

BOARD-INVITED REVIEW: The ethical and behavioral bases for farm animal welfare legislation

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ABSTRACT: Concerns about farm animal welfare vary among individuals and societies. As people increasingly consider the values underlying current farm animal production methods, farm animal welfare policy debates have escalated. Recent food animal protection policies enacted in the European Union have fueled highly contentious discussions about the need for similar legislative activity in the United States. Policymakers and scientists in the United States are apprehensive about the scientific assessment, validation, and monitoring of animal welfare, as well as the unforeseen consequences of moving too hastily toward legislating farm

animal welfare. The potential impact of such legislation on producers, food prices, animals, and concerned citizens must also be considered. Balancing the interests of all stakeholders has therefore presented a considerable challenge that has stymied US policymaking. In this review, we examine the roles of ethics and science in policy decisions, discuss how scientific knowledge relative to animal behavior has been incorporated into animal welfare policy, and identify opportunities for additional refinement of animal welfare science that may facilitate ethical and policy decisions about animal care.

Key words: animal welfare, behavior, bioethics, legislation

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INTRODUCTION

Moral decisions about our responsibilities to animals are made at different levels within a society, including choices made by individuals about whether to purchase particular animal products; development of standard operating procedures of animal husbandry by animal production industries, retailers, and advocacy groups; and legislative actions by governments to regulate particular practices. In the face of public concerns about animal exploitation, animal scientists are increasingly questioned about the welfare of animals used in commercial production systems. Professional advice by animal scientists who have expertise in animal welfare is important because the regulation of production practices, such as slaughter, transport, and more recently on-farm husbandry procedures, is considered at national and international levels. In this review, we explore the impact of ethics and science in policy decisions, discuss how governments have used scientific knowledge about animal behavior when drafting animal wel-

fare policy, and identify opportunities for further refinement of animal welfare science that will facilitate ethical and policy decisions about animal care.

ETHICAL AND SCIENTIFIC FRAMEWORKS IN ANIMAL WELFARE

It is helpful to recognize that there may be differing ethical underpinnings for concerns that motivate the protection of animals. For many citizens, moral decisions are based on religious doctrine. In the divine command framework, animals should be treated according to the Word of God as it is written in religious texts or through the guidance of religious leaders (Rachels, 1993). However, Judeo-Christian and Islamic religions suggest that animals were created for human use, whereas the Buddhist view requires consideration of the interests of animals. The theory of natural law is based on the concept that the natural world was created with rational order, values, and purpose, and because humans were created with the ability to reason, we function as moral agents (Rachels, 1993). In this framework, unnatural acts are morally unacceptable, and hence technology such as the development of transgenic animals would be considered wrong because animals should be treated according to their inherent natures

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and their evolutionary functions. Whereas some ethical questions require interpretation of the holy texts by religious leaders, proponents of the natural law theory turn to scientists for insight about whether animals are pushed too far with production methods, as well as fundamental knowledge about telos or the innate nature of livestock species.

In addition to these theories, other ethical frameworks have been developed to guide morality. Most people are familiar with discussions about our responsibilities toward animals being framed within utilitarian or rights-based principles. In the utilitarian framework, the morality of an act is determined by its consequences, with positive outcomes that are experienced by some individuals weighed against the costs imposed on others. In the 18th century, Jeremy Bentham, and later, Peter Singer, argued that animals are sentient beings; in other words they are capable of feeling pleasure and pain to differing degrees, and as a result their interests should be included in the analysis of consequences (Regan and Singer, 1989). Conversely, Kant argued for the categorical imperative—that some acts are either morally right or wrong regardless of their consequences (Rachels, 1993), and this forms the logical basis of animal rights positions (Regan, 1983). In social contract theory, developed by Thomas Hobbes in 1651, moral behavior is based on a set of rules about conduct that facilitates social living in an environment of scarcity (Rachels, 1993). Some proponents of this theory, such as Jacques Rousseau, argue that we have an implicit social contract with animals because of our shared evolutionary heritage.

To understand the differences in these positions, let us consider the issue of whether consuming horsemeat is morally acceptable. The animal rights position is clear; it is morally unacceptable to exploit other individuals, and hence horses should not be raised for meat. According to utilitarian principles, the suffering of horses must be weighed against nutritional and culinary pleasures received by the consumers, and it is difficult to argue that horses should not be raised for meat if other livestock products are acceptable. Conversely, the social contract position would allow this dichotomy, arguing that because horses have held special status in human society as comrades in war, co-workers in the field, and as companions, we have a duty to respect their dignity, and they should not be raised for food. Hence, animal scientists, who tend to debate animal issues firmly within the utilitarian framework, must recognize that there is no gold standard for ethical behavior and decisions about how animals should be treated. All of these ethical positions may be justified as rational because they follow the principles of logic, and the inherent strengths and weaknesses of these different frameworks continue to evoke disagreements among philosophers.

