feedback from the slaughterhouse on damage to birds that can be related to poor catching should be traceable to specific catching teams so that their performance can be improved.*

68. *Meat chickens that are caught by one leg should be carried to transport crates by two legs. End-of-lay hens should only be caught and carried by both legs. All poultry should be carried for the shortest distance and time possible.*

69. *Industry should consider adopting systems that allow end-of-lay hens to be slaughtered or killed in situ on the farm.*

## **Transport**

70. FAWC's premise is that animals should be slaughtered or killed as close to the farm as possible. Poultry production and processing are often part of a stratified industry in which farms are located within a short distance of the slaughter plant. Where this is not the case, any rationalisation of the poultry industry that leads to longer journeys between the farm and plant has implications for welfare. The quality and duration of transport are particularly important because the risks to the birds' welfare rise with longer and/or more complex journeys.

71. In our previous report on poultry transport (1990), we recommended that the total journey time should be no more than 15 hours, from the time of loading the first bird to unloading the last bird. WATO 2006 (and similar legislation in Scotland and Wales), which applied Council Regulation (EC) No. 1/2005 on the protection of animals during transport, now includes loading and unloading as part of the journey time for all animals except poultry, and also does not specify a maximum journey time for poultry. FAWC still considers that the journey time should be as short as possible and that greater attention should be paid to the quality of the journey to minimise any risks to welfare. Both points should be emphasized during training of drivers and others involved in poultry transport.

72. WATO 2006 (in applying Council Regulation (EC) No 1/2005) requires that ‘animals that are injured or that present physiological weaknesses or pathological processes shall not be considered fit for transport’. The farmer should be satisfied before (and after) catching that birds are fit to travel. Before a driver accepts a consignment of birds, it is his responsibility to be satisfied that they are fit for transport. FAWC considers that there should be clarity of responsibility during catching, loading and transport. There should be clear guidance available to poultry farmers, catching teams and drivers on the fitness to catch and to travel of poultry bound for slaughter.

73. There are only a few slaughterhouses in Great Britain that process end-of-lay hens; this can lead to long journeys. The birds’ fitness to catch and travel may be in doubt due to osteoporosis and other production stresses while their financial value is minimal: the farmer may even have to pay a headage charge to dispose of them. With end-of-lay hen transport tending to be less integrated than for other poultry, there may be more concerns about management control and communication.

74. Poultry are susceptible during transport to hyper- and hypothermia, particularly the latter when they are wet. End-of-lay hens with limited feather cover may be especially susceptible to cold. Most vehicles are passively ventilated and so rely on the vehicle’s movement and stack effect to maintain proper ventilation. Vehicles must be well ventilated: the pathways of air movement are now broadly understood following research on vehicle design. Data recorders that measure temperature and humidity can be placed in transport vehicles to map environmental conditions during transport. Slaughterhouse operators should take advantage of detailed weather reports when planning transport operations. Journey plans should include contingency planning to ensure that adverse weather does not compromise welfare due to heat or cold stress.

75. Many factors can affect the quality of the journey for the birds, e.g. handling during loading of the modules, the stocking density of the modules, vehicle design particularly its ventilation, the type of roads and how the vehicle is driven during the journey, weather conditions, vehicle breakdowns and delays due to road works or heavy traffic. It is important that hauliers and drivers are aware of these factors and how they can affect animals during any journey. Where welfare problems are discovered during or following transport, enforcement authorities should establish the likely causes in order that appropriate action can be taken, if necessary.

76. It is a requirement of EU Directive 853/2004 that animal crates and modules are made of non-corrosive material and be easy to clean and disinfect. Immediately after unloading and before any re-use, all equipment used for collecting and delivering live animals must be cleaned, washed and disinfected. Maintenance of transport systems is a pre-requisite under the animal transport legislation. Modules, trays and crates must therefore be kept in a good state of repair, without defects that could injure birds. Slaughterhouse staff, who are responsible for cleaning crates and restacking modules, should monitor them for cleanliness and damage before re-use.

77. Journey delays extend the catch-to-kill time and, in hot weather, can lead to heat stress and subsequent mortality. Contingency planning for emergencies should include discussion with the Police about facilitated access to alternative routes or other means to mitigate any risks to

welfare. The availability of an alternative vehicle and/or driver to assist at a serious breakdown or accident should be considered.

78. The importance of communication by telephone or radio between the driver and the slaughter plant cannot be overstated. The driver must be able to report any problems arising in the journey while the slaughterhouse must be able to inform the driver of any imminent delays at the slaughterhouse so that routes can be rearranged to keep vehicles moving and hence ventilated.

#### *Recommendations*

79. *Government should provide clear guidance on the fitness to catch and to travel of poultry bound for slaughter such that unfit birds are not loaded and transported.*

80. *Farmers, hauliers and slaughterhouse operators should agree contingency plans for transport of poultry to minimise any problems that may affect the welfare of the birds.*

81. *Government should consult with the Police about the needs of poultry during transport, particularly when journeys are disrupted in hot weather.*

#### **Lairage**

82. The responsibility for assessing animals on delivery to the slaughterhouse lies with the slaughterhouse operator, the Official Veterinarian and the Poultry Welfare Officer (PWO). The action to be taken in the event of birds delivered with welfare problems (e.g. heat stress, chilled, wet, damaged/injured, high mortality) should be clear for all involved and implemented without delay. Where welfare problems are suspected during transport then the Official Veterinarian may involve the Local Authority Trading Standards Department.

83. The condition of birds on arrival at the slaughterhouse can provide information about their welfare on farm and during catching, loading and transport. Slaughterhouse operators should record any injuries and the number of dead-on-arrival birds as part of their welfare controls. These records should be used to identify persistent problems with particular farms, catching teams or hauliers. At the slaughterhouse, Poultry Inspection Assistants and/or Poultry Meat Inspectors keep records of reasons for rejection, including bruising, fractures and other conditions that may reflect signs of poor welfare on the farm, during catching or during transport.

84. We considered what prevalence of injuries and/or dead-on-arrival amongst birds was acceptable on arrival at the slaughterhouse. Industry told us that the combined prevalence is less than 0.1%, but it is left to the Official Veterinarian to decide what level indicates poor welfare. For most, this will be any level which changes significantly from the norm. We believe that Government should provide guidance to the Official Veterinarian on the prevalence of injuries and/or the number of birds that are dead-on-arrival that is unacceptable, including the level at



which investigative action is needed. Defra is currently considering the assessment of welfare outcomes in relation to European broiler welfare legislation (Council Directive 2007/43/EC). FAWC considers that this should be extended to all white meat species to help identify a range of welfare outcomes that can be monitored by the Official Veterinarian and inspection staff in slaughter plants.

85. Monitoring of birds should take place regularly at all times that birds are present in the lairage or are waiting in vehicles on site outwith the lairage. An experienced PWO, working with the Official Veterinarian, should be available at all times that live birds are present on site. The PWO should regularly examine birds in crates for signs of suffering, distress or injury and take appropriate action without delay.

86. The time spent in the lairage should be kept as short as possible by careful scheduling of catching and transport. During our visits, we observed that many slaughterhouse operators arranged a short period, up to two hours, to allow birds to settle after transport. This settling period should be as short as possible. The ability to hold birds in the lairage will depend on the quality of the lairage environment that can be maintained.

87. The lairage capacity should match the throughput of the slaughterhouse, particularly the number of birds scheduled for delivery on any one day. Its capacity should take into account the need to cope with delays and breakdowns. Changes to the slaughterhouse, particularly when throughput is increasing, should not impact adversely on the lairage's capacity or its environment.

88. It is important to the smooth operation of poultry slaughter plants that deliveries of birds are carefully scheduled to maintain the required turnover throughout the day, while ensuring that the capacity of the lairage is not exceeded and time spent in the lairage is minimised. Slaughterhouse operators should ensure that scheduling is flexible enough to cope with vehicle delays, plant breakdowns and other eventualities, with a lairage of suitable size for the scale of the operation. Logistics managers should be aware of the implications of their actions for the welfare of birds. Communication with drivers is vital to ensure smooth scheduling of deliveries and to manage any problems with delivery that may occur.

89. The lairage must protect birds from adverse weather and ensure adequate ventilation. Birds should not be left in modules or on trailers in direct sunlight or be exposed to wind or rain. Where possible modules should be unloaded and stacked in columns enabling effective air movement between stacks. This will also improve the ability to inspect birds adequately. This resting area should be as quiet as possible and should be clearly separated from areas for crate or trailer washing to reduce noise and humidity.

90. The need for supplementary ventilation in the lairage depends on the size and throughput of the processing plant and on climate. Comfortable environmental conditions should be provided for birds in the lairage, avoiding extremes of temperature and relative humidity. Temperature and humidity within the lairage, particularly in the crates, should be monitored, as well as monitoring birds for signs of suffering and distress. All staff, including PWOs, must be aware of the interaction between high temperature and humidity in precipitating heat stress and be able

to act to alleviate this where problems are identified. Contingency plans are needed in case of power failures or a breakdown of lairage ventilation equipment.

91. Sudden loud noises agitate birds because they do not reflect their experience on the farm. In many of the plants we visited, noise levels were high in the lairage and processing areas and protective equipment was required for workers. Slaughterhouse operators should investigate how mechanical and pneumatic noise can be reduced in the lairage. Research on the effect of noise on poultry would improve understanding of the importance of achieving reductions in overall noise levels or in reducing particular types of noise.

92. If the slaughter line breaks down for significant periods then birds may be held in the lairage for long periods. Where possible, hours of operation should be extended to ensure that all live birds on site can be killed on the same day. Agreements with staff about this eventuality will be needed in advance while maintenance engineers should be on call. Contingency planning must be in place to deal with breakdowns on the slaughter line.

93. Legislation requires that if slaughter or killing is delayed, and if it is necessary, then drinking water should be available and feed should be provided twice daily, i.e. every 12 hours. However, birds cannot practically be fed or watered in transport crates. The Official Veterinarian, in conjunction with the slaughterhouse operator and any other veterinary advisor, should decide whether to hold birds in the lairage or, in exceptional circumstances, return them to farm, e.g. if the duration of the delay in the prevailing lairage conditions would compromise the welfare of the birds. These decisions should be based on a risk assessment that delivers the best outcome for the birds' welfare.

94. Animal health and welfare issues (e.g. biosecurity, damage and stress to birds during unloading) and practical difficulties (e.g. vehicle availability, driver's hours, sheds that have already been cleaned and disinfected) might militate against a return of the birds to the farm. The quality of the lairage environment will play a large part in risk assessment. Contingency planning for slaughter plants should cover long term breakdowns requiring birds to be held over in the lairage at the slaughterhouse, returned to the farm or forwarded to an alternative processor.

