

‘incommensurable variables’ can be weighed or balanced only on a contextual, case-by-case basis, for which ‘imaginative casuistry’ provides a means. Nordgren’s analysis here is necessarily detailed, including a discussion of how weighing before and after an experiment may differ. Balancing, he argues, ‘should be understood in terms of trade-off instead of aggregation’ and by using a ‘transparent... matrix’ with ‘two basic dimensions: expected level of human benefit (low, medium, high) and expected level of animal harm (mild, moderate, severe)’.

While this may sound familiar to those with experience of ethical review in the UK, Nordgren adds a number of helpful definitions and illustrations and also an important qualification about how ‘to reduce subjectivity and arbitrariness in making the ethical trade-off.’ ‘For example, in determining the likelihood of future human benefit, optimists and pessimists might make different judgements. One method of counteracting this risk is analogical reasoning based on precedents. This is particularly crucial in animal ethics committees and agencies. The way an ethical trade-off has been made in a similar previous case should be taken into account in the ethical trade-off in the new case’.

A long final chapter examines how Nordgren’s arguments might be applied to the production and experimental use of genetically modified animals, and concludes with detailed analysis of four case studies in which the trade-off differs in different ways from case-to-case. Different readers will no doubt be in different degrees of agreement or disagreement with Nordgren’s judgements. But the conceptual analyses and ethical arguments he offers provide a constructive and productive framework for achieving ‘substantial soundness’ in ethical decision-making about the use of animals in research. The clarity as well as depth of Nordgren’s analyses also makes this book an excellent introduction to these issues for undergraduate and postgraduate students of ethical issues in the life sciences.

Kenneth M Boyd

College of Medicine & Veterinary Medicine, University of Edinburgh, UK

Welfare of Production Animals: Assessment and Management of Risks

Edited by FJM Smulders and B Algers (2009). Published by Wageningen Academic Publishers, PO Box 220, 6700 AE Wageningen, The Netherlands. 588 pp Hardback (ISBN 978-90-8686-122-4) Price €98.00, US\$147.00.

This is a significant animal welfare textbook. It is large, 588 pages with few figures and tables. It is not a light read for perusing on the beach or before sleep, in fact it is not light at all. It is published by Wageningen Academic and issued by the European College of Veterinary Public Health and the European Food Safety Agency. It is volume 5 of a series of books on food safety assurance and veterinary public health. The book has an introductory chapter by the editors and then 22 chapters in 4 sections. The four sections are titled ‘Animal welfare — theoretical basis’ (10 chapters),

‘The assessment of animal welfare risks’ (4 chapters), ‘Management of risks for the welfare of production animals’ (7 chapters), and ‘Reconciling animal welfare and food safety’ (1 chapter). Each chapter is by a different author or group of authors, most of them European (29) but with a few notables from Australia, Canada and the USA. As many chapters are written by people whose first language is not English there are some sentences which are difficult to understand and there are also a few typographical errors in the text. The book is European in focus and concerned with production animals and poultry but there is a chapter on hunting. At the start of each chapter is a summary and at the end a conclusion section which identifies what has been done, what has been neglected and what needs to be done. As many of these chapters are written by people with vested interests in research or regulation it is not difficult to imagine what they suggest needs to be done but of interest is the recognition of what has been done and how far the subject has come in the last 5 decades. The summary and the conclusions are valuable as many of these chapters may not be of great interest to some readers and they can get quickly an abbreviated idea of what the chapter is about. Each chapter is referenced but the depth of referencing varies considerably between them.

The first section is a series of review chapters on different aspects of animal welfare. Some of these are theoretical as suggested by the name of the section but many are descriptive reviews of the science behind different aspects of animal welfare. The first chapter by Lennart Nordenfelt, titled ‘The concept of animal welfare: a philosopher’s view’ concludes that positive subjective experiences are central to the concept of animal welfare. This conclusion presents a difficult premise from which to work for those involved in animal welfare risk assessment and introduces the reader to the difficulties in this field of endeavour. Ron Broglio’s review of animal welfare in science and society follows. It identifies the range of participants involved in the discussion on animal welfare and suggests that a neutral source of information is required for translating animal welfare science results for the general public. Again, this chapter suggests that there will be difficulties in getting agreement in animal welfare risk assessment. These two chapters together form a philosophy subunit within the first section and are followed by chapters written by internationally recognised animal welfare scientists on their areas of expertise. These descriptive review chapters deal succinctly and clearly with the European Welfare Quality® project, and the welfare issues relating to housing, nutrition, management, transport, stunning and slaughter and killing for disease control. These review chapters have to cover large subjects and to the credit of their authors and the editors, they are focused on the particular subject and are reasonably thorough. Most are about 15 to 20 pages long so they cannot cover the complete subject in depth but they are very readable and sufficiently referenced to be of value. Personally I enjoyed all of these chapters and will reread them. They are suited to anyone with an interest in animal welfare and though the focus is generally European as illus-

trated by reference to EU legislation and intensive farming systems, many non-European readers will benefit from reading these chapters and gaining a better understanding of what is happening in Europe. The chapter on management by Hemsworth and Coleman belies the European focus and is a delightful read, fresh and interesting, as we expect from these Antipodeans. The chapter on hunting in this section is unexpected as game animals are generally not considered production animals although they are of course often eaten. It focuses on Central European techniques and traditions and although some aspects of hunting ethics are similar worldwide actions, (eg use of live ducks for dog training) may be allowed in one country and not another. I would have liked a more international review of the subject and felt that this was too limited to satisfy.