Similarly, scientists are asked to provide sound science from which policy decisions can be made about animal welfare, with the erroneous expectation that

a general scientific method exists (van den Belt and Gremmen, 2002). Science also follows logic and deductive reasoning, but is based on skepticism that precludes absolute certainty, with experimental results supporting, not proving, hypothetical inferences. Whereas scientific endeavors tend to lead to further academic questions and hypotheses to be tested, policy makers have the daunting task of interpreting the existing body of scientific evidence to make decisions on contentious issues. This task can be complicated when the waters are muddied by the vilification of threatening research as junk science and the corresponding sanctification of industry-commissioned research as sound science by corporate lobbyists (Michaels and Monforton, 2005). After a US Supreme Court precedent in a civil lawsuit against a pharmaceutical company, federal trial judges are now required to determine whether scientific testimony is reliable and relevant based on strict new standards—a factor that is likely to affect animal protection litigation in the future.

Scientists disagree about how animal welfare should be assessed, with groups developing techniques according to biological function (Broom, 1996), feelings (Duncan, 1996), or evolutionary history (Barnard and Hurst, 1996). More recently, researchers have suggested conceptual frameworks to reconcile these formerly polarized fundamental approaches (Fraser et al., 1997; Dawkins, 2004) and to develop techniques to explore animal welfare in complex real world conditions (Grandin, 1998; Main et al., 2001; Waiblinger et al., 2001; Boivin et al., 2003; Rushen, 2003). Scientific validity “refers to how well the design of your research and the methods you employ answer your research question” (Lehner, 1996). Value judgments are inherent in framing research questions to be explored, the methodology employed, and the interpretation of results. Scientists attempt to address bias by testing hypotheses with predictive models or controlled experiments that affect one or more variables, statistical analysis of data, transparency in reporting of methods and results, critical appraisal in peer review of manuscripts before publication, and replication of results by researchers in other environments.

Because it is a relatively new discipline, animal welfare science can be criticized for failing to provide sufficient replication of results; there are simply very few researchers working in this area at the present time. Of greater concern is a lack of transparency in methodology and interpretation of results by researchers supporting all sides of the animal welfare debate. For example, investigations of animal welfare challenges that are believed to be associated with particular husbandry practices too often involve collecting data for a laundry list of variables without a priori predictions indicating how the values are expected to change if animal welfare is poor or good. Not surprisingly, the results tend to be ambiguous, with data pointing in different directions, so that interpretations are vulnerable to the researcher's bias. Because animal welfare is multifactorial,

there is also a tendency to develop interdisciplinary experiments without including the relevant expertise on the team that would ensure appropriate methodology and interpretation of results for the research questions being asked. Animal behavior studies often seem to suffer from this oversight, sometimes appearing as poorly designed additions to otherwise sound experiments, where results may be inadvertently reported without sufficient peer review when published in journals that lack behavioral expertise on the editorial board.

Despite advances in behavioral science and neuroscience, arguments persist that some concepts that cannot be measured directly, such as emotions and consciousness, are beyond the scope of scientific inquiry. Ironically, these are precisely the concepts that the public is grappling with in animal welfare. Thus, a serious challenge to farm animal welfare investigators and policy makers is how to mitigate the bias regarding the welfare criteria that are selected for investigation, and for prioritization in decision-making. Some scientists have favored biological measurements, such as endocrine changes associated with stress, because these methods are easily standardized for high levels of repeatability. However, interpretation of physiological responses is difficult and often subjective. For example, physiological and hormonal changes, such as increased heart rate and plasma cortisol levels during branding or dehorning of cattle, that are associated with aversive stressful events are also observed during apparently pleasurable stressful events, such as play or sex. Hence, some techniques may favor high levels of precision at the expense of low levels of accuracy for the ethical question posed, namely, animal suffering (Cochran and Cox, 1992). Because animal behavior involves whole animal responses to internal and external environments, other researchers, therefore, have chosen to examine behavioral correlates of welfare, often in conjunction with other relevant and informative measures, such as physiological and production responses.

