Communicating farm animal welfare science: Wisconsin dairy producers' attitudes toward and interest in dairy cattle welfare

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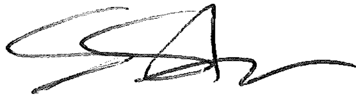

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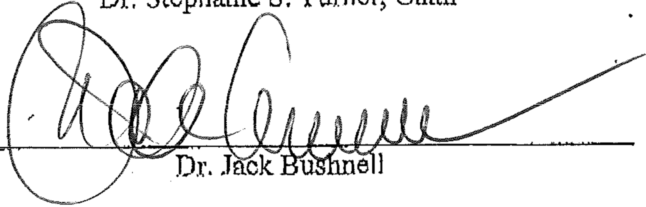

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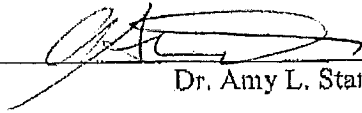

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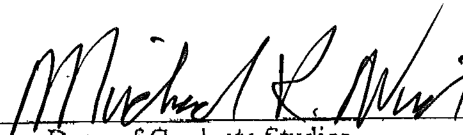
APPROVED: 

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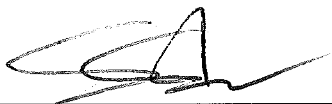
Under the Supervision of Dr. Stephanie S. Turner

Research in the field of farm animal welfare science provides the foundation for the farm animal welfare assessment criteria and legislation that has been developing over the past fifty years, especially in the EU, England, Australia, and Canada. Research in this field involves using empirical evidence to make judgments about an animal's state of welfare; however, a number of studies, primarily in the EU, explore producer opinions and knowledge about farm animal welfare issues. Few comparable studies of US producers exist in the literature. The current study of Wisconsin (WI) dairy producers targeted producers' opinions about an animal's ability to experience the affective states of pain, fear, boredom, and frustration; their opinions about controversial on-farm management practices (e.g., tail docking and dehorning); their familiarity with farm animal welfare initiatives (e.g., university extension-sponsored conferences); their interest in learning about dairy cattle welfare; and how they currently obtain farm management information. Surveys were mailed to a computer-generated random sample (n=1,000) of WI dairy producers with a response rate of 48%. Results indicated that farm type, farm size, producer age, and producer education level impacted survey responses.

This information could be used to develop welfare education strategies based on demographics and producers' preferred information sources.



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Introduction

Over the past fifty years, citizens in countries including the European Union (EU), United States (US), Australia, and Canada have expressed a growing concern over the welfare of animals in the agricultural industry. Recent studies in the EU and the US demonstrate that consumers regard the well-being of food animals as important and, in some cases, a key factor in their purchasing decisions (Prickett, Norwood, & Lusk, 2010). In response to these concerns, some countries have developed and continue to develop legislation and non-mandatory animal welfare guidelines to standardize acceptable farm animal management and transportation practices. Farm animal welfare science provides the empirical methods through which we can assess an animal's state of well-being. The resulting data and recommendations from these studies inform animal welfare legislation and guidelines.

Animal welfare scientists in the EU, Australia, and Canada have authored a large proportion of the farm animal welfare research published in peer-reviewed journals; however, the field is gaining traction in the US. Major Midwestern universities, including Michigan State, Ohio State, Iowa State, and Purdue University, are developing a variety of farm animal welfare programs and curricula. Recent initiatives in the University of Wisconsin System suggest that farm animal welfare science is also gaining momentum in Wisconsin. Recently hired faculty at two UW System schools specialize in animal welfare. In addition, recent dairy and beef cattle husbandry conferences hosted by the UW-Cooperative Extension included presenters who addressed farm animal welfare issues, and in 2011 the UW School of Veterinary Medicine began hosting the Dairyland Initiative, an online guide to welfare-friendly housing for dairy cattle.

Given these developments, it appears that the US is poised to contribute more significantly to the farm animal welfare research community. A majority of this research involves using empirical evidence to make judgments about an animal's state of well-being. A number of studies, however, explore producer and consumer attitudes towards and knowledge of farm animal welfare issues. Such studies are necessary to clarify consumer and producer perceptions of what constitutes good welfare so that we come closer to a definition of farm animal welfare that is amenable to both of these stakeholders. Some of these studies also explore whether consumers feel sufficiently informed about farm animal welfare issues. A limited number of US studies assess consumer, animal science faculty, and veterinary science faculty attitudes towards animal welfare; even fewer studies offer a focused assessment of producer attitudes.

I surveyed Wisconsin dairy farmers to determine the following: 1) farmers' knowledge of and attitudes toward farm animal welfare, including their knowledge of current animal welfare research and how this research informs on-farm animal management practices; and 2) farmers' interest in acquiring information about current farm animal welfare research and initiatives, as well as the means through which they would prefer to receive this information. I limited my survey to dairy farmers for two primary reasons. First, dairy farmers comprise the largest number of animal producers in the state, with the dairy industry accounting for 40% of Wisconsin's agricultural jobs (Wisconsin Ag in the Classroom, 2011) and milk being the state's top agricultural commodity (Wisconsin Ag in the Classroom, 2012). Second, Wisconsin produces more milk and dairy products than any other state in the nation except California (US Bureau of the Census, 2012). Thus, dairy farming involves a significant number of working

animals; it is necessary to ensure that these animals are experiencing optimal welfare and that producers have access to information about management practices that could improve the welfare of their herds.

While animal welfare scientists have been publishing research in peer-reviewed articles for several decades, Heleski, Mertig, and Zanella (2004) point out that the research "seems to have not yet attained its potential" (p. 2806). Specifically, they suggest that there may be a "critical gap" between "welfare science research findings and information dissemination to industry stakeholders." If this is the case, my survey represents one possible avenue through which to determine where gaps in animal welfare science knowledge exist among Wisconsin dairy producers. Thus, via the survey I am gathering information about specific stakeholders' (i.e., producers') understanding of a concept—animal welfare—and their knowledge about the controversial management practices (e.g., dehorning, tail docking, pasture access, etc.) that are the focus of animal welfare research findings. Determining what dairy farmers already know and how receptive they are to animal welfare information is an important preliminary step in the communication of animal welfare information to stakeholders.

The survey results may also inform best strategies for disseminating farm animal welfare research findings to dairy producers. For example, consider a scenario in which survey responses indicate that Wisconsin farmers are largely unfamiliar with current recommendations for pain management during the dehorning of cattle and that they have expressed interest in learning more about welfare-friendly on-farm management practices. They also indicate that they prefer to obtain agricultural information via print media, such as newsletters. As a result of this knowledge, cooperative extension agents

may find that creating an animal welfare research column within their regularly distributed newsletter is the most effective way to disseminate these findings to Wisconsin farmers. Similarly, if survey results indicated that an increasing number of Wisconsin farmers regularly use internet sites to obtain industry-related information, it may be worthwhile for cooperative extension agents to develop an online farm animal welfare information portal that is targeted to dairy producers.

Assessing stakeholder gaps in animal welfare knowledge, determining the degree to which they are receptive to this information, and understanding the means through which they prefer to receive information are necessary steps prior to developing animal welfare resources—most of which derive from scientific or technical documents—for a non-technical audience.

Chapter 1: Legal and Ethical Contexts for Farm Animal Welfare

Animal welfare science, a relatively new area of study, incorporates research from various disciplines in an attempt to assess animals' physical and psychological well-being. The goal of this research is to identify environmental conditions and management practices that increase captive and domestic animals' feelings of well-being. While scientists study animals in a variety of captive environments, including zoos, animal shelters, and research facilities, much research has focused on farm animals. Dr. David Fraser (2008), a professor of animal welfare at the University of British Columbia, explains that the formal scientific study of animal welfare in Europe began primarily during the 1960s, especially after the publication of British animal advocate Ruth Harrison's book *Animal Machines*. Harrison was the first to document the living conditions of chickens, pigs, and veal calves in large-scale production systems. She called into question not only the welfare of intensively farmed animals but also the safety of the food produced from animals whose physical and mental health appeared compromised (Harrison, 1964). The publication of *Animal Machines* in 1964 sparked much ethical debate, and the British government felt pressured to act. In response to the public's growing concerns, the government appointed a scientific committee, the Brambell Committee (named after immunologist and committee member chair William H. Brambell) to investigate the welfare of intensively farmed animals (Fraser, 2008).

The three major areas of animal welfare assessed currently include biological functioning (growth, reproduction, and incidence of sickness), affective states (ability to feel emotions like discomfort, pleasure, and frustration), and natural living (ability to engage in specie-specific behaviors in a natural environment) (Fraser, 2008). Those

involved in aspects of food production, including many animal scientists and veterinarians, often deem an animal's welfare "good" if the animal's biological functions, such as growth, reproduction, and incidence of sickness, are within healthy limits. For example, research shows that laying hens experience greater instances of respiratory illness and decreased productivity when the concentration of ammonia in their environment exceeds 25 parts per million (ppm) (Fraser, 2006, p. 99). Those who adopt "humanitarian attitudes towards animals," including animal welfare scientists and some ethicists, are concerned with animals' affective states, or their ability to feel emotions like pain, pleasure, and frustration. Indeed, Ian Duncan, one of the field's most influential welfare scientists, asserted that "...neither health nor lack of stress nor fitness is necessary and/or sufficient to conclude that an animal has good welfare...Welfare is dependent on what animals feel" (Duncan, 1993, p. 8; see also Fraser, 2008, p. 73). Consumers, on the other hand, are greatly affected by the quality of the environment in which food animals are raised. Many consumers do not trust farming practices that undermine an animal's ability to engage in natural behaviors, a concern that falls within the "natural living" assessment category (Fraser, 2004, pp.123–124; Fraser, 2008, pp. 229–232).

The Brambell Committee consisted mostly of agriculturalists and scientists whose assessment interests would have likely fallen within the area of biological functioning; however, it was member ethologist Dr. William Thorpe whose contributions influenced the committee to recommend funding for research in the field of animal behavior studies (Brambell, et al., 1965). The study of animal behavior, or ethology, informs the current assessment areas of affective states and natural living (Fraser, 2008, pp. 62–64). Hence,

applied ethologists have played an important role in animal welfare science by investigating why and how animals develop specific behaviors as a result of stress, industry management practices, and housing systems, among other factors (Millman, Duncan, Stauffacher, & Stookey, 2004).

This attention to an animal's behavioral needs, which includes how the animal responds to both "internal and external stimuli" (Croney & Millman, 2007, p. 558), is reflected in the Five Freedoms, a series of statements that define ideal animal welfare states: "Freedom from hunger and thirst – access to fresh water and a diet for full health and vigour; Freedom from discomfort – an appropriate environment with shelter and comfortable rest areas; Freedom from pain, injury and disease – prevention or rapid treatment; Freedom to express normal behaviour – adequate space and facilities, company of the animal's own kind; Freedom from fear and distress – conditions and treatment which avoid mental suffering." First introduced by the Brambell Committee and then refined by the Farm Animal Welfare Council in 1979, the Five Freedoms currently form the basis of EU farm animal policy (Farm Animal Welfare Council, 2009; Directorate-General, Health and Consumer Protection, 2007).

Farm Animal Welfare Legislation and Assurance Programs in the EU and the US

Regulatory measures for farm animal welfare differ significantly between the EU and US. The EU has a longer history of specifying minimum welfare standards that are legislated by individual countries. In the US, much agricultural legislation occurs at the state level, and only nine US states have instituted welfare regulations, which are limited to the issues of confinement and natural living. Yet despite fewer and less rigorous regulations, non-governmental welfare assurance programs, including non-mandatory

welfare guidelines, third-party labeling schemes, and retail industry guidelines are gaining momentum and may provide an effective means of introducing and maintaining welfare standards in this country. I provide more detailed descriptions of these alternatives in the section *Self-Regulation and Third-Party Auditing Systems* below.

