

Review of the scientific literature and the international pig welfare codes and standards to underpin the future Standards and Guidelines for Pigs

Response to reviewer comments

The authors have noted the reviewer comments in the review document and addressed where appropriate. With regard to specific reviewer comments, please find author responses below.

Reviewer 1

- Reviewer 1 suggested further clarification regarding where there is scientific evidence to underpin a new standard or guideline and where there is no scientific evidence indicating an area for future R&D.
Evidence for changes to current S&G and future R&D have been emphasised in the conclusion for each section of the review, and these conclusions have also been added to the executive summary.
- This review has addressed this term with a thorough review of the scientific literature and has identified gaps in knowledge. The authors have suggested areas of research that are warranted in order to fill these gaps.
No response needed.
- This review has certainly met this term. Nevertheless, the issue of gene editing was not addressed and I believe it needs to be with the possible need to incorporate comment into specific standards and guidelines (see General Comments).
Whilst breeding for better welfare is covered in section 5.1, gene editing is beyond the scope of the current project brief.
- Summarise contemporary (Australian and international) research findings which will inform the development of the welfare standards and guidelines including research on handling, housing, stockperson training, husbandry and management practices: The review adequately meets this term.
No response needed.
- Undertake a search of the social media (including NGOs websites) may be useful to identify the most popular welfare concerns (and where current/future pressure may come from). This may assist also in identifying new areas/issues that need to be addressed in the to-be-developed Australian Standards and Guidelines for Pigs: The review does not substantially emphasise this but I feel that it is adequately addressed.
No response needed.
- Examine provisions and comparisons across relevant international pig welfare codes and standards: The review considers all international pig welfare codes that are relevant to the Australian pork industry.

No response needed.

- Review any other relevant published information: The review is comprehensive and includes all relevant published information that I am aware of.

No response needed.

- The health and welfare aspects of various housing systems for all classes of pig, including aspects such as confinement, social grouping, flooring, housing design: This is addressed. In particular, the authors have quite rightly identified that the stage of reproductive cycle can influence stress responses which may be important when mixing sows. There are important interactions between the hypothalamo-pituitary adrenal and hypothalamo-pituitary gonadal axes, that have been better described in species other than the pig, and maybe useful in forming an understanding of the physiological consequences of mixing. This may be an area for further research to inform the standards and guidelines.

No response needed.

- The welfare effects of varying stocking densities and space allowance: This is addressed.

No response needed.

- Environmental enrichment for all classes of pig: This is addressed. The review highlights gaps in knowledge that, if known, would likely be useful in interpreting ways to improve welfare.

No response needed.

- Pain relief for invasive procedures: This is addressed. In particular, the authors have highlighted the controversies around these procedures and this is important. A better understanding is definitely required here.

No response needed.

- I feel that a definition of anesthetics and analgesics should be given.

Added to section 3.2.4 (Painful husbandry procedures: Piglets), line 1458.

- The need for husbandry procedures including teeth clipping, tail docking, castration: This is addressed.

No response needed.

- Preventative methods for adverse behavioural and physiological conditions including tail biting, stereotypic behaviours, and lameness: This is addressed.

I feel that the definition of stereotypies could come earlier in the review.

Stereotypic behaviour is defined when stereotypies are first discussed in section 3.1.7 (Barren environments) and then in further detail in section 4.4 (Stereotypic behaviours).

What is the acceptable working definition of “barren” environments? Also, what is meant by “stress adaptability”?

A definition of ‘barren environment’ is given in section 3.1.7 (Barren environments), lines 996-998.

- On-farm euthanasia methods: This is addressed.

No response needed.

- The focus of breeding programs on welfare traits, and the ability to genetically select for and against positive and negative welfare traits including those related to tail biting, aggression, and various production traits associated with farrowing: This is addressed but please see comments below concerning gene editing.

No response needed. Please note earlier comment on gene editing.

- This review is, understandably, largely based on behavioural literature with most excursions into physiology being limited to some aspects of stress and immunology (and stress and immunological responses). This is not a criticism of the authors. It highlights that the physiological aspects of research in pig welfare, especially the neurophysiological aspects, have not received near the attention that behaviour has. I believe that this underscores the need for more research of a physiological nature to parallel and support the behavioural research. This knowledge would inform the standards and guidelines.

