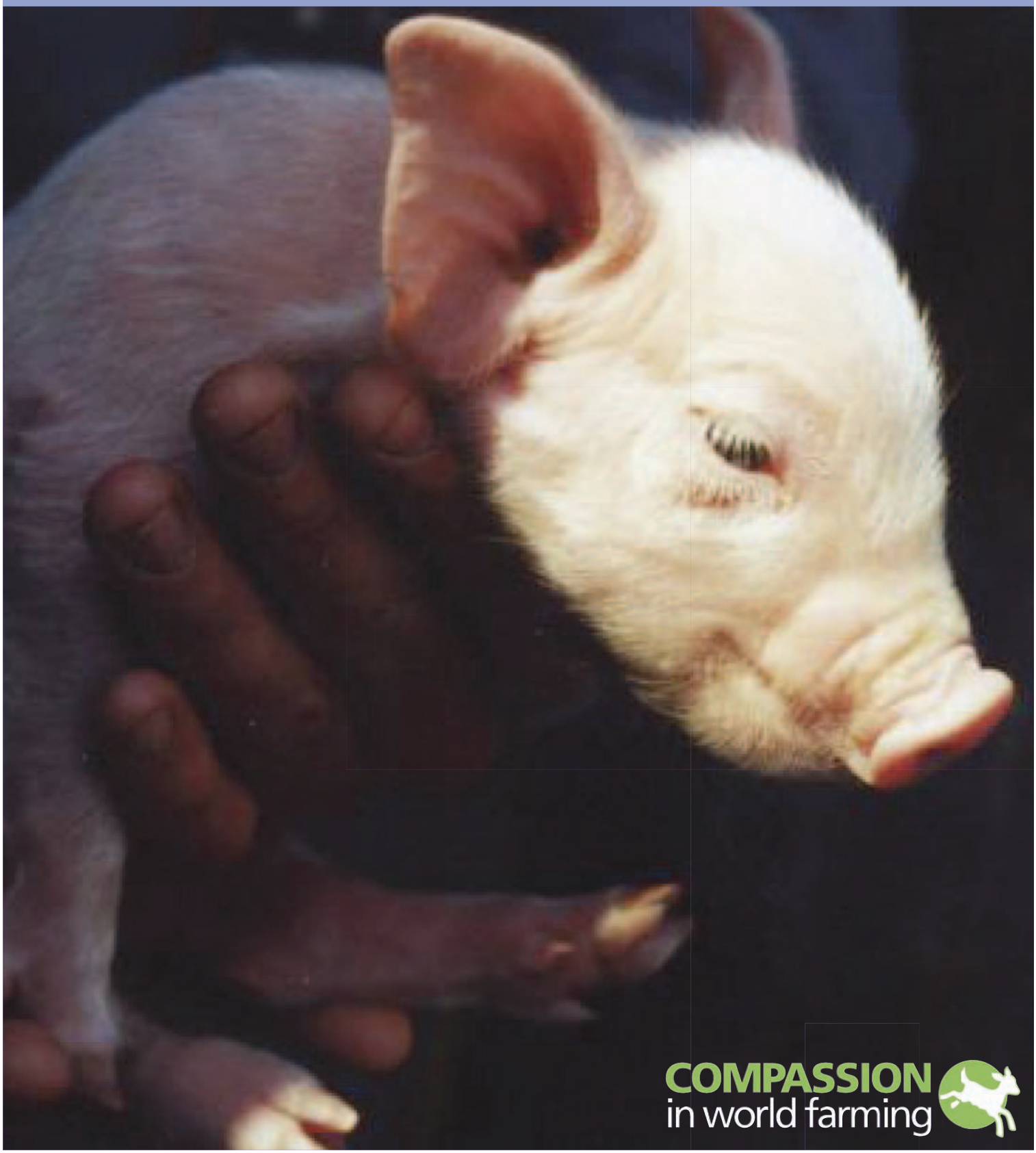
WELFARE OF PIGS IN THE EUROPEAN UNION

The urgent need for reform of existing legislation and effective enforcement



COMPASSION in world farming

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EXECUTIVE SUMMARY

The urgent need for reform of existing legislation and effective enforcement.

There are around 15 million sows in the European Union (EU27) and around 250 million pigs are reared for slaughter in the EU27 each year. In 1997, the EU adopted a legally binding Protocol annexed to the Treaty of Amsterdam, which recognises animals as sentient beings. The Protocol requires the EU and its Member States, in formulating and implementing EU policies on agriculture, to "pay full regard to the welfare requirements of animals". With this in mind, this report examines the welfare of pigs in the EU in relation to current legislation and enforcement and identifies necessary improvements to protect the welfare of breeding sows and pigs reared for meat.

Welfare can be poor in any farming system if stockmanship is poor. However, systems vary in their potential to provide good welfare. A husbandry system that provides for behavioural freedom without compromising health can be described as having high welfare potential. Major concerns for animal welfare arise from production systems with low welfare potential, i.e. those that fail to meet the behavioural and physical needs of the animal and are therefore likely to cause suffering. The ability of a system to provide good welfare is determined by factors that are built into the system. The building blocks of a good system include the provision of enough living space and access to resources to meet the needs of the animals. Systems with low welfare potential should be prohibited by legislation. Whilst it is essential to set high standards to ensure livestock production systems have high welfare potential, it is also important to monitor welfare outcomes to assess the extent to which that potential is realised.

Domestic pigs retain many behavioural and physiological characteristics of the European wild boar, from which they are descended. Pigs are highly social animals with a high level of curiosity and well-developed exploratory behaviour. Under natural conditions they live in family groups typically consisting of several sows and their young. They spend much of their time rooting, grazing and exploring their environment and pregnant sows construct an elaborate nest before giving birth.

WHEN GIVEN THE OPPORTUNITY, PIGS SPEND A LARGE PROPORTION OF THEIR TIME ENGAGED IN ROOTING, FORAGING AND EXPLORING THEIR ENVIRONMENT

Housing of pigs reared for meat

Ideally, pigs should have access to pasture to provide a complex and stimulating environment. When housed indoors, adequate space and environmental enrichment are essential for good welfare of pigs. In the absence of appropriate substrate to explore, pigs redirect their exploratory behaviour towards pen structures and other pigs, which can lead to damaging behaviours such as ear and tail biting. Provision of adequate enrichment is facilitated by the use of solid flooring.

Since 2003, EU legislation requires that "pigs must have permanent access to a sufficient quantity of material to enable proper investigation and manipulation activities, such as straw, hay, wood, sawdust, mushroom compost, peat or a mixture of such". However, this requirement is often ignored or inappropriate materials such as chains, ropes and rubber or plastic 'toys' are provided, which are not able to meet the behavioural needs of pigs.

Currently permitted space allowances are much too low and should be significantly increased. The minimum area of solid floor provided should be sufficient for all pigs to lie simultaneously in a fully-recumbent position without contacting other pigs. This solid floor area should be mostly covered with a thick layer of enrichment

material, sufficient to act as bedding, and fresh material should be added regularly. The wording of the Directive should be strengthened to ensure that complex natural material, which is ingestible or contains edible parts, is required for enrichment, such as unchopped straw, compost, earth or a mixture of these. Only housing systems which are capable of meeting the requirements for enrichment should be permitted. For this reason, the use of fully-slatted floors should be prohibited. Any slatted floor area provided for dunging and/or showering should be in addition to the minimum solid and bedded floor areas.

Mutilations

THE MAJORITY OF PIGS REARED FOR MEAT IN THE EU ARE KEPT IN BARREN OVERCROWDED CONDITIONS

The majority of piglets in the EU are routinely subjected to a number of mutilations, usually without any anaesthesia or analgesia, including tail docking and tooth clipping or grinding. These mutilations are performed in an attempt to reduce injuries from tail biting and injuries to sows' teats and other piglets. Despite a ban on routine tail docking and tooth clipping or grinding in the EU since 2003, these procedures continue to be performed routinely in most EU countries.

Tail docking and tooth clipping or grinding are painful and are unnecessary if pigs are kept in appropriate conditions. The wording of the Directive should be strengthened to completely prohibit tail docking and tooth clipping or grinding for non-therapeutic reasons. Tail biting and injuries to sows' teats and other piglets should be minimised by providing adequate space and enrichment and avoiding the use of fully-slatted floors in both the rearing and farrowing environments and by limiting litter size to that which can be fully sustained by the sow.

The quality of meat from some entire male pigs can be affected by 'boar taint', an odour and/or taste that some consumers find unpleasant. Surgical castration is commonly performed in most EU countries to reduce the incidence of boar taint.

Surgical castration results in significant pain and stress and should be prohibited. Entire male pigs could be reared to lighter slaughter weights to minimise boar taint in carcasses, as is already the case in several EU countries. Where pigs continue to be reared to higher slaughter weights, the use of immunocastration is preferable to surgical castration, at least as an interim measure until methods of rearing entire male pigs to higher slaughter weights without unacceptable levels of taint have been developed. Consideration could also be given to slaughtering males earlier and rearing only females to higher slaughter weights.

At the very least, as an interim measure for any piglets undergoing surgical castration, methods of anaesthesia that have been demonstrated to be effective in reducing pain and stress responses, in combination with prolonged analgesia, should be required for all piglets.

Housing of breeding sows

It is well established that the keeping of pregnant sows in stalls, which are so narrow that they are unable even to turn around, causes suffering. The use of individual stalls for the housing of pregnant sows will be prohibited in the EU from 1 January 2013. However, the period from weaning to four weeks after service is excluded from this prohibition.

The rationale for the exclusion of the period from weaning to four weeks after service from the requirement for group housing is concern that stress caused by mixing sows during this period may be detrimental to oestrus expression, pregnancy rate and embryo development and survival. However, a number of recent studies have found no adverse effects of mixing on reproductive performance.

Confining sows in individual stalls from weaning until four weeks after service causes stress and frustration. Housing sows in groups from weaning improves welfare and need not adversely affect reproductive performance. There is therefore no justification for the current exemption from the requirement for group housing of sows for the period from

weaning to four weeks after service and this exemption should be removed.

Stress should be minimised in group housing systems through design and management to minimise aggression and competition for feed and to meet the sows' needs for foraging and exploration, and through appropriate feeding to avoid chronic hunger. The wording of the Directive should be strengthened to ensure that sows have permanent access to roughage and that complex natural enrichment material, which is ingestible or contains edible parts, such as unchopped straw, compost, earth or a mixture of these, is provided in a thick layer, sufficient to act as bedding, covering the majority of the floor area of the pen, with fresh material added regularly.

Most breeding sows in the EU are confined in crates during farrowing and lactation. Confining sows in farrowing crates causes suffering and also negatively affects the welfare of piglets. Sows in crates are unable to fulfil their strong motivation to build a nest due to inadequate space and lack of nesting material and are unable to interact properly with, or move away from, their piglets.

The rationale for confinement of sows in farrowing crates is the assumption that piglet mortality is higher in pens that allow the sow

FARROWING CRATES SEVERELY RESTRICT THE MOVEMENT OF THE SOW

freedom of movement because of accidental crushing of piglets. However, research shows that piglet mortality is no higher in well-designed farrowing pens which provide adequate space and enrichment, improving the welfare of both sows and piglets. Farrowing crates should therefore be phased out. The Directive should also be strengthened to phase out the use of systems that are incompatible with the requirement to provide nesting material to farrowing sows.

Current EU legislation on the welfare of pigs is inadequate to protect welfare and is poorly enforced. Immediate action is needed to improve the welfare of pigs in the EU, including:

- **Significantly increased space allowances for pigs reared for meat;**
- **Strengthening of the wording on provision of environmental enrichment to ensure that complex natural material, which is ingestible or contains edible parts, is required and is provided in a thick layer, sufficient to act as bedding, covering the majority of the pen floor, with fresh material added regularly;**
- **Prohibition of the use of fully-slatted floors for pigs reared for meat;**
- **Strengthening of the wording on the prohibition of routine tail docking and tooth clipping or grinding to completely prohibit tail docking and tooth clipping or grinding for non-therapeutic reasons;**
- **Prohibition of surgical castration of piglets and at the very least, if there is a phase-out period for surgical castration, then removal of the exemption from the requirement to use anaesthesia and prolonged analgesia for piglets up to seven days of age;**
- **Removal of the exemption that allows the use of sow stalls for the period from weaning until four weeks after service;**
- **Strengthening of the wording on provision of high fibre food for sows to require that sows have permanent access to roughage;**
- **Phasing out of farrowing crates;**
- **Strengthening of the wording on the requirement to provide nesting material for farrowing sows to phase out the use of systems that are incompatible with this requirement.**

1. INTRODUCTION

There are around 15 million sows in the European Union (EU27) and around 250 million pigs are reared for slaughter in the EU27 each year (Eurostat, 2008). The major producing countries are Germany (53.3 million pigs slaughtered in 2007), Spain (41.5 million), France (25.7 million), Poland (24.7 million), Denmark (21.4 million), The Netherlands (14.2 million), Italy (13.6 million), Belgium (11.2 million) and the UK (9.5 million).

