

**Animal health and welfare in fattening pigs  
in relation to housing and husbandry<sup>1</sup>**

**Scientific Opinion of the Panel on Animal Health and Welfare**

**(Question No EFSA-Q-2006-029)**

**Adopted on 6 September 2007**

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## **PANEL MEMBERS**

The Scientific Panel for Animal Health and Welfare (AHAW) of the European Food Safety Authority adopted the current Scientific Opinion on 6 September 2007. The Members of the AHAW Scientific Panel were:

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## **SUMMARY**

Council Directive 91/630/EEC<sup>2</sup>, as amended, laying down minimum standards for the protection of pigs, requires the Commission to submit to the Council a report, based on a scientific opinion of the European Food Safety Authority (EFSA), concerning the welfare various aspects of housing and husbandry systems for farmed pigs. EFSA has therefore been required to provide a Scientific Opinion on several aspects of this, one concerning fattening pigs. The opinion should include: the effects of stocking density, including group size and grouping methods, space requirements and the impact of stall design and different flooring types taking into account different climatic conditions.

The Scientific Opinion was adopted by the Panel on Animal Health and Welfare (AHAW) on 6 September 2007.

Based on the scientific data presented in the Scientific Report and risk assessment, conclusions and recommendations were drawn. In relation to disease, respiratory and gastrointestinal infections and production-related diseases can have a major impact on the welfare of fattening pigs. Management, inspection and other disease prevention measures, handling, hygiene, floor type and the manure system have major effects on disease risk and significant importance for ensuring good welfare. At post-mortem slaughter inspection, pigs kept outdoors usually have a lower prevalence of lesions due to respiratory infections than indoor pigs but higher risk of some internal parasites. Leg disorders, which are caused by a complex of factors including genetic selection and high energy and high protein diet, are a major problem.

Interactions between many aspects of the biological functioning of pigs and effects of housing and management on welfare are described. Without suitable rooting and manipulation materials, pigs are likely to direct tactile behaviour towards companions using aggression or other causes of poor welfare. Manipulable material makes any floor more attractive for exploration and pigs prefer the presence of straw to an unbedded floor. The provision of appropriate foraging material is difficult in pens with fully slatted floors unless there is automatic shredding in the waste disposal system.

If the ambient temperatures are too high, adequate space to separate from other pigs, sufficient contact with a cool floor, access to outdoors, air-flow rates to help evaporation, water on the skin, or more drinking water help to avoid over-heating. In the case of too low a temperature, better insulation of the floor lowers the risk of hypothermia.

When there is too little sensory input, because of social isolation, a barren environment or too little light intensity, pigs are likely to show abnormal behavioural and physiological responses. Flashing lights can be disturbing to pigs and poor welfare is also associated with light of a wavelength or intensity that does not allow the pig to discriminate the behaviour of other pigs or materials.

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<sup>2</sup> E.C.O.J. n° L340 of 11/12/1991. p. 33.

The genetic selection for rapid growth and lean meat without enough consideration of other factors has led to some widespread and serious problems. However, selective breeding to eliminate the halothane gene has improved pig welfare.

Poor quality pen design can cause poor welfare in pigs because of parts that cause injury, or disturbance and aggression. If pigs do not have sufficient exercise, there can be adverse effects on bone and muscle development. Dunging behaviour (urination and defecation) is facilitated by design of the housing system and good management. Mixing unacquainted pigs leads to a substantial risk of fighting, injury and production loss.

Recommendations presented in the Scientific Opinion include the need to provide an environment and management so that the negative consequences of poor welfare such as injurious behaviours, physiological problems and immunosuppression, caused in barren environments, are avoided. In this sense, it is recommended that pigs should be provided with manipulable, destructible materials, wallows, lighting of appropriate wavelength and intensity, water of a quality and quantity sufficient for their needs, and a balanced diet with no harmful contaminants. In order to minimise disease in pigs, and hence poor welfare, effective disease preventive and management procedures should be in place. The design of accommodation for pigs should be such that the pigs have sufficient exercise for normal bone and muscle development. There should be further efforts to select and breed so that problems of pig welfare, including cardiovascular malfunction, risk of early death and leg disorders are maintained at a low level.