Recent studies demonstrate that consumers consider the well-being of food animals when making purchasing decisions (Prickett, Norwood, & Lusk, 2010; Rauch and Sharp, 2005). Product differentiation via labeling schemes provides consumers the option of purchasing products that come from animals who have been raised and slaughtered according to specific welfare standards. As such, animal welfare becomes one of a number of product preferences including organic, pasture-based, and free-range, to name a few. Fraser (2006) explains why animal welfare is treated as a consumer preference issue in countries like the US: "Societies that are highly committed to market economics are likely to treat animal welfare as a consumer preference issue to be solved by providing market choices between high-welfare products and other products; hence, product differentiation programs and corporate programs would presumably be the most acceptable" (p. 102). While similar product labeling programs exist in the EU, government regulation remains the primary means through which welfare standards are regulated because, as Fraser explains, "other societies appear to view animal welfare as a public-good issue beyond the scope of market solutions; in those cases, favoured solutions are likely to be based on regulations and inter-governmental agreements" (p. 102).

Below, I provide a more detailed overview of farm animal welfare legislation in both countries, including a brief discussion of some specific retail industry guidelines and product differentiation programs in the US.

EU legislation. Since the early 1990s, the European Union has legislated minimum standards for the protection of agricultural animals (Directorate-General, Health and Consumer Protection, 2007). Council Directives, or legislative acts that describe mandatory outcomes but do not define a means of reaching those outcomes, represent some of the most progressive and comprehensive animal welfare legislation in the world. Directives have been established for the welfare of laying hens, calves, pigs, and all species "kept for the production of food, wool, skin or fur or for other farming purposes, including fish, reptiles or amphibians" (European Commission, 2013).

The EU has been supporting expansive scientific investigation into farm animal welfare in an effort to quantify minimum standards for industry housing systems, the quality of flooring surfaces, feeding and food content requirements, husbandry practices, and behavioral enrichment, to name a few (European Commission, 2013). The results of these studies have been incorporated into the language of the EU's council directives, legislative acts that define standards which Member States are responsible for enforcing (EUR-Lex, 2009).

The EU has passed five Council Directives that mandate minimal welfare standards for farm animals, including laying hens, calves, pigs, and broiler chickens. The Directives prohibit such practices as tethering, outline feeding guidelines, and mandate that confinement systems such as sow stalls and veal crates be phased out (European Commission, 2013; Stevenson, 2012). For example, Council Directive 1999/74/EC,

Standards for the Protection of Laying Hens, required that battery cages be phased out by 2012 and that all cages used after this period be "enriched." Enriched cages provide each hen with the necessary space, comfortable substrate, and perches to carry out behaviors they are naturally motivated to perform (e.g., dust bathing). The EU directive requires that each cage provide hens at least about one square foot (750cm$^{2)}$ of space, a nest box, litter so that the birds can engage in pecking and scratching, and perches that allow at least 6 in (15 cm) per hen. Such requirements reflect quantifiable research produced by poultry scientists as well as recommendations by the EU's Scientific Veterinary Committee. Specifically, providing birds with a nest box, litter, and perches acknowledges evidence from the behavioral sciences that animals naturally engage in specie-specific behavior (Appleby, 2003). Increased cage sizes reflect a concern for the hens' inability to move freely in conventional housing systems called battery cages. Zoologists Marian Stamp Dawkins and Sylvia Hardie (1989) found that brown hens used 74 in^2 (475cm^2) just to stand in place and 197 in$^{2\,(}$1,272cm^2), or a little over one square foot, to turn around. Such findings pressured the EU to refine existing directives that ultimately led to the increased space requirements for both cage and non-cage alternative housing, as outlined in the most current directive (Appleby, 2003).

Currently, no directives exist for the welfare of dairy or beef cattle, but the Animal Health and Animal Welfare panel of the European Food Safety Authority (EFSA) has published scientific opinions (based on a risk assessment) on the impact of housing, feeding, management, and genetic selection on 1) behavior, fear, and pain; 2) metabolic and reproductive problems; 3) leg and locomotion problems; 4) udder problems; and 5)

overall welfare (Eurogroup for Animals, 2012). Some of the EFSA's main findings included the following:

- Behavioral problems, fear, and pain are more likely to be associated with housing systems than with feeding practices, management, or genetic selection (EFSA, 2009a).
- The estimated risk of experiencing behavioral problems, pain, and fear is highest for cows in tie stalls, which restrict cows' abilities to groom, socialize, and exercise. Risk is lowest for cows at pasture (EFSA, 2009a & 2009c).
- Cows are at a greater risk of suffering leg and locomotion problems, such as lameness, in tie stalls where there may be insufficient lying and walking space (EFSA, 2009b).
- Long-term genetic selection for high milk yield is positively correlated to incidence of lameness, mastitis, reproductive disorders, and metabolic disorders (EFSA, 2009c).

The absence of EU legislation for the welfare of dairy cattle is perhaps a consequence of the perception that these animals experience better welfare than other farm animals who face intensive confinement, such as pigs and laying hens. Indeed, "cow comfort" is a mantra of the dairy industry; milk quality and quantity increase when cows are comfortable. However, as noted in the EFSA's scientific opinions, dairy cattle are at risk of experiencing behavioral and physiological problems, especially when their housing environment is not managed properly. The EFSA, therefore, advises that management recommendations based on dairy cattle welfare research be incorporated into codes of practice and animal-based measures. This recommendation reflects the EU's recent

animal welfare strategy, which includes assessing animals' welfare based upon their ability to cope in their environment (output-based) rather than assessing the quality of the environment itself (input-based). The EU's new strategy is described in more detail below.

The EU's council directives represent some of the earliest and most inclusive farm animal welfare standards in that they address the three major areas of welfare assessment (i.e., biological functioning, affective states, and natural living). Yet, it is important to note that the EU has struggled to maintain adequate enforcement of their directives. Donald Broom (2009) explains that in the EU "[t]here are regional and national differences in the extent to which legislation is viewed seriously by those in the animal production business" (p. 349). In addition, he points out that many countries have reduced the number of staff dedicated to monitoring the implementation of welfare standards. Moreover, the diverse farming systems, climate, and geography across the EU make it difficult for many Member States to effectively carry out specific welfare requirements. Because of these factors, the European Commission has concluded that a "one size fits all" approach to welfare legislation has resulted in poor implementation across the entire Union (European Commission, 2012).

In response to some of these challenges, the European Commission developed an EU Animal Welfare Strategy for 2012–2015. Major components of the Strategy include the following:

- Developing a simplified legislative framework for animal welfare that focuses on using scientific measures (also called animal-based measures) to assess an individual's or group of animals' welfare *in their environment* rather than on

relying solely on prescriptive standards that may or may not apply to all producers across all Member States.

- Providing consumers with sufficient, clear, and science-based information about the animal welfare claims that appear on products.
- Educating and training farmers and animal welfare officials about welfare legislation, including providing officials with updated technical information and offering animal welfare training courses.
- Developing common welfare competency requirements for individuals who handle animals (European Commission, 2012).

The Strategy also acknowledges that one of the primary factors affecting animal welfare in the EU is lack of stakeholder (e.g., producers and consumers) knowledge about animal welfare research and alternative farming practices, as well as (noted above) the legitimacy of animal welfare claims on food products. The status of communication and dissemination of farm animal welfare information to these stakeholders is addressed in Chapter 2, Communicating Information about Farm Animal Welfare.

Despite challenges enforcing welfare legislation, the EU has nonetheless continued to establish the legal framework necessary to support animal welfare initiatives. For example, the EU's Lisbon Treaty (Article 13) (effective 2009) recognizes animals as sentient, which means they are capable of experiencing pleasure and pain (European Union, 2010). In addition, the "precautionary principle" plays an important role in EU animal welfare legislation (Croney & Millman, 2007). Generally, the principle allows governing bodies to enforce action that would prevent damage, even in the absence of scientific proof that such action would achieve the desired results. Germany first

employed the principle in a clean air bill during the 1970s. Subsequent German environmental policy reads that "[t]he principle of precaution commands that damages done to the natural world (which surrounds us all) should be avoided in advance and in accordance with opportunity and possibility" (World Commission on the Ethics of Scientific Knowledge and Technology, 2005, pp. 9-10). The European Commission states that "[t]he precautionary principle may be invoked where urgent measures are needed in the face of a possible danger to human, animal or plant health, or to protect the environment where scientific data do not permit a complete evaluation of the risk" (European Commission, 2011).

Thus, the principle encourages pro-active measures that prevent—in the case of animal welfare—animal suffering. The precautionary principle is significant because it places the onus on those who keep animals to prove that harm has not occurred as a result of specific husbandry practices (Croney & Millman, 2007).

US legislation. In the US, farm animal welfare legislation is currently limited to three federal statutes and nine state statutes. The three federal statutes include the Twenty-Eight Hour Law of 1877, the US Animal Welfare Act (1966), and the Humane Slaughter Act (1978), none of which provides for the welfare of animals while they are on farms. Only individual states can determine anti-cruelty laws for farm animals (Tomaselli, 2003). Currently, Arizona, California, Colorado, Florida, Maine, Michigan, Ohio, Oregon, and Rhode Island have passed laws that extend some type of protection to farm animals (Rumley, n.d.). In large part, animal welfare groups and concerned citizens have pressured state legislatures to regulate how farm animals are raised and handled. Depending upon the state, statutes may mandate humane slaughter practices and the

phasing out of gestation crates, veal crates, and battery cages. Of the nine, Michigan and California have banned both gestation and veal crates as well as battery cages (Humane Society of the United States, 2009). In June of 2012, Rhode Island passed legislation banning gestation crates, veal crates, and the practice of cattle tail docking (Humane Society of the United States, 2012).

Wisconsin has not passed farm animal protection laws; however, animal welfare initiatives led by the University of Wisconsin System demonstrate an interest in exploring welfare-friendly management and housing of dairy cattle, the State's most abundantly farmed food animal. For example, every year since 2010, dairy and beef cattle husbandry conferences hosted by the UW-Cooperative Extension have included presenters who address farm animal welfare issues, and the UW School of Veterinary Medicine is hosting the Dairyland Initiative, an online guide to welfare-friendly housing for dairy cattle. Both of these initiatives reflect an effort to work directly with producers to adopt practices that enhance animal welfare, an approach that some animal welfare advocates believe is ultimately more effective than legislation. Some of these advocates, such as Candace Croney, Associate Professor of Animal Sciences and an expert in animal well-being at Purdue University, along with professional associations like the American Veterinary Medical Association (AVMA), believe that the new laws may even decrease animal welfare. Croney (2009) explains that in order to meet the new legal requirements, producers may attempt to implement new practices they do not fully understand. For instance, poultry farms with a high stocking density that switch to a "cage-free" system may not carefully manage their flocks to minimize aggression, injury, and even cannibalization among birds. Moreover, some producers in legislated states will need to

invest in resources to develop alternative management practices and upgrade or replace animal housing. To recoup these costs, they will need to raise the price of their products. As a result, food retailers in legislated States could begin importing cheaper products from producers in non-legislated States (Croney, 2009). The EU already deals with this challenge and has advocated for including animal welfare standards in trade agreements with other countries (FarmingUK, 2013, May 25). For instance, the EU-Chile Free Trade Agreement of 2003 included language about incorporating animal welfare standards that both nations could agree upon. Specifically, a "Joint Management Committee for sanitary and phytosanitary (SPS) measures" ensures compliance with the welfare standards agreed upon by the EU and Chile as well as establishes technical working groups and ad hoc groups when further expertise is needed. Current standards address the welfare issues of stunning, slaughtering, and transport (Eurogroup for Animals, 2013).