HOW HAVE GOVERNMENTS USED SCIENTIFIC KNOWLEDGE TO REFINE ANIMAL WELFARE POLICY?

Within recent decades, several comprehensive pieces of animal welfare legislation have been introduced in Europe, many of them constraining the intensive confinement of farm animals. Switzerland has some of the oldest and most stringent animal welfare laws. The Swiss Federal Act on Animal Protection of March 9, 1978 (as per July 1, 1995) and Swiss Animal Protection Ordinance of May 27, 1981 (as per November 1, 1998) include basic principles that animals shall be treated in the manner that best complies with their needs (Article 1), and that “mass produced housing systems and installations for the keeping of farm animals may not be advertised and sold without prior authorization from authority designated by the Federal Council. Authori-

zation shall only be granted if such systems and installations provide proper living conditions for animals.” The costs of these testing procedures are paid by the applicant (Article 5). Member states of the European Union (EU) have increasingly regulated husbandry practices, such as phasing out conventional battery cages for laying hens and gestation crates for sows and requiring group housing for veal calves after 8 wk of age (Wilkins, 1997).

A particularly significant development for animal protection in Europe was the Treaty of Amsterdam, which came into effect in 1999, and which states:

“Desiring to ensure improved protection and respect for the welfare of animals as sentient beings; [have agreed upon] the following provision, which shall be annexed to the Treaty establishing the European Community, in formulating and implementing the Community’s agricultural, transport, internal market and research policies, the Community and Member States shall pay full regard to the welfare requirements of animals, while respecting the legislative or administrative provisions and customs of the Member States relating in particular to religious rites, cultural traditions and regional heritage.”

Hence, the protocol creates clear legal obligations to address animal welfare issues arising in policies and also includes a requirement to support animal welfare research. A EU action plan for animal welfare was introduced in January 2006 for 2006 to 2010, with the objectives of (1) upgrading the minimum standards for animal welfare, (2) promoting research and alternative approaches to animal testing, (3) introducing standardized animal welfare indicators, (4) better informing animal handlers and the general public on animal welfare issues, and (5) supporting international initiatives for the protection of animals.

Conversely, in most other countries, animal protection laws have traditionally been based on the value of animals as property, and hence the intent of most laws has been to protect animal owners against losses, rather than to protect animals from suffering per se (Wise, 2003). Similarly, animal cruelty laws were traditionally enacted to protect the public from violent individuals, rather than to prevent animal suffering [perhaps echoing Thomas Aquinas’ 12th century sentiments about human cruelty to animals ultimately leading to cruelty to other humans (Aquinas, 2004)]. For example, animal cruelty is discussed in the property section of the Canadian Criminal Code, which states “it is a federal offense to willfully cause or permit to be caused, by being the owner, unnecessary pain, suffering or injury to an animal or by willful neglect, cause damage or injury to animals while they are being driven or conveyed.”

Another significant factor that has influenced the European response to animal protection is the use of the precautionary principle for political decisions involving risk management. The precautionary principle has Ger-

man foundation and is used explicitly in EU risk management decisions about health, welfare, and the environment (Commission of the European Communities, 2000). The precautionary principle is used “where scientific information is insufficient, inconclusive, or uncertain and where there are indications that the possible effects on the environment, or human, animal or plant health may be potentially dangerous and inconsistent with the chosen level of protection” (Commission of the European Communities, 2000, page 8). In other words, the lack of full scientific certainty cannot be used as a reason for postponing measures to prevent damaging effects.

In terms of animal welfare, the precautionary principle provides animals with the benefit of doubt regarding suffering. The burden of proof about whether particular husbandry practices cause suffering is placed on those wishing to employ them. Hence, this approach is risk averse; there must be evidence that harm has not occurred, rather than simply lack of evidence that harm is caused just because the necessary studies have not been conducted. In scientific terms, this approach to risk management places more emphasis on avoiding type II statistical errors—that the null hypothesis is accepted when it actually should be rejected (van den Belt and Gremmen, 2002).

A country with a particularly progressive approach to animal protection that respects the creativity and individuality of producers while maintaining quality standards is Sweden. The Swedish Animal Welfare Law of 1988 includes some specific husbandry criteria according to the behavioral requirements of the species, such as a requirement for grazing of cattle, but more recently there are also animal-based health and performance audits that reward stockperson skills and attention to management. An on-farm animal welfare protocol is used to collect bird-related outcomes on broiler farms, such as mortality data, culls because of leg deformities, and footpad dermatitis (Algers and Berg, 2001). Incentives to improve housing and management are provided by correlating the maximum stocking density allowed at the time of slaughter in each broiler house to the total animal welfare score received.

