

Animal Behavior and Well-Being Symposium: Novel and multidisciplinary approaches to animal welfare

233 Opportunities and challenges of interdisciplinary approaches to quantifying welfare. Peter D. Krawczel*, *The University of Tennessee, Department of Animal Science, Knoxville, TN.*

There is a growing interest within the United States in ensuring management systems and strategies for animal agriculture are not only highly productive and cost efficient, but also provide for the welfare of animals raised within them. The benefit of this situation is the chance for an empirical approach to evaluating welfare across animal agriculture to make a valuable contribution to the public discourse. The overall objective of this presentation will be to address the challenges and opportunities to using interdisciplinary approaches to quantifying welfare. To narrow the scope of this paper, and provide a more cohesive narrative, examples from dairy production will be used to demonstrate the main concepts. The discussion of opportunities will focus on the interaction between traditional approaches to measuring welfare, such as behavior and productivity, and novel aspects of sleep, immune function, reproduction, or sociology. Sleep research on dairy cows provides a means to demonstrate how biologists, ethologists, and engineers can collaborate to redefine how the lying behavior of a dairy cow is assessed. Moving beyond ideas of immunosuppression and into the approaches to evaluate dysfunction of immune function may provide a more accurate assessment of the effect of a management strategy on a dairy cow or calf. End points commonly used to evaluate reproductive parameters, such as return to cyclicity in early lactation, could provide a means to evaluate the welfare of postpartum dairy cows. Finally, incorporation of sociologists provides a means to understand producers' attitudes toward disease, pain, housing, and other factors that can alter dairy cow welfare. The discussion of the challenges of engaging in a multidisciplinary approach will focus on pain mitigation and immune function. These areas will be used as examples of the difficulties that might be encountered when the collection of one response variable affects another.

Key Words: welfare assessment, multidisciplinary, dairy cow

234 Animal welfare as a source of confounding and variation in science. Amy L. Stanton*, *University of Wisconsin-Madison, Madison, WI.*

It has been well established that chronic stress has a negative impact on the welfare of animals under our care. From the stereotypic behaviors observed in high numbers in zoo and laboratory animals to the decreased milk let-down observed in roughly handled dairy cows the effect of housing and handling practices have been demonstrated clearly by the animals in our care. Although the impact of rough handling and barren environments have been studied many of the more subtle effects that are unique to animal science, especially non-traditional laboratory species, have not been examined as closely. The objective for this paper is to review the effect of common data collection systems and environments on management, behavior, and welfare of agriculture research animals and through this introduce a source of variation. The 3 R's of ethical animal science—Replace, Reduce, and Refine—are used to minimize the impact of research on animals and to reduce the number of animals used in research. Animal behavior and the associated welfare consequences may be sources of variation in many research studies. As an example, to collect physiological measures it is often necessary for animals to be housed in systems that vary greatly from non-research animals. These different housing and handling methods are not studied as extensively

in animal agriculture and may be having more of a negative effect on welfare than expected. For this reason, it is important that we understand the effect that different research practices have on animals and accompanying research results. Many of our agriculture species are social animals that have evolved as a prey species. However, many studies require isolation and extensive human observation. Both of which alter animal behavior and welfare. Alternatively, measurement devices, such as feeding gates, may affect normal behavior. Differences in social dominance, prior experiences, and temperament can alter the ability of animals to learn to interact with these systems. For these reasons, an understanding of animal behavior is essential to minimize welfare effects and the accompanying variation in study results.

Key Words: welfare, behavior, research

235 Interaction between coping style/personality, social stress, and disease risk. J.M. Koolhaas*, *University of Groningen, Groningen, the Netherlands.*

Ecological studies in feral populations of mice, fish and birds start to recognize the functional significance of phenotypes that differ individually in their behavioral and neuroendocrine response to environmental challenge. Within a species, the capacity to cope with environmental challenges largely determines the individual survival in the natural habitat. Recent studies indicate that the individual variation within a species may buffer the species for strong fluctuations in the natural habitat. A conceptual framework will be presented that is based on the view that the individual variation in aggressive behavior can be considered more generally as a variation in actively coping with environmental challenges. Highly aggressive individuals adopt a proactive coping style, whereas low levels of aggression indicate a passive or reactive style of coping. Similar coping styles have now been identified in a range of species including cattle, pigs and horses. They can be considered as trait characteristics that are stable over time and across situations. Evidence will be presented that a proactive coping style is best in a stable environment; these animals heavily rely on predictions. Reactive coping is more suited to variable environmental conditions because it is characterized by a continuous use of environmental input. Because the 2 extreme coping styles are adapted to different environmental conditions, there is differential stress vulnerability. Serious health problems may develop when coping fails. Social stress studies show that proactive individuals are resilient under stable environmental conditions but vulnerable when outcome expectancies are violated. Reactive individuals are in fact rather flexible and seem to adapt more easily to a changing environment. The health consequences of this interaction between individual coping style and social environment will be illustrated with examples from the cardiovascular system and the immune system. It will be argued that understanding animal welfare and the individual vulnerability to stress related disease requires a fundamental understanding of the functional individual variation as it occurs in nature and the underlying neurobiology and neuroendocrinology.

Key Words: coping style, welfare, individual differentiation

236 Of nature and nurture: The role of genetics and environment in behavioral development. T. Bas Rodenburg*, *Behavioural Ecology Group, Wageningen University, Wageningen, the Netherlands.*

The behavioral characteristics of an individual are determined by its genes and by its physical and social environment. Not only the individual's early life and current environment is of importance, but also the environment of previous generations. Through epigenetic processes, stress in parents and even grandparents can translate in changes in behavioral and physical characteristics of the offspring. This can also result in an increase in damaging behavior, such as feather pecking in laying hens. We have recently shown that stressed flocks of laying hen parent stock lay smaller eggs and that the offspring that hatched from these eggs were more fearful and showed more severe feather pecking already at one week of age. This effect depended on the genetic background of the hens: it was much more pronounced in the white laying hens than in the brown birds. Apart from epigenetics, also maternal hormones excreted before egg-laying or during pregnancy have effects on behavioral development of the offspring. Recent studies even indicate that epigenetic and hormonal effects may go hand in hand, where parental

stress leads to changes in gene expression in genes involved in hormonal responses. The environment in which an individual is born and in which it spends its first weeks of life also has considerable impact on behavioral development. Absence or presence of maternal care has been shown to have strong effects in laying hens: we found that maternal care resulted in birds that were less fearful and developed less damaging behavior when they were adult. In these experiments, we also studied effects of genetic selection on low mortality in group housing. We found that effects of selection on low mortality and of maternal care were additive in most cases, with birds selected for low mortality and reared with a foster mother having the best performance. This illustrates that in our approaches to breed and rear animals for good performance in group housing systems, an approach where genetic selection is combined with improvement of rearing and housing conditions of both parent stock and offspring has the largest chance of success.

Key Words: behavioral development, genetic selection, early-life environment