The second section covers the assessment of animal welfare risks. Risk analysis is carried out to allow a risk manager to focus on and attend to those areas with the greatest risk, thus maximising return for limited investment. In veterinary science and public health, the methodologies underpinning risk assessment have developed over the last few decades so as to reduce animal disease and public health problems by the most efficient means. In the first chapter by Bo Algers, an approach to risk assessment of animal welfare is described. The basic methodology involves four steps: hazard identification; hazard characterisation; exposure assessment; and risk characterisation. A team of experts is identified who have to agree on the essentials of animal welfare and their relative weighting. There are major problems with this issue of weighting. The following chapter by Frans Smulders uses a number of examples (calf production, pig welfare, killing seals, farming salmon) to illustrate different methods used by EFSA's to assess animal welfare risks. The methodologies are well described and their weaknesses exposed. This is the one seriously technical chapter in the book and for those not used to risk assessment terminology it probably requires rereading, not because it is poorly written, it is very clearly written, but because of the subject matter. The author appears confident that with ongoing commitment to the process, good quality risk assessment can be carried out. The following chapter by Serratos and Ribo from EFSA titled 'International context and impact of EFSA activities in animal welfare in the European Union' discusses how EFSA's activities fit in an international context with other organisations such as FAO, OIE, WTO and how EFSA fits within the European Union strategy on animal health and welfare. It lists the scientific opinions on welfare that EFSA's animal health and welfare panel has done and discusses some of the interactions between animal welfare, animal disease and food safety. The last chapter in this section by the same authors is titled 'History and procedural aspects of the animal welfare risk assessment at EFSA' and describes what its title suggests. This section, describing the methodology of risk assessment in animal welfare and the work of the EFSA in this field is probably the *raison d'être* for the publication of this book. It is timely that the methodology of risk assessment of animal welfare as carried out under the auspices of the

EFSA is described and reviewed in this manner. For all readers it illustrates the difficulties of such an exercise and for non-European readers it describes where at least a section of those people who work in animal welfare in Europe are headed.

The third section of this book is a bit of a hodge podge. Rushen and de Passillé bring us back to earth with a brilliant, concise discussion of the scientific basis of animal welfare indicators including input- and output-based standards, and the old reliables or not, (health, production, reproduction, behaviour, physiology). They cautiously suggest that we need to validate measures of welfare before using them in on-farm audits. Broom discusses the public interest in animal welfare, legislation and codes of practice and laments the lack of resources to enforce and implement these. Gavinelli and Ferrara continue in this vein discussing how animal welfare is managed in the EU. Non-Europeans may be irritated by their claim that Europe leads the field in animal welfare but in general this is true and those of us outside Europe watch where it goes with critical interest. Butterworth's chapter titled 'Animal welfare indicators and their use in society' discusses the apparent shift in Europe from prevention of cruelty to welfare to life quality and the move towards animal welfare as a public good. He discusses the Welfare Quality® project and discusses some 'tools' including animal-based and outcome-based measures of animal welfare. He is optimistic about a consensus amongst scientists regarding welfare assessment but I'm not sure Rushen would agree with this optimism. In his chapter on monitoring animal welfare, Cassidy describes how, within the EU, competent authorities monitor animal welfare and how this is organised and defined. The section ends with a chapter by Jan Hultgren on how the Swedish monitor animal welfare. They probably lead the world in animal welfare legislation, in documenting in large databases how animals are managed and in assessing animal welfare. Hultgren makes a very salient point that "animal welfare does not fit readily into the risk assessment framework developed for public health and contagious disease control" and suggests that, despite EFSA's efforts, methodological issues remained to be solved. There is a chapter on genetic improvement and animal welfare by Pascal Oltenacu in this section and while it is very interesting it appears somewhat out of place.

The final section is a single chapter on food safety in relation to animal welfare. It lists food safety hazards and then discusses stress and animal management factors, on- and off-farm, which might affect food safety. The authors discuss circumstances where improving animal welfare may be at the expense of food safety. The interaction between animal welfare and food safety is important as it is stated many times in this text that customers expect both safe food and high animal welfare standards and the conflict between these two ambitions is important, though, to-date, poorly researched and discussed. This is a very welcome review.