With an increasingly global economy, it is impossible to contemplate the future of farm animal welfare without taking into account the issues of trade in animal products. For countries with codified animal welfare standards, and thus greater costs of production, domestic industries are vulnerable to exports by countries with fewer regulations. Consequently, how concerns about animal welfare can be accommodated within the framework of the World Trade Organization (WTO) has been an active topic during negotiations (Bowles and Fisher, 2000; WTO, 2002). However, it is important to note that animal protection is also receiving attention in developing countries (Favre and Hall, 2004), although interpretation and enforcement of regulations may vary among countries.

For example, the Taiwan Animal Protection Law was promulgated by the president in 1998, stipulating that persons owning or caring for animals must be 15 yr of age or older, and must “provide adequate food, water and sufficient space of activities for the animal . . . and other appropriate care to prevent the animal from unnecessary harassment, mistreatment or hurt” (Article 5). Furthermore, Article 9 stipulates that “while carrying [transporting] an animal . . . it shall be prevented from being frightened or hurt.” Similarly, the Philippines Animal Welfare Act (1998) provides some regulation of the treatment of sentient animal species and also acknowledges religious and tribal traditions of animal sacrifice that continue to be practiced on some of the islands (Favre and Hall, 2004). More recently, animal welfare has become an issue addressed by the World Organization for Animal Health (OIE, 2004), with member states initially drafting standards for the protection of animals during transport and slaughter.

BEHAVIORAL AND WELFARE CONSIDERATIONS IN INTENSIVE CONFINEMENT OF FARM ANIMALS

In comparison with the EU nations, the United States currently has relatively little legislation aimed at regulating farm animal welfare. The perceived discrepancies in the level of animal protection have fueled scrutiny and criticism of US animal production industry standards, primarily by animal protection organizations. Many of these criticisms have focused on quality of life issues stemming from housing animals in close confinement, popularly referred to as factory farming, the term popularized by Ruth Harrison (1964). However, identifying and prioritizing the needs of farm animals has been extremely problematic for the scientific community.

For instance, the literature evaluating the extent to which gestation stalls meet the needs of sows compared with alternative housing systems is hotly debated, with European scientists recommending phasing out gestation stalls on the grounds of behavioral deprivation and affective states, whereas Australian scientists reviewing the same literature deemed these stalls to improve sow welfare on the grounds of biological function (Fraser, 2003). In addition to the underlying value judgments, the replication of studies is often difficult (McGlone et al., 2004b) because there can be substantial variation in the welfare measurements used and in their interpretation. Nonetheless, the justification for using gestation crates for sows, battery cages for laying hens, and crates for veal calves is particularly questioned because the ability of such restrictive rearing systems to meet the behavioral needs of animals housed within them is doubtful and because the animals are subjected to high levels of confinement for virtually their entire lives.

It is estimated that 95% of sows in the United States are housed in confinement, mainly in gestation stalls

(Bowman et al., 1996). This type of housing has been favored because it facilitates caretaker safety and efficiency, maximizes the efficiency of space utilization, requires reduced capital investment relative to other sow housing systems, and has notable benefits for sow welfare. For example, pigs housed individually have shown better growth rates than those that are group housed (Petherick et al., 1989). Other studies have reported similar production levels in sows kept in gestation stalls vs. sows housed alternatively in large group pens (Morrison, 2002) and small pens (Pajor, 2002) as well as outdoors and in hoop barns (Honeyman, 2002). Moreover, gestation stalls prevent potentially harmful agonistic behaviors, because restricted feeding practices that are necessary to prevent obesity can also result in increased competition and fighting when sows are group-housed (Deen, 2005). However, economic constraints have resulted in gestation crates that are too small to permit sows to turn around. Although they may stand up and lie down, sows are unable to fully adjust their posture (Arey, 1999), and depending on their size, many are unable to even lie down comfortably (McGlone et al., 2004a). In fact, for pregnant sows to be able to be housed merely in ways that meet the suggested US animal welfare guidelines (namely, to lie down without parts of their bodies extending into neighboring stalls), gestation crate sizes would need to be increased (McGlone et al., 2004a).

