

Book Reviews

Do Fish Feel Pain?

V Braithwaite (2010). Published by Oxford University Press, Great Clarendon Street, Oxford OX2 6DP, UK. 208 pp Hardback (ISBN 978-0-19-955120-0). Price £14.99, US\$29.95.

Some years ago I was asked if crustaceans felt pain. I then wondered how one might infer pain in animals that are taxonomically far removed from humans. As a starting point, I read the then recently published papers on fish pain by Braithwaite and colleagues. These were influential in my subsequent work and in the work of others on various taxa. Investigations that use mammals or birds are often based on preconceived ideas but, with fish, Braithwaite started with a virtual clean sheet. Clear definitions and approaches were required and this book describes how they were developed. In particular, the idea that noxious stimuli may be detected and adaptive responses may be made but without any particular unpleasant feeling or emotion, termed 'nociception' is discussed. The unpleasant emotion subsequent to that perception is what we call 'pain'. Thus, simply devising experiments that indicate reactions to electrical, thermal, mechanical or chemical stimuli do not by themselves allow an inference of pain. Rather, we expect a set of criteria to be fulfilled for the observations to be consistent with pain. These criteria are nicely described and experimental approaches are discussed in a very readable style. It notes the discovery of sensory systems in fish that are similar to those in mammals. It further investigates if there are associated prolonged changes in behaviour that could not easily be described as reflexes. In particular, it examines if there are extended shifts in attention after a potentially painful experience. Braithwaite reviews studies from other laboratories and builds up a mass of evidence that appears to suggest pain rather than just nociception in fish. She also examines work on other 'lower' animals, such as molluscs and arthropods, which often appear to have some of the same features that might be interpreted as being 'beyond simple nociception'. She attempts to draw a line between different taxa that may or may not experience pain.

The book goes well beyond a description of work on fish. It looks at a variety of experiments that investigate sentience in animals and how animals might be asked if they are aware of what they know. Work on affective states is covered and this will be a surprise to readers unaware of this area. It considers cognitive abilities of fish and again these may surprise some readers. The book ends with a consideration of how the new insights into fish abilities and feelings might be applied. Fish are already protected in terms of scientific investigations within the UK and many other countries. The number of fish that might be negatively affected in laboratories, however, might be considered as a drop in the ocean compared to those used in aquaculture and capture fisheries. Braithwaite reviews how aquaculture is beginning to include welfare considerations into rearing,

grading and killing but also notes how capture fishing has barely considered fish welfare (but has reacted to concern about inadvertent killing of birds, turtles and cetaceans). She suggests that these industries, dealing with vast numbers of fish every day, should change and how new methods to improve welfare could be introduced.

The text is written in a popular style and makes for an excellent read. Scientists and lay persons alike will learn much. However, I have a couple of niggles. First, having carefully defined nociception as the perception of a noxious event and pain as an internal emotional experience associated it seems odd to use phrases such as 'pain perception' or 'anatomy to perceive pain'. I suggest that animals might perceive stimuli, such as potential or actual damage caused by thermal, electrical, mechanical or chemical application via the nociceptive apparatus but then the subsequent pain is best described consistently as an experience or emotion, not a perception. Second, after considering if invertebrates experience pain and drawing the line, the question is asked: "Would we really wish to accord welfare consideration to earthworms"? I suggest that should depend purely on the scientific evidence of the ability of the animal to suffer rather than the convenience or inconvenience of applying welfare concerns to a particular taxon. Please note that I am not on a campaign to promote the rights of earthworms! Rather, I suggest that we should consider objectively each taxon with respect to their ability to suffer in the same way that fish have been considered.

So do fish feel pain? Braithwaite's conclusion is 'yes, they do'. Some might agree, others may say 'possibly', others will claim definitely not. Will reading this book change minds? I suspect that the 'possibly' group might be persuaded but I doubt if it will affect many commercial or recreational fishers. However, I urge all involved with fish or animal welfare to read the book. It is both readable and informative. I congratulate the author.

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Mastitis Control in Dairy Herds, Second Edition

R Blowey and P Edmondson (2010). Published by CAB International, Wallingford, Oxon OX10 8DE, UK. 272 pp Hardback (ISBN 978-1-84593-550-4). Price £39.95, US\$75.00, €55.00.

Mastitis Control in Dairy Herds, Second Edition by Blowey and Edmondson is a comprehensive compilation of topics related to the risk factors, clinical characteristics, therapy, and control of intramammary infections in dairy cattle. This book masterfully works its way through the overall subject area of mastitis and its control. The book is not referenced in the manner often used in scholarly books intended for agricultural or veterinary students, or as a scientific manuscript. However, the authors of the sources of the key tables

and figures used to support the major points are credited. As well, for the reader that requires further scientific background on the material presented, a listing of seminal references is provided at the end of the book.