#### *Recommendations*

95. *The Guidance (and any future Code of Practice) on the Welfare of Poultry at Slaughter or Killing should indicate the prevalence of injured and/or dead-on-arrival birds that is unacceptable, and that which would warrant investigative action by the Official Veterinarian. Referrals to other enforcement authorities should always be made quickly when required and consistency of approach across enforcement agencies should be reinforced.*

96. *Slaughterhouse operators should ensure that dedicated staff and equipment are available in the lairage to monitor its environment and the birds for any signs of suffering or distress, and to take immediate and appropriate actions to alleviate any problems identified.*

97. *Slaughterhouse operators should take account of the results of research on environmental conditions in the lairage in the design and operation of lairages.*

98. *Slaughterhouse operators should investigate how reductions can be made in mechanical, pneumatic and other sources of noise in the lairage.*

99. *Contingency planning for slaughter plants should include coping with breakdowns and implementing a solution that delivers the best welfare outcome for the birds already at the plant.*

### **Handling of animals prior to stunning, including shackling**

100. Birds are usually delivered to the slaughterhouse in purpose-built transport modules, which are unloaded into the lairage. They may be removed from the modules during preparation for stunning and slaughter or killing.

101. The most common modular system comprises a stack of plastic trays held within a metal frame. These trays are removed from the module, usually mechanically, and transferred to a conveyer leading to either a shackling area or controlled atmosphere stunner.

102. Workers in the unloading area, lairage and other areas where trays are transferred should be aware of the potential danger of trapping birds, particularly by their wings, when removing trays from frames and transferring birds to a conveyer.

103. Other modular systems are available. One such system used in mainland Europe uses a different method of removal of the birds from the module. In this case, the module is tipped to about 45° from the vertical, causing the birds to slide out of the trays onto chutes and then a transfer conveyer.

104. Some stakeholders told us that tipping birds out of transport crates was poor practice. We had initial concerns about the potential for distress or injury using such handling systems. However, we are aware that, as a result of an independent assessment of the system, improvements have been made which address many of our concerns. The improvements include greater control of the hydraulic tilting mechanism; a shallower chute angle to make the transition to the transfer conveyer less abrupt; a wider trampoline conveyer belt to give birds more space; a smaller differential in speed between conveyer belts; and a better belt surface for gripping to reduce trips or falls. In addition, an ante-mortem inspection area is provided for the Official Veterinarian or slaughterhouse staff to inspect birds before they are conveyed to the shackle area or the controlled atmosphere system; this allows an effective assessment of welfare to be made.

105. Older designs of transport crates are still used by smaller poultry operations. These are often constructed from plastic mesh with a small top opening through which birds are loaded and unloaded. Some turkeys and geese are transported for short journeys in walk-in trailers

or in fixed crates on agricultural trailers. On some farms, large birds may be walked from the holding areas to the slaughter plant. Again, effective monitoring is required of all systems for evidence of injury or poor welfare.

106. Slaughterhouse operators should consider the point at which sick or injured birds are killed. In systems where birds are shackled alive, then any such birds must be humanely culled and not shackled. If a controlled atmosphere system is used then the operator should consider whether it is better to cull them prior to entering the system or leave them to pass through the system. Similar consideration should be given to whether dead-on-arrival birds should be allowed to pass through the controlled atmosphere system. We were told that differentiating between these birds and those that were killed within the system was relatively easy, i.e. the former were stiff and cold to the touch and could therefore be removed from the processing line.

107. Live shackling, whereby birds are removed by hand from transport modules and hung inverted in a metal shackle so as to present the head for stunning in a water-bath, is commonly used in slaughterhouses employing electrical stunning. Both practical experience and scientific evidence show that current systems of inversion and live shackling raise significant welfare concerns. Inversion is unnatural and stressful and may elicit fear and an escape response, such as wing flapping.

108. Birds often flap their wings when first hung on the shackle line; however, they seem to settle down better when supported by a breast comforter. Birds will also flap their wings in response to sharp turns or unevenness in the shackle line, changes in light intensity and loud or unexpected noises. Shackling has also been shown to raise levels of plasma corticosterone and other haematological measures of fearfulness and stress.

109. The pain associated with shackling has been the subject of research since our Report on the Welfare of Poultry at the Time of Slaughter (1982). This research has shown convincingly that shackling is likely to be very painful. Pain is caused by the compression of the periosteum by the shackle and the variations in leg size that are not compensated for by shackle design, both of which are compounded by any bone fractures or joint dislocation. Nociceptors in the legs are stimulated maximally in response to various levels of mechanical stimulation: there is a sound relationship between activation of nociceptors and behavioural evidence of pain.

110. It may be possible to design a shackle to improve comfort and minimise pain but there would likely be a trade-off against conduction of electricity through the bird to the shackle. The bird's weight and the care and force with which it is hung in the shackles affect its welfare. Some broiler strains are more active than others and shacklers need to be aware of how to deal with all types. Runts, that may miss the water-bath, and any injured birds should not be shackled and should be killed humanely. Spraying shackles with water to improve electrical conductivity should take place before the birds are shackled.

111. Ducks, geese and turkeys are often inverted and shackled at slaughter, even though this is contrary to the good practice described in the Code of Recommendations for the Welfare of

Livestock. We would prefer that large, heavy birds were not inverted and shackled at all and discuss possible alternatives later. In the meantime, steps can be taken to improve welfare. For example, the shackle line should be designed to minimise manual lifting, a deep breast comforter that accommodates all bird sizes should be used, the line of the conveyor to the stunning bath should be short and straight, and birds should be hung with minimal force in shackles of appropriate design.

112. Workers on the shackle line have a vital role to play in ensuring good welfare and, although they do not need to hold a slaughterman's licence, they must be well trained, caring and competent. The use of closed-circuit cameras in shackling areas can promote good practice as well as monitoring performance. The EU Commission's proposals for a new Slaughter Regulation would require that workers shackling birds hold a certificate of competence.

113. We are aware of research being undertaken in the United States on automated shackling of live birds and would encourage Government and industry to make rigorous assessments of welfare before accepting any prototype or commercial systems for use in Great Britain. The current industry view is that automated shackling is only appropriate for dead birds.

114. Industry has informed us that the maximum 'hang-on' period (the period that birds can be hung in shackles before reaching the stunner) allowed legally in Great Britain is half that of other EU countries (3 minutes for turkeys and 2 minutes for other poultry). They would not welcome new legislation to reduce this period further but we consider that, while there is a need to allow birds to settle after hanging on the shackle line, the subsequent period for which they are hung while conscious should be as short as possible.

115. Ensuring that maximum 'hang-on' period is not breached is important. If there is a delay, e.g. due to a mechanical breakdown, then live birds may need to be removed from the shackle line in order to kill them. Concern for the welfare of the birds is vital under these circumstances.

116. In controlled atmosphere systems, birds remain either in transport crates or are unloaded onto a conveyor, negating the need for live shackling. During our study, we saw an increasing number of large plants using controlled atmosphere systems, but it is unclear whether they will be more widely taken up even if smaller, cost effective units can be developed.

117. Research on conveyors that restrain birds in an upright position while being stunned electrically has been carried out but we are not aware whether it has been developed commercially. FAWC considers that alternative systems of conveyance to stunners that do not require inversion and live shackling should be developed.

118. In the long term, FAWC considers that current systems of pre-slaughter inversion and shackling for poultry should be phased out, especially for large, heavy birds. We recognise the difficulties for industry of an end to traditional methods of inversion and shackling, but consider that Government in partnership with industry should find alternative methods of handling that avoid the pain and suffering current methods cause.

## *Recommendations*

119. *In the short term, we recommend that:*

- *workers on the shackle line must be effectively trained, caring and competent;*
- *extra support should be provided for the bird on the shackle line, e.g. by a breast comforter or other means that supports the weight of the bird once inverted;*
- *the period for which birds are hung on the shackle line while conscious should be as short as possible;*
- *large, heavy birds (e.g. large geese and turkeys) should not be inverted and shackled unsupported.*

120. *In the medium term, industry should improve the design and layout of shackle lines with an emphasis on the welfare of the bird.*

121. *In the long term, the current systems of pre-slaughter inversion and shackling of all poultry should be phased out.*

## **Stunning, slaughter and killing – general requirements**

122. Animals are stunned before slaughter so that they are insensible to pain and distress during cutting and bleeding. WASK 1995 requires animals to be stunned or killed before bleeding, sets out permitted methods and lays down specific requirements with regards to their operation.

123. Assessing the quality of stunning or killing methods for poultry, and the time to insensibility without avoidable pain or distress in some methods (including controlled atmosphere systems, neck dislocation, and slaughter without pre-stunning) is more difficult than with red meat species. There are concerns about various methods in terms of throughput speed, effectiveness and/or time to insensibility. Some animal welfare organisations would prefer all poultry to be stunned electrically with a low frequency current and at low throughput speeds to ensure immediate unconsciousness and/or death of all birds.

124. The general signs that a bird has been stunned effectively are: open eyes; an absence of rhythmic breathing; rigidly extended legs; constant rapid body tremors; and wings held tight against the body. Signs that a bird is dead are: absence of breathing; dilated pupils, wings drooping, and the absence of the third eyelid (nictitating membrane) reflex.

125. Indicators of an ineffective stun are: rhythmic breathing (movement noted in the vent area); tension in the neck (detectable by hand); and the presence of a third eyelid reflex. Any of these indicators in birds emerging from an electrical water-bath stunner would suggest a high electrical resistance and imply that the applied voltage should be increased. A large number of birds with these signs on exit from the stunner may indicate a more serious problem with the equipment. Birds showing signs of an ineffective stun or of recovery after passing through a controlled atmosphere system indicate major problems with gas delivery; immediate action must be taken to rectify the fault.

126. Practical assessment of unconsciousness and insensibility to pain is not easy on the processing line. Effective training in recognising the signs of unconsciousness (and consciousness) is essential. This could be available to workers as a short checklist. Those monitoring birds for signs of unconsciousness should have the power to act quickly if they believe that stunning is ineffective.

### **Electrical stunning and killing**

127. We visited large processing plants in Great Britain using electrical water-bath stunning with line speeds up to 10,000 birds per hour. We found that various electrical frequencies and line speeds were used for different types of production, e.g. a slow line speed for organic birds and high frequency stunning producing a recoverable stun. In other plants, there were long operational days with shift patterns for workers, in order to maintain high throughput and so minimise costs. Some slaughter lines and stunning systems seen were developed with the assistance of respected scientists in the field of welfare at slaughter and were audited independently.

128. Electrical stunning should pass sufficient current through the brain for a minimum period to interrupt normal brain activity “*such that the bird is immediately rendered unconsciousness and remains so until it is dead*” (WASK 1995). Water-baths usually hold more than one bird, so the current recorded will represent the total current flowing through the water-bath, rather than that received by individual birds.

129. Some systems stun - and also kill - birds by delivering sufficient current to induce cardiac arrest (typically 120-150 mA at 50 Hz for broiler chickens and 200-250 mA for larger birds such as turkeys). Such high currents may cause poor meat quality. However, by preventing any possible recovery to consciousness, a ‘stun-to-kill’ delivers certainty that a bird’s welfare cannot be affected once the stun has been administered. In view of this, FAWC favours the use of stun-to-kill electrical systems.