Furthermore, the design of gestation crates constrains the sows' abilities to perform most of their normal behavioral repertoires and considerably thwarts normal social behavior, an important factor given the high level of social complexity typically shown by pigs (Gonyou, 2005). Moreover, sows housed in gestation stalls often develop behavioral abnormalities such as bar biting, sham chewing, and polydipsia (Terlouw et al., 1991; Haskell et al., 1996). Because sows are unable to forage in stalls, it has been suggested that their high motivation to do so results in considerable frustration, which has been correlated with development of stereotypical behaviors (Wemelsfelder, 1984; Lawrence and Terlouw, 1993; Appleby, 2005). Add to this the growing evidence that pigs are mentally flexible, complex problem-solvers (Cerbulis, 1994; Laughlin et al., 1999; Cronney 1999; Cronney et al., 2003), and it begins to seem plausible that intensive, lifelong confinement in crates might cause sows to experience ongoing psychological suffering due to boredom and frustration and thus, perhaps, reduced welfare. Some of these same constraints are also associated with housing sows in farrowing crates, in addition to factors specific to the parturient and lactating sow, such as the lack of opportunity to perform nest-building behavior and changes in thermoregulatory needs (Widowski and Curtis, 1990). However, fewer concerns are raised about farrowing crates, and fewer legislative efforts have addressed this issue, perhaps because reduced crushing of piglets in farrowing crate systems confers benefits for the animals

as well as for humans that consume and produce pork products.

Similarly, the issues associated with laying hens illustrate how the behavioral and psychological aspects of welfare can conflict with pragmatic management concerns. Like the sow housing issue, there are ambiguities in the literature comparing the behavior, productivity, and mortality rates of hens kept in conventional battery cages vs. those housed in alternative systems, such as aviaries (Taylor and Hurnik, 1996). Some animal scientists have argued that there is insufficient scientific evidence to require abandoning conventional cages and have implied that laying hen welfare might consequently be worsened (Appleby, 2003). For instance, cannibalism is a commonly reported problem in noncage systems, in which birds, particularly of certain genetic strains, may not be well adapted to living in large groups (Appleby, 2003). Feather pecking and disease susceptibility are also problematic in alternative forms of layer hen housing (Flock et al., 2005). Conversely, many animal advocates tend to underemphasize the problems associated with free-range and aviary systems, arguing that laying hen welfare is substantially compromised in barren cage-rearing systems and that alternative housing systems are therefore superior (Wilkins, 2004).

One of the hen's strongest instincts is to seek out a nest to lay her eggs (Duncan, 1970). Although genetic selection has substantially reduced such broody behavior, commercial hens perform nest seeking when released into a natural environment (Duncan et al., 1978), and during the prelay phase, hens are motivated to perform a substantial amount of work to gain access to a nest, moving weighted swing doors or squeezing through tight spaces to do so (Duncan and Kite, 1987; Nicol and Dawkins, 1990). Hens also appear to be strongly motivated to peck, scratch, and forage even when provided food freely in trays (Nicol and Dawkins, 1990) and to dustbathe (Widowski and Curtis, 1990; Widowski and Duncan, 2000), attempting to do so even when kept on wire flooring (Vestergaard, 1987). Hence, conventional cage rearing systems do not permit hens to express their inherent nature or telos as described by Rollin (1995), namely to scratch, forage, perch, dustbathe, or construct nests for egg laying. Noncage systems have therefore been advocated for laying hens as a means to permit greater opportunities for the birds to express more of their natural behavior, thereby reducing the frustration of telos.

In recognition of the problems with cannibalism and feather pecking in aviary systems, the EU legislation was amended in 1999 to also allow cages that are furnished with a nest box, perch, and dustbath because these fulfill the behavioral needs of hens. Behavioral considerations have greatly influenced the EU ruling that conventional cages must be phased by 2012, in spite of disputes about how well behavioral indications of animal suffering and the actual amount of suffering experienced are correlated and despite suggestions that

production costs associated with alternative systems may increase by 5 to 50%, depending on the type of system that is implemented.

Much of the scientific literature focused on the behavioral needs of animals has been conceptually linked to the animals' motivational states. Motivation is a term used in the behavioral literature to describe factors that focus an animal's priorities in a particular direction, so that particular behavioral sequences are likely to occur. Hence, motivation is a conceptual term similar to stress or health. Motivation includes lower levels of cognitive processing, such as emotional states that are rooted in the more primitive structures of the brain, and greater levels of processing, such as memory, that modulate responses. Thus, issues associated with motivation are critically important as they pertain to welfare states related to frustration and psychological suffering, and the possibility exists that these feelings may be inhibited or exaggerated through anticipation or associations (Dawkins, 1990; Duncan and Petherick, 1991).