Finally, some animal welfare advocates argue that the language in the US state statutes is vague and the scope of the statutes too narrow. For example, California's Proposition 2, *Standards for Confining Farm Animals* (2008), prohibits a person from confining pregnant pigs, veal calves, or egg laying hens "in a manner that prevents such animals from lying down, standing up, fully extending his or her limbs, and turning around freely." While Proposition 2 acknowledges that confined animals need ample room to engage in natural behaviors, it does not incorporate other recommendations from animal welfare science literature, such as provisions for behavioral enrichment (e.g., perches, nest boxes), housing, and environmental factors like air quality. Professional organizations like the AVMA have issued statements expressing concern that the legislation does not take into account all aspects of animal welfare:

> The best housing environments take into consideration all relevant factors, including: freedom of movement; expression of normal behaviors; protection from disease, injury, and predators; adequate food and water; and proper handling. Proposition 2 would clearly provide greater freedom of movement, but would likely compromise several of the other factors necessary to ensure the overall welfare of the animals, especially with regard to protection from disease and injury. (AVMA, 2010)

The AVMA's concern that the language of California's Proposition 2 is too limiting demonstrates how different stakeholders' priorities may affect the application of animal welfare science to US policy and regulation. In this case, public concern over confinement systems, specifically, is reflected in the regulatory language. The AVMA rightly expressed concern that Proposition 2 fails to take into account all of the three assessment areas—biological health, affective states, and natural living conditions—that are necessary to ensure good welfare. But also notable is AVMA's focus on disease and injury prevention. Whereas veterinary scientists naturally place a higher priority on biological health, an ethologist, while acknowledging the necessity for biological health, would likely place just as high a priority on how an animal feels. As noted previously, prominent animal welfare scientist Dr. Ian Duncan claims that "[w]elfare is dependent on what animals feel" (Duncan, 1993, p. 8; see also Fraser, 2008, p. 73).

As an example of how scientists value the three main assessment criteria differently, consider past debates over the use of sow gestation crates in the EU and Australia. The EU has placed great importance on the role of affective states in assessing animal welfare. They maintain that negative affective states cause an animal to suffer.

Observing that sows confined to gestation crates exhibit abnormal behaviors, EU reviewers concluded that their inability to perform natural behaviors like rooting causes them to become frustrated. An Australian review team, on the other hand, concluded that sows' biological functioning is not significantly affected in gestation stalls. They argued that if sows experienced distress, they would also experience abnormal growth and reproduction, poor health, and an increased incidence of injury and disease, problems that were not specifically correlated with use of gestation stalls in the scientific literature. Scientists can measure growth, reproduction, survival, and incidence of disease or injury more objectively than affective states, which require some subjective interpretation; therefore, the Australian review team placed a higher priority on biological functioning. Their conclusions may also reflect the Australian government's preference for only objective scientific data when legislating animal welfare issues (Croney & Millman, 2007; Fraser, 2008; Millman, et al., 2004). As a result of these contradictory conclusions, some policy makers and scientists may view animal welfare science data as unsound rather than as subject to interpretation based upon individuals' welfare assessment priorities.

Self-regulation and third-party auditing systems. As mentioned previously, non-governmental means of establishing animal welfare standards may provide a more widely accepted alternative to state legislation in the US, where a market economy and powerful lobbies limit government regulation. Fraser (2006) identifies three main types of non-governmental welfare assurance programs: 1) Non-mandatory welfare codes and guidelines; 2) Assurance programs of corporate customers and their associations; and 3) Product differentiation and labeling programs. Below I provide an overview of the

different assurance formats and provide examples of current programs within these categories.

Non-mandatory welfare guidelines. In the US, non-mandatory welfare guidelines are recommendations created primarily by industries, sometimes in collaboration with professional animal welfare organizations, regulators, veterinarians, and scientists (Fraser, 2006). One of the first US commodity groups to develop guidelines was the United Egg Producers (UEP) (Mench, 2008). Other organizations that have developed guidelines include the American Meat Institute (AMI), the American Sheep Industry, the Milk and Dairy Beef Quality Assurance Center, the National Milk Producers Federation[1], the National Cattleman's Beef Association, the National Chicken Council, the National Turkey Federation, and the Pork Board (Mench, 2008; Food Marketing Institute, 2013; Farm Sanctuary, 2009). As non-mandatory measures, most organizations' guidelines are not regulated by government agencies; therefore, they provide the public only minimal assurance that farm animals experience good welfare. Overall, they serve primarily to educate food producers and the public about acceptable industry standards (Fraser, 2006).

Not only do commodity group guidelines serve primarily to educate, Mench (2008) points out that many are based on what Fraser has categorized as Type 1 and 2 animal welfare assessment requirements, which ensure animals' basic health and functioning (Type 1) and minimize negative affective states like pain, fear, and hunger (Type 2) (Fraser, 2006). As such, they often do not prohibit practices deemed inappropriate under Type 3 assessment criteria (providing animals opportunities to carry out natural behaviors), including restrictive confinement and limited access to pasture.

[1] This organization developed the National Dairy FARM Program, a third-party animal well-being verification program. However, their website contains no information about who performs their third-party audits.

Animal welfare groups like Farm Sanctuary (2009) also claim that most US welfare assurance programs fail to address all Five Freedoms in their standards and guidelines. The Five Freedoms (freedom from hunger and thirst; discomfort; pain, injury, or disease; fear and distress; and freedom to express normal behavior) form the basis of EU farm animal welfare legislation. Specifically, the guidelines do not systematically prohibit what some animal welfare scientists consider inhumane practices, such as castration after six months of age and/or without anesthesia, tail docking, dehorning without anesthesia, and early weaning, among other practices.

However, some of these commodity groups, such as the UEP and AMI, have adopted more rigorous standards as well as third-party auditing systems to ensure that guidelines are implemented (Fraser, 2006). For example, animal scientist and welfare advocate Temple Grandin has written a comprehensive animal handling and auditing guide for AMI called *Recommended Animal Handling Guidelines and Audit Guide: A Systematic Approach to Animal Welfare*. The guide scores slaughter plants on a variety of practices, including proper restraining techniques, handling of downed animals, proper use of electric prod and stunning equipment, and incidence of slipping and falling by animals (Grandin, 2012; Fraser, 2006). Third-party audits are performed by private firms that specialize in food safety, quality, and welfare auditing (Grandin, 2012).

The UEP developed welfare guidelines that define minimum standards for chicken housing, space allowances, feeding practices, beak trimming, molting, handling and transportation, biosecurity and animal health, and euthanasia procedures (UEP, 2010). Member companies must file a monthly compliance report and participate in an annual audit to ensure that they are meeting UEP's welfare standards (Fraser, 2006).

Audits are performed either by the US Department of Agriculture's (USDA) Agricultural Marketing Service or by Validus, an independent certification company. All auditors, regardless of their employer, must have completed the International Organization for Standards (ISO) 9001 Legal Auditor Training (Farm Sanctuary, 2009). It should also be noted that producers may display the UEP's United Egg Producers Certified label on their egg cartons only if they meet animal care guidelines. Labeling schemes are discussed in more detail below within the section *Product differentiation and labeling programs*.

Assurance programs of corporate customers and their associations. The food retail industry has the potential to significantly influence farm animal welfare standards more quickly than government regulation can (Croney & Millman, 2007; Fraser, 2006; Swanson, 2008; Mench, 2003). Swanson (2008) notes that "food retailers appear to be the primary conduit through which concerns are aired or change is motivated" (p. 375). Consider that a few of the largest chain restaurants, including McDonald's, Burger King, and Wendy's, were the first to develop animal welfare standards for egg production, animal confinement, and slaughter practices (Farm Sanctuary, 2009). Realizing that separate but similar guidelines and audits could be frustrating for suppliers, the National Council of Chain Restaurants (NCCR) and the Food Marketing Institute (FMI) joined forces in 2003 to create a set of standardized minimum guidelines that all of their member food retailers (26,000 members) and member restaurants/franchises (120,000 members) could utilize (Brown, 2004; Croney & Millman, 2007; Fraser, 2006; Mench, 2003). Such retailer-supplier cooperation has resulted in some of the most significant animal welfare reforms to date. For instance, Smithfield, the largest pork producer in the

US, plans to phase-out sow gestation stalls by 2017 (Mench, 2008). In a January 3, 2013 press release, the company announced that they had transitioned 38% of their pregnant sows to group housing systems by the close of the 2012 year. In the same release, they also confirmed plans to phase-out gestation stalls at their internationally-based farms by 2022 (Smithfield, 2013).

Nevertheless, corporate assurance programs are not without flaws. Both Fraser (2006) and Mench (2003) point out that welfare standards are difficult to enforce along the entire market supply chain. For example, a fast food corporation may impose welfare guidelines on the slaughter plants from which it buys beef, but these guidelines may not reach the feedlots that supply the slaughter plants or the breeders that supply the feedlots. Furthermore, with a growing market niche for food produced using animal welfare-friendly practices, corporations will likely rely on large producers who can easily supply them with enough raw materials to meet consumer demands (Mench, 2003). As a result, smaller farms that cannot compete with large producers may fail or, at the very least, find they must contract with larger operations to remain viable (Swanson, 2008). So while consumers have a right to expect that market structures will change as a result of more ethical food production practices, Croney and Millman (2007) contend that "[i]t is unreasonable to expect individual producers to willingly forgo profits or to accept lower standards of living to accommodate consumer demands for greater animal welfare standards" (p. 562). This is especially relevant when some studies show that consumers are not more likely to purchase products that are differentiated by welfare attributes alone (Liljenstolpe, 2008). As a possible solution, Guptill and Wilkins (2002) suggest that advocacy groups promote local retailers and producers (as cited in Swanson, 2008). For

example, only family farms and cooperatives of family farms are eligible to participate in the Animal Welfare Institute's Animal Welfare Approved (AWA) certification and labeling program (described in more detail in the section *Product differentiation and labeling programs*).

Product differentiation and labeling programs. Some organizations allow producers to display welfare assurance labels on their products if they meet certain animal welfare criteria. Fraser (2006) divides these programs into three categories, including those led by 1) producers; 2) food retailers; and 3) industry-independent organizations, often operated by non-profit animal welfare groups. The following organizations are examples of industry-independent US certification and labeling programs that include standards for dairy cattle:

- American Humane Certified (formerly Free Farmed)
- Humane Farm Animal Care's Certified Humane Raised and Handled
- Animal Welfare Institute's Animal Welfare Approved

Following a brief description of these programs, Table 1 provides an at-a-glance comparison of select dairy cattle welfare standards for each program.

Developed in 2000, American Humane Certified was the first third-party auditing and certification program in the US. Their first set of standards were based, in part, on the "Five Freedoms of Animal Welfare" developed by the UK-based Farm Animal Welfare Committee (FAWC): 1) Freedom from hunger and thirst; 2) Freedom from discomfort; 3) Freedom from pain, injury, or disease; 4) Freedom from fear and distress; and 5) Freedom to express normal behaviors (American Humane Association, 2013). American

Humane Certified standards were developed by an advisory committee of academicians, veterinarians, and scientists (American Humane Certified, n.d.).

Humane Farm Animal Care's (HFAC) Certified Humane Raised and Handled label allows producers to display the Humane Raised and Handled certification on their products if they comply with HFAC's welfare standards and third-party auditing system. HFAC's standards were written by a committee of academicians, veterinarians, animal scientists, and industry representatives (Humane Farm Animal Care, 2013a). For dairy cattle, they have outlined standards for food and water (quality, quantity, and access), housing environment, handling and management, herd health, transportation, and slaughter (Humane Farm Animal Care, 2013b). Like American Humane Certified, HFAC has based their standards on the Five Freedoms. As such, animals are provided opportunities to engage in behaviors they are naturally motivated to perform. For example, cows are highly motivated to lie down (Jensen, Munksgaard, Pedersen, Ladewig, & Matthews, 2004), with lactating dairy cows requiring 12 to 14 hours of rest per day (University of Wisconsin Cooperative Extension, 2011).