130. Practically, application of Ohm’s law means that the current flowing through each individual bird depends on its electrical resistance and the voltage applied. The minimum current required to induce insensibility for sufficient time for bleeding to cause death before recovery has been determined experimentally using low frequency, 50 Hz, Alternating Current (A.C.) in a water-bath and is: broiler chickens 105 mA, turkeys 150 mA and ducks and geese both 130 mA. At present, there are no widely recommended minimum currents for electrical stunning at higher frequencies.

131. Electrical water-bath stunners currently in use work on a constant voltage that is applied to all birds in the water-bath. In such a system, the resistance of every bird would have to be the same for all birds to receive the same current. The resistance of individual birds is highly variable (broilers, typically from 1000 to 2600 Ohms), which leads to variation in the current flowing through the bird, and hence the effectiveness of the stun. The causes of variation in electrical resistance include: the electrical contact between the bird and the shackle; the electrical

contact between the shackle and the earthing rail; the bird's anatomy, size, weight and feather wetness; and dipping of the wings as well as the head in the water-bath.

132. If the (variable) current received by each bird produced the desired effect, i.e. immediate unconsciousness maintained until death by bleeding, there would be no welfare problem. In practice, birds with a high electrical resistance may not be stunned adequately (increasing the possibility of recovery) while those with low resistance will be stunned but may have strong muscular spasms, possibly leading to breakage of the pectoral bone and haemorrhage of the breast muscle. There is a potential conflict between the welfare of high resistance birds and the quality of carcasses in low resistance birds with regard to the minimum stunning voltage applied.

133. Given that the aim of electrical stunning is to deliver the minimum current to stun every bird, the use of constant voltage, water-bath stunning systems for poultry is illogical. To be acceptable in welfare terms, and in compliance with the legal requirements, the current applied must be high enough to ensure adequate stunning of all birds. This may be at the expense of carcass quality.

134. A constant current system could solve the problem of variable electrical resistance, ensuring that every bird received the minimum required current. A complete working constant current system for electrical water-bath stunning was demonstrated at Silsoe Research Institute in the late 1990s but has not been developed commercially. FAWC sees this as a priority for further research and development. The EU Commission's proposals for a new Slaughter Regulation currently require constant current electrical stunning in new slaughterhouses from January 2011 and in all slaughter plants by the end of 2018. FAWC would strongly encourage Government to support these proposals.

135. The industry has expressed doubts that a constant current solution that is simple or affordable can be developed. All electrical water-bath systems require live shackling in their existing formats. It is not clear which solution, if either, would develop faster: a constant current stunning system or an alternative to live shackling that could provide satisfactory delivery to an immediate stun. This requires attention by Government and industry.

136. The welfare significance of the use of electrical water-bath stunning in small plants, in Britain and worldwide, should not be overlooked. When designed for optimum performance and operated correctly, electrical stunning can provide an effective and immediate stun lasting until death supervenes. Controlled atmosphere systems negate the need for inversion and live shackling of birds and the problems of pre-stun shocks and missed stuns. They require an expensive capital outlay that might be beyond the means of the operators of most small and medium-sized slaughterhouses unless other financial arrangements, such as leasing, can be made.

#### *Electrical frequency and minimum current needed in electrical stunning and killing*

137. A low frequency, 50 Hz, electrical current can cause birds to die from cardiac arrest if sufficient current is applied (typically about 120-150 mA for broilers). High frequency



stunning currents, i.e. >50 Hz, are now being used commercially since they are thought to minimise problems of poor meat and carcass quality, such as bone fractures and breast muscle haemorrhages. Frequencies above 125 Hz do not cause cardiac arrest and thus birds may recover after stunning. Therefore, rapid exsanguination is paramount where high frequency, electrical stunning is used; the stun-to-cut time must be minimal and the cutting of both carotid arteries should be mandatory. In addition, birds stunned electrically using pulsed D.C. can recover reliably and this method is used in some slaughterhouses for the production of Halal poultry meat.

138. When using A.C. to stun broilers, research has shown that the higher the frequency used, the higher the current required to induce epilepsy and thus unconsciousness and insensibility. The minimum current for a broiler chicken is 100 mA up to 200 Hz; 150 mA between 201 and 600 Hz; and 200 mA at 601-800 Hz. Electrical frequencies of over 800 Hz require in excess of 200 mA to induce the immediate onset of unconsciousness and insensibility. There are suggestions from some researchers that A.C. frequency should be capped at 800Hz but other organisations call for lower limits. Also, as the electrical frequency rises then an insufficient current is more likely to be applied, extending the period of brain activity, although not necessarily consciousness. This indicates that minimum currents should be set for different frequencies. High frequency A.C. and pulsed D.C. have been shown to produce better carcass quality but this may be at the risk of recovery from the stun before death supervenes.

139. Low and high frequency A.C. and pulsed D.C. have been compared in terms of the potential rate of recovery, and the effectiveness and immediacy of the stun. The results suggest that the minimum current for pulsed D.C. electrical water-bath stunning is 200 mA at frequencies up to a maximum of 200 Hz. This is because the probability of an epileptiform electroencephalogram (EEG) (i.e. an effective stun) decreases as frequency increases.

140. Concerns have been expressed to us that A.C. or pulsed D.C. at high frequency may only cause electro-immobilisation rather than an effective stun. More research is needed on the use of high frequency A.C. and pulsed D.C. systems with broiler chickens and other poultry species to determine the current and frequency needed to induce immediate unconsciousness that lasts long enough for death to occur by bleeding without recovery.

141. Pre-stun shocks must be painful. Wingtips hanging below the head lead to problems in water-bath stunners, particularly when larger birds like geese and turkeys are inverted. An electrically-insulated entry ramp before the water-bath helps flick the head into the water to hasten entry and reduce pre-stun shocks. The overflow of water should leave the water-bath stunner in the same direction as the slaughter line to reduce pre-stun shocks further.

142. We are seriously concerned about the occurrence of 'missed' stuns in electrical stunning systems. These can occur with small birds, when birds arch their neck or when the applied voltage is insufficient. Slaughterhouse operators should aim to eliminate any missed stuns and pre-stun shocks through the correct design and operation of electrical stunners. The depth of water in the stunning bath should be sufficient to immerse the birds' heads and necks or up to the base of the wings. The height of the water-bath should be adjusted to the size of birds. The period of immersion should ensure that the required depth of unconsciousness (or

death) is achieved. Birds should be clearly visible throughout stunning to enable problems to be identified, i.e. workers should be readily able to inspect birds as they enter the water-bath for any pre-stun shocks and the depth of immersion.

#### *Electrical stunning of turkeys, ducks and geese*

143. We saw large stag turkeys processed on a commercial slaughter line at 2,000 birds per hour. Birds were shackled alive and stunned in an electrical water-bath. This plant has closed since our visit and the major turkey processors in Great Britain now use controlled atmosphere systems. Electrical stunning is still in use in other, smaller premises slaughtering turkeys. The entry to the water-bath should be designed to minimise pre-stun shocks, particularly where the turkey's long wings hang below the head, and ensure that the head enters the water quickly. The minimum current for turkeys is 150 mA at 50 Hz. Head-only electrical stunning has also been shown to be effective in turkeys. The industry expressed some uncertainty about the choice of electrical frequency for both A.C. and pulsed D.C. stunning for turkeys; this should be clarified by research.

144. Members of the working group also saw a small farm-based electrical water-bath stunning system for turkeys, used all year round. Each bird entered the bath individually and triggered a current sufficient to stun and kill the large birds. The neck was seen to straighten in response to the applied current, ensuring immersion and an effective stun.

145. The commercial duck slaughterhouse visited used a traditional electrical water-bath stunning system. Application of 300 V produced a current of about 250 mA in each bird, which was considered easily sufficient to stun and kill. Indeed, the stunning bath was in a locked enclosure for staff safety. An entry ramp to the water-bath flicked the birds' heads quickly into the water. The current had the effect of straightening the neck ensuring that the head was held in the water, preventing "swan necking". Duck meat produces less contractile force when electrically stimulated and is dark so some of the carcass quality issues associated with high stunning currents used on broilers, e.g. blood splash in muscles and red wing tips, may be of less concern to the processor.

146. Geese can be slaughtered on commercial duck slaughter lines with electrical water-bath stunners. There are obvious size differences which will mean that the equipment may require modification, e.g. the longer wings could dip into the water-bath causing pre-stun shocks and longer necks need a different angle of entry for the head into the water-bath. Many of these difficulties can be overcome by adjusting the height of the water-bath.

147. Turkeys (and also ducks and geese) are slaughtered seasonally on farms that may process tens of thousands of birds over the period up to Christmas (and are overseen by the MHS) while some small slaughterhouses process only hundreds, or a few thousand, birds over the same period, with less official monitoring. Turkeys seen on one such farm were shackled live before being stunned and killed by a wand type stunner. Legislation requires that the electrodes used in hand-held electrical stunners span the brain. FAWC has already recommended in its Red Meat Slaughter Report that stunning equipment should be fit for purpose and approved as such. We also call for research into electrical pathways through birds in relation to stunning.

148. Defra is sponsoring research into the development of a hand-held electrical stunner for turkeys. On-farm and seasonal slaughter of turkeys has to comply with WASK, which requires effective stunning unless neck dislocation is employed. Earlier research has shown that head-only electrical stunning is effective for turkeys, if followed by rapid exsanguination. A portable device might provide greater flexibility for these operations and eliminate the need for neck dislocation or shackling.

#### *Monitoring the performance of electrical stunners*

149. The performance of electrical stunning within the slaughterhouse should be monitored continuously by the licensed slaughterman with supervision by the Official Veterinarian, slaughterhouse operator and the PWO. An ammeter or other equipment that monitors current should be readily accessible in the stunning area, retain a permanent record of current and be fitted with alarms to alert staff to any problems with the stunning equipment.

150. Maintenance of electrical stunning equipment is essential to its effectiveness. Records should be kept of the maintenance undertaken and defects resolved. Birds may receive an insufficient current due to poor electrical contact with the shackle or intermittent or premature electrical contact because of poor design or maintenance. These effects may not always be obvious to slaughterhouse operators but can be detected by modern monitoring systems.

151. In the event of a breakdown of the slaughter line, birds should be removed from the shackles and returned to trays if this is possible. Where birds cannot be removed from the shackle line, they should be killed as quickly as possible with a concussive device and those in the water-bath should be killed by increasing the current to induce cardiac arrest.