Opinions on ethical treatment of animals are often based on people's beliefs that animals have at least some mental capabilities (Allen, 1998), and several of the most compelling arguments about the welfare of farm animals in intense confinement relate to the animals' rudimentary cognitive capacities, such as sentience, feelings, preference autonomy (Regan, 1983), and the animals' abilities to experience pleasure, pain, and suffering (Singer, 1990). Yet the capacity of farm animals to demonstrate many of these mental states (and related others, such as memory, or intentionality) is not yet well understood. This lack of information is becoming increasingly problematic because (1) attribution of mental states to animals has been and will continue to be the basis for most animal welfare concerns; (2) currently, scientists cannot credibly refute or wholly justify the basis for concerns about animal mental states as influenced by current production standards; and 3) policymakers requiring validated, scientific information on animal mentality before incorporating such concerns into welfare standards are constrained by the shortage of information on the subject.

POLITICS, ETHICS, AND THE PROBLEM OF SCIENCE-BASED ANIMAL WELFARE REGULATIONS

State and federal governments as well as private industry are increasingly pressured to move toward alternative housing standards that are believed to better meet the behavioral needs of the animals in question and the ethical concerns raised by members of the public. Increasingly, legislation is being proposed in the United States at state and federal levels to ensure that the behavioral needs of farm animals are met. For example, a citizen-led ballot initiative in 2002 resulted in a ban on gestation crates in Florida, and in 2006 similar efforts were initiated to ban the use of crates as housing for sows and for veal calves in Arizona and to provide

federal protection for downed animals. Overall, however, attempts to introduce state or federal legislation pertaining to the treatment of farm animals have been unsuccessful in the United States.

A limiting factor on the imposition of such legislation is the widely held belief by US policymakers that decisions about farm animal welfare must be primarily scientifically driven. The assessment of animal welfare, however, by default involves scientific and philosophical factors. "Regulation of animal well-being is couched within a range of beliefs and assumptions about ethics and moral responsibility" (Kunkel, 2000). Concerns about farm animal welfare are based on the belief that morally relevant impacts upon farm animals must be weighed against the interests of both producers and consumers (Kunkel, 2000). Thus, much of the controversy over farm animal welfare is related to the inherent conflicts of these interests, especially in cases where economically sound management practices, such as increased stocking density, negatively affect the well being of farm animals (Estevez, 2002). What is considered acceptable or unacceptable livestock production practice relative to animal welfare is a reflection of social choice "made by collective and individual decisions rather than scientific assessment" (Bennett, 1995), which typically varies between societies and changes over time. Thus, those trying to address what are fundamentally moral concerns solely with scientific information are effectively speaking a different language from their critics, and are therefore likely to make little headway with them.

Moreover, social concerns are raised by the apparent inconsistencies between animal scientists' expressed views about animal welfare and the welfare challenges associated with intensive confinement systems designed and supported by many of these individuals. In a survey of US animal sciences faculty, the respondents agreed that agricultural animals should have room to move around freely, express a majority of their normal behavioral repertoire, and lie on comfortable substrates (Heleski et al., 2004). Yet, few of the modern intensive confinement production systems designed and endorsed by animal scientists permit animals to behave in ways that are compatible with such beliefs. Interestingly, when the respondents were asked to rank food producing species, the greatest concerns were directed at poultry production, despite the popular and dismissive characterization of chickens as "bird brained." Only 51% of the respondents felt that the predominant production methods used to produce eggs provided appropriate levels of animal welfare, and 58% found practices in broiler production acceptable. The discrepancy between animal scientists' statements about how farm animals should be treated and the reality of contemporary animal production systems raises far greater ethical problems than that of mere cognitive dissonance.

In a recent US survey, 76% of the respondents were concerned that farm animals might be mistreated or suffer in current food production systems, and 83% of

the respondents agreed with the statement, “it is wrong to cause farm animals any pain, injury or stress” (Bennett et al., 2002). Given this, the US animal production industries are facing a perceived failure to demonstrate professional ethics relative to animal care that correspond with their expressed values, as well as those of the consuming public and other interested citizens. “The general belief of concerned individuals is that government has a responsibility to bring supply and demand for agricultural products into better balance: to create an agriculture that can coexist harmoniously with the environment, and to restrict livestock systems that do not offer the animal a life of comparative fulfillment” (Kunkel, 2000). These are undoubtedly factors underlying the attempts to legislate US farm animal welfare standards.