The Animal Welfare Approved (AWA) label also requires third-party auditing of its member producers. This program is noteworthy for its "rigorous and progressive animal care requirements" and ranking as "the 'most stringent' of all third-party certifiers," according to the World Society for the Protection of Animals (Animal Welfare Approved, 2013a). Founded in 2006, AWA is the only farm animal welfare assurance program that requires producers to raise animals outdoors on a pasture or range. As mentioned above, AWA provides free auditing services to member farms. Thus, AWA asserts that "because we are not financially dependent on farmer fees, we are

able to remain unbiased and transparent in our auditing and certification" (Animal Welfare Approved, 2013a). Currently, AWA has created welfare standards for beef and dairy cattle, bison, sheep, goats, pigs, and poultry (chickens, turkeys, ducks, and geese) (Animal Welfare Approved, 2013b).

Table 1. Comparison of select welfare standards by program

Standard	American Humane Association, American Humane Certified[2]	Humane Farm Animal Care (HFAC), Certified Humane®[3]	Animal Welfare Approved (AWA)[4]
Pasture Access	*Voluntary* access to pasture or earthen exercise lots required; minimum of 4 hours per day, weather permitting	Systems in which cows have no access to pasture or exercise lot are prohibited All cattle should have access to exercise areas for 4 hours per day, weather permitting	Continuous outdoor pasture access required
Space Allowance	In semi-arid conditions: minimum loafing space in loose housing is 40–50 sq. ft. per adult cow. In cooler climates: 20–30 sq. ft. of roofed area per head for small breeds or 30–40 sq. ft. for larger breeds	Minimum space allowance of 60 sq. ft. per mature cow in loose housing; all cows must be able to lie down simultaneously Must provide sufficient space to groom, stretch limbs, rise, and turn around	Minimum indoor bedded lying area of 27–54 sq. ft. per cow depending on weight (220–1100 lbs.) Minimum loafing space of 20–40 sq. ft. per cow depending on weight (220–1100 lbs.)
	For freestall housing: o Stocking density of 1 cow per available freestall o Cows must be able to change position from standing to lying and vice versa in a normal manner without	For freestall housing: o Group size must not exceed the number of available freestalls o Cows must be able to change position from standing to lying and vice versa in a normal manner without difficulty or injury	For freestall housing: o Must be 5% more stalls than cattle o Must be large enough to permit largest cows in herd to lie down, stand up, and lung

[2] American Humane Association. (2013). *Animal welfare standards for dairy cattle*. Retrieved from http://www.humaneheartland.org/our-standards

[3] Humane Farm Animal Care. (2012). *HFAC standards for the production of dairy cows: January 2012*. Retrieved from http://www.certifiedhumane.org/index.php?page=standards

[4] Animal Welfare Approved. (2013c). *Dairy cattle and calves standards*. Retrieved from http://www.animalwelfareapproved.org/standards/dairy-cattle-2013/

Standard	American Humane Association, American Humane Certified[2]	Humane Farm Animal Care (HFAC), Certified Humane®[3]	Animal Welfare Approved (AWA)[4]
	difficulty or injury, including adequate space for forward lunging o Must include a loafing area	o A minimum of 2 ft. for forward lunging must be provided o Must include a loafing area	forward comfortably
Disbudding/ Dehorning	Hot iron disbudding (only permissible for calves less than 30 days of age) must be performed under local anesthesia Dehorning must be performed by a veterinarian under local anesthesia, and calves must be provided NSAID treatment for post-operative pain.	Hot iron disbudding is permissible during first 3 weeks of age and must be performed with pain control Dehorning of mature cattle must be performed by a veterinarian using a combination of sedative, local anesthesia, and an anti-inflammatory	Hot iron disbudding is permissible during first two months of age only and must be preceded and followed by administration of anesthesia and sedation Dehorning is prohibited
Weaning of calves	Calves must not be weaned before 5 weeks of age; must not be weaned until they are eating at least 1.5 lbs. of a calf starter ration or dry hay per calf per day.	Calves must not be weaned before 5 weeks of age; must not be weaned until they are eating adequate quantities of calf starter (at least 1.5 lbs. of calf starter ration per calf per day)	Calves must not be weaned from milk before 6 weeks of age; they *should* not be weaned before 12 weeks of age
Tail Docking	Prohibited	Prohibited	Prohibited
Food/Water Access	At least 24 in. of feed bunk space per cow; 30 in. per cow 21 days before and after calving Continuous access to clean, fresh drinking water	At least 30 in. feed bunk space per pregnant dry cow and fresh cows (up to 21 days in milk) Free access to clean, fresh drinking water each day	Free access to clean, fresh drinking water at all times
Housing Type Restrictions	*Emphasis* on freestall housing design to maximize comfort of animals Tie stalls not prohibited	Tie stall or stanchion barns prohibited (renovated tie stalls may be used for milking procedures only)	Tie stalls only permitted for milking and/or feeding immediately pre or post milking
Herd health care plan (includes *prevention* of and *continual*	Required	Required	Health plans *emphasizing* prevention of illness or injury required

Standard	American Humane Association, American Humane Certified[2]	Humane Farm Animal Care (HFAC), Certified Humane®[3]	Animal Welfare Approved (AWA)[4]
monitoring for disease/injury/ parasites)			
Handling	Use of sticks prohibited for excessive hitting, beating, or poking of cattle; electric prods prohibited except where animal and/or human safety is in jeopardy	Managers must be able to demonstrate competence in handling animals in a positive and compassionate manner Use of sticks prohibited for hitting cattle; animals must not be pulled or lifted by the tail, skin, ears, or limbs; aggressive tail twisting (e.g., jacking) is prohibited; electric prods prohibited	Efforts must be made to develop positive relationships between the farmer and animals through gentle handling Hot prods and electric shocks prohibited; abuse or maltreatment of animals is prohibited
Growth Hormones (e.g., rBST)	Prohibited	Prohibited	Prohibited

Though welfare assurance programs and labeling schemes are becoming more numerous, it is important to point out that the standards these organizations adopt and enforce are similar but not uniform. As noted previously, scientists, producers, and the public maintain different animal welfare assessment priorities. While those involved in aspects of food production may evaluate biological functions such as growth, reproduction, and incidence of sickness to determine an animal's welfare (Type 1 requirements), many ethicists and some animal welfare scientists are more concerned with an animal's affective states, or its ability to feel emotions like pain, pleasure, and frustration (Type 2 requirements). Most consumers, on the other hand, do not trust practices and environments that undermine an animal's ability to engage in natural behaviors, such as limited or no pasture access for cattle, separation of calves and cows

shortly after birth, and veal crates that severely restrict calves' movement. These types of concerns fall within the "natural living" assessment category (Type 3 and 4 requirements) (Fraser, 2004; Fraser, 2008). Consumers may become confused by and potentially distrustful of labeling schemes that do not uniformly include the same assessment criteria (Fraser, 2003).

After deciding which assessment criteria they are going to include in their guidelines, Fraser (2003) recommends that programs communicate to consumers "not only [their] standards but the basis on which [their standards] have been developed." He goes on to explain that "unless the underlying philosophy is explained, the public may come to view such programs as cynical attempts to co-opt the concept of welfare assurance without real reform" (p. 6). Furthermore, producers must justify the necessity of practices that some animal advocacy groups and consumers consider inhumane. Humane Farm Animal Care's Humane Raised and Handled production standards, for instance, are based upon on the Five Freedoms, which address all four types of assessment criteria. Generally, guidelines that address Type 2, 3, and 4 requirements are most likely to gain consumer confidence because the public places the most value on measures that eliminate pain and suffering and allow animals to carry out natural behaviors. Indeed, the certification and labeling programs described above incorporate Type 3 and 4 requirements into their guidelines (Fraser, 2006).

Ethics and Animal Welfare Science: A Rights-Based Versus a Care-Based Ethic

Whereas scientists whose research involves the use of laboratory animals may struggle to reconcile their personal ethics with the physical and emotional effects of their research on the animal subjects, animal welfare scientists' research is directly driven by

ethical concerns. The field of animal welfare science is unique among other scientific areas of study because ethics, as Suzanne Millman (2009) writes, "provide[s] the underpinning for the scientific questions posed" (p. 90). To understand how ethics provides a framework for the work of animal welfare scientists, it is necessary to 1) trace arguments for the ethical treatment of domestic animals from a historical perspective, focusing especially on the development of rights-based versus care-based philosophies; 2) establish important distinctions between these two philosophies; and to 3) ground animal welfare science within a care-based ethic.

Historically, Western culture has largely excluded animals—both wild and domestic—from the human moral community. In "Are Human Rights *Human*?," Paola Cavalieri (2003) points out that prominent Western philosophers such as Immanuel Kant, Rene Descartes, and Thomas Aquinas considered animals simply as a "means to an end" (p. 30). In other words, an animal's value was measured by its utility to mankind. More contemporary philosophers like Jeremy Bentham adhere to what Cavalieri calls a "softened version" of the means/ends doctrine. This version, Cavalieri explains, acknowledges animals as part of the larger moral community but relegates them to a lower moral status. As such, this view still maintains a hierarchy in which humans possess greater moral currency, so to speak, than animals. So, Cavalieri asserts, even though Bentham suggests that we have a moral obligation to consider an animal's ability to suffer, he does not condone using animals for human ends (p. 31). Moreover, Cavalieri points out that such a hierarchy allows us to draw what Bentham calls an "insuperable line" between humans and animals, but the characteristic that supposedly demarcates such a division is simply one of genotype. This, Cavalieri reminds us, is closely linked to

the same ideologies that denied slaves and women equal moral status as human beings. If biological characteristics like race and sex cannot dictate the moral status of an individual, it follows that the biological characteristic of genotype cannot determine an individual's moral status either (Cavalieri, 2003, p. 31; see also Singer, 1975/2009, p. 6).

Further, if animals may be considered full members of the human moral community, they must be granted what have been traditionally considered *human* moral rights—generally, rights to "non-interference" or, more practically, protection from "institutionalized violence and discrimination" by the state (Cavalieri, 2003, p. 33). Within this logical framework, Cavalieri contends that animals should be protected from "*codified* killing, confinement, mutilation and torture," activities one may associate with laboratory animal experimentation and some intensive farming systems (p. 34).

The idea that basic human rights must be extended to the animal community is perhaps the most controversial idea to have arisen out the animal ethics debate. The idea has been taken up by contemporary philosophers like Tom Regan (1983), who proposes that animals, like humans, possess "inherent value" and, therefore, should be granted the same "basic moral rights" as humans (p. 280). However, in the specific area of farm animal welfare, ethicists and animal scientists have argued for an ethic of care rather than of rights.

Philosopher Bernard Rollin, who has written extensively about farm animal welfare, makes compelling comparisons between the concepts of human rights, human nature, and animal natures. Rollin (2004) explains that basic human rights serve to protect interests "fundamental to human life and human nature." He contends that the protection of such is, essentially, "a theory of human nature" and argues that animals also

possess natures, which they fulfill via biologically and physiologically driven behaviors (p. 11) (this nature, which Rollin calls "telos," is discussed in more detail later).

Though Rollin claims that humans have a moral imperative to respect the interests of animals by allowing them to experience an existence consistent with their biological and physiological natures, he does not propose the abolition of animal use in agriculture. In other words, Rollin emphasizes humans' moral responsibility to prevent the pain and suffering of farm animals and, in doing so, remains consistent with other care theorists who argue that humans have a moral responsibility to protect those in positions of vulnerability, such as production animals.

