

Expert opinion regarding environmental enrichment materials for pigs

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Abstract

The aim of this article is to report on the expert opinion regarding the provision of environmental enrichment for pigs. A questionnaire was sent to 53 pig welfare scientists who were asked to specify which enrichment materials they considered sufficient to ensure pig welfare; 68% responded. 89% stated that providing a chain was not sufficient, while 84% stated that the provision of straw could be sufficient. 'Sustained animal-material interactions', 'rootability', 'manipulability' and 'chewability' were the main material properties referred to as being required for enriching pig pens. Areas of further research suggested by the respondents encompassed both fundamental and applied research, including preference tests and demand studies, deprivation studies and quantitative studies to determine cut-off points. A case is made for modelling the available knowledge to help close the gap between what is known in science and what is decided in society regarding animal welfare and environmental enrichment for pigs.

Keywords: animal welfare, environmental enrichment, EU, housing, pigs, questionnaire

Introduction

European citizens want acceptable levels of welfare for farm animals. On behalf of the citizens, policy makers must protect animals, often with legislative prescriptions about how farmers should treat their animals; however, farmers compete in an economic market and must maximise their profit; to do so, they look for 'loop-holes' in the law that give them an economic advantage.

Welfare scientists, belonging to the International Society for Applied Ethology, have contributed to animal welfare by generating knowledge about how animals respond to a variety of conditions. Traditionally, they have focussed on carrying out experiments and reviewing the existing literature. In addition, their opinions may be relevant for political decision making; however, scientists have sometimes been reluctant to give their opinions about controversial issues, such as environmental enrichment for pigs, where policy makers may ask scientists to give their opinions as to what material or substrate should be provided to pigs.

The EC Directive for the protection of pigs (2001/93/EC) stipulates that pigs should be provided with materials such as straw, compost, sawdust, wood or a similar material. In response, farmers maintain that their current practice (eg of providing chains and plastic balls) is sufficient (as a 'similar material'). However, when that argument does not hold, farmers start searching for the next most cost-effective 'similar material'. One solution, from the farmer's point of view, could be, for example, to provide a piece of hardwood

hanging on a chain, or alternatively to provide another material in a place that is hard to reach for the pigs so that the material lasts longer.

When farmers find 'loop-holes' in the law, policy makers may respond with increasingly complex regulations, often based on scientific research showing that the materials used by the farmers do not result in the required improvements in animal welfare. In addition, over time, the welfare demands themselves may require increasingly strict formulation because of increased scientific understanding and/or societal concern regarding animal welfare.

Legislation concerning enrichment materials for pigs may be understood in light of this process. At first (and in some countries still), there was no regulation regarding enrichment; later, some requirements were made, for example, to provide some material to explore and play — an iron chain being sufficient. Now, an additional step has been made in the EC directive (2001/93/EG) towards the provision of straw. Implementation into national legislation and changing farming practices require a specification of what exactly is allowed regarding environmental enrichment materials for pigs, either in terms of specific materials and/or in terms of specific material properties.

In order to generate a quick impression of the state of the art in science a questionnaire was sent to pig welfare researchers. The aim was to obtain expert opinion regarding environmental enrichment materials for pigs, in order to support political decision-making, ie further implementation of the EC directive into Dutch legislation.

Table 1 Percentages of answers by respondents (n = 36) to the stated questions.

Question	Yes (%)	Yes, provided (%)	No (%)	Other (%)
1. Is a chain sufficient?	3	0	89	8
2. Is straw sufficient?	67	17 (eg sufficient quantity)	11	5
3. Would you like to be involved in this project?	86	0	8	6

Table 2 Most frequently mentioned material properties believed to be required for adequate environmental enrichment for pigs, presented as a percentage of respondents (n = 36) mentioning an item.

%	Material properties
39	Provide occupation, exploration and maintain interest without habituation
39	Rootable/digable
31	Manipulable ie with mouth/rooting disc
28	Chewable
22	Variable and unpredictable (ie in terms of reward value and of availability)
17	Destructible
17	Thick layer (ie full bed or in a box)
17	Sufficient/plenty amount
14	Changeable (in some way)
14	Digestible/nutritional (at least partially)
14	Novelty/frequently refreshed, renewed

Materials and methods

In December 2003, a questionnaire was sent, by e-mail, to 53 pig welfare scientists containing the following questions:

- (1) Do you think something like a chain provided in a pen of pigs (especially weaners/growers/fatteners) is sufficient for their welfare when they are otherwise housed in pens that just meet the minimum legal requirements with respect to floors, social contact, space, climate etc? Yes/No;
- (2) Do you think something like straw would be sufficient? Yes/No;
- (3) What would you regard as sufficient enrichment material for pigs? (You may specify the answer not only in terms of materials, but also in terms of properties of materials and/or criteria, which these materials should satisfy);
- (4) Do you know how the EC Directive, with respect to enrichment materials for pigs, is being implemented in your country?
- (5) What research do you think is most needed to provide (better) answers?
- (6) What kind of research have you done, and do you have any research planned on this topic?
- (7) Could you recommend unpublished reports?
- (8) Would you be interested in being involved in our project?