Many of our moral concerns about farm animals stem from the agrarian perception of agriculture that still persists in the urban population (Thompson, 1993). However, Thompson (2005) also notes that it is reasonable for consumers to expect the animal production industries to demonstrate a commitment to ethical animal husbandry and for this to be reflected not just in the individual producers’ level of care for animals, but also in market structures, industry standards, and government regulations. Nonetheless, it is unreasonable to expect individual producers to willingly forego profits or to accept lower standards of living to accommodate consumer demands for greater animal welfare standards. Instead of punitive mechanisms such as legislation, governments can put forth enabling policies that provide incentives to facilitate improvements in animal welfare. For example, the supply management system used in some countries, such as Canada, for production and marketing of eggs, poultry meat, and dairy products, includes mechanisms to safeguard producer incomes while phasing in changes in production standards. Although legislation is necessary to create a level playing field for producers based on the most basic levels of care, mechanisms are also needed to address consumer confidence for citizens wishing to pay for even more stringent welfare requirements.

Determining what is proper welfare for sows, layer hens, and other intensively farmed animals is therefore a considerable challenge. Decision makers must give due consideration to the values and beliefs of all animal agricultural stakeholders, not all of whom agree on what aspects of animal welfare should be prioritized. They must also give equal consideration to the science on both sides of a topic (e.g., the evidence for and against housing sows in gestation crates), because when there is information to support both sides of a policy debate, the argument becomes one of ethics, rather than one of science vs. opinion (Weaver and Morris, 2004). This necessitates balancing ethical concerns with economic constraints and other factors, such as animal behavior, health, food safety, and environmental impact (Bracke et al., 2004; Deen, 2005).

There is an underlying concern by some stakeholders and policymakers that making certain concessions regarding ethical farm animal treatment may open the door for unreasonable additional demands by animal activists that benefit neither people nor animals (Thompson, 2005). For example, banning of veal crates in the United Kingdom in the 1990s resulted in the collapse of the British veal industry. Subsequently, the welfare of British calves worsened because producers initially responded by shipping surplus calves to production units in continental Europe (where veal crates were still used), and so the animals were subjected to the additional stressors of transport. The use of phase-in periods in EU welfare legislation (for example, in the battery cage ban) allows opportunities to identify and correct issues that run counter to the intent of these welfare regulations.

Nonetheless, the US animal production industries continue to emphasize economic and production aspects of animal care that are well understood but which do not necessarily address the specific moral concerns regarding animal quality of life that critics have raised for decades. Thus, disputes over how to incorporate the social issues related to farm animal welfare, combined with disagreement about how to characterize and monitor it, have seriously hindered ethical and political decision making (Bracke et al., 2004). Balancing what ought to be done about farm animal welfare with what is pragmatic and economically feasible remains a challenge that may be best resolved in the United States by voluntary regulation of farm animal welfare.

VOLUNTARY REGULATION OF FARM ANIMAL WELFARE

Rollin (1995) has long contended that a new social ethic for animal agriculture demands not only that the animal production industries provide healthy and affordable products to their consumers, but also that animal interests also be accorded proper consideration. Recent and ongoing attempts to legislate US farm animal husbandry policies appear to be more or less aimed at achieving this goal. Because constitutional issues and uncertainties about factual information can delay legislation and make laws difficult to amend with new knowledge, it is imperative that the animal production industries move toward self-regulating their policies and practices in keeping with the new social ethic of compassionate animal farming.

The United Egg Producers is one commodity group that has taken a proactive stance by commissioning an independent scientific review of their production practices in terms of existing knowledge about poultry welfare and then developing an action plan to identify areas for which action was warranted and where research funds should be directed (Mench, 2003; Fraser, 2006). From the consumer perspective, the Freedom Food scheme used in the United Kingdom is cited as evidence that progress regarding animal welfare is forthcoming

when stakeholders themselves take action to address welfare issues (Bracke et al., 2004). In the United States, Certified Humane was developed as an animal welfare certification program on the same principles as Freedom Foods, including third-party audits and an advisory scientific community. Several of the most promising initiatives have begun with efforts to develop validated means of monitoring farm animal welfare.