In 1997, the EU adopted a legally binding Protocol annexed to the Treaty of Amsterdam, which recognises animals as sentient beings. The Protocol requires the EU and its Member States, in formulating and implementing EU policies on agriculture, to "pay full regard to the welfare requirements of animals" (Protocol on protection and welfare of animals, 1997). With this in mind, this report will examine the welfare of pigs in the EU in relation to current legislation and enforcement and identify necessary improvements to protect the welfare of breeding sows and pigs reared for meat.

Animal welfare is about ensuring the well-being of the individual animal. It includes animal health and encompasses both the physical and psychological state of the animal. The welfare of an animal can be described as good or high if the individual is fit, healthy and has a good quality of life, which encompasses both freedom from suffering and the opportunity to experience positive feelings of well-being.

Welfare can be poor in any farming system if stockmanship is poor. However, systems vary in their potential to provide good welfare. Even if stockmanship is good, welfare is likely to be poor in confinement systems which severely restrict freedom of movement or in barren overcrowded conditions which limit behavioural expression.

A production system that provides for behavioural freedom without compromising health can be described as having high welfare potential. Major concerns for animal welfare arise from systems with low welfare potential, i.e. those that fail to meet the behavioural and physical needs of the animal and are therefore likely to cause suffering. The ability of a system to provide good welfare is determined by factors that are built into the system. Building blocks of a good system include the provision of enough living space and access to resources to meet the needs of the animals. Systems with low welfare potential should be prohibited by legislation.

Whilst it is essential to set high standards to ensure livestock production systems have high welfare potential, it is also important to monitor welfare outcomes to assess the extent to which that potential is realised. Examples of welfare outcomes include levels of mortality, lameness, injuries and abnormal behaviours such as stereotypies (repetitive behaviours with no apparent function which are considered to indicate poor welfare), as well as positive measures such as the occurrence of play behaviour.

Welfare outcomes reflect the overall performance of the system, which will be influenced both by the welfare potential of the system and by the level of human management skill applied to it.

2. THE NATURAL BEHAVIOUR OF PIGS

Domestic pigs retain many behavioural and physiological characteristics of the European wild boar, from which they are descended. Pigs are highly social animals and under natural conditions they live in family groups typically consisting of several sows and their young (Graves, 1984). Piglets stand within minutes of birth and begin to form social dominance relationships with littermates within hours (*Ibid*.). Aggression within the group is generally mild and infrequent once a stable hierarchy is formed, with dominance relationships playing a major role in settling disputes over access to food and other resources (*Ibid*.). Boars may congregate in bachelor groups but are generally solitary except during the breeding season (*Ibid*.).

DOMESTIC PIGS RETAIN MANY BEHAVIOURAL AND PHYSIOLOGICAL CHARACTERISTICS OF THE WILD BOAR

A pregnant sow will naturally move away from the rest of the group one or two days before giving birth (farrowing) to seek a secluded nest site. She makes a hollow and gathers tufts of grass and branches to construct an elaborate nest in which to give birth (Jensen, 1986). Domesticated sows show the same motivation to perform nest-building as wild-type sows and the pattern of nest-building behaviour and early maternal and nursing behaviours are largely unaffected by domestication (Gustafsson *et al.,* 1999). After farrowing, the sow and litter remain in or near the nest for around eight to ten days before rejoining the group and the young continue to suckle until they are gradually weaned at around 14 to 17 weeks of age (Jensen, 1986). Interactions between piglets from different litters thus begin very early in life and early associations often persist into adulthood, especially in females (Graves, 1984). Sows may share 'babysitting' duties whilst other sows in the group leave their young in order to forage (*Ibid*.).

Pigs are highly intelligent animals with a high level of curiosity and well-developed exploratory behaviour. Stolba and Wood-Gush (1989) studied the behaviour of domestic pigs in a large semi-natural enclosure and found that during daylight hours they spent around three quarters of their time engaged in exploratory and foraging behaviour, including rooting, grazing, walking over the enclosure, orienting to stimuli, nosing and manipulating objects. The pigs built large communal sleeping nests from tufts of grass and branches. They used different parts of the enclosure for nesting, defecating and feeding, and moved many metres from the nest site in a morning before defecating.

Pigs are unable to lose heat effectively through sweating and rely largely on behavioural mechanisms for temperature control. They pant, seek shade, wallow in water or mud and avoid body contact with other pigs to keep cool and seek shelter or huddle to keep warm. Domesticated pigs may struggle to keep cool at higher temperatures because the evaporative surface in the snout and the area of skin surface relative to body weight are considerably smaller than in the wild boar (van Putten, 1988).

WALLOWING IS IMPORTANT FOR TEMPERATURE REGULATION AND SKIN CARE

3. WELFARE OF PIGS REARED FOR MEAT

3.1 Housing of pigs reared for meat

3.1.1 The importance of environmental enrichment and solid flooring for the welfare of pigs

Ideally, pigs should have access to pasture to provide a complex and stimulating environment. When housed indoors, environmental enrichment is essential for good pig welfare. In the absence of appropriate substrate to explore, pigs redirect their exploratory behaviour towards pen structures and other pigs which can lead to damaging behaviours such as ear and tail biting. These abnormal and damaging behaviours, which can lead to pain and injury, are a sign that the needs of pigs to show certain behaviours are not met (AHAW, 2007a). Thus tail biting is an indication of an inadequate environment and indicates that welfare is poor in the pig performing the biting as well as in the pig that is bitten (SVC, 1997). The need to perform exploration and foraging behaviour is considered to be a major underlying motivation in tail biting (AHAW, 2007b). In unbedded systems, a higher proportion of slatted flooring further increases the risk of tail biting (AHAW, 2007b). Guy *et al.* (2002a) found that the incidence of tail biting was significantly greater and pigs spent more time inactive when housed on fully-slatted floors at a space allowance of 0.55m^2 per pig compared with pigs housed on deep straw with a space allowance of 1.63m^2 per pig.

WHEN PIGS ARE HOUSED INDOORS, ENRICHMENT OF THE ENVIRONMENT WITH STRAW OR OTHER COMPLEX NATURAL MATERIAL IS ESSENTIAL FOR GOOD WELFARE

Lack of appropriate enrichment can also lead to increased aggression (O'Connell and Beattie, 1999). Beattie *et al.* (2000) found that pigs reared in enriched environments from birth to slaughter (more space and provision of straw bedding in the farrowing/weaning pen; more space and provision of peat and straw in the growing and finishing pens) spent less time inactive and involved in harmful social and aggressive behaviour and more time engaged in exploratory behaviour compared with pigs reared in a barren environment (slatted floors and minimum recommended space allowances).

Lack of environmental enrichment can impair learning ability (Sneddon *et al.,* 2000), memory (de Jong *et al.,* 2000a) and immune response (Kelly *et al.,* 2000a) in pigs. Sneddon *et al.* (2000) conclude that cognitive development of pigs may be impaired in intensive housing systems, whilst de Jong *et al.* (2000a) suggest that the blunted circadian rhythm in cortisol concentrations in barren-housed pigs may reflect chronic stress and decreased welfare. Kelly *et al.* (2000a) found that weaned pigs housed in barren flatdecks showed a reduced antibody response to an immune challenge compared with pigs in straw pens, which the authors interpreted as stress-induced immune suppression in the barren-housed pigs. Barren housing may also affect the ability of pigs to cope with stressful situations. For example, de Jong *et al.* (2000b) found that pigs reared in a barren environment showed a tendency for increased manipulation of pen mates and fighting, and significant increases in salivary cortisol in response to mixing at transport and being in lairage, compared with pigs reared in an enriched environment (larger pens with straw bedding). The authors conclude that pigs reared in a barren environment are likely to experience more stress during common preslaughter procedures than pigs reared in an enriched environment.

Enrichment and flooring are important factors affecting the incidence of injuries and stomach ulcers in pigs. Kelly *et al.* (2000a) found that

pigs with foot injuries at weaning recovered quickly when housed on deep straw but that injuries increased after weaning in pigs housed in barren flatdecks. Housing in a 'Straw-Flow' system (supplied with 1kg straw daily) had an intermediate effect on injuries. Housing on deep straw prevented adventitious bursitis of the hock. Similarly, Ramis *et al.* (2005) found that the prevalence of limb lesions was much greater in barren-housed pigs (24% of observations) compared with pigs housed in sawdust-bedded barns (1% of observations). Mouttotou *et al.* (1999) found that the provision of bedding material was the most important factor in reducing the risk of bursitis in growing and finishing pigs. Guy *et al.* (2002b) found that pigs housed on deep straw with a space allowance of 1.63m^2 per pig had significantly less adventitious bursitis, injuries, stomach ulceration, lung damage and morbidity and mortality compared to pigs housed on fully-slatted floors at a space allowance of 0.55m^2 per pig.

Gastric ulcers are common in finishing pigs and are related to diet and stress (Amory *et al.,* 2006; Bolhuis *et al.,* 2007). The incidence of ulcers increased dramatically with the intensification of pig production and associated changes in diet and housing. The condition is now reported in most countries of the world where pigs are kept intensively (Amory *et al.,* 2006). Bolhuis *et al.* (2007) found that straw bedding reduced the incidence of stomach ulcers to a very low level compared with pigs in barren partly-slatted pens, which the authors attributed to the lower levels of stress when provided with straw bedding and/or a positive effect of straw intake on stomach content firmness. Amory *et al.* (2006) found that finishing pigs housed on slatted floors had a significantly higher mean ulcer severity score than pigs housed on solid concrete floors, which had a significantly higher score than pigs housed on straw bedding.

Housing can also affect growth rate and meat quality. Beattie *et al.* (2000) found that pigs provided with more space and enrichment (peat and straw) showed higher growth rates during the finishing period and produced pork with increased tenderness and lower cooking losses compared with pigs reared in a barren environment (slatted floors and minimum recommended space allowances). Similarly, Klont *et al.* (2001) found that housing pigs in an enriched environment (more space and straw) improved the water-holding capacity of pork compared with pigs housed in a barren environment (slatted floors and minimum recommended space allowances). Maw *et al.* (2001) found that pigs kept in straw-bedded housing produced bacon of superior eating quality compared with pigs in barren housing systems.

The EU Scientific Panel on Animal Health and Welfare (AHAW) recommends that an appropriate environment, including provision of manipulable, destructible materials, should be provided "so that the negative consequences of poor welfare such as injurious behaviours, physiological problems and immunosuppression, caused in barren environments, are avoided" (AHAW, 2007c).

3.1.2 The type, quantity and presentation of enrichment material necessary to meet the behavioural needs of pigs

Only natural materials are capable of meeting all of the criteria necessary to provide for the behavioural needs of pigs. The value of enrichment materials for pigs is greater if the materials are complex and compound (Jensen and Pedersen, 2007) and include one or more attractive food components (Olsen *et al.,* 2000). Studnitz *et al.* (2007) conclude that exploratory behaviour of pigs is best stimulated by materials that are complex, changeable, destructible, manipulable and contain sparsely distributed edible parts. The authors comment that exploratory behaviour is stimulated if the material has novelty value and that a material that is complex, changeable and destructible means that it is constantly changing and thus the novelty value will be maintained and will continue to stimulate exploration. If the material contains edible parts, foraging behaviour as well as the curiosity of the pigs will be stimulated. Suitable enrichment materials capable of meeting these criteria include straw, which is ingestible, and compost or earth, especially where these contain edible material such as plant roots. Straw should be unchopped (Day *et al.,* 2008).