In his article "Animal Ethics and Animal Welfare Science: Bridging the Two Cultures," David Fraser (1999) draws distinctions between these two philosophies and aligns the animal welfare science community with the theories espoused by care-based philosophers. Fraser (1999) distinguishes between two "types" of animal ethicists. He contends that Type 1 ethicists, such as Peter Singer and Tom Regan, consider the animal as an *individual* and thus the focus of moral consideration. Fraser argues that while these ethicists adhere to a "single ethical principle," with Singer proposing the "equal consideration of the interests of all sentient beings" and Regan arguing for an animal's "individual rights," many scientists see such theories as "simplistic." For example, Fraser explains that scientists must often balance conflicting interests in their research. They may be simultaneously concerned with minimizing animal suffering, preserving local ecology (which requires considering animals at the species level, not more simply as the broad category of "animals"), and ensuring that communities can maintain sustainable economies while working to conserve endangered species (p. 174).

Type 2 ethicists, which include individuals such as Rollin, philosopher Mary Midgley, and feminists Josephine Donovan and Carol Adams, attempt to "build bridges" with scientists via establishing a "common vocabulary" (Fraser, 1999, pp. 173-176). Philosophical terms that type 2 ethicists use, such as "interests," "needs," and "telos," coincide with the primary animal welfare concepts of feeling well, functioning well, and leading a natural life. For example, needs constitute those things that enable an animal to maintain "survival, health, and comfort," while interests pertain to that which the animal pursues and tried to avoid based upon what makes it "feel well" (Fraser, 1999, p. 178). Rollin proposed that animals have a "telos," an intrinsic nature expressed through "evolutionarily determined and genetically imprinted" activities that the animal engages in to fulfill its conscious and non-conscious needs (Rollin, 1981, p. 39; see also Fraser, 1999, p. 176). Fraser frames telos in biological terms. He identifies two components of an animal's nature or telos: 1) a set of adaptations that an animal possesses via its evolutionary history and 2) the animal's genetic development from an embryo to an adult. Thus, Fraser contends that telos "simply means that animals should be allowed to live in a manner for which they are *adapted*, and to have the type of *ontogenic development* that is normal for the species" (Fraser, 1999, p. 177) (added emphasis). Though compelling, Rollin's telos model is not without criticism. Haynes (2010) points out that Rollin fails to address two important questions: 1) Were animals that evolved through breeding programs evolved through consideration of their interests? 2) Isn't it part of an animal's nature to want to live as long as possible (p. 84)?

These questions remain a complex point of debate, the discussion of which falls outside the purview of this project. Therefore, I will at least establish the premises that

the animal welfare science community accepts as leading to good welfare and, importantly, that can be affected by on-farm management practices. Generally, when animals are physiologically healthy (biological functioning), emotionally stable (affective states), and able to carry out behaviors that are evolutionarily and developmentally appropriate for the species (natural living), animal welfare scientists may conclude that an animal is experiencing good welfare. This attention to the optimization of welfare for animals, which depends upon human care-giving (via on-farm management, in this case) is rooted in a philosophy of care versus that of rights (Fraser, 1999). Care theory was first articulated by feminist Carol Gilligan in her book *In a Different Voice*, and though Gilligan applied the concept to gender, it may also be applied to human-animal relationships. In sum, Gilligan (1982) contends that men's view of morality is based on "fairness" and "ties moral development to the understanding of rights and rules," while women's "conception of morality as concerned with the activity of care centers moral development around the understanding of responsibility and relationships" (p. 19). Gender implications aside, one may draw a distinction here between Regan's rights-based theory and a care-based theory that, as Josephine Donovan and Carol Adams (1996) point out, more aptly applies to many human-animal relationships because it acknowledges the provider-dependent dynamic between "carers" (humans) and the "cared-for" (animals) (p. 15).

Fraser (1999) points out, however, that despite our role as care givers, it is natural for us to feel more responsible to some animal groups than to others. He draws upon philosopher Mary Midgley's claims that humans belong to many sub-communities within which we assign ourselves different "ethical requirements." For instance, we may feel

more responsibility to immediate family members than to close friends, but more responsibility to close friends than to our neighbors. Midgley extends this analogy to the various animal communities we interact with. For example, she notes that we may treat family pets differently than animals raised on farms simply because we interact with them in a different capacity and feel a different degree of responsibility to them (p. 179). Regardless, Clement (2011) points out that it is farm animals' dependency on humans for survival that ultimately defines a care-based relationship.

Overall, animal welfare scientists' maintain a common goal: to empirically assess an animal's ability to cope with its environment and then to recommend practices that minimize the suffering and maximize the welfare of these animals, whether their environs are human homes, shelters, laboratories, zoos, or farms. And, as Millman (2009) notes, ethical judgments inform the scientific questions posed. In other words, they question how specific physiological, psychological, and environmental conditions—together—impact animals' affective states. As such, their work is interdisciplinary in nature, which may mark a paradigm shift in traditional animal science studies and discourse. Specifically, animal welfare scientists rely on empirical data from a variety of disciplines, such as ethology, stress physiology, and neurobiology, to make *subjective* inferences regarding the affective states of the animals they study. This practice has proven controversial among some scientists who insist that affective states cannot be measured directly and are, therefore, outside the realm of scientific inquiry. On the other hand, animal welfare scientists argue that this approach is necessary to fully assess an animal's welfare state as well as address the public's primary concern over animal suffering, a

term that encompasses the affective states of physical and emotional distress (Croney & Millman, 2007; Millman, 2009; Sandoe & Simonsen, 1992).

Animal welfare scientists have addressed and defended the multidisciplinary (also referred to as interdisciplinary) nature of the field. Candace Croney, Associate Professor of Animal Sciences at Purdue University, and Suzanne Millman, a professor of animal welfare at Iowa State University (2007), point out that because animal welfare science is a relatively new discipline, animal welfare scientists—particularly in the US—have yet to produce a significant amount of multidisciplinary research using methodologies that allow others to replicate their results. Croney and Millman (2007) also suggests that because animal welfare assessment draws upon a variety of disciplines, researchers may develop interdisciplinary experiments without incorporating subject-specific experts who could validate research methodologies and interpretation of study results. Consequently, some studies appear poorly designed, are highly scrutinized, and may be criticized by the scientific community. Moreover, Lund, Coleman, Gunnarsson, Appleby, and Karkinen (2006) point out that some animal welfare research involves designing studies that combine discipline-specific theories and concepts. The authors contend that this type of research is "problem-oriented" and that "discipline-related outputs are less central to the project design." As a result, researchers who are strongly grounded in a specific discipline find this multidisciplinary research non-academic and even "threatening" (p. 40).

On the other hand, Millman (2009) maintains that multidisciplinary research is beneficial to the field. She argues that "multidisciplinary studies can strengthen interpretation of results, especially when data from a variety of parameters consistently

point in the same direction" (p. 91). She offers a compelling example of recent research on postsurgical pain in dairy calves following disbudding procedures. Researchers involved in the study included dairy health managers, epidemiologists, endocrinologists, and applied ethologists. Pain was measured according to three parameters: physiological (changes in serum cortisol, heart rates, and respiratory rates); mechanical (algometric measures of response to pressure around horn bud region); and behavioral (head shaking, head rubbing, tail flicking). The data from each parameter consistently indicated that calves treated with meloxicam (an analgesic) prior to surgery displayed less pain sensitivity post-surgery. Such studies testify to the value of multidisciplinary research in animal welfare science.

Chapter 2: Communicating Information about Farm Animal Welfare

In December 2011, the Farm Animal Welfare Committee (FAWC)—an expert committee of the Department for Environment, Food and Rural Affairs and the Devolved Administrations in Scotland and Wales—released a report called *Education, Communication and Knowledge Application in Relation to Farm Animal Welfare*. The report included recommendations on how information about farm animal welfare should be communicated to consumers, producers, and other stakeholders within the food supply chain. The authors contend that the "contribution that formal and informal education currently makes to education about farm animal welfare can best be described as patchy" (p. 8), and that there is a "growing gap between knowledge at research level and on-farm application" (p. 24). Moreover, the authors suggest that information related to animal welfare is not always easily distinguishable from information focused solely on animal health. In other words, there remains an "under-emphasis" on "distinctive knowledge, advice and practice" related to an animal's psychological health (p. 24).

Indeed, the incorporation of animal welfare modules, courses, and degrees at universities in the EU, Australia, and Canada are growing but not yet abundant. In the US, the number of universities that offer comparable animal welfare coursework is scant, although a number of US-based programs have gained prominence in the last several years. In addition, while consumers in both the EU and US have expressed interest in purchasing animal welfare-friendly products, they remain confused about animal welfare labeling schemes (Fraser, 2003) or lack information about current husbandry practices and the welfare condition of farmed animals to make informed purchasing decisions (European Commission, 2007). Finally, producers themselves do not feel motivated to

implement management practices that enhance positive welfare because, as is the case in the EU, legislation is not properly enforced (Broom, 2009) or, as is the case in both the EU and the US, the financial losses they incur by implementing alternative practices cannot be recovered in what is currently a niche market for animal welfare-friendly food products (Croney & Millman, 2007).

The FAWC report makes it clear that a more effective means of disseminating information about farm animal welfare to various stakeholders is necessary. Therefore, in the first part of this section I provide an overview of some prominent animal welfare programs in several US universities. These programs are vital for exposing students who hope to enter animal-related careers to the ethical and practical dimensions of human-animal interactions.

In the second part of this section, I review current literature that explores consumer and producer opinions about and knowledge of farm animal welfare. A majority of these studies were undertaken in the EU, but several on consumer attitudes toward farm animal welfare were conducted in the US. The results of these studies are necessary to determine what specific stakeholders—consumers and producers—already know about farm animal welfare, what they are interested in learning, and how they would prefer to receive this information.

Farm Animal Welfare in University Curricula

Universities across the US have begun developing animal welfare programs at both the undergraduate and graduate levels. Most of these programs consist of collaboration between faculty in both veterinary and animal sciences, such as the Animal Welfare Program at Iowa State, the International Animal Welfare Training Institute at

UC Davis, and the Center for the Study of Animal Well-Being at Washington State University. Purdue University's Center for the Human-Animal Bond is comprised of faculty from the veterinary, animal, and nursing sciences, as well as faculty from philosophy and education, among others. In the spring of 2013, the Center posted positions for an assistant professor in animal welfare and an assistant professor in human-animal interactions (based in the Department of Comparative Pathobiology). Two Midwestern universities, Ohio State University and Michigan State University, were among the first in the US to develop farm animal welfare coursework and related programs.

In 2009, Ohio State University officially became a partner with the Animal Welfare Science Centre in Melbourne, Australia. Through this partnership, Ohio State is now incorporating animal welfare modules into animal and veterinary science curricula. The Human and Animals Core Curriculum, offered through the Department of Animal Sciences, includes courses that focus on human-animal interactions and the roles of animals in a human society. They also offer students opportunities to study human-animal interactions abroad in destinations such as Ireland, New Zealand, and Chile. The title of Ohio State's 2009 Animal Welfare Symposium, "Building Partnerships to Address Animal Welfare," indicates the nature of Ohio State's and the Animal Welfare Science Centre's relationship – to continue collaborative studies that advance animal welfare research internationally.

Michigan State University's Animal Welfare and Behavior Group (AWBG), which has been active for over ten years, teaches undergraduate and graduate courses on animal behavior, ethical issues in agriculture, and animal welfare assessment. Michigan

State offered its first online animal welfare course, ANS 805: Animal Welfare Assessment, in the fall of 2005 (Siegford, n.d.). The AWBG's research mission is to "scientifically study the impact [that] management and environment have on animal behavior and animal welfare," and their goals are to "discover solutions to practical problems facing animal-related industries and assist industries with implementing these solutions in socially responsible and sustainable ways" (Animal Welfare & Behavior Group, 2010, July 9).

The AWBG hosts an Annual Intercollegiate Animal Welfare Judging and Assessment Contest. The contest is based on traditional livestock judging contests but allows students the opportunity to "evaluate how well a given situation suits an animal species' evolutionary biology and meets its biological needs...and to develop the skills to critically examine a situation by gathering unbiased information and using that information to make a subjective, but educated, assessment of welfare quality" (Animal Welfare & Behavior Group, 2010, July 7). The contest draws participants from around the country, as well as from Canada and the EU. Undergraduate, graduate, and veterinary students are invited to register. The contest is a unique example of how animal welfare is being incorporated into traditional animal science curricula.