The recommendations for further research are mainly focused on the evaluation of the effects of the exposure to several factors (i.e. barren environment, light intensity, noise, respiratory disorders) on the welfare of fattening pigs. Recommendations for further research in relation to the heavy pig production are also provided.

The methodology and the results of this scientific report and opinion should be developed to identify welfare outcomes (indicators) that are valid and can be used in an animal welfare monitoring system.

**Key words:** Pig Welfare, pig disease, fattening pigs, weaner, grower, finisher, husbandry, pen design, housing system.

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## 1. BACKGROUND

Council Directive 91/630/EEC<sup>3</sup>, as amended, laying down minimum standards for the protection of pigs and requires the Commission to submit to the Council a report, based on a scientific opinion of the European Food Safety Authority (EFSA), concerning various aspects of housing and husbandry systems for farmed pigs. In this context and upon requests from the Commission, EFSA has already issued opinions<sup>4</sup> on “welfare aspects of the castration of pigs” and “the welfare of weaners and rearing pigs: effects of different space allowances and floor types”.

Council Directive 91/630/EEC, as amended, also provides for the Commission to report to Council, on the basis of an EFSA scientific opinion, on the effects on welfare of numerous other aspects of housing and husbandry systems for farmed pigs, such as the effects of stocking density, including group size and methods of grouping the animals; the implications of different space requirements, including the service area for individually housed adult breeding boars; the impact of stall design and different flooring types; the risk factors associated with tail-biting and possible means to reduce the need for tail-docking; the latest developments of group-housing systems for pregnant sows and also loose-house systems for sows in the service area and for farrowing sows which meet the needs of the sow without compromising piglet survival.

It should be noted that for weaners and rearing pigs EFSA has already issued a scientific opinion on the impact of different space allowances and flooring types, and so in respect of these two issues the new EFSA opinions should consider other categories of pigs (e.g. sows including farrowing sows, boars, pigs recruited for breeding programmes etc.). The Commission’s report to Council will be drawn up also taking into account socio-economic consequences, consumers’ attitudes and behaviour, sanitary consequences, environmental effects and different climatic conditions concerning this issue.

## 2. TERMS OF REFERENCE

### **Mandate 1: Request for a scientific opinion concerning animal health and welfare aspects of different housing and husbandry systems for adult breeding boars, farrowing and pregnant sows**

The opinion should consider, inter alia, the following specific issues:

- The effects of stocking density, including the group size and methods of grouping the animals, in different farming systems on the health and welfare of adult breeding boars, farrowing and pregnant sows
- The animal health and welfare implications of space requirements; including the service area for individually housed adult breeding boars.
- The impact of stall design and different flooring types on the health and welfare of breeding boars, pregnant and farrowing sows with piglets through weaning taking into account different climatic conditions.
- The latest developments of group housing systems for pregnant and farrowing sows with piglets through weaning, taking account both of pathological, zootechnical, physiological and ethological aspects of the various inside/outside -systems and of their health and environmental impact and of different climatic conditions.

<sup>3</sup> E.C.O.J. n° L340 of 11/12/1991. p. 33.

<sup>4</sup> [http://www.efsa.eu.int/science/ahaw/ahaw\\_opinions/catindex\\_en.htm](http://www.efsa.eu.int/science/ahaw/ahaw_opinions/catindex_en.htm)

- The latest developments of loose-house systems for sows in the service area and for farrowing sows with piglets through weaning, which meet the needs of the sow without compromising piglet survival.