#### *Recommendations*

152. *The design and operation of all electrical stunning systems should ensure that all birds receive an immediate stun lasting until death, and that pre-stun shocks and missed stuns are eliminated.*

153. *FAWC favours the use of stun-to-kill systems, which deliver certainty that a bird's welfare cannot be compromised once the stun has been administered.*

154. *Equipment for monitoring electrical stunning must be readily accessible in the stunning area and the data recorded, preferably automatically.*

155. *In the medium term, Government should assess the technical developments in high frequency A.C. and pulsed D.C. stunning to determine the optimum combination of current and frequency to stun birds effectively.*

156. *In the medium term, Government should support research into electrical pathways through poultry during stunning in relation to system design and the requirements of an effective stun.*

157. *In the long term, Government and industry should co-operate on the development of*

*electrical stunning systems which address the welfare concerns associated with variable current and the need for inversion and live shackling.*

### **Controlled atmosphere systems**

158. In our 1982 Poultry Slaughter Report, we recommended research and development into methods of killing poultry in their transport containers using carbon dioxide, CO<sub>2</sub>. However, as the aversiveness of carbon dioxide became clear it was recognised that the welfare problems associated with electrical stunning should not be replaced with new problems associated with the induction of birds to unconsciousness with aversive gas mixtures. The aversiveness of carbon dioxide to poultry and alternative gas mixtures were added to the research brief.

159. The main welfare criteria by which a controlled atmosphere system should be judged are pre-slaughter handling, aversiveness of the gas (mixtures), disruption of respiration, anaesthesia, the period to insensibility to pain and distress, the mental state at the onset of muscular contractions, injuries sustained and whether all birds are killed within the system.

160. A significant proportion of broiler chickens are killed using controlled atmosphere systems in Great Britain and the major turkey processors are now using controlled atmosphere systems. Every bird should be exposed to the gas concentration that renders it insensible to pain and distress until death supervenes. Monitoring and control of gas concentration throughout the gas enclosure are essential (and are usually done automatically). Most enclosures have observation windows as birds enter the system. However, in some systems it is difficult to inspect birds at each stage in the process. It is a requirement of WASK that there is a means of monitoring birds visually and industry should not operate substantially closed systems where neither the Official Veterinarian nor the slaughterman can see the birds under normal conditions or when a problem arises.

161. The time to render a bird insensible to pain or distress is an issue with all controlled atmosphere systems. None produce immediate insensibility in a way similar to electrical stunning. Therefore, induction to a state of insensibility without avoidable pain or distress becomes a key requirement.

162. A major advantage of controlled atmosphere systems is the avoidance of inversion and live shackling. Birds are either killed in their transport crates or are conveyed mechanically to the controlled atmosphere system. Additionally, pre-stun shocks and the risk of an insufficient electrical current are eliminated. However, the achievement of reduced pre-slaughter handling stress should not lead to a new set of welfare problems associated with the gas mixtures used.

163. Carbon dioxide is a gas whose presence in high concentrations is known to be aversive (due to dissolution in nasal and mouth fluids, producing acid), as well as a potent respiratory stimulant that can cause breathlessness (gasping). However, it also has beneficial anaesthetic effects. A research objective has been to determine the concentrations at which aversiveness to carbon dioxide becomes distressing for poultry.

164. Anoxia is caused by a reduced concentration of oxygen, O<sub>2</sub>, in a gas mixture, where it is usually displaced with an inert gas such as argon, Ar, or nitrogen, N<sub>2</sub>. Levels generally below 2% O<sub>2</sub> are used in slaughterhouses to kill poultry by anoxia. Inert gas mixtures, being tasteless and odourless, do not in themselves appear to be aversive, but respiratory disruption associated with anoxia has been found in some research.

*Controlled atmosphere systems for chickens and turkeys*

165. Experimentally, hens can detect concentrations of CO<sub>2</sub> of about 7.5% and above or O<sub>2</sub> levels of 10% or below and, given a free choice, learn to avoid such atmospheres. Their preferences were not, however, strong enough to overcome other motivations such as feeding or social pressure.

166. Early research concluded that when chickens were exposed to a hypercapnic anoxic gas mixture, (i.e. less than 2% O<sub>2</sub> displaced by 60% Ar and with a concentration of CO<sub>2</sub> below 30%), they became unconscious, as indicated by a suppressed EEG and lack of somatosensory evoked potentials (SEPs), before those exposed to high concentrations of CO<sub>2</sub> (49%) in air or an anoxic mixture of Ar alone. These results and those of a comb pinching test indicated that unconsciousness preceded muscular convulsions. In another study, the mean times for EEG suppression in broilers exposed to 90% Ar in air or 60% Ar/30% CO<sub>2</sub> in air mixtures were similar, while the latter abolished SEPs quicker than Ar alone. A 40% CO<sub>2</sub>/30% O<sub>2</sub>/30% N<sub>2</sub> combination tested in this study took twice as long to suppress EEG and did not create an isoelectric EEG in broilers, indicating a recoverable stun.

167. A hypercapnic anoxic mixture (<2% O<sub>2</sub>, 60% Ar, <30% CO<sub>2</sub>) has also been shown to induce unconsciousness more rapidly than an anoxic gas alone in turkeys. Use of high concentrations of CO<sub>2</sub> would render turkeys insensible quickly but the aversiveness at these levels (50-90%) would be unacceptable given the alternatives available. The use of Ar anoxia was also considered acceptable by the original researchers because, although induction to unconsciousness was longer, little if any respiratory distress was observed before loss of sensibility.

168. In preference tests designed to indicate the aversiveness of CO<sub>2</sub> and anoxic gas mixtures to turkeys, researchers have found that birds could detect and chose to avoid atmospheres with high concentrations of CO<sub>2</sub> (72%). Gasping, vocalisation and head shaking were said to support the view that inhalation of CO<sub>2</sub> at high concentrations was unpleasant. Inert gases, being tasteless and odourless, did not seem to be detected, evidenced by a lack of respiratory distress before loss of consciousness. Turkeys appear to be more resistant to anoxia than chickens, indicated by longer times to loss of brain responsiveness. Any reaction to the onset of anoxia could be minimised by ensuring residual O<sub>2</sub> levels remain below 2%. Reaction to 30% CO<sub>2</sub> in Ar did not include avoidance in turkeys, although there was some gasping and head shaking, albeit at reduced levels than seen with high concentrations of CO<sub>2</sub>. Discomfort was either tolerated or suppressed by rapid loss of consciousness.

169. Some commercial slaughterhouses in Great Britain use 70% N<sub>2</sub> and 28-29% CO<sub>2</sub> with a dwell time of more than 2 minutes for killing turkeys, although unconsciousness is thought

to be reached in 9-10 s. Processors find that use of a controlled atmosphere system improves carcass quality compared with electrical stunning.

170. Research on the use of controlled atmosphere systems with chickens in the Netherlands compared hypercapnic anoxia (30% CO<sub>2</sub>, 60% Ar, <2% O<sub>2</sub> in air) against a biphasic approach (30% O<sub>2</sub>, 40% CO<sub>2</sub>, 30% N<sub>2</sub> for 1 minute followed by 80% CO<sub>2</sub>, 5% O<sub>2</sub>, 15% N<sub>2</sub> for 1 minute). Birds subject to hypercapnic anoxia lost consciousness faster than those subject to the biphasic approach, but anoxia induced signs of agitation (initially gasping and later muscular contractions) in a period when consciousness could not be fully excluded. These signs were much less pronounced in the biphasic approach and muscular contractions, if seen, took place when birds could reliably be considered unconscious. The researchers suggested that a milder death in the biphasic system, although taking longer, was preferable to a faster but more distressing death. Research with turkeys found similar results.

171. A recent Defra-sponsored project has assessed comprehensively the welfare of chickens when stunned in a controlled atmosphere system. This work was prompted by previous controversy over the use of CO<sub>2</sub> and its aversiveness. The project also examined anoxic gases and the biphasic gas system developed in Europe. The initial aversion and physiological and behavioural responses of chickens to gas mixtures were investigated. Examination of the physiology of the nasal and oral areas assessed the sensory abilities of chickens to detect the various gas mixtures. Laboratory findings were tested in pilot and full commercial trials.

172. The initial aversion to gas mixtures was tested by introducing gas to chicks at a feed dish and observing behaviour before, during and after gas delivery. As in previous research it was confirmed that chicks could detect and would react to CO<sub>2</sub> at concentrations of 10% and above through interrupted feeding, respiratory disruption and headshaking (which increased in line with CO<sub>2</sub> concentrations). Chicks returned to feeding after the test, suggesting this behaviour indicated *“mild or at most moderate immediate aversion to CO<sub>2</sub>”* up to 25% CO<sub>2</sub>.

173. Unequivocal evidence of aversion, indicated by withdrawal from the feeding area, was seen at higher concentrations of CO<sub>2</sub> (40%, 55% and 70%). Introduction of pure Ar or N<sub>2</sub> elicited no reaction from the birds, other than some head shaking (possibly a result of novel or alerting stimuli), but led to loss of balance and posture within the timed observation (20 s after a 10 s gas delivery).

174. The physiological and behavioural effects on chickens of exposure beyond the immediate introduction of gas mixtures could affect their welfare and further research by the same scientists examined this. Simultaneous measurements of electroencephalograms (EEG), electrocardiograms (ECG) and respiration were taken from birds exposed to a variety of gas mixtures (and their behaviours recorded): i.e. anoxic gas (either N<sub>2</sub> or Ar with less than 2% residual O<sub>2</sub>), a hypercapnic anoxic mixture (30% CO<sub>2</sub>/70% Ar or 40% CO<sub>2</sub>/60% N<sub>2</sub>), and hypercapnic hyper-oxygenation (biphasic treatment with 40% CO<sub>2</sub> /30% O<sub>2</sub>/30% N<sub>2</sub> followed by 80% CO<sub>2</sub> in air).

175. Findings were that strong respiratory responses were associated with hypercapnic gas mixtures (those containing CO<sub>2</sub>), although it was suggested that these arose from respiratory

reflexes and that evidence for pain at low to intermediate concentrations of carbon dioxide was limited. EEG evidence indicated that chickens subject to an anoxic (and hypercapnic anoxic) gas still demonstrated brain activity both before and after periods of muscular contractions. The biphasic controlled atmosphere system exacerbated respiratory responses in the first, anaesthetic phase but appeared to eliminate the possibility of muscular contractions being experienced.

176. Physiological examination of the nasal and oral epithelia indicated nociceptors that were capable of detecting and responding to CO<sub>2</sub> and other aversive chemicals.

177. The commercial trials resulted in similar findings to those in the laboratory. Anoxic approaches produced less respiratory disruption, fastest loss of posture but more and earlier convulsions. The biphasic approach increased respiratory disruption, extended time to loss of consciousness but produced little or no early convulsions.

178. The researchers concluded that each controlled atmosphere system studied had different welfare concerns. Gas mixtures with more than 40% CO<sub>2</sub> were initially aversive and these, and lower carbon dioxide levels, disrupted respiration. Anoxic gas mixtures cause muscular contractions, and possibly injuries, at an earlier stage when consciousness could not be completely ruled out. It was suggested that aversion and respiratory disruption might be outweighed by a gentler induction to unconsciousness.