According to Thompson (2005), development of animal production industry standards that are based on sound scientific and ethical principles may provide the best alternative to imposed legislation of contemporary farm animal husbandry, but only if certain key conditions are met: 1) it must be clear that the ethical goals and principles place appropriate weight on the welfare and interests of the animals themselves at the same time that they recognize the role of animal agriculture in satisfying vital human needs. 2) Consumers must have confidence that the standards are taken seriously and that livestock producers faithfully follow the recommended practices. 3) Producers themselves must believe that the standards are established and administered fairly.

Although some mix of market incentives, government regulations, and self-administered industry standards may eventually emerge to address the new challenges of ethical animal husbandry, only a system that meets all 3 of these criteria can truly be said to be ethically justified. Steps have already been taken in this direction. In fact, the recent food animal welfare initiatives implemented by the fast food and supermarket industries may represent a shift in animal agriculture similar to that predicted by Hodges (2003) and motivated by the new social ethic described by Rollin (1995). These efforts have provided unprecedented impetus for farm animal welfare reform in the United States in the absence of legislation. Schweikhardt and Browne (2001) refer to such efforts as “the arrival of politics by other means,” proposing that once companies believe that their consumers value a particular aspect of a product (e.g., welfare-friendly animal husbandry), it becomes possible for policy advocates to influence enough of the market to establish regulations that may provide a competitive edge (Schweikhardt and Browne, 2001). Animal welfare may provide that distinguishing characteristic for progressive producers and retailers in the United States.

For example, in the late 1990s to early 2000s, under the guidance of animal welfare scientists, the McDonald's corporation presented animal welfare guidelines for its producers (Fraser, 2006). This action was subsequently emulated by its competitor, Burger King, and later by other fast food chains. By 2003, the National Council of Chain Restaurants (NCCR) and the Food Marketing Institute (FMI), which represent over 26,000 food retail stores and over 120,000 restaurants, franchises, and cooperators, followed suit, drafting a program to develop and support industry efforts at improving farm animal welfare (NCCR, 2003). These mini-

mum welfare standards, imposed mainly because of pressure exerted on multinational corporations by animal activists within the United States and abroad, have effected change in US farm animal welfare more quickly and substantially than government actions would probably have done (Estevez, 2002). It is unlikely that these efforts would have occurred without a social ethic similar to that described by Rollin (1995) that extends some level of moral consideration to farm animals.

Nonetheless, Bracke et al. (2004) point out that the monitoring of farm animal welfare may involve important conflicts of interest for the stakeholders, who may have opposing goals. Consumers, for example, may tend to set very high demands on production while desiring transparency of the monitoring process. This may conflict with the producer's desire to maintain autonomy and to demonstrate success in promoting animal welfare. Further conflict arises with welfare groups interested in having the monitoring process demonstrate that intensive animal production systems should be greatly modified or discontinued altogether (Bracke et al., 2004). How monitoring of welfare is done also should be seriously considered because there are several ways to do so, including periodic monitoring of randomly selected farms and voluntary monitoring for animal welfare certification.

CONCLUSIONS AND IMPLICATIONS

Public interest in animal welfare is growing and has inspired numerous discussions and debates about US farm animal welfare policy. Factual knowledge is required to support ethical decisions, and in particular the need for a greater understanding of affective states and behavioral needs of farm animals require pushing the boundaries of the methods currently used. Laboratory techniques used in cognitive psychology, such as preference tests, have been modified for use in farm species such as chickens (Dawkins, 1983; Duncan, 1992), pigs (Spinka et al., 1998), cattle (Tucker et al., 2003), and sheep (Kendrick et al., 2001). In addition, these techniques have been refined using economic theories of supply and demand to design tests in which animals can respond with their feet, making it possible to “ask” them questions about their affective states, providing quantitative information about the strengths of their motivation and priorities (Dawkins, 1983, 1990; Mason et al., 2001). In addition to laboratory tests in controlled environments, solutions for animal welfare require understanding of how different factors interact in real world environments. Interdisciplinary approaches are needed to explore the complexity of animal welfare. Furthermore, opportunities exist for further use of statistical techniques such as meta-analysis methods that combine data from numerous experiments, and epidemiology that accommodates uncertainty and confounding factors. Moreover, attending to the ethical questions posed by citizens, rather than simply consumers, will allow us to better identify the

factual knowledge that is needed for decision making about animal welfare without raising false expectations about what answers science can provide. Finally, to keep pace with public and political demands for expertise in this discipline, animal welfare should be a compulsory course in the animal science curriculum, as is also being explored within the veterinary profession (Estol, 2004).

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