**Mandate 2: Request for a scientific opinion concerning animal health and welfare aspects of different housing and husbandry systems for farmed fattening pigs**

The opinion should consider, inter alia, the following specific issues:

- The effects of stocking density, including the group size and methods of grouping the animals, in different farming systems on the health and welfare
- The animal health and welfare implications of space requirements
- The impact of stall design and different flooring types on the health and welfare of fattening pigs taking into account different climatic conditions.

**Mandate 3: Request for a scientific opinion concerning the risks associated with pig tail biting and possible means to reduce the need for tail docking considering the different housing and husbandry systems**

**This report will refer only to Mandate 2 as referenced above.**

### **3. ACKNOWLEDGEMENTS**

The European Food Safety Authority and the AHAW Panel wishes to thank the members of the working group chaired by the panel member D. M. Broom: B. Algers, T. Nunes Pina and M. Sanaa (Risk Assessors), M. Bonde, S. Edwards, J. Hartung, I. de Jong, X. Manteca Vilanova, G. Martelli, G. P. Martineau, for the preparation of the Scientific Report, which has been used as the basis of this Scientific Opinion.

The scientific co-ordination for this Scientific Report has been undertaken by the EFSA AHAW Panel Scientific Officers Elisa Aiassa and Oriol Ribó.

### **4. SCOPE AND OBJECTIVES**

#### **4.1. Introduction**

In 1997, the Scientific Veterinary Committee of the European Commission published the report *The Welfare of Intensively Kept Pigs*. The SVC (1997) Report contains information on the biology and behaviour of pigs in natural and semi-natural conditions, an overview of production systems, a production systems comparison, specific husbandry factors and pig welfare. Further, chapters covered socio-economic aspects. In that report conclusions and recommendations were made.

The “Scientific Report on animal health and welfare in fattening pigs, in relation to housing and husbandry” contains an update of the scientific information presented in the previous SVC Report, excluding economic aspects which are not in the mandate for this report but including a risk assessment. This Report is one of five EFSA Reports on the welfare of pigs: “Welfare aspects of the castration of piglets (July 2004); “The welfare of weaners and rearing pigs: effects of different space allowances and floor types” (EFSA, 2005); “Animal health and welfare aspects of different housing and husbandry systems for adult breeding boars, pregnant, farrowing sows and unweaned piglets” (EFSA, 2007); and concerning “the risks associated with tail-biting in pigs and possible means to reduce the need for tail-docking considering the different housing and husbandry systems” (EFSA, 2007 under adoption procedure at the time of writing).

Factors which are important for pig welfare include housing (space and pen design, flooring and bedding material, temperature, ventilation and air hygiene), feeding (liquid feed, concentrates, roughage) other management of the animals (grouping, weaning, human-animal relations) and their health (disease prevention, health control and health service).

Where the welfare of fattening pigs has been described in “The welfare of weaners and rearing pigs: effects of different space allowances and floor types” (March 2005), this information is not repeated in the Report unless new information is available, in which case an up-date is included.

#### **4.2. Statement of purpose of the Risk Assessment Exercise**

The working group set out to systematically determine whether various factors potentially affecting pig welfare are beneficial or constitute a potential hazard or risk. To the latter end their severity and likelihood of occurrence in animal (sub) populations were evaluated using a qualitative (i.e. using expert opinion to classify magnitude and exposure) and a quantitative (estimating percentages of magnitude and exposure) approach. This allowed an estimation of associated risks to pig welfare, hence providing the basis for decision makers to decide which measures could reduce or eliminate such risks. It should be noted, however, that this does not imply that a hazard that has a serious effect on just a few animals should not be dealt with by managers on farm level as the suffering imposed on some animals constitutes a major welfare problem for those individuals.

#### **4.3. The chosen approach**

In line with the terms of reference, the working group carried out a qualitative risk assessment. A quantitative risk assessment approach was followed, which constitutes a development of the one produced in earlier welfare reports such as the one in the Calf Welfare Report and the methods for the qualitative and quantitative risk assessment are described in chapter 8 of the Scientific Report.

