

details the welfare of gestating gilts and sows, with focus on such issues as close confinement, hunger, stereotypic behaviour, feeding systems, social organisation and aggression. There is also some discussion about the trend away from close confinement and of welfare in extensive systems. The next chapter is entitled 'Welfare of weaned piglets' (Garcia and McGlone) but does also cover the farrowing environment, welfare aspects of cross-fostering and pre-weaning mortality, and revisits painful procedures previously covered in Chapter 6. Other contents in this chapter are weaning stress, transportation and the potential of new technologies, such as PLF and gene editing.

The final three chapters focus on the finishing pig, including on-farm welfare and welfare during transport and slaughter. Chapter 10 (Amory) covers welfare on the farm with an important section focused on tail-biting and environmental enrichment. Chapter 11 (Young) covers transportation, detailing loading and handling, factors affecting welfare during the actual transport process, and lairage at the slaughter plant. The volume wraps up with a short Chapter 12 (Støier and colleagues) on humane slaughter techniques and discusses handling and stunning impacts on welfare, mostly in relation to EU requirements.

So, overall, I was disappointed. If you want to learn about how pig production can be economically, environmentally and socially sustainable, then this book will not give you the answers. But, if you want up-to-date reviews on some of the most pressing welfare issues in different stages of production, or an introduction to pig health, then there are some good chapters included.

References

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Animal Welfare, Third Edition

Edited by MC Appleby, IAS Olsson and F Galindo (2018). Published by CABI, Nosworthy Way, Wallingford, Oxon OX10 8DE, UK. 440 pages. Paperback (ISBN: 9781786390202). Price 39.99, €55.00, US\$ 65.00.

Ever since its first edition, *Animal Welfare* has been the point of first call of many students, lecturers and researchers in the animal welfare science field. It is therefore timely that a new edition has been released seven years after the second edition was published. In line with previous editions, the third edition is very accessible and aimed at undergraduate and postgraduate students, as well as early career researchers and animal professionals outside of academia. It provides a concise summary of a wide range of aspects relating to animal welfare. The book is organised into 19 chapters over five parts. The parts form a logical journey, starting with an introduction to animal welfare issues, followed by a concise description of problems relating to animal welfare, assessment of animal welfare, solutions to animal welfare problems, before ending with a chapter on implementation of animal welfare solutions. New to this edition is the provision of supplementary material online, two digital-only chapter appendices and the option to also obtain a free e-book version of the book.

Although no major additions or deletions appear to have been made to the content, overall the content has been updated, and rewritten where evidence has evolved since the last edition of the book. For example, recent work on genetic polymorphism and temperament (Table 10.2; p 200) has been added to Chapter 10 on physiology to reflect our greater understanding since the previous edition. In a number of cases, content has been clarified with clear examples and explanations (see, for example, Table 8.1 on p 144 of the new third edition compared to section 8.1.2 on p 121 of the previous edition). This has made the text much more accessible to readers. Similarly, examples have been updated to demonstrate that classic topics (such as preference and motivation; Table 11.1; p 215) remain current. The reproduction of photos and figures in colour add to the increased accessibility of the new edition. Moreover, where required, figures have been updated to reflect advances in our understanding (see, for example, the addition of epigenetic influences to the diagram on physiological processing on p 184 of the new edition). Similarly, where appropriate, figures have been replaced with more up-to-date examples (eg Fig 10.4 on p 195 on cortisol secretion in sheep replaces Fig 10.3 on p 167 on the same topic).

Although this third edition sees many positive updates compared to its predecessor, there are a number of weaknesses which may need addressing in a future edition. Firstly, prediction of welfare problems through technology-enhanced behaviour analysis is covered only briefly in Chapter 9, even though this area of animal welfare science is currently seeing rapid developments (see, for example, Kashiha *et al* 2014, Vásquez Diosdado *et al* 2015 and

Barker *et al* 2018). (Very) early disease detection or identification of husbandry-related issues will have a large impact on animal welfare, and it is important for the target audience of this book to develop a good appreciation of these important advances in our field. Secondly, there appears to be no reference to recent developments in social network analysis to animal welfare (see, for example, Koene & Ipema 2014 and Boyland *et al* 2016). Even though the possible contribution of social network analysis to animal welfare is not entirely clear yet, and may vary by species and setting, the topic should at least have been introduced so that the reader is alerted to developments in this area.

There are also two issues which make the book less user-friendly than it could have been. Although, in theory, the amalgamation of a physical book and online supplementary material might work, in practice it is somewhat rusty. Provision of individualised links to supplementary material (or even QR codes if one wants to be fully mobile device-friendly) would not have been difficult and would have made referring to supplementary material much easier than the current system, where one has to access the publisher's website and then manually navigate to the correct material. Technology, and especially mobile technology, allows for this to be more integrated. Furthermore, the continued page numbering between the book and the online-only indices makes looking up specific topics complicated. For example, if one looks up the keyword 'sensors', the index refers the reader to page 394. However, no such page exists in the hardcopy book. This specific page number belongs to Appendix 8, which can only be found in the online supplementary material and in the e-book version, for which one has to register an account. This issue undermines the role of this book as a key reference work. It also assumes the reader has access to the internet at all times, which is perhaps not ideal and may limit the usefulness of the book to readers in less-developed countries.

Regardless of the minor weaknesses in this edition, this book continues to make a valuable contribution to animal welfare science with its updated material, enhanced clarity and extended use of examples both in the book and online. It provides a clear and concise overview of animal welfare science, it is written in an accessible and convincing manner and it is sufficiently updated to remain a key handbook for animal welfare scientists in all stages of their career for the foreseeable future.

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