Objects such as chains, ropes and rubber or plastic 'toys' are not able to meet all of these criteria and are not suitable enrichment materials for pigs. Scott *et al.,* (2007) found that pigs spent less than 2% of time manipulating a hanging 'toy' (a 'helicopter'-like object with chewable arms) in either straw-bedded or fully-slatted pens, compared with 21% of time engaged in manipulation of straw in the straw-bedded system. The authors conclude that the

low level of occupation with the toy was not related to spatial restriction of access because the level of toy manipulation was not affected by the number of toys provided (one vs. four). Van de Weerd *et al.* (2005) found that straw bedding prevented the development of tail biting but that the addition of a simple enrichment device (a 'bite rite tail chew') could not compensate for the deficiencies in a barren environment. Similarly, Zonderland *et al.* (2008) found that provision of a chain or rubber hose was ineffective in preventing tail biting. AHAW (2007b) conclude that there is little evidence that provision of toys such as chains, chewing sticks and balls can reduce the risk of tail biting.

On the basis of expert opinion, Bracke (2006) concludes that the main material properties required for enrichment of pig pens are 'ability to provide occupation, exploration and maintain interest without habituation', 'rootable', 'manipulable' and 'chewable'. Other important properties that were mentioned by a significant number of experts include 'variable/unpredictable', 'destructible', 'thick layer', 'sufficient/plenty', 'changeable', 'at least partially digestible/nutritional' and 'novelty/frequently refreshed'. A majority (84%) of the experts considered that provision of straw could be sufficient (some experts answered with qualifications, e.g. provided a sufficient quantity is provided), whilst only 3% of experts considered that providing a chain could be sufficient.

The EU Scientific Panel on Animal Health and Welfare recommends: "Since indestructible objects such as chains or tyres are not sufficient to provide for the manipulatory needs of pigs, they may be used as a supplement to destructible and rooting materials but not as a substitute for them" (AHAW, 2007c).

The quantity of enrichment provided is important. Day *et al.* (2002) investigated the behaviour of pigs with different levels of straw provision (none, minimal, substantial and deep). The authors reported that the quantity of straw-directed behaviour was proportional to the amount of straw provided and that an increasing amount of straw resulted in an increase in rooting and ploughing behaviour and a concomitant decrease in harmful behaviours including aggression, biting of other pigs, ear chewing, belly nosing and tail biting. Zonderland *et al.* (2008) found that a small amount of straw provided twice daily on the pen floor significantly reduced, but did not eliminate, the occurrence of bite marks and tail wounds, and that provision of straw in a rack had a lesser effect.

Kelly *et al.* (2000b) found that a 'Straw-Flow' system (supplied with 1kg straw daily) had advantages over barren flatdecks for the housing of weaned pigs in terms of a reduction in potentially damaging behaviours. However, the authors conclude that differences in play and other behaviours suggest that a deep straw system (with more than four times the quantity of straw) provides welfare benefits over and above those of 'Straw-Flow'.

Enrichment should be provided on the floor of the pen because, as a ground-feeding species, foraging from a rack is an abnormal posture for pigs (Buchholtz *et al.,* 2000). Van de Weerd *et al.* (2006) found that enrichment use was significantly higher in a straw-bedded system compared with provision of straw from a rack or various enrichment objects (flavoured feed dispenser, flavoured liquid dispenser or 'bite rite tail chew'). Consequently, one or more pigs had to be removed as a result of tail biting in all treatments except the straw-bedded system. The authors note that straw could be manipulated from different postures in the straw-bedded system and this was reflected in the fact that a significant proportion of time engaged in enrichment use in the straw-bedded system was whilst lying down. Similarly, Scott *et al.* (2006) found that the proportion of time pigs spent interacting with sugar beet pulp shreds in a hopper or a hanging 'bite rite' enrichment device in a fully-slatted system was very low compared with the time spent interacting with

COMPLEX NATURAL ENRICHMENT SHOULD BE PROVIDED IN A THICK LAYER ON THE FLOOR OF THE PEN TO ALLOW ALL PIGS TO ENGAGE IN ROOTING, FORAGING AND EXPLORATORY BEHAVIOUR

straw in a straw-bedded system. AHAW (2007b) recommends provision of straw bedding to minimise the risk of tail biting.

Appropriate enrichment should therefore be provided in a thick layer, sufficient to act as bedding, on the floor of the pen. This necessitates the use of solid flooring. Scott *et al.* (2006) conclude that at present no form of enrichment suitable for use in slatted systems provides the same level of occupation as seen with straw.

The EU Scientific Panel on Animal Health and Welfare states: "only lower quality enrichment materials are provided [in fully-slatted systems] like hanging toys, indicating a risk for pig welfare as the need for exploration will not be met in these systems. Solid floors facilitate provision of adequate enrichment materials" (AHAW, 2007a).

Bedding should be provided across the majority of the pen floor to allow all pigs to engage in exploratory and foraging behaviour throughout the day and to provide a comfortable lying surface. However, at higher temperatures, an area of unbedded solid floor may also be beneficial to aid in thermoregulation (Fraser, 1985).

In order to meet the needs of pigs to express exploratory and foraging behaviour, environmental enrichment should be:

- Manipulable;
- Rootable;
- Chewable;
- Complex/compound;
- Changeable/destructible (as a result of the pigs' activities);
- Ingestible/contain edible parts;
- Safe and non-toxic;
- Provided at floor level;
- Provided in a thick layer covering the majority of the floor area of the pen to ensure all pigs can engage in exploratory and foraging behaviour throughout the day;
- Regularly refreshed.

3.1.3 Current housing systems for pigs in the EU and enforcement of existing EU legislation on enrichment

Since 2003, provision of enrichment material for pigs is a legal requirement in the EU. Commission Directive 2001/93/EC states: "pigs must have permanent access to a sufficient quantity of material to enable proper investigation and manipulation activities, such as straw, hay, wood, sawdust, mushroom compost, peat or a mixture of such, which does not compromise the health of the animals." The current wording of the Directive leaves too much room for interpretation (Bracke, 2006). Although only natural materials are listed in the Directive, the wording is not explicit that items like metal chains, ropes and rubber or plastic 'toys' are insufficient to meet the behavioural requirements of pigs. The wording of the Directive should be strengthened to ensure that complex natural material is required for enrichment such as unchopped straw, compost, earth or a mixture of these.

EU LEGISLATION ON THE PROVISION OF ENVIRONMENTAL ENRICHMENT IS POORLY ENFORCED AND MANY PIGS ARE REARED IN BARREN PENS ON SLATTED FLOORS

The legislation on provision of manipulable materials is poorly enforced. Food and Veterinary Office (FVO) inspection reports reveal that in many countries the provision of manipulable materials is not strictly monitored or unsuitable materials such as chains are accepted as suitable enrichment (FVO, 2005a-f, 2006a-e, 2007a-e) and in some cases the transposition of the relevant requirements into national legislation has been significantly delayed (FVO, 2005g, 2006f) or is incomplete (FVO, 2005h). An investigation of 60 pig farms in Germany, Spain, The Netherlands, Hungary

and the UK, carried out by Compassion in World Farming, found no or inadequate environmental enrichment on over one third of farms visited in the UK and between 70 and 100% of farms visited in the other countries (Compassion in World Farming, 2008).

A survey of housing systems for pigs in Europe in the late 1990s indicated that the majority of weaned piglets (over 80%) and growing/finishing pigs (over 90%) in the countries surveyed were housed in partially- or fully-slatted systems with no or restricted straw (Hendriks and van de Weerdhof, 1999). Of the countries surveyed, only the UK had a significant proportion of both weaned pigs (40%) and growing/finishing pigs (35%) housed in systems with straw. Although there is no independently verified information available on the current level of straw provision for pigs in the UK, the British Pig Executive estimates that 65% of finishing pigs in the UK are now reared in systems with some degree of straw provided on the pen floor (BPEX, reported in FAWC, 2008). Bedding is required by legislation for all pigs in Sweden.

The prohibition of fully-slatted floors for the housing of pigs in the EU is essential to ensure that proper environmental enrichment can be provided. The use of fully-slatted floors for pigs reared for meat is prohibited in Sweden and Norway and is being phased out by legislation in Denmark (by 2015) and Switzerland (by 2018).

PIGS ARE OFTEN REARED IN SEVERELY OVERCROWDED CONDITIONS - CURRENTLY PERMITTED SPACE ALLOWANCES FOR PIGS REARED FOR MEAT IN THE EU ARE MUCH TOO LOW

3.1.4 Space allowance

Inadequate space allowance also contributes to stress and increased levels of aggression and harmful social behaviours. High stocking density, especially when associated with lack of enrichment and fully-slatted floors, increases the risk of tail biting (AHAW, 2007b).

Minimum space allowances for pigs should be adequate to allow for:

- Separation of lying and dunging areas – adequate space is necessary to minimise lying in the dunging area and fouling of the lying area, which is important in maintaining good hygiene and minimising the risk of disease;
- Comfort and thermoregulation, e.g. by adopting a fully-recumbent lying position (lateral lying) avoiding contact with other pigs;
- A range of activities including standing, lying in various positions, walking to resources even at times when all other pigs are lying down, exploratory behaviour, and social interaction including escaping from aggression.

The relationship between body size and physical space occupied is not linear but can be described by the equation $A = kW^{2/3}$ where A is the floor area in m^2, W is the body weight in kg, and k is a numeric constant which varies according to the body posture of the animal (Petherick, 1983).

Space allowances currently permitted in the EU are so low that they are likely to adversely affect the performance of pigs. Gonyou *et al.* (2006) investigated floor space requirements of nursery and grower-finisher pigs in partially- and fully-slatted systems and found that the critical k value, below which average daily weight gain started to decrease was 0.0348. Current legal minimum space allowances in the EU commonly fall below this value of k (Table 3.1). Even these inadequate space allowances are often poorly enforced. FVO inspection reports reveal that in many countries accurate measurements are not taken during checks, or obstructions such as feeding troughs are

included in the measurements (FVO, 2005b, 2005e, 2005g, 2005h, 2006a, 2006b, 2006c, 2006e, 2006g, 2006h, 2007e, 2007f). A number of European countries, including Sweden, Germany, Norway and Switzerland, have set greater minimum space allowances than those required under EU legislation for most weight classes of pigs reared for meat.

It is likely that the welfare of pigs will be adversely affected by a lesser degree of crowding than that necessary to adversely affect their performance. Meunier-Salaün *et al.* (1987) investigated the performance, behaviour and physiology of growing-finishing pigs housed at 0.34m², 0.68m² and 1.01m² per pig. The authors suggest that their results could be interpreted as indicating chronic stress in pigs housed at the lowest space allowance and that their findings demonstrate that behavioural and physiological responses are earlier and more sensitive indicators of adaptation to the environment than productivity.

Beattie *et al.* (1996) investigated the effects of space allowance and enrichment on the behaviour of pigs between 6 and 12 weeks of age. They found that a space allowance of 0.5m² per pig reduced exploratory behaviour and increased time spent standing inactive compared with a space allowance of 1.1m² or more per pig in pens enriched with peat and straw. The authors reported that pigs kept in an enriched environment with a space allowance of 0.5m² per pig were greatly restricted in their use of the substrates and therefore their behaviour was more similar to the behaviour of pigs in a barren environment.

Table 3.1 Space allowances per animal for weaner and rearing pigs: Comparison of space allowances required by EU legislation (under Council Directive 91/630/EEC) and calculated according to a k value of 0.047 (necessary for all animals to be able to lie fully-recumbent simultaneously – see text for explanation).

At space allowances equivalent to k values below 0.047, all animals are not able to lie fully-recumbent simultaneously. For comparison, k values at legal minimum space allowances are presented.