The objectives of the scientific assessment are:

- to review and report recent scientific literature on the animal health and welfare of fattening pigs,
- to report on recent findings as an update to the Scientific Veterinary Committee’s previous report,
- to make a qualitative risk assessment concerning the welfare of fattening pigs.

Where relevant, food safety implications of different farming systems are also considered.

### **5. CONCLUSIONS AND RECOMMENDATIONS**

Some conclusions and recommendations in this list are of a general nature and refer to all pigs including fattening pigs. Some of these are also used in other reports prepared in 2007 on: “Animal health and welfare aspects of different housing and husbandry systems for adult breeding boars, pregnant, farrowing sows and unweaned piglets” (EFSA, 2007); and “The risks associated with tail-biting in pigs and possible means to reduce the need for tail-docking considering the different housing and husbandry systems” (EFSA, 2007 under adoption procedure at the time of writing).

Conclusions and recommendations from the Report “The welfare of weaners and rearing pigs: effects of different space allowances and floor types” (EFSA, 2005), whose subject matter overlaps substantially with this Opinion, are also relevant. These are not replicated here. In a few cases, new information requires some update in the previous recommendation, and these

are marked with “\*+”. Data presented in the space allowance and floor types Report are not repeated in the Report unless an update is required. Hence, some of the Conclusions and Recommendations of the current Scientific Opinion depend in part on data from the previous Report. Some of the conclusions below were produced following the reports on fattening pigs, sows and boars, tail-biting, welfare aspects of castration and effects of space and flooring on pig welfare. As a consequence they appear in more than one scientific opinion.

Except where otherwise stated, the conclusions and recommendations of the 1997 SVC Report and the EFSA Reports on space allowance and flooring and castration are supported.

### 5.1. Conclusions concerning the welfare of fattening pigs

The risk assessment tables and the histograms focusing on the welfare of individual pigs and welfare in populations of pigs are an integral part of the conclusions to this Report

- 1) Leg disorders, which are caused by a complex of factors including genetic selection and *ad libitum* feeding of high energy and high protein diet, are a major problem in fattening pigs. These cause poor welfare because of pain, reduced ability to move around and increased risk of victimisation.
- 2) Respiratory and gastrointestinal infections and production-related diseases can have a major impact on the welfare of fattening pigs. Whilst there is much published information on these subjects, there are also substantial gaps in scientific knowledge about them and their influence on animal welfare.
- 3) Pigs have good diurnal vision, hearing and olfaction and use all of these senses when exploring their environment. They learn rapidly and have substantial cognitive ability and a complex social life.
- 4) In common with other domestic animal species, when there is too little sensory input, because of social isolation, a barren environment or too little light intensity, pigs show abnormal behavioural and physiological responses.
- 5) Grooming in pigs, a means of caring for the skin and alleviating irritation, involves rubbing the body on posts and walls, occasionally scratching the head and body with the feet, and wallowing. At lower temperatures, below 14C for pigs over 50 Kg, wallowing serves only a grooming purpose, but at higher temperatures it also helps in thermoregulation.
- 6) Pigs show strong preferences to root with the nose and manipulate material with the mouth. These behaviours may be part of foraging but both are also shown when potential food is not ingested and at times when the pig is satiated with food, so they can also have an exploratory or other function that is not directly food-related. Appropriate substrates are earth for rooting and destructible materials such as straw or twigs for manipulation. When suitable rooting and manipulation materials are not available, pigs are likely to direct tactile behaviour towards companions, e.g. anal massage or tail-biting, or to show increased aggression. These are among the major causes of poor welfare in pigs.
- 7) Material for rooting and manipulation could be bedding material but the quantities needed are much smaller than those needed as bedding. Studies on preferences for such materials and on the adverse effects of its absence carried out since 2005 have further emphasised its importance for weaned pigs, older fattening pigs and sows. Substantial quantities of straw or similar material are the most preferred but smaller quantities receive much usage.
- 8) The prevention of disease is of significant importance for ensuring good welfare. One key action is regular inspection of the pigs by farm staff and veterinary checks where necessary followed by prompt treatment of problems. Another is the maintenance of good hygiene by