179. We witnessed controlled atmosphere systems used to kill broiler chickens, end-of-lay hens and turkeys by anoxic gas mixtures in slaughterhouses in Great Britain and the biphasic system used on broilers in the Netherlands and Germany. Reduced pre-slaughter handling for end-of-lay hens was particularly identified as a welfare advantage. The plants visited in Great Britain that processed broilers and end-of-lay hens used various combinations of N<sub>2</sub> and Ar, the latter gas being used to keep the lighter nitrogen stable. We were told that CO<sub>2</sub> could be added to the gas mixture if its anaesthetic properties were required.

180. In the biphasic controlled atmosphere systems seen in the Netherlands and Germany, the broiler chickens spent one minute in the anaesthetic gas phase (30% CO<sub>2</sub>, 40% O<sub>2</sub>, 30% N<sub>2</sub>) before the conveyer delivered them to the second phase (80% CO<sub>2</sub> in air). On emerging, birds still had a heart beat but no brain function and this loss was irreversible.

181. WASK states that “...birds may be killed in a slaughterhouse by exposure to an anoxic gas mixture which rapidly renders birds insensible to pain or distress...”. FAWC considers, on the basis of the available research discussed above, that the authorised gas mixtures in Great Britain should be extended to include others, such as the biphasic system used in Europe, that have been proven to be effective. The major advantages of controlled atmosphere systems are minimised pre-slaughter handling and lack of live shackling. This is a particular advantage to end-of-lay hens and large, heavy geese and turkeys. Pre-stun shocks and any risk of the application of an inadequate electrical current (due to high resistance) are also eliminated.

182. Our support for controlled atmosphere systems is provisional on continuing research and development to clarify the implications for bird welfare of any gas mixtures' effects during induction to unconsciousness.

183. Slaughterhouse systems must be approved as being fit for purpose. This is particularly important for controlled atmosphere systems as the accurate and consistent delivery of gas mixtures has implications for bird welfare. It is also important that those operating and monitoring controlled atmosphere systems, including the licensed slaughterman and the Official Veterinarian, are trained and able to demonstrate competence.

184. Controlled atmosphere systems improve the working environment for workers, have the advantage to slaughterhouse operators of staff efficiencies and the potential to improve bird welfare through reduced pre-slaughter handling. There are also carcase quality advantages.

185. On our visits, we were told that maintenance was vital if a controlled atmosphere system is to be operated successfully. A programme of cleaning and maintenance is not only important for animal welfare but also for efficient gas use and, therefore, for controlling costs. Records should be kept of maintenance undertaken and defects resolved.

186. Most slaughterhouses that use controlled atmosphere systems had sophisticated computerised gas monitoring. Gas monitors are critical to maintaining uniform gas concentrations throughout the apparatus. Sensors and sample lines need to be cleaned regularly to maintain effectiveness.

187. The point has already been made that it is a requirement of WASK that there is a means of visually monitoring birds in the chamber. Industry should not operate substantially closed systems where neither the Official Veterinarian nor the slaughterman can see birds in normal conditions or when a problem arises.

188. Some slaughterhouse operators are so confident about the reliability of the controlled atmosphere system that they have removed back-up electrical water-bath stunning equipment. Others, who may have had equipment installed for less time, retained this contingency. In a breakdown, birds already in the gas would stay in the gas enclosure and be killed. Live birds can be left in crates in the handling system until the line can restart. Where there was a need to gain access to the inside of the enclosure it took around 2 minutes to vent gas out and then 5-10 minutes to refill.

#### *Recommendations*

*189. Government should amend the legislation to allow the use in Great Britain of different gas mixtures used in controlled atmosphere systems elsewhere in Europe which rapidly render birds insensible to pain or distress.*

*190. Research and development should continue on controlled atmosphere systems for poultry to clarify the welfare outcomes and to seek new gas mixtures and systems, including those for killing birds on a small scale.*

*191. Those operating and monitoring controlled atmosphere systems, including the responsible slaughterman and the Official Veterinarian, must be trained and able to demonstrate competence.*



192. *Slaughterhouse operators should comply with the legal requirement that there is a means of visually monitoring birds that are in the chamber.*

### **Slaughter in abattoirs**

193. FAWC's previous recommendations for neck cutting to take place less than 15 s after the stun (1982, 2003), especially if poultry can recover from stunning, are supported by scientific research. FAWC continues to believe that the stun-to-cut interval must be as short as possible to ensure that death by loss of blood takes place before any return to consciousness.

194. The major blood vessels of the neck, including both carotid arteries, should be cut to ensure rapid exsanguination for all recoverable methods of stunning, and especially in the case of high frequency electrical stunning. There is a potential risk of recovery from the stun without effective exsanguination. Where stunning also leads to death, e.g. high voltage A.C. electrical stunning or in some controlled atmosphere systems, then the interval to bleeding is not pertinent to bird welfare but may have consequences for meat quality. The EU Commission's proposals for a new Slaughter Regulation would require the cutting of both carotid arteries and we call on Government to support this.

195. Broiler chickens and end-of-lay hens that are slaughtered at full commercial line speeds are cut automatically because manual cutters are unable to match the line speed. A complete ventral neck cut is recommended, although some automatic cutters currently cut only one side of the neck.

196. End-of-lay hens regain consciousness faster than broilers stunned with the same current, thus rapid exsanguination by cutting both carotid arteries may be even more essential for these birds. Larger birds and those processed at slower line speeds tend to be cut manually, where it should be easier to ensure that the required blood vessels are cut.

197. Prototype machines for automatic detection of an inadequate neck cut have been developed and the cut can then be made manually as a back-up. The prototypes have not yet been commercially developed. Birds showing any signs of recovery must be readily accessible in the bleed out area to allow humane culling.

198. An alternative strategy to ensure that all blood vessels in the neck are cut is decapitation. The resulting severing of the spinal cord would make assessment of consciousness impossible but immediate maceration of the head following decapitation would negate any need for assessment. Such processes may not comply with current requirements for meat hygiene.

### *Recommendation*

199. *All major blood vessels of the neck, including both carotid arteries, must be cut to ensure rapid exsanguination, especially for all recoverable methods of stunning.*

## **Slaughter without pre-stunning**

200. On the basis of the available evidence, veterinarians, scientists, and enforcement and animal protection groups worldwide consider that animals should be stunned before slaughter. In EU and British legislation, there are exemptions from the legal requirement to stun an animal before slaughter when it is killed by the Jewish or Muslim method for the food of Jews or Muslims. The number of poultry killed by various methods is no longer collected or published by the MHS.

201. We visited processing plants in which poultry were not stunned prior to slaughter. Here we saw chickens processed individually at low throughput speeds by methods where pre-stunning was not practised. We also saw high-throughput slaughter systems for chickens for Halal meat, in which recoverable electrical stunning was used. We were told during our study that controlled atmosphere systems for poultry have been certified for producing Halal meat in Sweden, Denmark, France and Germany.

202. In low-throughput plants, we observed careful handling and presentation of individual birds to the slaughterman prior to slaughter. At a processing rate of around 350 birds per hour to each slaughterman there was little time pressure on the slaughter process.

203. The time to loss of consciousness is a critical measurement since this is the period in which birds may experience pain and distress. One study measured the time to brain death in broilers, indicated by the EEG and somatosensory evoked potentials. Brain death was reached in 2 minutes when both carotid arteries were cut and up to 4 minutes if only one artery was cut. These birds were anaesthetised and respirated artificially. More recent research undertaken in Australia has used various indicators of the time to loss of consciousness; i.e. loss of eye response (by 15 s), loss of posture (8-26 s), onset of muscular contractions (5-23 s) and time to loss of 60% of free blood (21-45 s). Further research, including measurement of the ECG and EEG, is required to confirm conclusively the time to loss of consciousness when poultry are slaughtered without pre-stunning. The evidence gathered so far indicates that many birds are likely to be conscious for 20 s or more after the neck cut is made.

### *Recommendation*

204. *Further studies, including measurement of the ECG and EEG, are required to confirm the length of time to loss of consciousness, during which pain and distress could be experienced, for birds slaughtered without pre-stunning.*

205. When a transverse incision is made across the neck of a bird, a number of sensitive tissues are transected including skin, muscle, trachea, oesophagus, carotid arteries, jugular veins, major nerve trunks and numerous minor nerves. Such a large cut will inevitably trigger sensory input to pain centres in the brain. Our conclusions from the evidence reviewed are that such an injury would result in significant pain and distress in the period before insensibility supervenes.

206. Little behavioural reaction was seen when the neck of poultry was cut without stunning. Manual restraint may partly explain this. Manipulation of the neck cut cannot avoid stimulating

nerves and would therefore be painful. Rubbing on the surface of the cone used to restrain birds during bleed out would also cause a noxious nociceptive stimulus in a conscious bird.

207. FAWC is concerned about the pain and distress experienced by conscious birds, in particular that likely to be generated by a neck cut and, where practised, subsequent manipulation of the wound. Following consideration of the available evidence, FAWC is in agreement with the prevailing international scientific consensus that slaughter without pre-stunning causes pain and distress. On the basis that this is avoidable and in the interests of welfare, FAWC concludes that all birds should be pre-stunned before slaughter.

208. FAWC is mindful that for certain sections of British society, the method of slaughter of animals for food is part of religious faith and an associated way of life. We welcome the EU-sponsored project on religious slaughter aimed at improving knowledge and expertise through dialogue and debate on the welfare, legislative and socio-economic aspects (<http://www.dialrel.eu>). We also recognise the difficulties of reconciling scientific findings with matters of faith. We urge Government to continue to engage with the religious communities to enable progress to be made.

#### *Recommendations*

*209. Slaughter of poultry without pre-stunning causes significant avoidable pain and distress. Government should engage with the appropriate communities to ensure that avoidable pain and distress is prevented.*

*210. Where poultry are not insensible to pain or distress during slaughter, manipulation of wound surfaces of the neck should not take place.*

#### **On-farm slaughter or killing**

211. There are several reasons for slaughtering or killing poultry on-farm, e.g. culling sick or injured birds and meeting the demands of the seasonal industry. The law contains specific requirements to protect the welfare of animals slaughtered or killed outwith slaughterhouses. A slaughterman's license is required for on-farm slaughter but not for routine culling of unwanted chicks; killing birds by dislocation of the neck or decapitation on the agricultural holding on which they were reared; slaughter or killing of an animal by its owner for private consumption; immediate killing of an animal for reason of its welfare (i.e. emergency slaughter); and slaughter or killing other than for commercial use.

212. We recognise that on-farm slaughtering and killing activities are regulated by WASK. However, when compared with the same activities taking place in a licensed slaughterhouse or when red meat species are killed, these activities are less regulated, may be unsupervised and subject to inadequate facilities and skills. There is the added difficulty of enforcing legislation on the farm.

### *Recommendation*

213. *Where on-farm slaughter or killing by exempted methods is undertaken by unlicensed persons, they should be demonstrably competent to carry out the task required and fully aware of the guidance available. Any equipment used must be appropriate for the task and well maintained.*

214. The Code of Recommendations for the Welfare of Livestock recommends that a systematic inspection of all flocks should be undertaken at least twice each day at appropriate intervals for the purpose of checking health and welfare. Sick or injured birds must either be culled straight away or removed to a hospital pen. The use of hospital pens depends on species and value but they must be managed properly to prevent unnecessary suffering. Guidance on humane methods of culling poultry is included in the Codes and should be updated with advances in scientific knowledge and the development of new methods.