These recent curricular initiatives indicate a trend to educate students about the ethical issues they will and do face as agricultural producers and consumers. Though it is encouraging that many US academic institutions are addressing the issue of farm animal welfare, it is also important to examine how this research is disseminated to other stakeholder groups, especially farmers.

A number of studies have examined how farmers prefer to obtain industry-related information. For example, Jordan and Fourdraine (1993) found that the largest US dairy producers relied primarily on veterinarians for information, while Gloy, Alkridge, and Whipker (2000) found that crop and livestock farmers preferred to consult industry-specific and general farm publications (see also Jensen, English, & Menard, 2009). Russell and Bewley (2011) surveyed 1,074 licensed milk producers in Kentucky to determine the producers' opinions about extension programming. One of the survey questions asked producers to "identify their preferred information delivery method." Russell and Bewley reported that a majority of survey recipients preferred to consult print media, including farm magazines (81.0%), agricultural newspapers (77.4%), printed newsletters from county agricultural agents (75.7%), and printed newsletters from university extension (65.0%). Recipients ranked electronic media as the least effective information delivery method, with only 11.9% of the recipients preferring university websites (11.9%), 2.7% relying on webinars, and 0.4% consulting podcasts and blogs. Though producers appear to prefer non-electronic information sources, the USDA's National Agricultural Statistics Service (NASS) (2011) reports that over half of all farms nationwide (62%), regardless of income, have access to a computer and the internet. They also report that DSL is the most common method of internet access. Mishra and Williams (2006) found "that age of the farm operator, educational level of farm operator and spouse, and farm size play a positive role in farm Internet use," and that farms receiving income from an "off-farm business" will also be more likely to use the internet (p. 22).

US Consumer Perceptions of Farm Animal Welfare

Research on citizen and farmer conceptions of farm animal welfare is more abundant in the EU, but studies on US consumer opinions about farm animal welfare have increased in recent years. Prickett, Norwood, and Lusk (2010) cite several U.S. studies that confirm the importance American consumers place on farm animal welfare. For example, Rauch and Sharp (2005) found that a majority of survey recipients in Ohio agree that farm animals' quality of life is important, that the well-being of farm animals is just as important as that of pets, that efforts should be made to minimize farm animal pain, and that most Americans would be willing to pay more for meat from animals that were treated humanely. In their own study, Prickett, Norwood, and Lusk (2010) surveyed over 1,000 Americans to determine citizen attitudes toward farm animal welfare. The study concluded that "a majority of individuals…consider animal well-being in their shopping decisions, consider animal well-being more important than low meat prices, and approve of government regulation to promote farm animal welfare" (p. 346). In accordance with previous studies, Prickett, Norwood, and Lusk's research revealed that a majority of citizens place a high priority on providing farm animals with access to the outdoors as well as opportunities to engage in natural behaviors.

EU Producer and Consumer Perceptions of Farm Animal Welfare

Overall, studies in the EU demonstrate that both consumers and farmers agree that "animals should not suffer"; however, both groups maintain somewhat incongruous perceptions of animal welfare (Verbeke, 2009). A number of studies have attempted to better understand these differences by exploring citizens' and farmers' attitudes toward

animal welfare as well as whether their behaviors (e.g., on-farm management practices, purchasing decisions) reflect these attitudes.

In one influential study, Te Velde, Aarts, and Van Woerkum (2002) interviewed Dutch consumers and farmers to determine the following: 1) Their perceptions of the treatment of animals in that country's intensive farming systems, and 2) Whether discrepancies exist between their perceptions of and behaviors regarding animal welfare. The authors based their study on the theoretical assumption that "people construct perceptions according to their frames of reference," which are influenced by the following: convictions (opinions about "the way things are"), values (opinions about the way things should be), norms (the translations of values into rules of conduct), knowledge (constructed from experiences, facts, stories, and impressions), and interests (economic, social, and moral) (p. 206). They found that farmers' perceptions are grounded in the assumption that good health is paramount to good welfare. These farmers believed that their animals experienced good welfare. However, farmers were not knowledgeable about other aspects of welfare, such as providing animals an opportunity to display natural behavior. They were also leery of alternative production systems, which they perceived as inefficient and even detrimental to an animal's well-being. For instance, farmers' criticisms of these systems are captured in the following statements: "little piglets, dying from the cold," "chickens eating each other," and "the spread of disease due to bad hygiene as a result of using straw." The authors recognize these statements as farmers' attempts to distance their own traditional practices with those of alternative farming systems (e.g., organic), whereby the farmers have aligned alternative systems with extreme examples of poor production practices (p. 209). The authors later

identify this strategy as a defense mechanism against criticism toward the livestock farming industry perpetuated by negative media stories and animal advocacy groups.

While farmers perceived the overall welfare of their livestock as good, consumers held a very negative perception of livestock welfare. This negative perception derives from two values heavily emphasized by consumers but not presented by farmers: freedom to move and freedom to fulfill natural desires. This difference in values defines the primary difference between how farmers and consumers conceive of animal welfare: farmers more often relate good welfare to an animal's physical health while consumers relate good welfare to both an animal's physical *and* mental health. In other words, consumers believe that to experience good welfare, "animals have to *feel* good" (Te Velde, Aarts & Van Woerkum, 2002, p. 211). On the other hand, most consumers held *convictions* similar to that of farmers (animals are meant to serve humans, meat is a necessary element of the human diet, keeping animals and killing them for meat is legitimate, and farmers are there to feed the rest of the population), and both consumers and farmers expressed the desire for a clean conscience. While consumers expressed this desire directly as a specific interest, farmers' need for the general population to view their work as legitimate, also referred to as a license to produce, is comparable to a clean conscience.

Finally, Te Velde, Aarts , and Van Woerkum (2002) contend that both farmers and consumers hold ambivalent feelings about animal welfare, feelings that arise from the tension between "a 'standard story' that justifies livestock farming and meat eating, and doubts about the moral validity of that story" (p. 212). More specifically, negative messages from the media and animal advocacy groups cause consumers to doubt the

legitimacy of livestock farming and farmers to doubt the welfare of their animals. To deal with ambivalent feelings, the authors argue that consumers, farmers, and perhaps the whole meat-sector and the government engage in "collective non-responsibility" and "functional ignorance." That is, they do not actively search for information about animal welfare and even seem to prefer to remain uninformed. For example, the authors explain that livestock farmers justify their farm practices based on what "the consumer" demands and, according to the authors' findings, consumers' interests include (in addition to a clean conscience) "healthy, tasteful, cheap meat that is readily available" (p. 210). Thus, farmers continue to engage in the practices that will yield healthy, cheap, and abundant products despite the possibility that these practices may not ensure that their livestock experience optimal welfare. Consumers, the authors surmise, choose to remain ignorant about the conditions in which the livestock they eat are raised because "[t]his information would seriously embarrass most of them," and because "people do not like to accept problems if they do not have clear ideas about possible solutions" (p. 217). Hence, though Dutch consumers claim to be dissatisfied with the condition of livestock in intensive farming systems, they continue to buy products sourced from these operations.

Overall, I drew two salient points from Te Velde, Aarts, and Van Woerkum's (2002) study: 1) Farmers and consumers maintain different perceptions of welfare, and 2) consumers' buying behavior does not necessarily reflect their attitudes toward animal welfare. These conclusions are corroborated by more recent studies. For example, Vanhonacker, Verbeke, Van Poucke, and Tuyttens (2008) conducted a cross-sectional survey among Flemish citizens and farmers to determine how each group valued the concept of animal welfare. Citing Te Velde, Aarts, and Van Woerkum's (2002)

theoretical assumption that people's perceptions are influenced by their convictions, values, norms, knowledge, and interests, Vanhonacker, Verbeke, Van Poucke, and Tuyttens focused on quantifying stakeholder's values only (i.e., opinions about the way things should be). The authors identified 72 animal welfare aspects that were assigned to one of the following "key dimensions" used to assess an animal's welfare state: housing and climate, transport and slaughter, feed and water, human-animal relationship, animal suffering and stress, animal health, and ability to engage in natural behavior. So, for example, the aspects "available space" and "outdoor access" fall under the dimension "housing and climate," and the aspects "disease" and "preventative medication" fall under the dimension "animal health."

Vanhonacker, Verbeke, Van Poucke, and Tuyttens (2008) found that the differences between citizens' and farmers' concept of animal welfare fit within five main categories of the 72 animal welfare aspects: 1) Space; 2) Pain and stress; 3) Ability to engage in natural behavior; 4) Feed and water, animal health, and human-animal relationship; and 5) Aspects that are of high importance to farmers (e.g., flooring type and barn temperature) but less so for citizens because they relate to production practices with which most citizens are unfamiliar. The authors found that citizens deemed aspects in categories one and two (aspects related to space and pain and stress) as negative, especially when they perceived that livestock production was increasing in intensity. Farmers deemed these categories important, too, but felt that solutions to these problems at the farm level could be economically burdensome. Citizens place great importance on category three—an animal's ability to engage in natural behavior—while farmers placed little importance on this issue. Both citizens and farmers placer relatively high

importance on aspects within category four (feed and water, animal health, and human-animal relationship). As noted above, farmers placed greater importance on aspects within category five than citizens. In terms of evaluative beliefs, citizens and farmers remain divergent. Citizens evaluate the current state of farm animal welfare quite negatively while farmers view it as more positive.

The authors contend that farmers hold more positive views because their definition of animal welfare relates primarily to an animal's physical health. In other words, so long as farmers can ensure that their animals are eating well and growing fast, then they assume the animals' are experiencing good welfare. The authors point out, however, that their study analyzed differences between citizens and farmers as two aggregate groups; perceptions of farm animal welfare could differ within each group if one gathered data specific to sub-groups such as vegetarians within the citizen group and organic farmers within the farmer group. Indeed, a number of studies in the EU explore organic farmers' attitudes toward farm animal welfare.

Bock and van Huik (2007) synthesized the results of six national studies that explored European pig farmers' attitudes and behavior towards animal welfare. Each of the national studies surveyed approximately 60 farmers who participate in one of four quality assurance schemes: 1) *Basic quality assurance schemes* focus primarily on issues such as food safety, product quality, and product traceability but also contain an animal welfare component that meets the animal welfare standards set by European or national legislation; 2) *Top quality schemes* are similar to basic quality assurance schemes but adhere to stricter animal welfare standards than those set by legislation; 3) *Specific animal welfare schemes* maintain animal welfare standards that significantly exceed those

established via legislation; and 4) *Organic schemes*, which include standards regarding environmental health, food safety, food quality, and animal welfare. Animal welfare standards in this scheme exceed those set by legislation. The authors found that they could categorize farmers into two major groups based upon how they define animal welfare: 1) Those that define animal welfare in terms of good health and that consider welfare important because it affects "zoo-technical performance" and, consequently, marketability, and 2) Those that define welfare in terms of an animal's ability to engage in natural behavior. The first group is comprised mostly of farmers who participate in basic quality or top quality assurance schemes while the second group is represented primarily by farmers in specific animal welfare and organic schemes.

Bock and van Huik's (2007) results suggest that producers who participate in organic or welfare-friendly schemes view stricter regulation of welfare-friendly practices more favorably because many of them already engage in these practices. On the other hand, those in basic or top quality assurance schemes question the effectiveness of stricter animal welfare regulations because, as Te Velde, Aarts, and Van Woerkum (2002) found, they do not believe that consumers will pay more for welfare-certified products. Adopting welfare-friendly practices would likely require these farmers to invest in resources to alter their current farming practices. If consumers are not willing to pay higher prices to offset those costs, farmers, in turn, cannot commit to alternate production practices. Moreover, these farmers are discouraged from adhering to stricter welfare standards because retailers often import cheaper meat from countries with less rigorous welfare regulations.