the use of proper biosecurity precautions. A further action, which is of importance in relation to enteric diseases, is to minimise the exposure of the pigs to their faeces and urine. Management, handling, hygiene, floor type and the manure system have major effects on disease risk.

- 9) \*+In the case of an outbreak of a highly contagious disease, the use of a set of biosecurity precautions reduces the risk of its transmission. These include various aspects of decontamination. Liquid slurry is easier to decontaminate chemically than solid manure.
- 10) \*+If the ambient temperatures are too high for pigs, their welfare will be poor and they are at risk of dying. They cool themselves in several ways. Firstly by wallowing in water or mud, an especially favoured method at temperatures above 19C in pigs of over 50 Kg. Secondly by reducing activity level so that there is less body heat production. This occurs at temperatures above 19C in larger pigs and above 25C in pigs of more than 20 Kg. Thirdly, pigs will seek areas where there is greater air-flow. Fourthly, when lying the posture adopted is to stretch out the legs at 25C or above for smaller weaned pigs and at 19C and above for larger pigs. The building in which pigs are kept may provide heating or ventilation systems that compensate for outside temperatures. At higher temperatures, adequate space to separate from other pigs when standing or lying, sufficient contact with a cool floor, or access to outdoors, or evaporative cooling aided by higher air-flow rates, or water on the skin or more drinking water help to avoid over-heating.
- 11) High humidity is generally better for pig skin condition but it impairs cooling by evaporation at temperatures near or above 19C for larger pigs (more than 50 Kg) and at 25C for smaller pigs (more than 20 Kg).
- 12) If the ambient temperature is too low, better insulation of the floor, for example from a substantial layer of bedding, lowers the risk of hypothermia. Pigs in groups huddle at low temperatures. Rest is likely to be disrupted if huddling is necessary because of the disturbance caused by neighbouring pigs.
- 13) If pigs cannot be inspected individually in such a way that sick, injured or frequently attacked or belly-nosed animals can be identified, there is a potential for very poor welfare in some animals.
- 14) Flashing lights can be disturbing to pigs and poor welfare is also associated with light of a wavelength or intensity that does not allow the pig to discriminate the behaviour of other pigs or of materials such as straw. The major periods of activity by pigs are in the light period. The minimum duration of the dark period for there to be sufficient rest is 6 hours. It is indicated from one study that a light level of 450 lux during the light period is required in order that a normal diurnal endocrine rhythm is established. Adequate inspection of animals is not possible unless there is a sufficient light level. In some circumstances, pigs find very high light intensity aversive, but this may be affected by the social situation. Pigs are not able to discriminate cues adequately at light levels of less than 10 lux.
- 15) With the exception of recently born piglets, when unacquainted pigs are mixed there is a substantial risk of fighting, injury, production loss and poor welfare. There will be some fear, injury and pain in attacked animals, and other severe physiological effects as is evident from the carcasses of animals slaughtered after mixing. A consequence of the associated poor welfare is often increased risk of disease. The interchange of pathogens amongst pigs mixed from different buildings can also increase disease prevalence, especially in younger pigs whose immune system is not fully developed.
- 16) When the welfare of pigs in large groups is studied, the number of sources is a key factor affecting disease and whilst there are some results indicating that there are few welfare