A notable omission in this book is a 'Foreword' that clearly outlines the readership for whom the text is intended. Perhaps this is by design. As such, a potential reader would need to scan through the Table of contents. From it, one will expect that the book will cover essentially the whole waterfront of the subject of mastitis control. Then, the Introduction chapter frames the primary intentions of the text, if not its detail and depth. Finally, it is most probably the authors' intentions, for a potential reader to leaf through the book to get a sense of its content. In so doing, one will be moved by the outstanding array of excellent photographs and other illustrations, which the authors have woven into the fabric of the text. This approach clearly gives life to the various subjects covered, and generally instills reality to this major health problem for dairy cattle. Various problems that are seen frequently by veterinarians in dairy practice, and that are experienced occasionally by individual dairy farmers (but hopefully infrequently), are expertly described and illustrated in this book. The illustrations are used skillfully to motivate the reader to continue, and are a very positive aspect of the book.

The text would be particularly useful for students at the university level. For example, students pursuing degrees in general agriculture, dairy science, or veterinary medicine, could use this text as a resource for aspects of their studies. It is a fact that the majority of students in colleges of veterinary medicine are from non-agricultural backgrounds, even if they intend to pursue a career in food animal practice. For those individuals, this book could provide an outstanding foundation for this important subject. Similarly, many graduate students who are conducting research on aspects of immune mechanisms, pharmacokinetics of specific therapies, or other molecular experiments, often need a general reference source in order to put their own findings into the larger context of mastitis control. Finally, this book could serve as a valuable role for the background training of individuals employed as sales people and technical representatives in agricultural support industries. For example, people working for pharmaceutical, milking equipment and dairy supply companies, and farm advisors with dairy marketing co-operatives, would find useful information in this book to improve their background knowledge base. This book is not particularly informative for the advanced veterinary practitioner looking for solutions to complex mastitis problems in dairy herds.

The authors have chosen to integrate descriptions of the normal structure and function directly with information on the abnormalities and disease conditions, in the same chapters. This approach to constructing the book is somewhat novel, but perhaps problematic for some readers. For example, as early as Chapter 2, on 'Structure of the teats and udder', the authors describe abnormalities of the teat and udder structure, immediately following the description of the normal state. This approach is used throughout the

text on subjects, such as host defences, mastitis organisms, milking equipment, milking management, contagious infections, environmental factors, and so on. This method does tend to streamline the book. It is probably very effective for individuals with some familiarity with the subject. On the other hand, there is some concern that novice readers may struggle to distinguish the normal or common from situations where problems are likely to occur. All-in-all, this approach helps the book to flow smoothly from section-to-section, and is generally acceptable.

The text has a distinctly British flavour. This is noted by the use of some specific terminology, by the emphasis on particular pathogens and clinical conditions (such as summer mastitis), by the description of treatment protocols, as well as by the example herd situations used. Nevertheless, problems with mastitis, and the challenges faced with its control, are largely international in perspective. There are only a small number of topics that are not generally applicable to dairy production systems in the rest of Europe, Scandinavia, North America, Australia and New Zealand.

It is to be expected that a book focusing on a broad, but detailed, subject area would present some aspects in a manner that may not be universally understood or agreed upon. In this book, this is particularly the case when regional differences in the distributions of the pathogens, or environmental factors, might fuel differences in opinions. In this regard, there are numerous examples in this book where the authors could have framed the points of emphasis in a different manner. Some of these differences will be described in this review.

Right at the outset, in the Introduction chapter under 'What is mastitis', the authors give credit to the National Institute for Research in Dairying's five-point plan for mastitis control for having fostered great progress over the years. The authors allude to the need for extending this plan to continue our progress with reducing mastitis and improving milk quality. However, the authors do not refer to the new 'Recommended Mastitis Control Program' of the National Mastitis Council (NMC) that is widely available in North American and International versions on the NMC website. This new plan gives specific steps for dealing with environmental mastitis and monitoring herd progress.

In Chapter 2, on the structure and function of the mammary gland, there are excellent plates and descriptions of various abnormal conditions. Unfortunately, the authors have not provided pictures, or other graphics, of a normal mammary gland or teat. Similarly, in Chapter 14, on disorders of the udder and teats, the authors assume that the reader has a sound knowledge as to what is normal.