Live weight (kg)	Space (m²)		k value at legal min. space allowance
	Legal min.	k = 0.047	
Up to 10	0.15	0.22	0.032
Over 10 up to 20	0.20	0.35	0.027
Over 20 up to 30	0.30	0.46	0.031
Over 30 up to 50	0.40	0.65	0.029
Over 50 up to 85	0.55	0.92	0.028
Over 85 up to 110	0.65	1.10	0.028
More than 110	1.00	>1.10	<0.043
e.g. 120	1.00	1.16	0.040
e.g. 130	1.00	1.23	0.038
e.g. 140	1.00	1.29	0.036

Petherick and Baxter (1981) calculated that the space required for pigs to lie laterally recumbent is equivalent to k = 0.047. Space allowances currently permitted in the EU are significantly lower than this (equivalent to a k value of between 0.027 and less than 0.043 – see Table 3.1) and therefore do not provide sufficient space for all pigs to lie fully-recumbent simultaneously. The EU Scientific Veterinary Committee recommended that minimum space allowances for pigs should be calculated according to k = 0.047 (SVC, 1997) and the EU Scientific Panel on Animal Health and Welfare recommends that minimum space allowances based on k = 0.047 are necessary for pigs to be able to thermoregulate adequately at temperatures that may exceed 25°C (AHAW, 2005).

In practice, most pigs are currently housed at a temperature close to the upper limit of their comfort zone and, particularly during the summer months, are at risk of being kept at temperatures above their range of comfort and thermoneutrality (Webster, 1995). It is therefore important that all pigs are provided with sufficient space to allow all animals to lie fully-recumbent avoiding contact with other pigs.

The opportunity to wet the skin through the provision of wallows or showers is also important to allow pigs to thermoregulate adequately at higher temperatures, especially for heavier pigs (AHAW, 2007a). AHAW (2007c) recommends that pigs should be provided with wallows. In Denmark, showering facilities are compulsory for all pigs above 20kg.

Since a space allowance calculated according to k = 0.047 is based on the space required for all pigs to lie fully-recumbent simultaneously, this minimum space requirement should apply to the lying area of the pen, which should be entirely composed of solid flooring, and additional space should be provided for feeding, dunging, wallowing/showering and other activities.

Indeed, some studies suggest that welfare may still be compromised at space allowances calculated according to k = 0.047 and that welfare can be improved at higher space allowances. For example, Turner *et al.* (2000) investigated the effects of stocking density on aggression and immune competence of growing pigs housed on deep straw at two different group sizes. The pigs grew from around 30kg body weight at the start of the experiment to around 60kg at the end of the experiment six weeks later. The authors compared stocking densities of 50kg/m^2 (equivalent to around 0.6m^2 per pig or a k value of 0.061 at 30kg and 1.2m^2 per pig or a k value of 0.077 at 60kg) and 32kg/m^2 (equivalent to around 0.9m^2 per pig or a k value of 0.092 at 30kg and 1.9m^2 per pig or a k value of 0.122 at 60kg). For comparison, a k value of 0.047 is equivalent to 0.46m^2 per pig at 30kg and 0.73m^2 per pig at 60kg. Thus both of the stocking densities considered in this study offered more space than that provided by a k value of 0.047 (and considerably more space than the current legal minimum). Independent of group size, the authors found higher lesion scores and suppressed immune response in pigs provided with the lower space allowance, suggesting that the smaller space allowance increased stress and aggression, possibly because of the difficulty in escaping from the immediate vicinity of an aggressor or interference leading to inconclusive results of a fight and the need for future aggression.

The EU Scientific Panel on Animal Health and Welfare states: "For pigs of up to 110kg, aggression, skin lesions, tail-biting and responses to adrenal challenge tests, all increased with decreasing space allowance in the range equivalent to k = 0.024 to 0.060, in particular up to 0.048" (AHAW, 2005).

From the evidence presented above, it is clear that currently permitted minimum space allowances under EU legislation are much too low. The minimum solid-floored lying area should be sufficient to allow all pigs to lie fully-recumbent without contacting other pigs. Evidence presented in sections 3.1.1 and 3.1.2 indicates that, in order to meet the behavioural needs of pigs, the majority of this lying area should be covered with a thick layer of complex natural enrichment material, sufficient to act as bedding. This minimum bedded area should also be defined by the Directive. Any slatted area provided for dunging and/or showering should be in addition to the minimum solid and bedded floor areas.

3.1.5 Conclusions and recommendations on the housing of pigs reared for meat

- **Current EU legislation regarding environmental enrichment, flooring and space allowances is inadequate to protect the welfare of pigs and is poorly enforced;**
- **Currently permitted space allowances are much too low and should be significantly increased. The minimum area of solid floor provided should be sufficient for all pigs to lie simultaneously in a fully-recumbent position without contacting other pigs;**
- **This solid floor area should be mostly covered with a thick layer of enrichment material, sufficient to act as bedding, and fresh material should be added regularly. The wording of the Directive should be strengthened to ensure that complex natural material, which is ingestible or contains edible parts, is required for enrichment, such as unchopped straw, compost, earth or a mixture of these;**
- **Pigs should have access to wallows or showers;**
- **Only housing systems which are capable of meeting the requirements for enrichment should be permitted. For this reason, the use of fully-slatted floors should be prohibited. Any slatted floor area provided for dunging and/or showering should be in addition to the minimum solid and bedded floor areas.**

3.2 Mutilations

3.2.1 Tail docking and tooth clipping or grinding

The majority of piglets in the EU are routinely subjected to a number of mutilations, usually without any anaesthesia or analgesia, including tail docking and tooth clipping or grinding, which are known to cause pain in piglets (AHAW, 2007d). Piglets show behavioural changes indicative of pain following tail docking, including tail wagging (flicking the tail from side to side or up and down), tail jamming (clamping of the tail stump between the hind limbs) and vocalisation (Noonan *et al.,* 1994; Sutherland *et al.,* 2008). In addition to acute pain, docked pigs may suffer from long-term pain associated with neuroma formation (AHAW, 2007e).

THE PRACTICE OF TAIL DOCKING HAS INCREASED AS A RESULT OF INCREASED PROBLEMS WITH TAIL BITING FOLLOWING THE INTENSIFICATION OF PIG PRODUCTION AND THE ADOPTION OF SLATTED FLOORING

The practice of tail docking has increased as a result of increased problems with tail biting following intensification of pig production and the adoption of slatted flooring (AHAW, 2007e). From the evidence presented in section 3.1, it is clear that tail biting can be addressed by ensuring that pigs are provided with an appropriate environment. The results of numerous studies indicate that when pigs with intact tails are fed an adequate diet, provided with sufficient water, provided with straw or other manipulable materials, or earth for rooting, and kept at a stocking density which is not too high, tail biting is seldom serious (AHAW, 2007e). There is also evidence that early housing conditions may affect levels of tail biting later in life (*Ibid.*). For example, Moinard *et al.* (2003) found that tail biting was less likely on farms where straw was provided in the farrowing environment.

In order to avoid problems with tail biting:

- Complex natural enrichment material, such as straw, compost, earth or a mixture of these, should be provided in a thick layer across the majority of the floor area of the pen to ensure all pigs can engage in exploratory and foraging behaviour throughout the day;
- Pigs should be provided with adequate space;
- Fully-slatted floors should not be used;
- Enrichment should be provided in the farrowing environment.

The teeth of young piglets are innervated and clipping the teeth without anaesthesia causes acute pain (SVC, 1997; AHAW, 2007d). Piglets show behavioural responses to tooth clipping, which are indicative of pain and distress. These responses include vocalisation during the procedure and teeth champing (frequent opening and closing of the mouth) in the minutes following the procedure (Noonan et al. 1994; Rand et al. 2002).

There is also evidence for long-term pain following tooth clipping. Hay *et al*. (2004) found that tooth clipping leads to pulp cavity opening, fracture, haemorrhage, infiltration or abscess, and osteodentine formation. The authors conclude that most of the observed alterations are known to cause severe pain in humans and it is therefore likely that tooth clipping induces severe pain in piglets. They also note that opening of the pulp cavity creates an opening for bacterial entry, which may lead to further health disorders, and recommend that the rationale of this practice should be re-evaluated.

Similarly, Prunier *et al*. (2002) conclude that in addition to short-term pain, pigs are likely to experience long-term pain from the tooth abnormalities that occur following clipping and that this pain is likely to last until the

milk teeth are lost and replaced with permanent teeth, a period of 50 to 120 days. This means that many pigs reared for meat may experience pain as a result of tooth clipping throughout their entire life.

Tooth grinding may be used to remove the sharp tip of the teeth as an alternative to tooth clipping. Tooth grinding still constitutes a significant mutilation. Hay *et al*. (2004) report that all of the histological alterations associated with pain that occur following tooth clipping also occur following grinding, although most of the effects appeared sooner and were of greater magnitude after clipping than after grinding. Prunier *et al*. (2002) also report that grinding, as well as clipping, results in many tooth abnormalities.

Tooth clipping or grinding is performed in an attempt to reduce injuries to sows' teats and to other piglets. However, AHAW (2007d) notes that the incidence of injuries to sows' teats is similar whether piglets' teeth are shortened or left intact. Gallois *et al*. (2005) conclude that overall, tooth clipping or grinding has very little effect on sow mammary injuries and litter performance.

A piglet's sharp canine and incisor teeth are designed, from birth, to enable them to compete for the best teats (Fraser and Thompson, 1991). Competition for access to teats is increased in larger litters (AHAW, 2007d). Limiting litter size to that which can be fully sustained by the sow is therefore important to minimise competition between piglets and hence the risk of injuries. AHAW (2007f) recommends that genetic selection should not aim at exceeding an average of 12 piglets born alive per litter.

Competition at the udder is also affected by sow health and milk production (AHAW, 2007d). Providing enrichment and adequate space in the farrowing environment has a beneficial effect on sow health and welfare and consequently on milk production. Algers *et al*. (1990) found that sows provided with straw performed more rapid suckling grunts during nursing, which are associated with oxytocin release and milk let down. Milk production is likely to be increased in farrowing systems that allow the sow freedom of movement, both as a general consequence of improved welfare and comfort leading to higher feed intake (Dunn, 2005) and from a reduction in the incidence of specific conditions affecting lactation. For example, mastitis-metritis-agalactia (MMA) is a common lactation failure syndrome in sows. MMA is rare in pasture-based systems and the incidence of MMA in indoor systems is significantly higher in sows confined in farrowing crates compared with loose-farrowing systems (AHAW, 2007d).

Provision of enrichment and adequate space in the farrowing environment also directly influences piglet behaviour. Lewis *et al*. (2006) found that enrichment of the farrowing environment with shredded paper tended to reduce both teat lesions and piglet facial lesions. Piglets with paper spent less time inactive or manipulating pen fittings and more time interacting with the enrichment. Hvozdik *et al*. (2002) found that piglets housed in small pens (3.6m^2 or 6.8m^2, where the sow could not move freely) showed abnormal development of agonistic behaviour compared with piglets in larger pens (29m^2, allowing free movement of sow). Piglets in the small pens showed increased levels of aggression, including biting of other piglets.

Verhovsek *et al*. (2007) found that sows in farrowing crates had more severe injuries to the udder compared with sows in farrowing pens, and that the high level of severe lesions toward the rear of the udder was caused by abrasions from the sows' hind limbs as a result of restriction when getting up and lying down, in combination with slatted flooring. A number of studies indicate that tooth clipping is not necessary in outdoor farrowing systems (Brown *et al.*, 1996; Delbor, 2000).

Considering the severe pain and other negative impacts on the welfare of piglets caused by tooth clipping or grinding, together with the poor welfare of sows confined in farrowing crates (see section 4.2), tooth clipping and grinding should be prohibited and injuries to sows' teats and other piglets should instead be minimised by providing adequate space and enrichment in the farrowing environment and by limiting litter size to that which can be fully sustained by the sow.

Since 2003, routine tail docking and tooth clipping or grinding are prohibited in the EU. Commission Directive 2001/93/EC states: "Neither tail docking nor reduction of corner teeth must be carried out routinely but only where there is evidence that injuries to sows' teats or to other pigs' ears or tails have occurred. Before carrying out these procedures,

other measures shall be taken to prevent tail biting and other vices taking into account environment and stocking densities. For this reason inadequate environmental conditions or management systems must be changed."

However, survey data from 19 EU countries suggest that over 90% of pigs in the EU are tail-docked (AHAW, 2007e). Tail docking is prohibited in Sweden, Finland, Norway and Switzerland. Tooth clipping is also performed on the majority of piglets in most EU countries (PIGCAS, 2008). Tooth clipping is not performed on a significant proportion of piglets in Sweden, Finland and Italy (*Ibid*). Tooth clipping is prohibited in Denmark, Germany, Norway and Switzerland, although tooth grinding is still permitted in these countries.