- problems in large groups, other results indicate that disease incidence is increased so welfare can be poorer than in small groups.
- 17) If animals are sick or injured in a severe or prolonged way, or if they are frequently subjected to attack or belly-nosing, their welfare can be very poor.
  - 18) Poor quality pen design can cause poor welfare in pigs because of parts that cause injury or open sides between adjacent pens so that there is disturbance and aggression. If pigs have pens that allow the opportunity to hide their heads or bodies from other pigs, aggression and belly-nosing may be reduced.
  - 19) If pigs do not have sufficient exercise, there can be adverse effects on bone and muscle development.
  - 20) \*+Many aspects of the behaviour of modern pigs have a common genetic basis with those of the wild boar ancestors. However, generations of selective breeding have resulted in changes in morphology, growth and temperament. Some of these changes have helped the animals to adapt to modern housing and management conditions; however others can cause problems for pigs. The genetic selection of pigs for rapid growth and lean meat without enough consideration of other factors has led to some widespread and serious problems, in particular leg disorders, cardiovascular malfunction when high levels of activity are needed or stressful conditions are encountered, and inadequate maternal behaviour.
  - 21) \*+Pigs use separate areas for lying and for urination and defecation (dunging behaviour), except (i) when stressed by heat, disease, etc.; (ii) when the space allowance in a housing system is not sufficient, or (iii) when the system is poorly designed or managed. Adequate management and design of the housing system: position of drinkers, floor quality in the lying area, position of open pen partitions, possibility for visual contact with pigs in neighbouring pens, and lack of draught in the lying area facilitate this dunging behaviour. Where some individual pigs dung and urinate in the lying area, a change in design or space allowance is usually necessary.
  - 22) The actions of stockpersons have a substantial effect on pig welfare. During the development of young pigs, relatively brief contact with non-aggressive humans can improve the welfare of the pigs, growth rates and ease of later handling.
  - 23) Pigs need water of good quality. This is often still necessary even if they are provided with wet feed. If water supply systems are not well maintained, pigs can be deprived of water. Where pigs have high concentrations of blood toxins, their requirement for water is increased.
  - 24) Pigs need an adequate quantity of a balanced diet in order to reduce the risk of disease and abnormal behaviours, as well as to decrease pollutants spreading with manure. If there is insufficient care taken in selecting and keeping feed, pigs can be subjected to harmful contaminants such as mycotoxins and man-made toxic substances and these can cause pathology and have severe effects on welfare. Unbalanced diet can significantly increase nitrogen losses and ammonia production.
  - 25) Rest in pigs is impaired in over-crowded conditions because other individuals step on or otherwise disturb the pigs. Rest can also be impaired when there is huddling due to low temperature, human disturbance, too much noise, or an insufficiently long dark period during each 24 hours.
  - 26) Where straw, or other manipulable materials of plant origin, are provided for pigs, provided that the materials are used when fresh or stored in good conditions, any risk of mycotoxin presence can be reduced to a low level.