215. Most broilers, hens or small ducks culled on-farm for reason of sickness or injury are killed by the traditional method of neck dislocation. The method is lawful and is designed to cause immediate severance of the spinal cord; training and experience are required if stockmen are to cull sick and injured birds correctly by neck dislocation. Research has indicated that a period of sensibility exists in some birds when killed by this method. Crushing the neck causes the loss of visual evoked responses much more slowly than neck dislocation by hand, which in turn does not have the immediate effect of concussion. Further research should be undertaken to clarify the comparative costs and benefits to bird welfare of methods of poultry culling. Any alternatives to neck dislocation should not lead to delay in culling birds.

216. Poultry can be killed effectively by concussion, which causes an immediate and profound loss of brain function; several concussive devices are available commercially. However, some concerns have been expressed about concussive killing of small birds which may be too mobile or too small a target.

### *Recommendations*

217. *FAWC favours the use of effective concussive killing methods for emergency culling of poultry.*

218. *For culling small numbers of small birds, neck dislocation should be retained as a lawful method, but concussive methods should be further refined and developed.*

219. *Research should be undertaken to clarify the comparative welfare costs and benefits of culling methods for small poultry.*

220. *Guidance on methods of humane culling of poultry in the Codes of Recommendations for the Welfare of Livestock should be updated with advances in scientific knowledge and the development of new methods.*

221. Private slaughter is a very restrictive term for the killing of an animal for the personal consumption of the owner. Poultry meat obtained in this way cannot be supplied by any

means to others, outwith the owner's family. The methods used probably reflect the restricted circumstances, e.g. most birds are either killed by concussion or dislocation of the neck.

222. In line with comments made in our Red Meat Slaughter report (2003), it would be better for animal welfare and public health for a professional, licensed person to kill and dress the animal. However, given the widespread keeping of poultry in small numbers, the costs of this requirement would be disproportionate to the benefit. Nevertheless, those killing animals for whatever reason must be competent to do so.

223. Some small mobile slaughter units have been developed independently for small scale on-farm slaughter. These systems have been researched but not yet developed commercially for poultry. There has been more progress made with mobile units in the United States, especially in response to recent disease control preparations.

224. There is a range of sizes of on-farm slaughter operations from small scale slaughter of birds for local butchers or the farm shop to a farm-based low-throughput slaughterhouse. Some operators will only kill their own birds but others will take in birds from other growers, especially for the seasonal market; two million farm-fresh turkeys (annual total 15 million) are produced around Christmas time. In such operations, there is little need to catch and transport birds for on-farm slaughter and low throughputs mean more individual treatment. The disadvantage may be low-tech stunning with potential welfare implications. Slaughtermen may only be engaged in this capacity seasonally or in tandem with other farm duties. They should nonetheless be trained and competent to carry out the duties expected of them.

225. The types of electrical stunner used on-farm are either hand-held wands or tongs or small water-bath stunners. Some operators invert birds in cones before electric tongs are applied and the necks are cut. Defra is funding research into a hand-held electrical stunner for turkeys, which might also be used for seasonal and on-farm slaughter of several species of poultry. Even in small operations it is necessary to be able to monitor the current applied. Equipment used only seasonally needs to be well maintained.

226. British law has been changed recently to allow the use of controlled atmosphere methods to kill end-of-lay hens and breeding birds on-farm. We would like to see the development of small controlled atmosphere systems for small-scale slaughter of poultry on-farm for human consumption and disposal (as in some EU countries). Hand-held concussive devices might also be suitable for seasonal slaughter but are not currently allowed under WASK for this purpose.

227. Neck dislocation without prior stunning is a lawful method of killing poultry. FAWC considers that it would be better to concuss birds for on-farm slaughter or killing but the legislation (WASK) does not currently recognise this. Concussion can be used to kill a bird provided enough energy is imparted; neck dislocation is then unnecessary.

#### *Recommendation*

228. *Government and industry should consider the development of controlled atmosphere systems and percussive devices as stunning methods for on-farm slaughter of poultry.*

## **Mass killing for emergency disease control**

### *Contingency plans and general requirements*

229. Mass killing of poultry for disease control in an emergency should adhere to the principles of humane killing. Many of the general observations and recommendations made in FAWC's Report on Foot and Mouth Disease 2001 and Animal Welfare: Lessons for the Future (2002) are also relevant to mass killing of poultry for emergency disease control, particularly those relating to preparedness, killing options, suitability of killing equipment, ready availability of field killing teams, welfare disposal schemes, movement restrictions and access to information. For some diseases, such as avian influenza, there may be concerns over both human health and animal welfare.

230. Contingency plans for disease control in poultry must address animal welfare; they should be specific to the farm and must also be realistic and translate into action. The plan must detail the various roles and responsibilities, including communication between groups.

231. Diagnosis and confirmation of disease should be done quickly to minimise the time spent under restriction. As all poultry on infected premises must be killed, infected birds should be killed first after confirmation and killing should proceed rapidly in order that the welfare of diseased and restricted birds is not compromised. A main object of the contingency plan should be to kill all potentially infected birds on the farm within 24 to 48 hours to minimise the risk of disease spread.

232. Killing of poultry for disease control must be under veterinary supervision. The availability of trained catchers and slaughtermen is essential. They should be aware of the implications for animal welfare of their actions and know how they should work to prevent unnecessary suffering.

233. The use of a company's own catching teams confers an advantage. Any contract for the provision of catching gangs and slaughtermen in emergencies must ensure the rapid deployment of a sufficient number of trained workers to cope with the anticipated scale and circumstances. Remuneration is an important incentive for catching teams and slaughtermen. Any period of lay-off required after exposure to a disease (e.g. 96 hours for avian influenza) should not leave these staff worse off or the incentive is lost. Personal Protective Equipment (PPE) is necessary when zoonoses are involved and their use causes fatigue, requiring regular rest breaks. Identification and communication can also be difficult when PPE is used.

### *Confinement and isolation*

234. In the context of recent outbreaks of avian influenza, FAWC has advised Defra and the devolved administrations about movement restrictions, housing free-range flocks and methods of mass killing.

235. If there was a significant risk of disease spreading from wild birds to domestic poultry then there is a case for confinement or isolation. The consequences for welfare would depend on the

season, weather, species at risk and production system. Most commercial poultry that are kept indoors would be largely unaffected, provided that the duration of any restriction or extension of the production cycle was not unreasonable. Some thinning might be required. Confinement of free-range birds in suitably equipped houses should be adequate for their physical needs for a short period. Problems will exist where housing is only designed for overnight roosting. In all cases, high standards of husbandry and monitoring, with veterinary supervision, are essential. Adverse effects on welfare (e.g. feather pecking, respiratory or heat stress) should be minimised, with culling being one option in a contingency plan.

236. The stress of sudden confinement of free-range birds will depend on the species involved and their age. Point-of-lay birds, unaccustomed to regular ranging could probably be confined without significant effect. Older flocks that are used to ranging would be likely to experience stress, leading to adverse behaviour or disease (e.g. feather and vent pecking, acute egg peritonitis), resulting in significant mortality. Geese and gamebirds may be particularly stressed if they are confined. Such adverse effects must be balanced against the risk of infection and disease. On some farms, the risk assessment may require that some flocks should be kept outdoors if strict isolation can be established in other ways: on others culling may be the preferred option.

237. A welfare disposal scheme may be necessary to protect those poultry whose movement off-farm is restricted because of the emergency. The welfare of poultry can reach critical points much faster than cattle, sheep and pigs because of their relatively rapid growth rate, short production cycle and husbandry systems.

#### *Killing of poultry for disease control in an emergency*

238. WASK was amended in 2007 to allow the use of gas to kill poultry outwith the slaughterhouse for the purpose of disease control in emergencies. This method is also allowed for killing of end-of-lay hens and end-of-life breeding birds, which are particularly vulnerable to poor welfare. To be taken up by industry, its costs would have to be similar to those incurred in catching, transport and processing such birds at a slaughter plant.

239. The use of controlled atmosphere systems for killing poultry in emergencies on farms involves various considerations, e.g. choice of gas in terms of its effectiveness and humaneness; supply and transport of large quantities of gas from a manufacturing plant to an infected farm; gas delivery from a bulk container to an enclosure in which birds are exposed to the gas; control and monitoring of gas concentration; monitoring of bird welfare; and human health and safety.

240. A variety of enclosures have been used, e.g. a 'wheelie' bin, an ex-cargo container and the poultry house itself. Birds can be loaded into wheelie bins, which are pre-filled with gas. This is a low-tech solution which is demanding for the workers and can only be used for a few birds. There is also a risk that birds can be smothered before they are killed. A concussive device would probably be a better method of killing a small number of birds. In Great Britain, the use of wheelie bins has been superseded by the development of containerised gas units.

241. Containerised gas units (CGUs) have been developed in which a welding gas mix (80% argon, 20% carbon dioxide) is used to induce rapid unconsciousness (15 s), followed by anoxia

(90-120 s later). Birds are placed in metal containers in normal transport modules before the gas is introduced. The disadvantage is the need to catch and load birds in transport modules; however, the lack of transport and live shackling are major advantages, particularly for end-of-lay hens.

242. Whole house gassing has the advantage of killing birds *in situ*, both for floor-based and multi-tiered cage units. Trials have been carried out on the direct injection of carbon dioxide gas into a poultry house and observations of behaviour and death have shown that this method is effective in killing all the birds. Various technical issues have been investigated and resolved, e.g. the method of injection, temperature at bird level, and monitoring of gas concentration.

243. While FAWC is supportive of whole house gassing, the method requires large quantities of liquid carbon dioxide (1-2 kg/m<sup>3</sup>), is expensive and is logistically difficult. Defra informed us that contracts are in place for adequate supplies of this gas.

244. Although carbon dioxide is the only gas that is commercially available in sufficient quantities in an emergency, it is also aversive to poultry. Any aversion must be balanced against the need to kill birds quickly in circumstances where there might be significant concern for the health of the national flock, poultry workers and the general public.

245. Trials and observations indicate that a concentration of 45% carbon dioxide in air is sufficient to kill all chickens in a poultry house after 22 minutes. Trials with ducks and turkeys showed that these could also be killed within 10 minutes with 45% carbon dioxide in air. Time to death depends on size of house and rate of gas supply, among other factors. The physiological ability of some species of ducks to adapt to hypercapnia and hypoxia during diving was not seen; the White Pekin duck is a variety of Mallard, a group of dabbling ducks that usually do not dive.

246. A recent trial in Great Britain suggests that whole house killing of hens in cages using carbon dioxide is reliable and practical. With appropriate attention to the method of gas delivery, there was no evidence that birds died of hypothermia when liquid carbon dioxide was introduced at low temperatures.

