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INTRODUCTION

Animal Welfare and Epidemiology—Across Species, Across Disciplines, and Across Borders

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In North America, there is strong interest in nonhuman animal welfare issues by the general public, with shifts in government and corporate policies about human animal care and use in a number of areas (Millman, 2009/this issue). Decisions about animal welfare are based on moral principles and scientific knowledge; the relatively young discipline of animal welfare science struggles to keep pace with the demand for knowledge in this area. There is a need in the United States and abroad for research that provides guidance for auditing the welfare of animals on the farm and for identifying key farm factors that are associated with greater animal welfare. An epidemiological approach is warranted for such
studies; to date there has been limited attention to this approach, especially within the United States.

During the past 50 years, academics have debated how animal welfare can be measured, and a variety of parameters can be categorized in terms of affective states, biological function, and natural history (Fraser, Weary, Pajor, & Milligan, 1997). During a keynote address to the International Association for Applied Ethology, a pioneer in the discipline of animal welfare science, ethologist Dawkins (1997) identified one of the limitations for applied animal welfare science research as a lack of fundamental knowledge about animal suffering that can then be applied to real-world scenarios. Around this same time, veterinarian and animal welfare expert Webster (1998) expressed his frustrations:

Welfare scientists should decide when “enough is enough.” When we have sufficient knowledge to achieve real progress in addressing a practical welfare problem, that is the time to convert this research into action. (p. 268)

Animal welfare researchers have tended to design experiments using a reductionist model to examine specific welfare parameters in single species while controlling confounding effects of other variables within laboratory or controlled environments. This approach has been effective for identifying animal-based measures of poor and good welfare as well as flagging environmental and stockperson factors that impact animal welfare.

However, complex interactions between these factors at the farm level make extrapolation of laboratory-based findings to the farm problematic. A different approach is needed to provide empirical data about animal welfare in practice. Veterinary epidemiologists study disease occurrence across time and location, answering questions about prevalence and movement of diseases as well as the relative importance and interactions between risk factors. In doing so, epidemiologists have focused on methods of study design and data analysis that answer research questions about outcomes in complex farm settings. However, veterinary epidemiologists are not trained in the measurement and evaluation of animal welfare. These two groups together have the skills to conduct applied research on animal welfare in the environment in which animals are exposed.

Recently interdisciplinary studies have emerged that illustrate the complexity of how factors interact to affect animal health and welfare on farms and provide data for decision making by policymakers and animal users (Algers & Berg, 2001; Cleveland-Nielsen, Baekbo, & Ersboll, 2004; Scott, Nolan, & Fitzpatrick, 2001). Animal welfare researchers are applying laboratory-based knowledge to field conditions in collaborations with epidemiologists (Main, Whay, Webster, & Green, 2003; Rushen, 2003; Zurbrigg, Kelton, Anderson, & Millman, 2005).

These types of studies are important for policy decisions meant to improve animal welfare. Since 1999, the Workshop for Animal Welfare Assessment at
Farm and Group Level (WAFL) has been held every 3 years in Europe, providing unique opportunities for scientists working in animal welfare, veterinary medicine, and animal production to share information about techniques to assess welfare in laboratories and, in field conditions, present research findings and debate the relative strengths and weaknesses of different methods. This academic discourse is critical for the development and rigor of any discipline.

A conference, *Welfare and Epidemiology: Across Species, Across Disciplines, and Across Borders*, was held in Ames, Iowa, July 14–16, 2008. The motivation for the conference was, in part, to complement the existing (European) WAFL meetings by generating interest in science, industry, and animal organizations within North America. The conference was jointly organized by Iowa State University, Ontario Veterinary College, and Norwegian School of Veterinary Sciences with the overall objective to create awareness about the link between animal welfare and epidemiology scientific disciplines in regard to addressing public concerns about animal care. Specifically, the conference was developed to do the following:

1. Discuss research in epidemiology, animal science, and veterinary medicine that is designed to answer questions about animal welfare;
2. Identify priority areas where further research or intervention is needed;
3. Stimulate interest by students and scientists to develop research projects at the interface of epidemiology and animal welfare science; and
4. Provide networking opportunities for established epidemiology and animal welfare research groups for collaborative efforts across species, disciplines, and borders.

The program was organized around three main themes:

1. What data is collected in animal welfare research using a multidisciplinary approach?
2. What approaches are used to analyze epidemiologic data?
3. What data is being generated in the field that could be used to assess animal welfare?, and
4. How is data being used by industry and policymakers to address animal welfare concerns?

Plenary speakers were invited to provide expertise and international perspectives. Suzanne T. Millman (Iowa State University) provided an overview of public attitudes about animals in society, policy and marketing relating to animal welfare, and a brief overview of the scientific approach to animal welfare research. David C. J. Main (University of Bristol) and John L. Barnett (University of Melbourne) provided insights in animal welfare policy and on-farm welfare
assessments in the United Kingdom and in Australia, respectively. Cate Dewey (University of Guelph) discussed epidemiological techniques for responding to animal welfare research questions, specifically drawing on her experiences with swine transportation data. Ken E. Leslie (University of Guelph) presented an overview of his group’s research, teaching, and extension activities involving dairy cattle welfare, drawing from epidemiology and ethology expertise with concepts progressing from veterinary practice to the small studies in the laboratory, larger studies on commercial farms, and through extension phases. In addition, abstracts were solicited for oral and poster presentations, with participants from North America, Europe, Australia, and New Zealand. The plenary papers and conference abstracts are presented in this special issue of the Journal of Applied Animal Welfare Science.

The quality of a conference is dependent on the participants involved. It was our aim to have a diverse and interactive audience of 100 participants. We were delighted that our conference included registrants from across the globe, comprised of students, researchers, producers, animal industry representatives, policymakers, and animal protection organizations. Participant evaluations expressed enthusiastic support for future conferences in this theme, and we hope some collaborative projects transpire to continue the growth of this important interdisciplinary and relevant subject.

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