No response needed.

- There is no discussion of gene editing and I feel that this is a topic that needs to be taken into consideration when developing standard and guidelines in the livestock industries, including pigs. Again, this is not a criticism of the authors because addressing gene editing is not in the Terms of Reference nor in the suggested key areas that should be covered by the review. Nonetheless, I feel that this topic should be considered when developing standards and guidelines given the burgeoning research effort and interest in gene editing to modify function in animals and, importantly, because gene editing may be used to remove negative welfare traits.

Please note earlier comment regarding gene editing.

- The discussion of the concepts of animal welfare are comprehensive and very helpful.

No response needed.

- There is one mistake in the Biological Functioning Section (1.3.1). In the second paragraph, the sentence commencing “Stress-induced secretion of these pituitary hormones...”, pituitary should be changed to stress hormones (or just hormones) or something similar since glucocorticoids are not pituitary hormones.

Pituitary hormones changed to stress hormones, line 443.

- Furthermore, earlier in the paragraph of the same section (Biological Functioning Section 1.3.1) the term sympatho-adrenal- medullary system is used but, strictly speaking, the correct nomenclature is the sympatho-adrenal system because the cortex of the adrenal gland, and the glucocorticoids synthesised by the cortex, play a critical role in the functioning of this system.

The term sympatho-adrenal-medullary system (SAM) is widely recognised and used in the literature.

- In section 2.1, under husbandry procedures, the sentence of Australia: is incomplete.

Corrected, line 606-607.

- In section 3.2.1 Group size during gestation, can the authors please check the sentence commencing, “Neither Taylor et al. (1997) or...”

Corrected, line 789-790.

- In section 3.2.4, second paragraph, I suggest changing ,” Furthermore, corticosteroids...” to, “Furthermore, glucocorticoids...” since mineralocorticoids and sex steroids are not relevant to the comment.

Changed, line 1479.

Reviewer 2

On the whole the review of the Australian welfare codes is fairly comprehensive; however there is some missing literature that would be worth citing and there are certain welfare challenges that have not been discussed or elements that require further discussion. These include:

- A detailed discussion about the impact of prenatal stress on both short and long-term outcomes for offspring. This is particularly relevant in the section on gestating sow housing and management.

A detailed discussion about the impact of prenatal stress on both short and long-term outcomes for piglets is beyond the scope of the current brief, and at present relevant literature is inconclusive and limited. Furthermore, the objective should be to reduce the stress experience by the gestating sow and as a result the neonates.

- I think the discussion about glucocorticoids is missing reference to chronic stress resulting in cortisol dysfunction – i.e. hypocortisolism.

This is addressed in the section 1.3.1 (Biological functioning).

- There are some caveats that should be mentioned in the discussion around gestation stall housing that stem from the European experience - I have given detailed notes and links in my comments.

Addressed throughout section 3.2 (Farrowing/lactating sow and piglets, including painful husbandry practices).

- Shoulder ulceration/lesions have not been mentioned in the section on injury/physiological challenges – yet are highly relevant for sows.

Section 4.3 (Shoulder ulcers) added, line 2412.

- The protective elements of enrichment, in particular the relationship between pre-weaning enrichment and health could be further discussed and this would mean more elements on positive welfare could/should be included – e.g. relationship between play and growth and brain health.

The benefits of enrichment with regard to welfare supported by appropriate literature are discussed throughout the document, i.e. sections 3.1.7 (Barren environments) and 3.2.3. (Barren environments).

- Tail docking/biting discussion should reference the latest work on short and long-term pain sensitivity.

The most relevant literature has been referenced.

It is also worth mentioning that the UK welfare codes are under review and the new codes are likely to go before parliament shortly and be published next year. This may make some of the review's citations on UK codes outdated – however a caveat about this could be included and I have made further notes in the attached.

This has been noted in section 2 (Purpose of this Review and the Australian Model Code of Practice for the Welfare of Animals – Pigs), line 599-602.