In the chapter on the mastitis organisms, the authors have done an admirable job of describing the array of microorganisms that are responsible for clinical and subclinical intramammary infections. In general, the appropriate emphasis is placed on the most common clinical findings. Bullet points are used effectively to further emphasise specific features. However, once again, regional differences that profoundly affect the distribution and severity of infec-

tions are not clear in this text. For example, in many regions of the world, subclinical intramammary infections with *Staphylococcus aureus* remain as a major challenge for optimal udder health and milk quality. In most of these situations, a picture to depict this problem would be a relatively normal udder, with perhaps one smaller quarter, as opposed to the image shown in Plate 4.5. In a similar context, the information provided on coliform mastitis is lacking in detail and emphasis for the magnitude of the problem in some regions of the world.

In various sections of the book, it is evident that the authors are most familiar with free-stall cubicle housing systems with milking parlours that are used in Britain. It could be suggested that there is not enough emphasis on tie-stall systems that still predominate in many parts of the world, and on robotic milking systems that have gained huge momentum, in regions such as Scandinavia. Throughout the book, there are a number of other minor oversights in detail and emphasis.

On the subject of intramammary infection and clinical mastitis as a major animal welfare concern for the dairy industry, this book largely missed the mark. In the opening paragraphs, the authors state that their objective is to achieve a thorough understanding of mastitis, and by so doing, reduce the levels of infection, improve the economics of dairy production, and benefit cow welfare. However, throughout the remainder of the text, the authors fail to address the specific issue of animal welfare concerns related to mastitis. There is no mention of work being done to quantify the state of cow welfare in dairy production systems. The topics of animal welfare audits, or foods certified as being produced in a welfare-friendly system, are not described. To the authors' credit, they have included an extremely well-done chapter on 'The environment and mastitis'. This chapter focuses on stalls, bedding, yards and various other environmental factors. It is largely concerned with keeping dairy cattle clean in various production systems. Yet, in so doing, general welfare concerns are largely addressed.

On the subject of pain associated with clinical mastitis, the authors have not specifically addressed the topic. There is no mention of landmark research conducted in Britain to quantify the perceptions that various individuals have toward the level of pain that is inflicted by veterinary procedures, or that is endured by animals affected with different clinical ailments. In this research, mastitis was considered to be relatively high on the list of painful conditions. In the section on therapy for clinical mastitis, the authors describe the use of non-steroidal anti-inflammatory drugs for the treatment of inflammation in severe clinical mastitis. Yet, there is no mention of the control of pain by this therapy. The authors would contend, and rightfully so, that there are no drugs approved for the control of pain in cattle with mastitis, and as such, it should not be discussed. However, the authors do not seize a great opportunity to discuss this subject. In so doing, they could have emphasised that veterinarians, dairy farmers, and herdpersons should use means

available to them to influence regulators and pharmaceutical companies to address this situation.

In summary, *Mastitis Control in Dairy Herds* is a useful addition to currently available resources on mastitis and udder health management. The entire subject area is covered in considerable detail, and with generally appropriate emphasis. Readers should note that there are regional differences that might be important as to the relevance of the information provided to their personal situation. As for the impact of mastitis on dairy cow welfare, this book does not provide either new insight or avenues for further dialogue.

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Biology of Breeding Poultry

Edited by PM Hocking (2009). Published by CAB International, Wallingford, Oxon OX10 8DE, UK. 464 pp Hardback (ISBN 78-1-84593-375-3). Price £95.00.

Over the past few decades, breeding poultry have undergone intensive selection for higher productivity and improved feed conversion. The management systems and feeding strategies for breeding birds have also developed in parallel with the genetic changes, but a comprehensive documentation of literature on these aspects of breeding poultry is seriously lacking. In this context, this book, edited by PM Hocking of the University of Edinburgh, UK, is a valuable contribution. The book is based on papers presented at the 29th Poultry Science Symposium held in Edinburgh in July 2007.

The book is organised into eight parts, each containing several chapters dealing with different key aspects of poultry breeding. The first part sets the scene by providing overviews of the genetics of modern commercial poultry and developments in the management of breeding poultry. Developments in genetic improvements in terms of quantitative genetics and transgenesis are discussed in Part II, including a short review on prospects for sex determination in poultry. The two chapters in Part III discuss in depth two aspects of interest, namely endocrinology and ovarian follicular development, in the reproduction process.

Mating behaviour and basic biology of sperm fertility have received little attention in recent decades. These issues are discussed in Part IV, where the relevance of sperm competition in fertilisation success is also detailed. As the growing period of broilers continues to shorten, the quality of day-old chicks has become increasingly important to success of poultry meat production. Chick quality is determined largely by egg- and incubation-related factors, which are dealt with in detail in Part V. These are described in a very clear and simple manner. There is also an interesting section on broodiness, which can be a nuisance in commercial breeder systems, and broody control.

The first two chapters in Part VI deal with managing the environment and present practical aspects relating to lighting management and environmental enrichment of breeders. The