In another study, Vetouli, Lund, and Kaufmann (2012) assess farmers' attitudes toward and practice of animal welfare aspects in organic dairy calf rearing. They explored how these organic farmers implemented aspects of natural living in calf management, a "precondition for accomplishing welfare" as well as a "principal aim" of organic production (p. 349). Overall, the authors concluded that economic constraints and farmers' differing opinions about what practices promote naturalness and good welfare determined the extent to which they implemented practices that create natural living conditions for calves.

To determine organic dairy farmers' opinions about the concept of naturalness in farm management, Vetouli, Lund, and Kaufmann (2012) interviewed six farmers using semi-structured questionnaires that included both open- and close-ended questions as well as an opportunity for an open discussion about the topic of animal welfare in general. Like the other studies I reviewed, this study included questions that asked producers what animal welfare is, which factors affect it, and how calf welfare can be assessed. They also asked producers about the concept of naturalness and its relationship to animal welfare.

Vetouli, Lund, and Kaufmann (2012) found that all of the farmers "agreed" or "strongly agreed" that the concept of natural living is necessary to accomplish good welfare for calves. However, the extent to which each farmer implemented elements of natural living on their farm (either meeting or exceeding EU regulations) depended upon the importance that they placed on the specific welfare aspects described previously (i.e., biological functioning, affective states or feelings, and natural living). This finding is consistent with the other studies I reviewed: producers' conceptions of animal welfare are

influenced by how important they deem each individual welfare aspect. Thus, farmers who placed greater importance on the aspect of natural living—an area emphasized in organic principles—implemented management practices that exceeded EU regulatory requirements. For example, two of the farmers implemented long-term natural suckling systems, and one of these farms also provided free outdoor access for their calves. Both of these farms experienced similar or higher milk production than the other interviewed farms. Moreover, one of these farmers claimed that natural suckling reduced udder disease and that naturally suckled calves suffer from fewer health problems.

Additionally Vetouli, Lund, and Kaufmann (2012) found that economic constraints prevented farmers from implementing the practices they thought were necessary to promote natural living. Specifically, the authors note that "small or old facilities…do not allow [farmers] to provide natural living conditions as much as they believe they should" (p. 360).

Overall, then, both US and EU citizens regard a farm animal's ability to engage in natural behaviors in a non-confining environment as the most important indicator of welfare. Farmers surveyed in the EU, on the other hand, place more value on an animal's health and ability to produce; if an animal appears to be in proper health and is producing normally, then farmers regard the animal as experiencing good welfare. In accordance with the principles of organic farming, organic dairy producers place high importance on the welfare aspect of natural living. However, like the farmers interviewed in many other studies, the extent to which organic producers at least meet or exceed EU regulations greatly depends on whether they can afford the resources to implement necessary management practices.

Few focused assessments of US farmers' attitudes toward animal welfare exist in the literature; therefore, surveying this group will provide valuable data for animal welfare science researchers and university administrators who seek to incorporate animal welfare science into course curricula, as well as promote animal welfare science outreach programs through cooperative extensions.

Chapter 3: Wisconsin Dairy Producer Survey

In this section, I describe my own research project, which involved sending surveys to a random selection of 1,000 Wisconsin dairy producers to determine their opinions about and interest in cow welfare. This chapter includes my research questions, project methodology, details about the survey, and the survey results and analysis.

Research Questions

As described in Chapter 2, animal welfare programs and curricula are becoming more prevalent within many US universities. A number of Midwestern universities are developing quite extensive programs, including Michigan State, Iowa State, Ohio State, and Purdue Universities. Recent initiatives in the University of Wisconsin System (described in Chapter 1) suggest that farm animal welfare is also gaining momentum in Wisconsin.

Given these recent developments, it is necessary to consider the impact that farm animal welfare initiatives will have on Wisconsin dairy producers and their cattle. Specifically, it is necessary to assess producers' knowledge of current farm animal welfare issues, their attitudes toward animal welfare, and their interest in receiving information about animal welfare-friendly management practices. Few studies on US producer attitudes toward animal welfare exist in the literature. Likewise, there are few focused studies on Wisconsin producers' attitudes toward specific practices that impact animal welfare (Hoe & Ruegg, 2006; Fulwider, et al., 2008). I surveyed Wisconsin dairy producers to determine the following:

1. Producers' knowledge of and attitudes toward farm animal welfare, including their opinions about controversial management practices (e.g., tail docking and dehorning).
2. Producers' interest in acquiring information about current animal welfare research and initiatives, as well as the means through which they would prefer to receive this information.

Materials and Methods

Survey design. To assess Wisconsin producers' knowledge of and attitudes toward farm animal welfare, as well as their preferred information channels, I developed a two-part survey based on those by Heleski, Mertig, and Zanella (2004) and Vergot, Israel, and Mayo (2005). Heleski, Mertig, and Zanella's surveys assessed US animal science and veterinary college faculty's attitudes toward farm animal welfare. A majority of the information categories that their questions represented are appropriate for a survey of producers' attitudes as well. The categories I included in my own survey are outlined below under "Survey Part 1..." Vergot, Israel, and Mayo (2005) conducted their study to examine preferred sources and channels of information used by beef cattle producers in Florida. Most of the sources and channels of information they included in their survey can be generalized to Wisconsin dairy producers. These sources and channels are described below under "Survey Part 2..."

Survey Part 1: Assessment of producers' knowledge of and attitudes toward farm animal welfare. Heleski, Mertig, and Zanella's (2004) survey consisted of 52 quantitative (close-ended questions), most of which could be answered using Likert scale responses (strongly agree, agree, neutral/unsure, disagree, or strongly disagree). The authors

identified nine categories within which the 52 quantitative questions were placed; I incorporated several of these categories (revised) into my own survey to create the following categories:

1. Producer values as they pertain to the Five Freedoms, which are a series of statements developed by the Farm Animal Welfare Council (FAWC, 2009). The Five Freedoms serve as the basis for most farm animal welfare legislation (freedom from hunger and thirst; freedom from discomfort; freedom from pain, injury or disease; freedom from fear and distress; and freedom to express normal behavior).
2. The degree to which producers believe that animals are capable of experiencing specific affective states, including pain, fear, boredom, and frustration.
3. Agreement/disagreement with controversial husbandry practices (e.g., tail docking and dehorning).
4. Producers' perceived importance of specific animal welfare practices, some of which are formally recommended in codes of practices or even legislated in other countries (producers were asked to rank these items).
5. Demographics, including size and type of farm; respondent's role on farm; and producer age, gender, and education level.

Survey Part 2: Assessment of producers' preferred sources and channels of information. Vergot, Israel, and Mayo's (2005) study asked respondents to rate the sources of information they used on a scale from 0-4 (0 - never use, 1 - seldom use, 2 - sometimes use, 3 - usually use, 4 - always use). The authors identified 16 possible channels of information. I modified the original list to create 13 categories:

- Farm magazines
- Agricultural newspapers
- Extension newsletters
- Other farmers
- Extension agent
- Veterinarian
- Nutritionist
- University extension-sponsored conferences
- Television
- Radio
- University websites
- Commercial websites
- Other

My final survey consisted of 16 questions and a space for comments. Five questions sought producers' opinions about specific on-farm management practices (e.g., tail docking and dehorning) and animals' capacity to experience affective states such as pain, fear, and frustration; one question sought producers' opinions about the effectiveness of milk production as a welfare indicator; two questions asked producers to rank specific management practices that may impact cow welfare, as well as to indicate the importance they place on possible consequences of an unhealthy cow; three questions asked producers to identify their preferred sources of farm management information and their interest in learning more about animal welfare-friendly management practices; the final six questions sought producer demographics. In the comments area, recipients were

invited to share any comments or concerns about dairy cow welfare. (See the appendix for a copy of the survey.)

Expert Consultation

Prior to and while writing the survey, I sought counsel from Dr. Amy Stanton, Assistant Professor and Animal Well-Being Specialist in the UW-Madison Department of Dairy Science. Dr. Stanton has provided invaluable feedback and suggestions throughout the survey writing process. She also secured significant funding for the project.

I have also consulted with Dr. Christine Gabel, Clinical Assistant Professor (Environmental Public Health program) and DVM in the UW-Eau Claire College of Nursing and Health Sciences, and Dr. Tyson Kreiger, Assistant Professor of Psychology at Utica College. One of Dr. Gabel's areas of expertise is veterinary epidemiology. Like Dr. Stanton, she has provided feedback on my survey design as well as my method for deriving a survey sample. One of Dr. Kreiger's areas of expertise includes survey development, so he provided valuable feedback about the appropriateness of question format (e.g., Likert type, ranking, etc.) for the data I sought, as well as the clarity of the content.

Survey Implementation

According to an October 2012 report by the National Agricultural Statistics Service (NASS), there are approximately 11,000 dairy producers in Wisconsin. I selected a sample (n = 1,000) of this total population using computer-generated random numbers from a complete listing of Wisconsin licensed dairy producers maintained by the Wisconsin Department of Agriculture, Trade, and Consumer Protection (DATCP).

NASS (2011, August) also reports that 67% of Wisconsin farms have internet access and that DSL is the most common internet access method among farmers nationwide. However, Paul Zimmerman of the Wisconsin Farm Bureau notes that many Farm Bureau members live in rural areas of Wisconsin and still rely on dial-up for internet access (personal communication, 2013). To ensure that recipients did not struggle to download attachments over what may be slow internet connections, I mailed surveys via the US Postal Service. To ensure the highest possible return rate, I followed Dillman's (2000) strategy for survey implementation, which included contacting survey recipients on multiple occasions (e.g., prenotice letter, survey with cover letter, thank you postcard) and providing pre-stamped return envelopes with the survey. In their article "Surveying farmers: A case study," Joost, Pennings, Irwin, and Good (2002) noted that many farmers indicated January and February as the best months to receive a survey. Therefore, I began the mailing process in early February. I sent prenotice letters first, followed by the cover letters and surveys approximately one week later. I sent a thank you/reminder postcard approximately one week after mailing the surveys.

Statistical Analysis

I began the statistical analysis by coding all 476 survey responses by response type on the Likert scale and entered the data into an Excel database. I then determined the frequencies and percents of the response items for each question. For example, the first question asked respondents to indicate whether they strongly agreed, agreed, were undecided, disagreed, or strongly disagreed with the following statement: "Milk production is the best indicator of a cow's welfare." Table 2 below shows the total number of survey recipients who responded to the question ("total"); how many

recipients strongly agreed, agreed, were undecided, disagreed, and strongly disagreed with the statement (the "frequency" of each response item); and the frequency for each response item as a percent of the total population ("percent").

Table 2. Frequencies and percents for survey question #1, "Milk production is the best indicator of a cow's welfare."

Code	Response Item	Frequency	Percent
1	Strongly Agree	89	19%
2	Agree	250	52%
3	Undecided	36	8%
4	Disagree	94	20%
5	Strongly Disagree	7	1%
	Total	**476**	**100%**

Additional analyses using SAS statistical software revealed associations between survey responses and the following producer demographics: farm type (organic and/or pasture-based, freestall, tie stall, or a combination of freestall and tie stall), farm size (1–50 cows, 51–100 cows, 101–500 cows, and 500–1000+ cows), producer age (18–49, 50–64, and 65 and over), and producer education level (some high school, high school diploma, 2-year degree or short course, and bachelor's degree and/or postgraduate degree). Chi square (X^2) tests were run to determine the statistical significance ($P \leq 0.05$) of these associations.