247. The use of foam as a vector for gas during killing is being researched in several countries, including the United States, Great Britain and the Netherlands. Whilst some researchers and the industry in the US favour small bubble foam generated by compressed air, current British research is concentrating on using nitrogen to generate large diameter, foam bubbles that release nitrogen when birds agitate the foam. FAWC welcomes continued research into this technique as it shows promise in enabling large numbers of birds to be killed *in situ*, quickly and effectively. FAWC recommends that high priority is given to the development of practical methods using foam to kill poultry on farms.

248. Ventilation shutdown is a method of mass killing of poultry for disease control on farms, but is only lawful in England. It is a method of last resort that must be authorised by the Secretary of State and any use must be supervised closely by Animal Health. FAWC has previously advised the Government that there may be an exceptional scenario where there is no other option but to use ventilation shutdown, even though the welfare of one flock is compromised for the greater



benefit of other birds and/or public health. Prior to authorisation, the authorities must be clear that the benefits are substantial and outweigh any harms; expert assessment indicates that death will be rapid and no alternatives are available; a back-up method is in place to kill any birds that are still alive after ventilation shutdown; and any use is well documented to inform future decisions and contingency planning.

249. Concussive killing devices might be suitable for killing small flocks in an emergency. They should be used by trained personnel operating equipment consistently to manufacturer's instructions. As with our observations of the Foot and Mouth Disease outbreak in 2001, there is a risk of these devices overheating if their use is prolonged. Additional equipment and ammunition should be available on the farm as well as operators capable of maintaining killing equipment. Pneumatic versions of concussive killing devices that do not require reloading after each shot might be quicker to operate in these circumstances.

250. There may be circumstances where large numbers of poultry need to be killed for reasons not related to disease control, e.g. for commercial reasons or due to feed contamination. Effective methods of killing large numbers of birds need to be available for such circumstances and any such mass culls should be conducted under close veterinary supervision.

### *Recommendations*

251. *Contingency planning for control of disease outbreaks must ensure:*

- *that animal welfare is considered at all stages from detection of disease to killing;*
- *clarity of roles and responsibilities;*
- *ready availability of trained and competent staff involved in catching and killing;*
- *the welfare of free-range birds that need to be housed is fully protected;*
- *that the welfare of healthy birds whose movement off farm is prevented by disease restrictions is fully protected, by a welfare disposal scheme if necessary.*

252. *Government and industry should give high priority to the development of practical methods using foam to kill poultry on farms.*

### **Surplus day-old chicks killed in hatcheries**

253. Each year in Great Britain, more than 30 million unwanted male chicks and unviable chicks from egg-laying strains and around 5-8 million unviable broiler and broiler breeder chicks are killed in hatcheries. Avoidable pain, distress or suffering must not be caused when these chicks are killed.

254. Although male chicks from egg-laying strains are reared in some developing countries, they are neither profitable nor demanded by consumers in developed countries. Genetic markers have been developed, notably using feather colour, to enable quick separation of the sexes, but if differentiation in eggs became possible then males could be killed mechanically before hatching.

255. Lawful methods for killing chicks are exposure to certain gas mixtures (as set out in WASK 1995), instantaneous mechanical destruction, and neck dislocation.

256. Since unconsciousness is not induced immediately when chicks are killed by gas, the period of induction should be rapid and without avoidable distress. A concentration of carbon dioxide of 100% can be used lawfully but is highly aversive. FAWC would like to see the end of aversive gases for killing chicks. We witnessed the use of other gases, such as argon (with less than 2% residual oxygen), in commercial hatcheries. A dwell time of 3 minutes ensured that all chicks were dead and unconsciousness was reported to be reached quickly and without convulsions. Argon is inert, heavier than air and kills chicks by anoxia. It does not seem to cause the respiratory discomfort in chicks that is seen with carbon dioxide. Nitrogen has similar anoxic properties but is lighter than air and more difficult to handle. A residual oxygen concentration below 2% is essential for anoxia.

257. Mechanical maceration causes death instantaneously. However, we were told that it may not be an ideal method for large numbers of chicks, especially if the rate of delivery of chicks exceeds the capacity of the machine. Most commercial hatcheries favour the use of gas for killing chicks but unhatched embryos in hatchery waste must be killed by maceration. The market for dead day-old chicks among keepers of captive raptors and reptiles requires whole chicks. Neck dislocation is the only viable method of killing small numbers of chicks. The Humane Slaughter Association has produced guidance on instantaneous mechanical destruction and other disposal methods.

#### *Recommendation*

258. *The use of aversive gas mixtures for killing chicks should be phased out.*

#### **Farmed gamebirds and rabbits**

259. Very few, if any, gamebirds are actually killed in slaughterhouses. Most are shot in the field before being transported to a slaughterhouse or cutting plant for processing. Unfortunately, we were unable to visit a gamebird slaughterhouse during our study. There is limited scientific information on the killing of quail and guinea fowl.

260. The commercial industry for farmed rabbit meat is very small in Great Britain compared with other EU Member States. There is only one rabbit slaughterhouse producing meat for human consumption in Great Britain, which, unfortunately, we were unable to visit during our study. The information we were able to gather about slaughter of rabbits did not raise particular welfare concerns as long as best practice is followed.

261. There is limited scientific information about the stunning of rabbits; the minimum current for stunning is in excess of 140 mA or captive bolts can be used as an alternative.

#### **Licensing and training**

262. Our previous analysis and conclusions about a licensing system for slaughtermen working with red meat species also hold true for poultry. The skill and performance of the slaughterman is crucial to the welfare of the animal during slaughter. We should like a review to be undertaken of the system of licensing slaughtermen, including those involved in emergency killing.

263. Slaughtermen must be trained and competent, as evidenced by a slaughterman's licence, which is awarded by the MHS. In the majority of cases, the certificate of competence (that enables a licence to be issued) is issued by the Official Veterinarian, who may also be seen to have a basic training function by the slaughterman and slaughterhouse management. We remain convinced that the training, accreditation and enforcement roles of the Official Veterinarian do not sit together comfortably. EC Transport Regulation No. 1/2005 requires that examiners of drivers for their certificate of competence must be independent. This supports our previous recommendation that a licence to slaughter should only be awarded to those who have achieved a level of competence that has been assessed and verified independently.

264. In our Red Meat Slaughter report, we were critical of the fact that a slaughterman's licence was valid for life, unless revoked or suspended. Although there is continuous assessment of performance by the Official Veterinarian, we remain concerned about those licensees who return to work but may not have worked as a slaughterman for some time. These individuals are able to restart work without any refresher training or re-assessment.

265. Animal welfare at slaughter must form an integral part of the training of any person working in a slaughterhouse. Training should encompass the wide variety of slaughterhouses, species and equipment and take account of the learning needs and abilities of trainees.

266. The Official Veterinarian enforces animal welfare legislation in the slaughterhouse and must be trained in its requirements as they relate to the many and changing systems in use for stunning and slaughter of animals and the particular welfare issues that may arise. Recently, there have been various technical improvements in systems of electrical stunning and in controlled atmosphere systems. Official Veterinarians and slaughtermen must be trained in these developments.

267. WASK 1995 requires that *'the occupier of a slaughterhouse or knacker's yard shall ensure that at all times when there are live animals on the premises a person (whether or not himself) is available who is competent, and who has authority to take whatever action may be necessary to safeguard the welfare of the animals'*. Training of Poultry Welfare Officers is provided by the University of Bristol and others and, as with the course for Animal Welfare Officers for the red meat slaughter industry, has attained a high level of recognition. Transfer of science and best practice from elsewhere is essential to allow every plant to develop its own operating procedures to protect animal welfare. The role of the PWO is crucial to the identification and monitoring of animal welfare throughout the slaughterhouse. We welcome the EU Commission's proposals to formalise this role in legislation and we urge Government to see this maintained in the negotiations on the new Slaughter Regulation. The role and functions of the PWO/AWO should be clearly set out in the Guidance (and any future Code of Practice) on the Welfare of Poultry at Slaughter or Killing.

268. The structure of the PWO training system is changing to create senior PWOs, who will be able to update the training of PWOs in their work place. Many assurance schemes already require PWOs to be present in the slaughterhouse, though we recognise that training may be more difficult in small slaughterhouses.

## *Recommendations*

269. *Government, in partnership with industry, should review the current system of licensing slaughtermen.*

270. *Animal welfare during slaughter must form an integral part of the training of any person working with live animals in the slaughterhouse.*

271. *More attention should be paid to training in animal welfare in the Official Veterinarian's Continuing Professional Development.*

272. *Government and industry should ensure that appropriate schemes are in place for training and assessment of farmers, stockmen, slaughterhouse workers, field professionals and other persons killing animals.*

273. *We urge the Government to support the EU Commission's proposals to formalise the role of the PWO/AWO in a new Slaughter Regulation, and to set out clearly the role and functions of the PWO/AWO in the Guidance (and any future Code of Practice) on the Welfare of Poultry at Slaughter or Killing.*

## **Legislation and enforcement**

274. Relevant legislation and potential changes in the future were discussed earlier in this Report. References in our Red Meat Slaughter report to the potential impact on animal welfare of legislation in other areas, e.g. food hygiene or the environment, apply equally to poultry slaughter and we welcome Government's recognition of the need to take these impacts into account when developing new regulations.

275. The Red Meat Slaughter report reviewed the enforcement sanctions available to the MHS. Following its publication, we were pleased that Government intends to include improvement notices as an intermediate option between a written warning and a prosecution. Prevention of the use of certain equipment or the ability to close a slaughter line until improvements have been made, are likely to be highly effective in promoting preventative maintenance. Government also accepted a recommendation for the use of specifically trained auxiliaries, under veterinary supervision, to take on some welfare monitoring. We look forward to developments in both these areas.

276. There should be a review of enforcement in slaughterhouses that are registered with the FSA, but which do not require approval. Animals processed through small non-approved slaughterhouses should benefit from the same principles of humane slaughter as those in approved slaughterhouses and there should be assurance through adequate surveillance that they do.

### *Recommendation*

277. *Animals processed through small non-approved slaughterhouses should benefit from the same principles of humane slaughter as those in approved slaughterhouses and there should be assurance through adequate surveillance that they do.*

### **Equipment design and approval**

278. Manufacturers of slaughter equipment and builders of slaughterhouses must consider animal welfare at an early stage during design and construction. We remain convinced that Government and industry in partnership should be able to access readily research findings and best practice about animal handling, stunning and slaughter. This is particularly important in mechanised poultry slaughterhouses where large numbers of birds are handled and processed mechanically. The Guidance (and any future Code of Practice) on the Welfare of Poultry at Slaughter or Killing should explicitly refer slaughterhouse operators to the information that is available. The reference centres proposed by the EU Commission in a new Slaughter Regulation might in future be the repositories of this design information.