It is clear that both tail docking and tooth clipping or grinding continue to be performed routinely in the majority of EU countries. It is also clear that steps to improve the environment by providing adequate space and enrichment are often not taken (see sections 3.1.3 and 4.2). Current legislation on tail docking and tooth clipping or grinding is widely ignored and must be strengthened to completely prohibit these operations for non-therapeutic reasons.

3.2.2 Castration

The quality of meat from some entire male pigs can be affected by 'boar taint', an odour and/or taste that some consumers find unpleasant. A number of compounds are though to be involved in the development of boar taint, primarily androstenone and skatole. Androstenone is a male sex pheromone produced by the testes in sexually mature male pigs. Skatole is produced in the hind-gut of both male and female pigs. Skatole levels increase at puberty and tend to be higher in entire males; levels can also be increased if pigs wallow in excreta (AHAW, 2004a). In the absence of normally functioning testes, boar taint is rarely a problem unless pigs are kept in conditions heavily fouled with their urine and faeces or if they are fed certain foods such as yeast from breweries (*Ibid.*).

Surgical castration is commonly performed to reduce the incidence of boar taint. The vast majority of male pigs are castrated in most European countries. 90 to 100% of male pigs are castrated in Austria, Belgium, Bulgaria,

THE MAJORITY OF MALE PIGLETS ARE CASTRATED IN MOST EU COUNTRIES, USUALLY WITHOUT ANY ANAESTHETIC OR PAIN RELIEF

Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Italy, Latvia, Lithuania, Luxembourg, Malta, The Netherlands, Slovakia, Slovenia and Sweden. Based on data for 26 EU countries, around 100 million male pigs are castrated in the EU27 each year, representing around 80% of male pigs produced in the EU (Table 3.2).

The risk of boar taint is greater when pigs are reared to higher slaughter weights. In several countries it is common for castration to be avoided by rearing entire males to lower slaughter weights. Around a fifth of male pigs in Poland, around a quarter in Greece, the majority in Portugal, Spain and Cyprus, and almost all in the UK and Ireland, are not castrated (Table 3.2).

Table 3.2 Prevalence of castration of male pigs in the EU.

Numbers of male pigs are assumed to be 50% of total pig slaughterings from Eurostat (accessed 30/12/08). Mean carcass weights are calculated from Eurostat (accessed 30/12/08). Proportions castrated are taken from the survey reported in PIGCAS (2008) except where stated otherwise. Proportion castrated in the EU27 is estimated based on data for 26 countries (which represent over 97% of EU pig production).

Country	Mean carcass weight (2007)	Estimated male pigs slaughtered – 2007 (head)	Estimated % males castrated	Estimated number of pigs castrated
Austria	94.8	2 799 580	100	2 799 580
Belgium	94.7	5 611 513	98	5 499 283
Bulgaria	68.9	299 343	*92	275 396
Cyprus	81.0	339 39	39	132 366
Czech Republic	88.6	2 033 048	100	2 033 048
Denmark	84.3	10 692 302	95	10 157 687
Estonia	79.3	238 173	100	238 173
Finland	87.2	1 223 166	98	1 198 703
France	88.7	12 865 190	98	12 607 886
Germany	93.5	26 655 422	100	26 655 422
Greece	62.5	972 604	76	739 179
Hungary	92.8	2 690 801	97	2 610 077
Ireland	78.5	1 307 500	0	0
Italy	117.9	6 797 803	100	6 797 803
Latvia	76.8	263 265	100	263 265
Lithuania	78.7	631 085	91	574 287
Luxembourg	67.5	73 496	100	73 496
Malta	85.0	47 145	**100	47 145
Netherlands	90.9	7 093 500	98	6 951 630
Poland	84.5	12 372 146	82	10 145 160
Portugal	63.0	2 888 858	11	317 774
Slovakia	94.6	601 423	92	553 309
Slovenia	81.9	202 656	96	194 550
Spain	82.9	20 744 272	33	6 845 610
Sweden	88.2	1 502 058	95	1 426 955
UK	77.9	4 741 866	2	94 837
Total (26 countries)	-	125 687 614	79	99 232 621
EU27	88.5	128 654 110	79	101 636 747

* Data from Causeur *et al.* (2003)
** Assumption from AHAW (2004a)

Surgical castration represents a serious welfare insult and should be prohibited. Research confirms that castration is painful. Most piglets vocalise when restrained but piglets who are castrated emit more high frequency calls and these calls are of higher intensity and of longer duration than in sham-castrated piglets (Weary *et al.,* 1998; Taylor and Weary, 2000; Marx *et al.,* 2003; Puppe *et al.,* 2005). Puppe *et al.* (2005) conclude that the observed changes of acoustical parameters during surgical castration can be interpreted as vocal indicators for experienced pain and suffering.

Following castration, piglets also show behavioural changes indicative of pain, including trembling, spasms, stiffness, prostration, huddling up, avoidance of certain postures, tail wagging and scratching the rump, and some of these behaviours persist for several days following the procedure (Hay *et al.,* 2003; Moya *et al.,* 2008). These studies also found that castrated piglets tend to show reduced social cohesion. Castrated piglets were more often isolated and their behaviour more often desynchronised compared with their littermates (e.g. sleeping while other piglets are suckling). Hay *et al.* (2003) comment that isolation and desynchronisation may result from the prostration induced by pain and/or may be a protective reaction to avoid contact with littermates that could potentially cause further pain.

Castration results in significant increases in adrenocorticotropin hormone (ACTH), lactate and cortisol, indicative of stress and tissue damage (Prunier *et al.,* 2005). There are also some indications that surgical castration may compromise the long-term health of pigs (AHAW, 2004a). De Kruijf and Welling (1988) reported that pneumonia, chronic pleurisy and chronic pericarditis were found more frequently in castrates than in entire males and suggested that immunosuppression occurs in castrated males.

The pain caused by castration can be reduced by the use of anaesthesia and analgesia. Injection of local anaesthetic into the testis is likely to be associated with some pain. However, a number of studies indicate that overall pain response to castration is significantly reduced by the use of local anaesthetic. Marx *et al.* (2003) found that piglets castrated without anaesthesia produced almost double the number of screams as piglets castrated using local anaesthesia with lidocaine (intratesticular injection) or restrained without castration. Horn *et al.* (1999) reported that local anaesthesia with lidocaine (intratesticular injection or intratesticular injection combined with subcutaneous infiltration of the anaesthetic into the tissue around the spermatic cord) reduced resistance movements during the castration procedure, including during the cutting of the spermatic cord, which is considered to be the most painful part of the procedure (Taylor and Weary, 2000).

The EU Scientific Panel on Animal Health and Welfare recommends that "local anaesthesia should be used for castration of piglets" and that "[a]nalgesia should be used to prevent pain in piglets which are castrated" (AHAW, 2004b).

The Panel considered that it was "not possible to recommend a method of general anaesthesia for pigs undergoing castration at the present time". However, further research on the use of general anaesthetics for piglet castration has been conducted since the publication of this opinion.

Walker *et al.* (2004) found that inhalation anaesthesia with isoflurane or isoflurane/nitrous oxide was effective in reducing reaction to castration and provided a safe, short, reliable method of anaesthesia for piglets undergoing castration. The authors report that induction was smooth without excitation, fear, hyperventilation or gasping. Similarly, Hodgson (2006) investigated the use of isoflurane delivered in a novel inhaler (consisting of a mask, centre body with open-close valve, vaporisation chamber with wick and injection port, and a re-breathing bag) and concluded that this method has the potential to provide economical, safe, rapid anaesthetic induction and safe, smooth recovery in piglets. In a further study, Hodgson (2007) concluded that both isoflurane or sevoflurane, delivered in a novel inhaler, could provide economical, safe, rapid anaestheic induction and maintenance with optimal conditions for castration and rapid, smooth recovery. Schultz *et al.* (2007) concluded that isoflurane anaesthesia was effective in reducing the stress response (as measured by catecholamine concentrations) following castration. Axiak *et al.* (2007) found that a combination of ketamine, climazolam and azaperone administered by intramuscular injection provided effective anaesthesia for piglet castration, although the recovery time is much longer than with isoflurane.

In terms of animal welfare, it is preferable for anaesthetic to be administered by a veterinarian. Currently in the EU, the methods of anaesthesia described above can only be used by a veterinarian. However, methods of anaesthesia that can be used by farmers are likely to be preferred by the industry. For this reason, there is interest in some EU countries in the adoption of systems for carbon dioxide anaesthesia of piglets during castration. Research in The Netherlands found that in general piglets were effectively anaesthetised using a mixture of 70% CO_2 and 30% oxygen, although some piglets did show a reaction during castration (Kluivers-Poodt *et al.,* 2008). Dutch companies have developed anaesthetising devices using this mixture, which are considered to meet the necessary technical and practical criteria for use on farm (*Ibid*.). However, CO_2 is known to be aversive to pigs (Raj and Gregory, 1995). Kohler *et al.* (1998) report that violent struggling and vocalization were elicited by CO_2 and that, although a mixture of 80% CO_2 and 20% O_2 was effective in producing profound surgical anaesthesia and eliminating behavioural reactions during the castration procedure, the stress response (indicated by elevated ACTH and β-endorphin plasma concentrations) was significantly greater following castration with CO_2 anaesthesia than following castration without anaesthesia. The authors conclude that it does not therefore seem reasonable to advocate an anaesthetic regimen for the castration of piglets which is more stressful for the animals than castration without anaesthesia.

In most EU countries, anaesthesia is not used or is very seldom used for castration of piglets (PIGCAS, 2008). In Lithuania, Hungary, Poland and Slovakia, anaesthesia is routinely used on some farms. Where anaesthesia is used, different variants of local anaesthesia using lidocaine are the most common methods. General anaesthesia by injection (ketamine, azaperone, methomidata, mopenthium natricum or pentobarbital) may also be used. Whichever method of anaesthesia is used, prolonged analgesia is essential to reduce pain and discomfort in the days following castration. The use of analgesia following castration is even less common in the EU than the use of anaesthesia (PIGCAS, 2008).

Commission Directive 2001/93/EC permits castration of male piglets only by methods that do not involve tearing of tissues and requires that where castration is performed after the seventh day of life, it must be carried out by a veterinarian and must be performed under anaesthetic with additional prolonged analgesia.

The EU Scientific Panel on Animal Health and Welfare states: "it is impossible to surgically castrate a male pig without tearing tissues... It is clear therefore, that on this point the Directive is being widely ignored" AHAW (2004b).

It is also apparent from a questionnaire survey of piglet castration practice in Europe that in some countries it is common for piglets to be castrated after seven days of age without the use of anaesthesia or analgesia (PIGCAS, 2008). Castration of female pigs for non-therapeutic reasons is not permitted under EU law. However, a small number of producers in some EU countries routinely castrate female pigs and this is generally performed without anaesthesia or analgesia (PIGCAS, 2008).

Taylor *et al.* (2001) investigated the responses of piglets to castration at 3, 10 or 17 days of age and concluded that the pain caused by castration is not affected by age. AHAW (2004b) concludes that there are no clear data demonstrating that pain perception related to surgical castration is lower in pigs younger than seven days of age. There is therefore no justification for the current situation where EU legislation does not require anaesthesia and analgesia for piglets castrated up to seven days of age. Castration of piglets without anaesthesia at any age is prohibited in Norway and will be prohibited in Switzerland from 2010. In Norway, local anaesthetic is used and must be administered by a veterinarian. In Switzerland, farmers will be permitted to use isoflorane as a general anaesthetic.

Whilst appropriate anaesthesia and prolonged analgesia are able to reduce the pain and stress associated with castration, it is preferable to avoid surgical castration altogether. Boar taint is rarely a problem if entire male pigs are slaughtered earlier before they reach sexual maturity. Methods of rearing entire male pigs to higher slaughter weights without unacceptable levels of boar taint could also be developed. Boar taint in entire male pigs can be reduced by various feeding and management practices and by genetic selection. Skatole levels

can be reduced by modulating nutrition, feeding, rearing and management (including hygienic) conditions, whereas genetic selection is more efficient at lowering androstenone levels, and both compounds can be reduced by measures that delay or suppress sexual development (AHAW, 2004a). There is evidence that feeding high-fibre diets (which is also likely to help in the prevention of gastric ulcers – see section 3.1.1) and the use of certain feed ingredients can reduce boar taint (*Ibid.*). Provision of wallows or showers is also important to avoid pigs wallowing in excreta.