The 53 scientists that were contacted were either well-known senior pig-welfare scientists (most of them being members of the International Society for Applied Ethology) or were selected from a literature review of papers on environmental enrichment for pigs.

Results

By the end of January 2004, 36 (68%) scientists had responded from the following countries: Belgium (3), Canada (1), Czech Republic (1), Denmark (2), France (3), Germany (3), Norway (1), Spain (2), Sweden (3), Switzerland (2), The Netherlands (7), UK (6) and the USA (2).

Questions 1, 2 and 8: Sufficiency of a chain and straw, and interest in collaboration

Table 1 shows the percentage of respondents' answers to question 1: Is a chain sufficient? question 2: Is straw sufficient?; and question 8: Would you like to be involved in this project?

Requirements for enrichment materials for pigs

The number of respondents mentioning a material property were counted in direct relation to the wordings used. This generated a long list of items that partially overlapped. For example, 'occupation' may be in the form of 'manipulation', which, in turn, may consist of 'rooting' and 'chewing'. Table 2 shows the material properties most frequently mentioned by the respondents.

In addition, some further material properties were mentioned, but less often; these are presented in Table 3.

Some respondents also specified related requirements for human welfare: economical (ie not expensive), robust material (ie lasting a long time), re-usable after cleaning and compatible with slatted floors.

Some respondents listed materials that they considered to be sufficient individually. These were all organic materials (eg straw, soil, peat, hay and bark), except for one respondent who listed chains, balls and rubber tubes. Other respondents

Table 3 Further material properties mentioned.

%	Material properties
11	Multiple materials, olfactory/smell (ie interesting), rewarding
8	Biteable, carryable, does not get soiled/easy to clean, causing no harm (ie health problems, including dustiness), movable, multifunctional/allow a range of behaviours (eg foraging, exploring and lying), organic material, playable (including scampering), prevent tail-biting and other harmful social behaviour, provide lying comfort (ie bedding and thermoregulation)
6	Deformable, edible flavour, flexible (ie not stiff), ingestible/swallowable, liftable, not inducing stereotypic behaviour (eg chain chewing)
3	Allowing appetitive feeding behaviour (ie food searching), allowing 'nest-building' (ie bedding construction), beatable, providing gut-fill (ie satisfy hunger), maintaining lively pigs, not eliciting aggression, provide hiding opportunities, simultaneous usage by the animals in the pen (ie synchronised activity), sniffable, giving rooting resistance/digging in, object should be buckled (ie not loose in pen)

Table 4 Most frequently mentioned studies required for the future. % indicates the percentage of respondents (n = 36) mentioning an item.

%	Studies
25	A lot / enough knowledge is already available, but need theory formation, modelling
25	The need of pigs to explore (preferences, demand, individual variation)
22	Effects of different types and quantities of substrates and the duration of resource allocation, for example, to determine cut-off points of what is acceptable
19	Deprivation effects (eg on tail biting and induction of stress)
17	Ontogenetic effects (eg of age and sensitive periods; long-term studies)
17	Practical and economic designs of objects, including handling of straw and manure
14	Determine which material properties are relevant

demanded a combination of organic materials to be provided simultaneously to the pigs. Materials explicitly mentioned as *not* sufficient were artificial materials, chains, pieces of wood or pieces of rope, a chain or football, fake 'tails' and other 'toys' and a straw rack (each item was mentioned by one respondent only).

Country status

Only few respondents specified the status of enrichment for pigs in their country: one scientist from Denmark stated: "legislation has been made, but the industry seems to be very inventive regarding getting around the legislation, ie by using what we call 'fake tails' (made of plastic) or other 'toys'". One scientist from the UK stated that a rootable substrate, such as straw, was considered to be the most desirable situation, but added that other items could be acceptable when enrichment was varied and provided in a reasonable amount, for example, hanging objects, tyres, alkathene piping and logs of wood. One scientist from Germany first replied that most producers probably provide a piece of hardwood hanging on a chain. Upon further inquiry this respondent stated that hardwood would soon no longer be considered acceptable, and that recent regulation intentions in Germany state that one device is not sufficient: a minimum of two items must be selected from a list of enrichment materials and feeding techniques.

Canada and the USA do not appear to have regulations regarding enrichment for pigs. In Norway regulations demand a solid floor in the lying area and the provision of bedding material; most Norwegian farmers use sawdust.