279. We believe that the poultry slaughter industry does not appear to take sufficient advantage of technological innovations and knowledge transfer relating to stunning, slaughter and killing. The reasons for this are not clear. We are particularly concerned that scientific and technological advances in electrical stunning and controlled atmosphere systems should be introduced by the industry when new slaughterhouses are designed or existing plants are modernised. Government and its agencies should facilitate a greater dialogue between researchers, inventors and manufacturers to enable more rapid uptake by the poultry industry of the most promising research.

### *Recommendation*

280. *Government and industry should work in partnership to make available research findings and best practice about animal handling, stunning and slaughter. The Guidance (and any future Code of Practice) on the Welfare of Poultry at Slaughter or Killing should explicitly refer slaughterhouse operators to the information that is available.*

281. Our Red Meat Slaughter report called for a mandatory system to approve stunning and killing equipment as fit-for-purpose. The need for approval is even greater in a poultry slaughterhouse where much of the equipment used to stun and slaughter poultry is mechanised. FAWC therefore urges Government and industry to establish a system of independent assessment and approval for slaughterhouse equipment. The assessment system already used in Germany might be viewed as an example. FAWC considers that the review of the European Slaughter Directive should provide an opportunity to formalise and harmonise approval procedures.

282. In the absence of formal approval, the technical specifications of slaughter equipment should include information related to welfare. We welcome the EU Commission's proposals requiring manufacturers to supply detailed instructions for slaughterhouse equipment.

283. There is no independent body in Great Britain to assess the safety and effectiveness of equipment for use in a slaughterhouse (e.g. in terms of technical performance and animal welfare). Any equipment must comply, and be seen to comply, with the law.

284. Slaughterhouse operators should audit the performance of stunning and slaughter equipment and systems. There should be regular assessment of effectiveness from technical data and measurement of animal-based outcomes. We were told that experimental equipment and processes – but not commercial equipment - for studying animal welfare at slaughter require approval under Home Office legislation.

285. The FSA approves the design and fitting out of slaughterhouses to ensure compliance with meat hygiene regulations. In principle, approval could be extended to include animal welfare. In addition, existing slaughterhouses should be inspected regularly, at least every five years, to ensure that their design and systems used are fit-for-purpose, especially where modifications have been made.

#### *Recommendations*

*286. Government and industry should work in partnership to establish a system of independent assessment and approval for slaughterhouse equipment to ensure suitability for the purpose intended.*

*287. Slaughterhouse operators should regularly audit the performance of stunning and slaughter equipment and systems. There should be regular assessments of the effectiveness of the operation of the equipment from technical data and through measurement of animal outcomes.*

*288. Government should ensure that the approval of a slaughterhouse's design and construction includes animal welfare objectives. Existing premises should have a regular and detailed animal welfare audit, at least every five years.*

## **APPENDIX A**

### **MEMBERSHIP OF THE FARM ANIMAL WELFARE COUNCIL (WINTER 2008)**

Professor Christopher Wathes – Chairman

Professor Michael Appleby

Professor Richard Bennett

Professor Henry Buller

Dr Joanne Conington

Mr Huw Davies

Professor Sandra Edwards

Mr David Henderson

Mr George Hogarth

Mr Gwyn Jones

Mrs Ruth Layton

Mr Stephen Lister

Dr David Main

Professor David Morton

Mr Andrew Nicholson

Reverend Professor Michael Reiss

Mr Stuart Shearlaw

Mr Steven Tait

Ms Alison Ward

Mrs Meryl Ward

Mr Ian Baker, Mr John Don, Mr Richard Maunder, Miss Miriam Parker, Dr Martin Potter and Mr Mike Vaughan were also members of the Slaughter Working Group during their appointment to the Farm Animal Welfare Council and contributed to the study.

## **APPENDIX B**

### **ORGANISATIONS THAT GAVE EVIDENCE AND ASSISTANCE**

2 Sisters Food Group

ADAS

Animal Welfare Science, Ethics and Law Veterinary Association (AWSELVA)

Anglia Autoflow Ltd

Association of Meat Inspectors

Assured Chicken Production (A.C.P)

Bernard Matthews Ltd

Board of Deputies of British Jews

British Egg Industry Council (BEIC)

British Poultry Council (BPC)

British Veterinary Association (BVA)

British Veterinary Poultry Association (BVPA)

Campaign for the Protection of Shechita

Compassion in World Farming (CIWF)

Co-operative Society

Farm Animal Care Trust (FACT)

Food Standards Agency (FSA)

Grampian Food Group

Halal Food Authority (HFA)

Halal Monitoring Committee (HMC)

Humane Slaughter Association (HSA)

Islamic Cultural Centre

Islamic Medical Association UK

Local Authorities Co-ordinator of Regulatory Services (LACORS)

Meat Hygiene Service (MHS)

Meat and Livestock Commission (MLC)

Meat Trades Christian Fellowship

Meat Training Council

Moy Park Ltd

Muslim Council of Great Britain



National Animal Welfare Advisory Committee, New Zealand (NAWAC)  
National Council of Shechita Boards  
National Farmers' Union  
National Proficiency Tests Council (NPTC)  
Roslin Research Institute  
Royal Society for the Prevention of Cruelty to Animals (RSPCA)  
Sainsbury plc  
Scottish Society for the Prevention of Cruelty to Animals (SSPCA)  
Shechita UK  
Silsoe Research Institute  
Stork PMT  
Tesco Stores Ltd  
Union of Muslim Organisations of UK and Eire  
Union of Orthodox Hebrew Congregations  
Universities Federation for Animal Welfare (UFAW)  
University of Bristol  
University of Glasgow  
University of Wales, Bangor  
Vegetarian Economy and Green Agriculture (VEGA Research)  
Vegetarians International Voice for Animals (VIVA)  
Waitrose  
World Society for the Protection of Animals (WSPA)  
Yara International

FAWC should like to thank all the individuals who gave evidence and the slaughterhouse operators, slaughtermen, veterinarians and others whom members of the Working Group met during visits in Great Britain, Germany and the Netherlands.

We should also like to thank the veterinary and policy advisors from Defra and the devolved administrations for their help during the preparation of this Report.

## APPENDIX C

### GLOSSARY OF TERMS

**A.C.** - alternating current

**Ammeter** – Instrument that measures electric current (flow of charge per unit time), usually in amperes, through a conductor.

**Anaesthesia** – Induced loss of the sensation of pain to permit the performance of surgery or of other painful procedures

**AWO** - Animal Welfare Officer – person who is competent and who has authority within the slaughterhouse to take whatever action may be necessary to safeguard the welfare of animals

**Anoxia** – depletion of oxygen in atmosphere or blood

**Ante-mortem inspection** – inspection of poultry before death

**Biphasic** – two phased

**Blood splash** – visible evidence in the meat of a haemorrhage during the stunning or slaughter process

**Broiler** – meat chicken

**Carotid arteries** – major blood vessels of the neck

**CCTV** – closed circuit television

**Concussive stunner** – mechanical device for stunning animals by concussion

**Constant current system** – electrical stunning system able to adjust voltage applied in response to electrical resistance and ensure the same current is applied to each animal

**CGUs** - Containerised Gas Units for emergency killing

**Controlled atmosphere system** – system where animals are exposed to gas mixtures which rapidly render them insensible to pain or distress

**CPD** – Continuing Professional Development

**Culling** – killing an animal, usually because it is suffering from disease or injury

**Decapitation** – removal of the head from the neck

**Depopulation** – removal of animals from rearing or production accommodation

**D.C.** - direct current

**DOA** – dead on arrival

**Dry stunning** – electrical stunning without the use of water as a medium

**EEG** – electroencephalogram, measurement of electrical activity of the brain

**ECG** – electrocardiogram, measurement of electrical activity of the heart

**EFSA** – European Food Safety Authority

**Electrical water-bath** – water filled container through which electrical current is passed and into which birds' heads are immersed in order to induce immediate unconsciousness

**End-of-lay hens** – hens that have reached the end of their (commercially) productive lives

**Epithelia** – tissue layers

**Exsanguination** – removal of blood from an animal

**FSA** – Food Standards Agency

**Gait scoring** – assessment of a bird's walking ability by observation

**HACCP** – Hazard Analysis and Critical Control Points. A systematic preventive approach to food safety

**Halal** – allowed or permitted for Muslim consumption

**Hypercapnia** - increased carbon dioxide levels in blood

**Hypercapnic anoxia** - depletion of oxygen in blood accompanied by increased blood carbon dioxide levels

**Hypercapnic hyper-oxygenation** - increased blood carbon dioxide levels accompanied by increased oxygen in atmosphere or blood – an anaesthetic gas mixture

**Instant mechanical destruction (maceration)** – method of disposal of day-old chicks and hatchery waste

**Lairage** – area of a slaughter premises for delivery of animals and holding prior to slaughter

**MHS** – Meat Hygiene Service

**MLC** – Meat and Livestock Commission (now replaced by the Agriculture and Horticulture Development Board)

**Nociceptor** – a peripheral nerve organ or mechanism for the reception and transmission of painful or injurious stimuli.

**OIE** – World Organisation for Animal Health

**Official Veterinarian** – Meat Hygiene Service veterinary representative in approved slaughter premises

**Ohm's law** - Voltage (V) = Current (I) x Resistance (R). When considering electrical stunning the delivered current is represented by: Current (I) = Voltage (V)/Resistance (R)

**OVS** - Official Veterinary Surgeon; previous title of the Official Veterinarian.

**Pain** – an unpleasant sensory or emotional experience associated with actual or potential tissue damage, or described in terms of such damage.

**Pathogenic** – disease causing

**Pectoral bone breakages** – breakages of wing bones

**Periosteum** – layer of connective tissue covering bones to which muscles and tendons are attached

**PIA** – Poultry Inspection Assistant

**PMI** – Poultry Meat Hygiene Inspector

**PPE** – personal protective equipment

**PWO** - Poultry Welfare Officer

**Pullet** – a young domestic fowl

**Pulsed D.C.** – electrical wave-form with variable voltage but of constantly positive or negative value

**Quiescent** – inactive

**Sentient** – conscious, aware, able to feel, responsive

**Shechita** – Jewish method of slaughter

**SEP** – somatosensory evoked potential - evoked activity in the brain using somatosensory stimuli

**Stunning** – any process which causes immediate loss of consciousness which lasts until death

**Swan necking** – action whereby a bird bends its neck back such that its head avoids immersion in the electrical water-bath

**Venesection** – a cut to the neck of an animal for the purpose of bleeding

**Ventilation shutdown** – method of killing poultry for disease control purposes which involves the cessation of natural or mechanical ventilation of air in a building in which birds are housed with or without any action taken to raise the air temperature in the building.

**WASK** – The Welfare of Animals (Slaughter or Killing) Regulations 1995

**WATO** – The Welfare of Animals (Transport) (England) Order 2006 (and similar legislation in Scotland and Wales)

**Zoonotic disease** – disease caused by infectious agents that can be transmitted between (or are shared by) animals and humans

## **APPENDIX D**

### **CONTACT DETAILS**

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