When entire males are reared in confinement systems, aggression and mounting behaviour can be a problem and hence the rearing of entire males may require improved standards for space, floor quality, enrichment and pen layout (AHAW, 2004a). Avoidance of mixing is also beneficial. Rearing entire males in sibling groups from birth to slaughter reduces aggression (Fredriksen *et al.,* 2008) and boar taint (AHAW, 2004b). Rearing entire males requires careful management but has advantages in terms of improved growth rate and feed conversion, increased leanness of the carcass and a reduction in waste (AHAW, 2004a). Electronic methods of detecting boar taint in carcasses are being developed to facilitate easy and rapid identification of tainted carcasses. Further development of pork processing techniques to mask taint would also be beneficial.

An alternative to surgical castration is immunization against gonadotropin-releasing hormone (GnRH), known as immunocastration. The vaccine is administered via two injections several weeks apart and can be applied during the latter stages of production. Immunocastration is effective in reducing boar taint, whilst partially retaining the production advantages of entire male pigs (Zeng *et al.,* 2002; Cronin *et al.,* 2003; Jaros *et al.,* 2005; Zamaratskaia *et al.,* 2008). Sexual behaviour and aggression are also reduced by immunocastration (Cronin *et al.,* 2003). Zamaratskaia *et al.* (2008) conclude that immunocastration offers advantages over surgical castration through improved animal welfare and better carcass quality.

Immunocastration is commonly used in Australia. It is licensed for use in Switzerland and is expected to be licensed for use in the EU in 2009. Prunier *et al.* (2006) advise that consumers may be reluctant to accept immunocastration. However, a survey in Sweden indicated that consumers would be willing to pay more for pork from immunocastrated pigs compared with the present situation with surgically castrated male pigs (Lagerkvist *et al.,* 2006). The authors conclude: "Immunocastration provides several potential public as well as agribusiness advantages over surgical castration, including animal welfare improvements, potential cost savings in procedures, and gains from higher growth rates for pigs. Our findings suggest that immunocastration is a socially viable alternative. Therefore, the abolition of surgical castration of pigs should be supported."

Taylor and Weary (2000) conclude that rather than focusing on pain control, welfare problems associated with castration may be better reduced by using non-surgical approaches (e.g. immunocastration) or by eliminating the need for castration by rearing entire males to lighter slaughter weights or selecting boars for slightly later sexual maturity.

The use of lower slaughter weights or immunocastration may not be 100% effective in eliminating boar taint. However, even among surgically castrated males, the proportion of carcases affected by boar taint is significant (AHAW, 2004a). Given the serious welfare implications of surgical castration, the rearing of entire males to lower slaughter weights would appear to be the best immediate solution to avoid surgical castration of piglets, as is already the case in several EU countries.

Where pigs continue to be reared to higher slaughter weights, immunocastration could be adopted to replace surgical castration, at least as an interim measure until methods of rearing entire male pigs to higher slaughter weights without unacceptable levels of boar taint have been developed. There are clear welfare benefits from the use of immunocastration over surgical castration, although it would be important to keep the welfare aspects of immunocastration under review. Consideration could also be given to slaughtering males earlier and rearing only females to higher slaughter weights. In the longer term, genetic selection of males for reduced levels of boar taint and/or slightly later sexual maturity could offer a potential solution for pigs reared to higher slaughter weights. Sperm-sorting technology could also be developed to allow the production of predominantly female pigs.

Summary of short- and long-term solutions to improve the welfare of pigs in relation to castration:

- Entire males should be reared to lower slaughter weights to minimise boar taint without the need for castration;
- Steps should be taken to minimise boar taint and aggression in entire males, including rearing in litter groups, modifying feeding practices and providing adequate space, opportunities to wallow other than in excreta, and a thick layer of complex natural enrichment material, sufficient to act as bedding, covering the majority of the floor area of the pen;
- Where pigs are reared to higher slaughter weights, immunocastration should be used in preference to surgical castration and consideration should be given to slaughtering males earlier and rearing only females to higher slaughter weights;
- At the very least, as an interim measure for any pigs undergoing surgical castration, methods of anaesthesia which have been demonstrated to be effective in reducing pain and stress responses of piglets to castration should be adopted without delay, in combination with prolonged analgesia. The method of anaesthesia should be chosen on the basis that it, in itself, does not cause further welfare issues.

In the longer term:

- Genetic selection of males for reduced levels of boar taint and/or slightly later sexual development could allow entire males to be reared to higher slaughter weights;
- Further development of feeding strategies to reduce boar taint could also be useful in allowing entire males to be reared to higher slaughter weights;
- Electronic methods of detecting boar taint in carcasses are being developed to facilitate easy and rapid identification of tainted carcasses;
- Further development of pork processing techniques to mask taint would also be beneficial;
- Development of sperm-sorting technology could allow the the use of sexed semen for the production of predominantly female pigs.

3.2.3 Conclusions and recommendations on mutilations

- **Current EU legislation regarding tail docking and tooth clipping or grinding is inadequate to protect welfare and is poorly enforced. Despite a ban on routine tail docking and tooth clipping or grinding in the EU since 2003, these procedures continue to be performed routinely in most EU countries;**
- **Tail docking and tooth clipping or grinding are painful and are unnecessary if pigs are kept in appropriate conditions. The wording of the Directive should be strengthened to completely prohibit tail docking and tooth clipping or grinding for non-therapeutic reasons;**
- **Tail biting and injuries to sows' teats and other piglets should be minimised by providing adequate space and enrichment and avoiding the use of fully-slatted floors in both the rearing and farrowing environments, and by limiting litter size to that which can be fully sustained by the sow;**
- **Current EU legislation regarding piglet castration is also inadequate to protect welfare and is poorly enforced;**
- **Surgical castration results in significant pain and stress and should be prohibited;**
- **Entire male pigs could be reared to lighter slaughter weights to minimise boar taint in carcasses, as is already the case in several EU countries;**
- **Where pigs continue to be reared to higher slaughter weights, the use of immunocastration is preferable to surgical castration, at least as an interim measure until methods of rearing entire male pigs to higher slaughter weights without unacceptable levels of taint have been developed. Consideration could also be given to slaughtering males earlier and rearing only females to higher slaughter weights;**
- **At the very least, as an interim measure for any piglets undergoing surgical castration, methods of anaesthesia that have been demonstrated to be effective in reducing pain and stress responses, in combination with prolonged analgesia, should be required for all piglets;**

4. WELFARE OF BREEDING SOWS

4.1 Housing of pregnant sows

4.1.1 The impact of confinement in stalls on the welfare of sows

It is well established that keeping sows in individual stalls causes suffering. Stalls severely restrict the movement of sows, to the extent that they have difficulty lying down and standing up (AHAW, 2007f). Confined sows show increased levels of stereotypies, urinary tract infections, unresolved aggression and inactivity associated with unresponsiveness (suggesting that sows may be depressed in the clinical sense), reduced muscular and bone strength and cardiovascular fitness (SVC, 1997; AHAW, 2007d).

IT IS WELL ESTABLISHED THAT CONFINING SOWS IN INDIVIDUAL STALLS CAUSES SUFFERING

The extensive evidence that individual housing in stalls is detrimental to the physical and psychological well-being of sows and the clear welfare advantages of housing sows in groups led to an EU Directive prohibiting individual stalls for the housing of pregnant sows from 1 January 2013. However, the period from weaning to four weeks after service is excluded from this prohibition. Council Directive 2001/88/EC states: "Sows and gilts shall be kept in groups during a period starting from 4 weeks after the service to 1 week before the expected time of farrowing."

The use of sow stalls is already limited or prohibited by legislation in several European countries, including the UK, Sweden, Finland, Norway and Switzerland. However, in the EU as a whole, individual housing in stalls remains the most widely used housing system for sows during gestation (AHAW, 2007d).

Housing sows in stalls until four weeks after service exposes them to the same welfare hazards as confinement during the remaining gestation period, including frustration, stress and restricted movement (AHAW, 2007d). Sows are highly active, restless and motivated for social contact during the pre-oestrus period (from around three to four days after weaning and the following four to five days), and during the two to three days of oestrus sows engage in high levels of social activity including sniffing, flank nosing and mounting other sows as well as standing in front of the boar if he is present; aggression is hardly ever observed during this period (Pedersen *et al.,* 1993; Pedersen, 2007). This activity is part of the natural oestrus behaviour of sows and when sows are confined during this period this strong motivation cannot be expressed (AHAW, 2007d).

The EU Scientific Panel on Animal Health and Welfare concludes: "Housing of sows in individual stalls from weaning and until 4 weeks after mating severely restricts their freedom of movements and causes stress. Further it does not allow sows to move and socially interact during a period of the reproductive cycle where they are highly motivated to do so" (AHAW, 2007f) and "on the basis of established knowledge, group housing from weaning seems to imply a number of welfare advantages" (AHAW, 2007d).

4.1.2 The impact of stress on reproductive performance of sows and design and management of group housing systems to minimise stress

The rationale for the exclusion of the period from weaning to four weeks after service from the requirement for group housing is concern that stress caused by mixing sows during this period may be detrimental to oestrus expression, pregnancy rate and embryo development and survival.

However, a number of recent studies have found no adverse effects of mixing on reproductive performance. For example, van Wettere *et al.* (2008) found no adverse effects on ovulation and pregnancy rate or embryo development and survival when group-housed, mated gilts were remixed on days 3/4 or 8/9 of gestation compared with gilts kept in stable groups or housed individually in stalls. The authors conclude that individually housing gilts immediately after insemination did not improve embryo survival and that remixing gilts during the first ten days of gestation had no adverse effects on embryo development or survival. Similarly, Cassar *et al.* (2008) investigated effects on reproductive performance of grouping unfamiliar sows at 2, 7, 14, 21 and 28 days after service, compared with sows housed individually in stalls, and found no effect on farrowing rate or litter size of grouping per se or of day of gestation when grouped. These results indicate that there is no benefit from housing sows individually for four weeks after service compared with grouping sows earlier in gestation. There is therefore no justification for the individual housing of sows in the period from weaning to four weeks after service.

Indeed, aggression is likely to be minimised if sows are returned to groups as soon as possible after any period of separation (e.g. during farrowing and lactation or for service). Hoy *et al.* (2005) investigated the frequency of aggressive interactions between sows grouped after weaning and then separated for 7 or 28 days and found that the number of aggressive interactions was significantly lower after reunion if sows were reintroduced after 7 days of individual housing in stalls compared with those reintroduced after 28 days of individual housing. The authors conclude that the frequency of aggressive interactions increases with increasing time interval between separation and reunion. In the UK, where sow stalls have been completely prohibited since 1999, sows may be housed individually during service (although they must still have room to turn around) and the welfare code recommends returning sows to groups 30 minutes after insemination (DEFRA, 2003).

Where sows are kept in large groups, aggression at mixing can be reduced by pre-mixing small groups of sows prior to their introduction together to the larger group (Durrell *et al.,* 2003). Group housing systems have also been developed for sows during lactation. These systems can avoid the need to regroup sows after weaning and may have welfare benefits for both sows and piglets (see section 4.2).

A number of studies have also found no effect of induced stress (Razdan *et al.,* 2002 and 2004) or repeated acute stress from repeated regrouping (Soede *et al.,* 2006) on reproductive performance. Turner *et al.* (1999, 2002 and 2005) conclude that acute stress or repeated acute stress, even during the critical period of induction of oestrus and ovulation, do not affect reproductive performance in pigs but that severe stress can affect reproductive performance in some pigs if this continues for a substantial period. From these results and those discussed above showing no adverse effects of mixing during early pregnancy, it appears that sows are able to adapt to the transient stress of mixing and that reproductive performance is unlikely to be adversely affected unless stress is prolonged, for example if there is severe competition at feeding or inadequate space to allow sows to escape aggressive interactions.