Switzerland has EU-independent legislation specifying precise alternatives as to what is sufficient, defined in terms of feeding systems and specific materials such as straw or a moveable soft-wood beam. In Sweden provision of straw or a comparable material is required.

What research is done and what is needed?

Only a limited response was received to question 6, what relevant research the scientist had been doing, and question 7, whether he/she had unpublished reports; most references were made to recently completed and still on-going work. Relatively little enrichment work was planned for the near future. The main studies mentioned are listed in Table 4.

Other, less frequently mentioned types of study included: studies of animals in semi-natural environments; the combined effects of enrichment and other factors, such as space; neurological studies; the effects of unpredictability and variation; qualitative behaviour evaluation; and epidemiological studies.

Discussion and conclusions

The response rate to the questionnaire differed between countries: there was no response from either Australia or Italy (1 scientist was contacted in each country), but there was a 100% response rate from the Czech Republic (1), France (3), Norway (1), Spain (2) and Sweden (3). For countries with the largest number of experts contacted, response rate was high for The Netherlands (88%: responses from 7 out of 8 scientists contacted) whereas it was relatively low for the UK (50%: responses from 6 out of 12 scientists

contacted). A possible explanation for this finding is that the relevance of the research may have been perceived to be higher by Dutch scientists. Nevertheless, the findings are likely to represent the current state of opinion on environmental enrichment in the science of pig welfare because many of the most well-known senior pig welfare scientists in each country did respond (data not shown) and because a wide range of countries were represented.

In accordance with the published literature (eg Feddes & Fraser 1994), 89% of pig welfare scientists believed that a chain was not a sufficient enrichment material for pigs; this result may help end the ongoing discussions between policy makers, animal protection agencies and farmers on this specific point. In addition, 84% of scientists asserted that straw was sufficient, or may be so under certain conditions, for example, provision of sufficient quantity, distribution and maintenance. Furthermore, two respondents explicitly stated that they considered straw to be a 'gold' standard against which other materials should be compared.

There was a wide range of responses from the scientists: from saying that a chain was sufficient to saying that no type of enrichment provided in otherwise legally minimally-acceptable pens would ever be adequate for welfare. These differences in opinion probably reflect underlying differences in value systems, perhaps expressing different conceptions of animal welfare (see Fraser *et al* 1997, eg in terms of animal feelings, natural living conditions or proper biological functioning) and/or expressing different ethical points of view towards the use of animals for the production of food. These differences in value systems are unlikely to be resolvable by a perfect experiment. For example, consider the much praised study by Van de Weerd *et al* (2003) who tested 74 different enrichment objects in 222 groups of 3 weaners and 222 groups of 3 growing pigs. Van de Weerd *et al* (2003) found that not being rootable increased the animal-object contact on both day 1 and day 5 after introduction of the enrichment object, but explained that this finding was an artefact because the non-rootable objects happened to be mostly edible.

The results of this questionnaire confirm that current scientific opinion recognises the importance of rooting behaviour for pigs; 'rootability' scored joint highest on the list of material properties (Table 2) together with 'animal-material interactions' (maintaining interest), 'manipulability' and 'chewability'. Such established scientific opinions are rather firm and resistant to experimental findings, and, therefore, worthwhile to identify and perhaps apply to support political decision-making. This is not to deny the importance of carrying out experiments. For example, Van de Weerd *et al* (2003) also found that many objects were used by the pigs in unforeseen ways, indicating the need for experimental verification of whether enrichments work as they were intended. However, recognising the functional role of established scientific opinion in practical decision-making does indicate added value for what I have called a semantic

modelling approach (see Bracke *et al* 2002a,b; Bracke *et al* 2004a,b). Its objective would be to formalise the reasoning process from basic empirical facts to political and ethical decisions by making underlying value judgements explicit. The results of this questionnaire could provide a good starting point for modelling the relationships between enrichment materials, their properties and welfare indicators as measured in scientific research. Although it is beyond the scope of this paper to explain this more fully here, a first step could be to 'translate' the decision-maker's dichotomous problem (is a chain sufficient? yes/no) into a problem of allocating a cut-off point on a continuous scale. Such a scale is implicit in scientific thinking, as was confirmed in the questionnaire in that several experts stated it explicitly and in that 67% of the respondents provided answers suggesting an underlying continuous 'enrichment' variable.

In line with this argument, the questionnaire also confirmed that a modelling approach was a priority for future work. In part, this finding may, perhaps, be related to a personal bias by the author. Nevertheless, it does suggest that it could be worthwhile to try to systematically use the large amounts of information that are already available (published and otherwise). A better understanding of the rational and value-based aspects of the reasoning processes involved in decision making will target experiments to inevitably remaining gaps in knowledge and contribute to improved application of the experimental findings.

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