- 27) Additional cooling devices, such as water sprinklers, showers, increased air speed, and shaded areas in outdoor management systems help to reduce heat stress during summer. If sprinklers for cooling are used in housing systems with bedding, wetting of the litter can lead to bacterial growth and increased release of noxious gases.
- 28) \*+In outdoor rearing systems, the substratum for pigs can be good. Pigs kept outdoors usually have a lower prevalence of lesions due to respiratory infections at post-mortem slaughter inspection compared with indoor pigs but the risk of some internal parasites may be higher. There is a risk that pigs may be infected by, or in turn infect, wild birds and mammals, for example wild boar with classical swine fever or brucellosis.
- 29) \*+Compost or straw-based deep-litter bedding can provide thermal comfort in cold conditions, but their heat production potential can result in heat stress at higher ambient temperatures. Pigs in warmer conditions indoors need access to an additional area with a different floor quality to cool down.
- 30) \*+Manipulable material makes any floor more attractive for exploration and, in choice tests, the presence of straw is preferred to an unbedded floor. Straw may be used by pigs when lying, but only when they are not over-heated. The extent of the use of straw and other bedding materials (sawdust, wood chips, peat, etc.) is influenced by different climatic conditions and the availability of such material and also by the type of housing chosen in various European regions. Straw-based housing systems in buildings often kept at cooler temperatures are typically found more frequently in Northern Europe.
- 31) \*+The use of bedding materials in combination with a fully-slatted floor creates problems in handling the manure. However, small quantities of straw from racks, if sufficient for rooting behaviour to be possible, can be used as environmental enrichment on any slatted floors. The use of straw or other materials, in small quantities for manipulation by the pigs in order to fulfil their needs, can be combined with slatted floors provided that an adequate waste disposal system, perhaps involving automatic shredding is used. Shredding systems are not commonly in use at present. If the straw is chopped before giving it to the pigs, larger quantities can be used but manipulation possibilities are reduced. The materials may fall through the gaps so that they are not available to the pigs but can easily be replaced. In practice, at present few farmers using fully-slatted floors provide particulate materials for manipulation.
- 32) \*+The provision of appropriate foraging material is difficult in pens with fully slatted floors so housing systems with partly-slatted or solid floors with bedding lead to fewer problems with manipulative behaviour directed at pen mates such as tail-biting. The occurrence of tail-biting can be reduced dramatically by the provision of straw as well as by other measures (see the Scientific Report on the risks associated with tail-biting in pigs and possible means to reduce the need for tail-docking considering the different housing and husbandry systems; EFSA, 2007).
- 33) Selective breeding to eliminate the halothane gene is a good example of the technology to improve pig health and welfare. Demonstrated differences in some genetic lines indicated the potential for further improvements arising from this approach.

## 5.2. Recommendations

Since space allowance and flooring are key issues affecting fattening pig welfare, the recommendations from the EFSA Scientific Opinion (EFSA Space Allowance) (not listed here) are also important and relevant to this report.

- 1) Pigs should be provided with such an environment and management that the negative consequences of poor welfare such as injurious behaviours, physiological problems and immunosuppression, caused in barren environments are avoided.
- 2) In order to provide for the need to root with the nose and manipulate destructible materials, each pig should have access to manipulable destructible material such as straw or other fibrous material that does not harm the pigs if ingested to such an extent that negative effects do not occur.
- 3) Since indestructible objects such as chains or tyres are not sufficient to provide for the manipulatory need of pigs, they may be used as a supplement to destructible and rooting materials but not as a substitute for them.
- 4) Pen surfaces suitable for body-rubbing, and wherever possible wallows, should be provided for pigs for grooming purposes.
- 5) Where the ambient temperature around the pigs is below the lower critical temperature, shelter for outdoor pigs and an insulated lying area should be available to the pigs. At such temperatures inside the building, insulating bedding should be provided. Since huddling behaviour disrupts sleep in pigs, the necessity for huddling should be minimised by bedding provision or ambient temperature control.
- 6) Where the ambient temperature around the pigs is above 19C in pigs of over 50Kgs and above 25C in weaned pigs, once established on solid feed, measures should be taken to facilitate heat loss in the pigs. This is best achieved by allowing the pigs to take action to cool themselves by visiting a wallow or other place where they can cool themselves such as a cool floor, shower, or place of greater air flow. Above these temperatures, each pig should be able to lie so that it is not in contact with any other pigs.
- 7) In order to minimise disease in pigs, and hence poor welfare, effective disease preventive and management procedures should be in place. In addition to health control and health service these procedures include e.g avoiding mixing of animals, daily inspection of all the pigs so that sick or injured animals can be identified and more intensive inspections when infectious diseases, injury due to aggression, belly-nosing or tail-biting is occurring.
- 8) The lighting in pig houses should not be flashing and should be of a wavelength and intensity during the light period that allows pigs to discriminate the behaviour of other pigs and materials such as straw and to show normal diurnal rhythms. The light level and distribution at times of inspection should be sufficient to allow each pig to be seen.
- 9) The design of accommodation for pigs should be such that the pigs have sufficient exercise for normal bone and muscle development and opportunities to avoid or hide from other pigs that may show aggression, belly-nosing or tail-biting to them.
- 10) Breeding of pigs in order to eradicate halothane gene has significantly improved pig welfare. There should be further efforts in selection and breeding methods so that the likelihood of problems of pig welfare, including cardiovascular malfunction, risk of early death and leg disorders is maintained at a low level. Welfare outcomes concerning the frequency of cardiovascular malfunction, mortality rate and prevalence leg disorders should be defined.
- 11) Pigs should be exposed to appropriate human contact early in their lives so that later they are less fearful and negative effects on their welfare during the handling of the animals are minimised and there are associated benefits for production.
- 12) All pigs should be provided with water of good quality sufficient for their needs. Water supply systems should be well-maintained and their efficiency regularly checked.