A number of reviews reveal that whilst some studies have suggested that reproductive performance may be adversely affected in group housing systems, others have found equal or better reproductive performance in group housing systems (Kongsted, 2004; Kemp *et al.,* 2005). Group housing systems vary widely in terms of group size, space allowance, provision of enrichment, flooring, feeding system and other aspects of design. It is therefore likely that any adverse effects on reproductive performance are the result of inadequate design or management of systems rather than the result of mixing per se. For example, insufficient space allowance may impair reproductive performance (Kongsted, 2004) and the reproductive performance of low ranking sows may be adversely affected if they are unable to gain access to sufficient feed (Kongsted, 2005 and 2006). Rather than confining sows in stalls for a period after service, which severely impairs their welfare, a better approach to avoid any adverse effects of stress on reproductive performance is to ensure appropriate design and management of group housing systems to minimise stress.

A number of approaches have been developed to reduce competition and aggression at feeding in group-housed sows, including the use of individual feeding stalls or electronically-controlled feeding systems (Arey and Brooke, 2006). Electronically-controlled feeding systems permit undisturbed and individually-tailored feed consumption irrespective of a sow's social rank. Nowachowicz *et al.* (1999) reported high reproductive performance in sows housed in groups with this feeding system and found no significant differences in reproductive performance between sows of different social

rank. Bates *et al.* (2003) reported improved reproductive performance in sows group-housed with electronic sow feeders (ESF) compared with sows housed individually in stalls. In the ESF system, a greater percentage of sows remained pregnant after initial service and farrowed a litter and a greater percentage of sows returned to oestrus within 7 days of weaning compared with stall-housed sows.

ACCESS TO ROUGHAGE AND PROVISION OF COMPLEX NATURAL ENRICHMENT MATERIAL ARE IMPORTANT TO ALLEVIATE CHRONIC HUNGER IN RESTRICTIVELY FED SOWS AND TO PROVIDE OPPORTUNITIES FOR FORAGING

Chronic hunger and lack of opportunities to express foraging and exploratory behaviour can also contribute to stress and aggression in sows. Restrictive feeding and lack of roughage and/or appropriate enrichment can lead to increased restlessness, stereotypies and aggression, a high prevalence of stomach ulcers and frustration in sows (AHAW, 2007d). Restrictive feeding during early pregnancy, beyond the first few days after mating, may adversely affect embryo survival and maintenance of pregnancy (Peltoniemi *et al.,* 2007).

Levels of feed restriction commonly used commercially result in persistent high feeding motivation and oral stereotypies in sows (Lawrence and Terlouw, 1993). Feeding high-fibre diets to sows reduces feeding motivation, oral stereotypies and general restlessness and aggression (Meunier-Salaün *et al.,* 2001). O'Connell (2007) found that provision of grass silage improved the welfare of newly introduced sows in large dynamic groups. Feeding high-fibre diets to sows during gestation may also have benefits for piglet performance. Guillemet *et al.* (2007) found that piglets from sows fed high-fibre diets during gestation showed improved growth rates during their first week of life and tended to be heavier at weaning. Feeding high-fibre diets can enable sows to be fed *ad libitum* whilst controlling nutrient intake; in group housing systems where sows are fed together, *ad libitum* feeding can solve problems of aggression over competition for feed and variation in feed intake between sows of different social rank (Ru and Bao, 2004).

The EU has recognised the need for sows to be provided with high-fibre food. Directive 2001/88/EC states: "To satisfy their hunger and given the need to chew, all dry pregnant sows and gilts must be given a sufficient quantity of bulky or high-fibre food as well as high-energy food". However, the current wording of the Directive leaves too much room for interpretation of what constitutes a 'sufficient quantity'. The Directive should be strengthened to require that sows have permanent access to roughage.

Provision of sufficient quantities of suitable material for foraging and exploration is particularly important for the welfare of sows because they are fed a restricted diet (AHAW, 2007d). Provision of straw in a rack is not sufficient to meet the needs of sows (Stewart *et al.,* 2008). Complex natural enrichment material should be provided in a thick layer, sufficient to act as bedding, covering the majority of the floor area of the pen. Boyle *et al.* (2002) found that provision of peat moss bedding to group-housed gilts reduced stress compared with gilts housed in individual stalls or unbedded group pens, as shown by the reduced response to ACTH challenge in the gilts in bedded group pens.

As with other pigs, EU legislation requires that sows are provided with enrichment materials. Commission Directive 2001/93/EC states: "pigs must have permanent access to a sufficient quantity of material to enable proper investigation and manipulation activities, such as straw, hay, wood, sawdust, mushroom compost, peat or a mixture of such, which does not compromise the health of the animals." However, although only natural materials are listed in the Directive, the wording is not explicit that items like metal chains, ropes and rubber or plastic 'toys' are insufficient to meet the behavioural requirements of pigs. The wording of the Directive should be strengthened to ensure that complex natural material, which is ingestible or contains edible parts, is required for enrichment, such as unchopped straw, compost, earth or a mixture of these.

The Scientific Panel on Animal Health and Welfare concludes that "Lack of foraging material, especially for restrictively fed pigs, is associated with frustration", that "Frustration also may occur due to provision of an inappropriate material such as chains or tyres" and that "Lack of bulky or high-fibre food for restrictively fed sows [and] gilts... is associated with prolonged frustration and pain due to stomach ulcers is likely to occur. Therefore appropriate provision of fibre is essential to avoid bad welfare" (AHAW, 2007f).

Group housing systems should be designed and managed to minimise aggression and meet the welfare needs of sows by:

- Maintaining stable groups with minimal mixing of unfamiliar sows;
- Where sows are mixed, taking steps to reduce aggression, e.g. by pre-mixing smaller groups of sows before introduction to a larger group;
- Where sows are separated, for example during farrowing and lactation or for service, minimising the period between separation and reunion;
- Provision of adequate space;
- Design of feeding systems to minimise competition and ensure adequate feed intake in all sows;
- Provision of permanent access to roughage;
- Provision of adequate quantities of enrichment material in the form of a thick layer of complex natural material, which is ingestible or contains edible parts, such as unchopped straw, in the lying area, with regular addition of fresh material;
- Design of systems to allow opportunities for sows to escape from aggressive interactions, e.g. by providing partitions for sows to hide behind.

A long-term study by Broom *et al.* (1995) compared the welfare of sows in individual stalls, small group housing (groups of five sows in pens with 3m x 2.2m strawed lying area and 2m x 2.2m dunging area) and large group housing (38 sows in a pen with electronic sow feeders, 11.4m x 5.5m strawed lying area and 5.1m x 5.5m dunging area). The authors report that stall-housed sows had poorer welfare compared with sows in both group housing systems, especially as time went on. Analysis of data over four parturitions combined showed no significant differences in reproductive performance between the different systems.

SOWS SHOULD BE KEPT IN STABLE GROUPS THROUGHOUT GESTATION IN WELL-DESIGNED GROUP HOUSING SYSTEMS WITH A THICK LAYER OF BEDDING MATERIAL SUCH AS STRAW

Mixing was minimised because no new animals were added during the experiment and the animals were returned to the same groups after farrowing and service. The authors report that social stability increased over time in both group housing systems and conclude that the success of the group housing systems in this study must be partly attributed to the high social stability in the groups. In addition, stress was likely to be minimised in the group housing systems because both group housing systems included straw bedding, with fresh straw added at regular intervals, and the feeding systems were designed to minimise aggression (individual feeding stalls in the small group and electronic sow feeders in the large group). In addition, the large group housing system incorporated a free-standing wall in the lying area, behind which sows could hide to escape from aggressive interactions. This study clearly demonstrates improved welfare and no adverse effects on reproductive performance when sows are housed in well-designed group housing systems without individual housing during early pregnancy.

4.1.3 Conclusions and recommendations on the welfare of pregnant sows

- **Confining sows in individual stalls from weaning until four weeks after service causes stress and frustration. Housing sows in groups from weaning improves welfare and a number of recent studies indicate that mixing sows during this period need not adversely affect reproductive performance. There is therefore no justification for the current exemption from the requirement for group housing of sows for the period from weaning to four weeks after service and this exemption should be removed;**

- **Stress should be minimised in group housing systems through design and management to minimise aggression and competition for feed and to meet the sows' needs for foraging and exploration, and through appropriate feeding to avoid chronic hunger;**
- **The wording of the Directive should be strengthened to ensure that sows have permanent access to roughage and that complex natural enrichment material, which is ingestible or contains edible parts, such as unchopped straw, compost, earth or a mixture of these, is provided in a thick layer, sufficient to act as bedding, covering the majority of the floor area of the pen, with fresh material added regularly.**

4.2 Housing of farrowing and lactating sows

4.2.1 The importance of nesting material for farrowing sows

Under natural conditions, sows seek a suitable nest site one or two days before parturition, create a hollow and collect grass and twigs from up to 50 metres away to construct a nest (Stolba and Wood-Gush, 1989). Sows are highly motivated to perform nest-building behaviour prior to farrowing and the provision of nesting material is essential to the behaviour (Arey *et al.,* 1991). Sows will make a great deal of effort to gain access to straw for nest building. Arey (1992) reported that sows were observed to press a panel up to 300 times to gain access to 18kg of straw prior to farrowing.

SOWS ARE HIGHLY MOTIVATED TO PERFORM NEST-BUILDING BEHAVIOUR PRIOR TO FARROWING

The quantity of nesting material is important. Arey *et al.* (1992) found that provision of 2.25kg of straw was inadequate to be perceived as a satisfactory nest site. Arey *et al.* (1991) found that on average sows removed 23kg of straw from a hopper to construct a nest. When 23kg of straw was provided in a pre-formed nest, sows removed on average a further 9.5kg from the hopper, suggesting that the action of collecting nesting material is likely to be important to the sow as well as the quantity of material.

The EU Scientific Panel on Animal Health and Welfare concludes: "Sows nest-building behaviour is triggered by internal hormonal factors. Thus, the motivation for nest building is high in spite of if housing conditions allow for nest building or not. As a consequence, lack of nesting material is very likely to cause stress and an impaired welfare" (AHAW, 2007f).

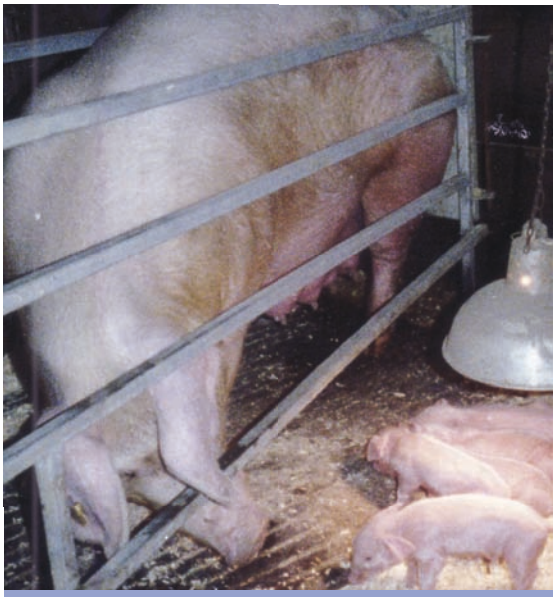
Commission Directive 2001/93/EC states: "In the week before the expected farrowing time sows and gilts must be given suitable nesting material in sufficient quantity unless it is not technically feasible for the slurry system used in the establishment." As farrowing crates are partly- or fully-slatted, bedding is not commonly provided in crates (AHAW, 2007d). The Directive must be strengthened to ensure that nesting material is provided for all farrowing sows. The exemption for units with incompatible slurry systems should be removed immediately for newly built systems and by a designated date for others.

4.2.2 Welfare of sows in farrowing crates and free-farrowing systems

In some EU countries, the use of farrowing crates is restricted to a limited period around farrowing. However, in the EU as a whole, the use of farrowing crates throughout lactation is the predominant system (AHAW, 2007d). Except in exceptional circumstances, the use of farrowing crates is prohibited in Norway and Switzerland.