This book is targeted at veterinarians, animal scientists, welfare scientists, students and risk managers. I think that many readers will find the chapters in the first and third

section interesting and easy to read and in many cases familiar. The chapters on risk assessment in the second section will be of interest to those interested in this aspect of animal welfare but may not interest the general animal welfare reader. The final chapter is a warning to those who believe that food safety and high animal welfare always go hand-in-hand and adds to the complexity of risk assessment in the production of safe food from animals.

This book is essential reading for people involved in animal welfare assessment and regulation worldwide as it describes how the EU is moving towards animal welfare risk assessment and management. This activity has implications for everyone involved with production animals worldwide and, in particular, personnel working in countries that export meat, egg or milk products to the EU as the latter will probably use the success of risk assessment and management of animal welfare within Europe as a means of defending its importance as a trade issue at the WTO. The description of how animal welfare is managed in Sweden is particularly important as it describes the intensity of data collection and regulation which may become standard in other countries that can afford such practices.

The assessment of animal welfare risks is a field of scientific endeavour in its infancy and this is, to my knowledge, the first textbook to focus on the subject. Many of us may criticise the methodology being used but risk assessment is necessary if we are to manage animal welfare issues efficiently and economically. The Swedish model is probably too intensive, politically unacceptable and expensive for many countries but the work being undertaken by the EFSA is admirable and, hopefully, will lead, probably after several iterations, to methodologies that are acceptable to scientists, regulators, legislators and the public, and are affordable. This book will encourage discussion internationally about the process and the authors and particularly the editors are to be congratulated on their product.

In conclusion this is a very useful book. I read it from cover-to-cover but I suggest readers take time and enjoy particular chapters or sections piecemeal. I will certainly use it as a resource and I recommend it to anyone interested in the welfare of production animals.

Kevin Stafford

Massey University, New Zealand

Meat Science, 2nd Edition: An Introductory Text

PD Warriss (2010). Published by CABI, Wallingford, Oxon OX10 8DE, UK. 240 pp Paperback (ISBN 978-1-84593-593-1). Price £35.00.

Ten years after the publication of the first edition, a second edition of *Meat Science* is now available. Some additions have been made, and recent developments in technology and new knowledge in biology have been included.

This is a traditional textbook, and it is obvious that it is aiming at undergraduate and, to a certain extent, also post-graduate students wanting to learn more about meat, and about how animals are turned into meat products. Each

chapter starts with a 'box' of questions. The answers to these questions are then given in the chapter. This layout emphasises the teaching aspect of the book, and may give a 'secondary school' impression to non-student readers.

The book includes information on carcass composition, meat chemistry, meat quality and hygiene. The book is written with an obvious UK perspective, but most of the content is nevertheless valid also in other countries, especially within the European Union.

From an animal welfare perspective, the most interesting chapters are the ones dealing with live animal handling, stunning and slaughter, and the chapter on animal welfare in general. The chapter on stunning and slaughter gives a very useful introduction to current commercially practiced stunning methods and the main principles upon which these are based. The chapter doesn't go into much technical detail, but to a person previously unfamiliar with the different options and methods available, the information provided will form a solid base for further reading.

With respect to handling and ante mortem inspection, the content of the text is fine but, in my view, far too short. The handling of animals at slaughterhouses with respect to unloading facilities, driving and coercion methods, lairage design and mixing of groups has a large effect not only on animal welfare but also on the meat quality. This is valid both in terms of stress-related meat quality effects and in relation to possible injuries leading to downgrading or rejections. Thus, this section could have been more extensive. The effects of live animal handling on meat quality are handled in a later chapter, but more emphasis could have been put on the prevention of such problems by proper lairage design and proper training of staff.

The ante mortem inspection procedure is mentioned, but no reference is given in this chapter to the regulatory framework of the European Union, the so-called 'Hygiene Package' (EC 852, 853 and 854/2004), which governs the work of the official veterinarians at the slaughterhouses. A more thorough review of the standard tasks and duties of these official veterinarians would have been useful, both for veterinarians-to-be and for other groups, to increase understanding of the role of the official vet. A reader can easily get the impression that ante mortem inspection is mainly about identifying cases of anthrax and foot-and-mouth disease, which is rarely the case. The importance of ante mortem inspections to discover possible animal welfare-related problems on farm or during transport could have been elaborated on.

The specific chapter about animal welfare has a wide and general approach. It takes the reader through the basic definitions of animal welfare, introducing, for example, the classical Duncan and Broom definitions. A couple of examples of different animal welfare concerns related to meat animals, such as caesarean sections due to oversized calves in dairy cows bred to Belgian Blue bulls, and leg weakness in broilers, are mentioned. Furthermore, husbandry practices, such as castration, debeaking and tail docking are discussed from an animal welfare perspective.