- 13) Pigs should be provided with a diet whose components are balanced so that the pig is not harmed and which do not contain harmful contaminants such as mycotoxins.
- 14) Although outdoor pig units usually have less respiratory disorders than indoor units, however, care should be taken to minimise exposure to infectious agents.
- 15) Liquid feeding methods have benefits for pigs, including benefits for welfare, but should be accurately managed so as to minimise the risk of contamination by pathogens.
- 16) Dietary fibre provision should be managed in order to reduce both abnormal behaviour and ammonia production from excreta.
- 17) Indoor housing systems should be modified so that the occurrence of pressure bursae on leg joints is minimised. A threshold level for the occurrence of pressure bursae could be used as a welfare outcome.
- 18) The diets fed to pigs should be quantitatively and qualitatively adjusted so that the incidence of leg disorders is minimised.
- 19) The methodology and the results (Conclusions and Recommendations) of this opinion as well as the previous opinions on Pig Welfare, should be further analysed identifying welfare outcomes or indicators (in particular animal-based) suitable for the development of an animal welfare monitoring system.

### **5.3. Recommendations for further research (in order of priority)**

- 1) The effects of barren environments on the welfare of young pigs and their future coping abilities.
- 2) 2.a. How to provide for the needs of pigs to root and to manipulate materials in practical farm situations.  
2.b. A comparison of systems for removal of rooting or manipulable materials where slatted floors or partly slatted floors are used.
- 3) The effects on animal welfare of respiratory diseases.
- 4) The effects of light intensity, duration of light period and type of lighting on the welfare of pigs.
- 5) Methods for minimising the adverse effects of social mixing in pigs.
- 6) Methods of genetic selection of pigs to minimise negative side effects of selection for productivity such as cardiovascular and leg disorders and to maximise disease resistance.
- 7) The effects of housing system design on leg disorders in fattening pigs.
- 8) The causation of respiratory and gut disorders in pigs in relation to management system.
- 9) The effects of weaning at different ages on the welfare of piglets and sows and its relation to disease prevention methods and the need for antibiotic treatment measures.
- 10) Systems for preventing over-heating in pigs on farm.
- 11) The management of pig food so as to minimise mycotoxins, other toxins and pathogens that could lead to poor welfare in pigs.
- 12) The effect of housing and management system on disease resistance in growing pigs.
- 13) The effect of noise on the welfare of growing pigs.
- 14) The effect of housing system on skin care and grooming behaviour.

With respect to Italian heavy pigs in particular, it would be worthwhile investigating topics related to:

1. The quality of meat from heavy pigs reared in different conditions as to availability of space, floor type and/or provision of litter;
2. The consequences of drinking water deprivation on the welfare of pigs fed liquid diets;
3. Elements of environmental enrichment especially suited to heavy pigs kept on fully slatted floors.

## **6. REFERENCES**

References used in this Scientific Opinion are available and listed in the Scientific Report published at the EFSA web ([www.efsa.europa.eu](http://www.efsa.europa.eu)).