Even when straw is provided, sows in farrowing crates are unable to perform proper nest-building behaviour because of the restricted space. Damm *et al.* (2003) found that nest building was impaired in crated sows compared with sows in loose-farrowing pens ('Schmid' pens) and that crated sows showed increased heart rate in the hour before farrowing and

increased levels of oral/nasal stereotypies. Restriction of space around farrowing causes physiological stress, as measured by increases in plasma cortisol and ACTH in gilts in farrowing crates compared with pens (Jarvis *et al.,* 2002). Provision of straw to gilts in crates did not prevent this stress response.



THE FARROWING CRATE SEVERELY RESTRICTS THE MOVEMENT OF THE SOW AND PREVENTS HER FROM INTERACTING PROPERLY WITH HER PIGLETS

The EU Scientific Panel on Animal Health and Welfare considers that frustration and stress due to insufficient space and due to lack of foraging and nest-building material in farrowing crates and pens which are too small are major risk factors for the welfare of sows. They conclude: "Housing of sows in farrowing crates severely restricts their freedom of movement which increases the risk of frustration. It does not allow them, for instance, to select a nest site, to show normal nest-building behaviour, to leave the nest site for eliminative behaviour or to select pen areas with a cool floor for thermoregulation" (AHAW, 2007f).

As well as causing poor welfare for sows, the restricted and barren environment of the farrowing crate can have long-term consequences for the behaviour of piglets. Chaloupková *et al.* (2007) found that piglets from enriched farrowing pens (more space, freedom of movement for the sow and provision of straw) showed more pre-weaning play behaviour and reduced aggression in feed competition tests later in life compared with piglets from farrowing crates. Other studies have also indicated that pre-weaning aggression between piglets is lower in pens providing more space and enrichment compared with crates (see section 3.2.1).

Sows in farrowing crates are unable to move away from their piglets. In farrowing systems that allow the sow to leave her piglets, sows show a clear preference for defecating away from the piglets and sows do not abandon their litter but most voluntarily reduce contact with the litter over time (Pajor *et al.,* 2000). The authors conclude that the inability to urinate and defecate away from their lying area may be an additional stress associated with confinement and that constant confinement with older litters is aversive for many sows.

Pajor *et al.* (1999) found that piglets from 'get-away' pens where the sow can leave the piglets gained 27% more weight and consumed 31% more food after weaning than piglets from confined pens. Similarly, Pajor *et al.* (2002) found that sows who spent most time away from their litter nursed their piglets less often, consumed less feed and lost less weight over lactation and that the piglets of these sows consumed more creep feed before weaning, lost less weight on the day of weaning and gained more weight during the following week. Such systems can therefore reduce the demands of lactation for sows and improve piglet performance at weaning.

Group farrowing systems have also been developed which allow mixing of piglets from around 10 to 14 days of age, as well as sows, in a communal area. Such systems can have additional benefits for piglet welfare. Hillmann *et al.* (2003) found that piglets reared in an enriched group farrowing system (straw-bedded farrowing boxes and a communal area) were better adapted to social and non-social challenges at weaning compared to piglets from an enriched individual farrowing system (individual pen incorporating a straw-bedded lying area). Similarly, Weary *et al.* (2002) found that a farrowing system allowing mingling of both sows and litters provided welfare advantages for sows in terms of time away from piglets, reduced demands for nursing and opportunities for social interaction and for piglets in terms of reduced growth check and aggression at weaning.

4.2.3 Piglet mortality in farrowing crates and free-farrowing systems

The rationale for confinement of sows in farrowing crates is the assumption that piglet mortality is higher in pens that allow the sow freedom of movement because of accidental crushing of piglets by the sow. However, piglet mortality resulting from other causes is often

higher in crates. For example, a number of studies have found higher piglet mortality as a result of savaging by the sow in farrowing crates compared with loose-farrowing systems (Cronin *et al.,* 1996; Jarvis *et al.,* 2004). Ahlström *et al.* (2002) note that savaging gilts are more restless and responsive towards piglets during farrowing, whereas inactivity and passivity during this period are suggested to reflect good maternal care in the pig, and conclude that this may be related to the individual's inability to cope with restrictive environments around farrowing. Cronin *et al.* (1996) also found a tendency for higher piglet mortality from chilling/starvation and splay leg (a condition affecting mobility which makes it difficult for the piglet to access a teat) in farrowing crates compared with pens. Higher levels of piglet mortality from starvation may be related to poorer milk production in crated sows. Results of a large-scale trial in Denmark indicate that sows in free-farrowing systems consumed more feed during lactation compared with sows in crates, which was assumed to lead to higher milk production, as both individual piglet weight and total litter weight at weaning were significantly higher in the free-farrowing system (Dunn, 2005).

A recent large-scale study of reproductive data from commercial farms in Switzerland indicated that no more piglet losses occurred in loose farrowing pens than in farrowing crates (Weber *et al.,* 2007). Whilst piglet losses due to crushing were higher in pens (0.62 piglets per litter) compared with crates (0.52 piglets per litter), mortality from other causes was higher in crates (0.89 piglets per litter) than in pens (0.78 piglets per litter). AHAW (2007d) comments that most studies comparing mortality rates in different farrowing systems have been carried out with a small or moderate sample size but that studies using larger sample sizes have shown that piglet mortality was the same whether the sow was crated or not or that piglet mortality was lower in loose housing. Similarly, in a review of loose farrowing systems by Wechsler and Weber (2007) the authors conclude that, taking scientific evidence as well as practical experience into account, piglet mortality in loose farrowing systems need not exceed that of crate systems. They recommend that farrowing sows should be kept in sufficiently large pens with a nest area and an activity area.

WELL-DESIGNED FARROWING PENS THAT ALLOW THE SOW FREEDOM OF MOVEMENT IMPROVE THE WELFARE OF BOTH SOWS AND PIGLETS AND DO NOT LEAD TO AN INCREASE IN PIGLET MORTALITY

Sows typically take measures apparently designed to advertise their presence to piglets and reduce the chances of crushing, such as rooting vigorously before lying down carefully; these behaviour patterns can only occur if there is enough space (Blackshaw and Hagelsø, 1990). In a review of the literature on lying down and rolling behaviour in sows, Damm *et al.* (2005) conclude that in a loose-housing situation, providing adequate space for pre-lying behaviour and a well-controlled lying-down sequence is likely to improve piglet survival. AHAW (2007d) suggests that a minimum pen size of 5m^2 is advisable.

4.2.4 Conclusions and recommendations on the welfare of farrowing and lactating sows

- **Sows are highly motivated to perform nest-building behaviour prior to farrowing. The Directive should be strengthened to phase out the use of systems that are incompatible with the requirement to provide nesting material to farrowing sows;**

- **Confining sows in farrowing crates causes suffering and also negatively affects the welfare of piglets. Sows in crates are unable to fulfil their strong motivation to build a nest due to inadequate space and lack of nesting material and are unable to interact properly with, or move away from, their piglets. Well-designed farrowing pens that allow the sow freedom of movement improve the welfare of both sows and piglets and do not lead to an increase in piglet mortality. Farrowing crates should therefore be phased out.**

5. CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS AND RECOMMENDATIONS CONCERNING PIGS REARED FOR SLAUGHTER:

- Current EU legislation regarding environmental enrichment, flooring and space allowances is inadequate to protect the welfare of pigs and is poorly enforced;
- Currently permitted space allowances are much too low and should be significantly increased. The minimum area of solid floor provided should be sufficient for all pigs to lie simultaneously in a fully-recumbent position without contacting other pigs;
- This solid floor area should be mostly covered with a thick layer of enrichment material, sufficient to act as bedding, and fresh material should be added regularly;
- The wording of the Directive should be strengthened to ensure that complex natural material, which is ingestible or contains edible parts, is required for enrichment, such as unchopped straw, compost, earth or a mixture of these;
- Pigs should have access to wallows or showers;
- Only housing systems which are capable of meeting the requirements for enrichment should be permitted. For this reason, the use of fully-slatted floors should be prohibited. Any slatted floor area provided for dunging and/or showering should be in addition to the minimum solid and bedded floor areas;
- Current EU legislation regarding tail docking and tooth clipping or grinding is inadequate to protect welfare and is poorly enforced. Despite a ban on routine tail docking and tooth clipping or grinding in the EU since 2003, these procedures continue to be performed routinely in most EU countries;
- Tail docking and tooth clipping or grinding are painful and are unnecessary if pigs are kept in appropriate conditions. The wording of the Directive should be strengthened to completely prohibit tail docking and tooth clipping or grinding for non-therapeutic reasons. Tail biting and injuries to sows' teats and other piglets should be minimised by providing adequate space and enrichment and avoiding the use of fully-slatted floors in both the rearing and farrowing environments and by limiting litter size to that which can be fully sustained by the sow;
- Current EU legislation regarding piglet castration is inadequate to protect welfare and is poorly enforced;
- Surgical castration results in significant pain and stress and should be prohibited;
- Entire male pigs could be reared to lighter slaughter weights to minimise boar taint in carcasses, as is already the case in several EU countries. Where pigs continue to be reared to higher slaughter weights, the use of immunocastration is preferable to surgical castration, at least as an interim measure until methods of rearing entire male pigs to higher slaughter weights without unacceptable levels of taint have been developed. Consideration could also be given to slaughtering males earlier and rearing only females to higher slaughter weights;
- At the very least, as an interim measure for any piglets undergoing surgical castration, methods of anaesthesia that have been demonstrated to be effective in reducing pain and stress responses, in combination with prolonged analgesia, should be required for all piglets.

CONCLUSIONS AND RECOMMENDATIONS CONCERNING BREEDING SOWS:

- Confining sows in individual stalls from weaning until four weeks after service causes stress and frustration. Housing sows in groups from weaning improves welfare and a number of recent studies indicate that mixing sows during this period need not adversely affect reproductive performance. There is therefore no justification for the current exemption from the requirement for group housing of sows for the period from weaning to four weeks after service and this exemption should be removed;
- Stress should be minimised in group housing systems through design and management to minimise aggression and competition for feed and to meet the sows' needs for foraging and exploration, and through appropriate feeding to avoid chronic hunger;
- The wording of the Directive should be strengthened to ensure that sows have permanent access to roughage and that complex natural enrichment material, which is ingestible or contains edible parts, such as unchopped straw, compost, earth or a mixture of these, is provided in a thick layer, sufficient to act as bedding, covering the majority of the floor area of the pen, with fresh material added regularly;
- Sows are highly motivated to perform nest-building behaviour prior to farrowing. The Directive should be strengthened to phase out the use of systems that are incompatible with the requirement to provide nesting material to farrowing sows;
- Confining sows in farrowing crates causes suffering and also negatively affects the welfare of piglets. Sows in crates are unable to fulfil their strong motivation to build a nest due to inadequate space and lack of nesting material and are unable to interact properly with, or move away from, their piglets. Well-designed farrowing pens that allow the sow freedom of movement improve the welfare of both sows and piglets and do not lead to an increase in piglet mortality. Farrowing crates should therefore be phased out.

Summary of recommendations to improve the welfare of pigs in the EU

Current EU legislation on the welfare of pigs is inadequate to protect welfare and is poorly enforced. Immediate action is needed to improve the welfare of pigs in the EU, including:

- **Significantly increased space allowances for pigs reared for meat;**
- **Strengthening of the wording on provision of environmental enrichment to ensure that complex natural material, which is ingestible or contains edible parts, is required and is provided in a thick layer, sufficient to act as bedding, covering the majority of the pen floor, with fresh material added regularly;**
- **Prohibition of the use of fully-slatted floors for pigs reared for meat;**
- **Strengthening of the wording on the prohibition of routine tail docking and tooth clipping or grinding to completely prohibit tail docking and tooth clipping or grinding for non-therapeutic reasons;**
- **Prohibition of surgical castration of piglets and at the very least, if there is a phase-out period for surgical castration, then removal of the exemption from the requirement to use anaesthesia and prolonged analgesia for piglets up to seven days of age;**
- **Removal of the exemption that allows the use of sow stalls for the period from weaning until four weeks after service;**
- **Strengthening of the wording on provision of high-fibre food for sows to require that sows have permanent access to roughage;**
- **Phasing out of farrowing crates;**
- **Strengthening of the wording on the requirement to provide nesting material for farrowing sows to phase out the use of systems that are incompatible with this requirement.**

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The urgent need for reform of existing legislation and effective enforcement

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