Results and Discussion

Profile of responders. A total of 481 surveys (48%) were returned. Of the respondents who reported the type of farm they operated (n = 480), a majority (56%) identified as tie stall operations. This profile is consistent with the 2010 National Agricultural Statistics Service (NASS) Dairy Producer Survey, which reports that 60% of Wisconsin dairies house cattle in tie stall facilities. Of the producers who reported herd size (n = 477), a majority owned between 1–100 cows, with 29% identifying as 1–50

head and 38% as 51–100 head operations. Farms with 500 or more cows comprised 34% of the respondents. These results are also consistent with NASS census data. The 2007 NASS census reports the most common Wisconsin dairy herd size at 50–99 head (42%) (NASS, 2007).

Nearly all of the respondents self-identified as the farm owner (97%), and most were male (90%). The prevalent age range was between 50–64 years (52%). A majority of the respondents indicated high school as their highest level of education (56%).

Responder opinions about affective states. The affective states included in the survey—pain, fear, boredom, and frustration—represent those addressed in the Five Freedoms (freedom from pain, fear, and distress) (FAWC, 2009). The term "distress" encompasses boredom and frustration, which may occur when an animal is prevented from engaging in innate behaviors that it is motivated to perform, such as natural foraging and feeding behaviors (Fraser, 2008; von Keyserlingk, Rushen, de Passillé, & Weary, 2008; Meyer, Puppe, & Langbein, 2010). Cattle exhibit these emotional states through stereotypies, including tongue rolling, bar biting, and licking of equipment (Sambraus, 1985). A number of studies have demonstrated that restricting a cow's feed intake induces frustration and, consequently, stereotypies (Redbo, Emanuelson, Lundberg, & Oredsson, 1996; Sandem, Braastad, & Bøe, 2002). Additionally, easily digestible, highly concentrated feed does not adequately fill the rumen and increases oral stereotypies (Redbo & Norblad, 1997) Studies suggest that rumination is a behavioral need (Lindström & Redbo, 2000) and, possibly, an "anti-boredom" activity (Ewbank, 1978).

Nearly all respondents (n = 473) agreed that cows can experience pain (98%) and fear (96%). A lower percentage of respondents (n = 462) agreed that cows can experience boredom (54%) and frustration (53%). This lower percentage may be due to lack of observed stereotypies or because the majority of recipients' cattle simply do not experience frustration as a result of low quality feed and, consequently, the inability to properly ruminate.

Farm size and producer education level were associated with respondents' opinions about a cow's ability to experience pain (P = 0.05). A larger percentage of both 101–500 and 501–1000+ head operations strongly agreed that cows can experience pain (63%). Producer education level affected opinions about both pain (P = 0.01) and fear (P = 0.01). A larger percentage of college and post-graduate degree holders strongly agreed that cows can experience pain (74%) and fear (71%).

Responder opinions about on-farm management practices. Four of the survey questions sought producer's opinions about specific controversial management practices, including tail docking, disbudding and dehorning, pasture access, housing substrate, stocking density, and handling.

Tail docking. The practice of tail docking remains a common practice among North American producers. According to the 2007 National Animal Health Monitoring System survey, 39% of cows have docked tails (United States Department of Agriculture, 2007). However, recent studies demonstrate that this practice does not improve cow cleanliness and limits a cow's ability to swat flies (von Keyserlingk, Rushen, de Passillé, & Weary, 2009; Sutherland, & Tucker, 2011). Moreover, professional veterinary associations like the American Veterinary Medical Association (2012) advise against the practice, and

codes of practice outside of the US, such as the Canadian National Farm Animal Care Council (2009), prohibits the practice unless "medically necessary" (p. 34).

Half of all survey respondents (n = 475) disagreed (51%) that tail docking is necessary to maintain cow cleanliness. However, farm type, farm size, and producer education level were strongly associated with opinions about tail docking (P < 0.01 for all demographic variables).

Producers of freestall operations were most likely to strongly agree or agree (55%) that tail docking is necessary to maintain cow cleanliness. Larger farms were also more likely to agree that tail docking is necessary, with 53% of 101–500 head operations and 66% of 501–1000+ operations strongly agreeing or agreeing. Approximately 56% of those who completed a short course or hold a 2-year degree strongly agreed or agreed that tail docking is necessary (Table 3).

Table 3. Responder opinions about tail docking by farm type, farm size, and producer education level

	Percentage of responders					
Demographic variable	Strongly agree	Agree	Undecided	Disagree	Strongly disagree	*P*
Farm type*						
Combination	20.0	22.9	14.3	34.3	8.6	
Freestall	28.2	26.7	9.6	23.7	11.9	<0.01
Tie stall	11.2	18.7	12.0	39.0	19.1	
Other	5.4	13.5	13.5	46.0	21.6	
Farm size (head)						
1–50	5.9	12.5	12.5	47.1	22.1	
51–100	15.0	21.1	12.8	33.9	17.2	<0.01
101–500	26.2	27.0	9.5	24.6	12.7	
501–1000+	31.0	34.5	6.9	24.1	3.5	
Producer education level						
2-yr degree and Short Course	28.6	27.4	9.5	19.1	15.5	
College/post-graduate degree	4.2	19.7	5.6	52.1	18.3	<0.01
High school diploma	15.7	20.4	13.7	34.5	15.7	

Demographic variable	Percentage of responders					P
	Strongly agree	Agree	Undecided	Disagree	Strongly disagree	
Some high school	20.0	13.3	13.3	33.3	20.0	

[a]Combination = tie stall and free stall; Other = organic and/or pasture based

Disbudding and dehorning. Evidence suggests that calves experience "immediate pain and post-operative pain" following both disbudding and dehorning procedures (Weary & von Keyserlingk, 2012). Current recommendations include administration of a local anesthetic during the removal process, a post-operative analgesic to minimize pain after the anesthetic has worn off, and a sedative to reduce the overall stress to calves during the procedure (Millman, 2009; Rushen, Vasseur, Weary, & de Passillé, 2010; von Keyserlingk, Rushen, de Passille, & Weary, 2008).

A recent survey indicates that only 18% of US dairy farms report providing pain relief when dehorning dairy calves (Weary & von Keyserlingk, 2012). Consistent with this finding, only 19% of the survey respondents (n = 476) agreed that pain medication is necessary during disbudding and dehorning procedures, while 54% disagreed that pain medication is necessary. Farm type, farm size, producer education level, and producer age did not significantly affect opinions about the necessity of providing pain medication during dehorning and disbudding procedures (P = 0.40, 0.91, 0.24, and 0.82, respectively).

Pasture access. While the public considers grazing one of the most important aspects of cow welfare, animal welfare scientists have argued that properly managing the herd—whether on pasture or in confinement operations—is essential to determining welfare outcomes. Specifically, producers must successfully optimize cows' dry matter intake and maintain normal rumen pH values (Fisher, Hutjens, & Ballard, 2005). Indeed, during

preference tests cows sometimes choose indoor housing over pasture depending upon the weather and their food needs; high producing cows require a total mixed ration (TMR) feeding method to ensure their nutritional needs are met versus the more limited dry matter (DM) feed available on pasture (Charlton, Rutter, East, & Sinclair, 2011). On the other hand, studies outside of the US have found that cows in zero-grazing systems are more likely to suffer from such diseases as mastitis, metritis, some types of bacterial infections, dystocia, ketosis, and retained placenta. A number of studies both in the US and abroad have also found that lack of pasture access increases the incidence of lameness (von Keyserlingk, Rushen, de Passillé, & Weary, 2008) and that access to pasture can help lame cows recover (Hernandez-Mendo, von Keyserlingk, Veira, & Weary, 2007).

A majority (61%) of respondents (n = 139) indicated that pasture access is important or very important. Among the most common reasons cited for pasture access included necessity to get cows off concrete for hoof and leg health, provision of a better walking surface, and opportunity to forage.

Housing substrate, stocking density, and handling. Respondents were asked to rank, in order of importance, specific management practices that may impact cow welfare. These practices included providing cows with a soft, clean surface; adjusting stocking density to ensure cows have adequate resting space; providing each cow with a minimum of 24 inches of linear feed bunk space (based on the National Farm Animal Care Council's code of practice for dairy cattle); and ensuring that staff handle cows in a manner that minimizes the animals' fear of humans. About half (56%) of the producers who responded to this question (n = 149) ranked the practice of providing cows with a

soft, clean substrate as the most important practice among those listed. While it is common knowledge that soft substrates increase a cow's physical comfort when lying down, studies have also shown that cows who are not provided comfortable bedding (e.g., concrete flooring) experience an increased incidence of hoof lesions, swelling of the front knees (due to an increase of physical impact on the knees when attempting to come into a standing position on concrete) and lameness. Clean bedding reduces the presence of bacteria that can cause udder diseases such as mastitis (von Keyserlingk, Rushen, de Passillé, & Weary, 2008).

Respondents ranked proper handling as the second most important practice (41%). This high regard for proper handling is corroborated by a considerable amount of research in the area of ethical stockmanship. For example, research has demonstrated that stockpersons' attitudes and behavior towards cows affects the animals' behavior, particularly their fear of humans (Breuer, Hemsworth, Barnett, Matthews, & Coleman, 2000; Hemsworth, Coleman, Barnett, & Borg, 2000; Waiblinger, Menke, & Coleman, 2002). In general, cattle are sensitive to tactile, visual, and auditory contact with humans. Neutral and/or positive interactions between humans and cattle (pats, slow movements, and soft speaking, etc.) decreases cattle's fear response to humans.

Respondents ranked items related to stocking density and linear feed bunk space as least important, with 41% ranking stocking density as third most important and the same percentage of respondents ranking feed bunk space as least important.

Responder opinions about the interplay of production, health, and welfare

Milk production as a welfare indicator. An increasing number of studies demonstrate that while milk production may be one indicator of biological health, high

production alone is not indicative of good welfare. For instance, intentionally changing cows' diets, genetics (via breeding), and environment in ways to increase milk production could result in poor welfare if not managed properly. Additionally, while preliminary results from recent studies of Wisconsin dairies suggest that high producing herds still maintain a low prevalence of lameness (13%) (Cook, 2012), other studies demonstrate that high milk production places extra demands on the cow that can lead to compromised immune function and increased fertility problems (EFSA, 2009c; von Keyserlingk, Rushen, de Passille, & Weary, 2008; O' Driscoll, 2012).

Survey respondents were asked whether they considered milk production the *best* indicator of a cow's welfare. Well over half (72%) of the total number of respondents (n = 476) agreed that milk production is the best indicator of cow welfare. Farm type and producer age significantly influenced respondents' opinions (P = 0.05 and 0.02, respectively). Producers of freestall operations were more likely to strongly agree or agree (77%) that milk production is the best indicator of a cow's welfare. Those with tie stall operations were the next most likely to strongly agree or agree (70%). Eighty-seven percent of respondents ages 65 and over strongly agreed or agreed that milk production is the best indicator of a cow's welfare (Table 4).

Table 4. Responder opinions about milk production as a welfare indicator by farm type and producer age

	Percentage of responders				
Demographic variable	Strongly agree	Agree	Undecided	Disagree/Strongly disagree	*P*
Farm type*					
Combination	11.1	52.8	5.6	30.6	
Freestall	25.7	51.5	6.6	16.2	0.05
Tie stall	16.8	53.4	9.3	20.5	
Other	14.3	48.6	0.0	37.1	

Demographic variable	Percentage of responders Strongly agree	Agree	Undecided	Disagree/Strongly disagrèe	*P*
Producer age					
18–49	16.2	52.1	6.0	25.8	
50–64	19.8	49.4	9.1	21.8	0.02
65 and over	21.0	66.1	4.8	8.1	

* Combination = tie stall and free stall; Other = organic and/or pasture based

Health and welfare. Respondents were asked to rank, in order of importance, the possible consequences of an unhealthy cow. Consequences included less milk production, lower quality milk, the potential for the cow to experience pain, and the costliness of caring for an unhealthy cow.

Respondents (n = 140) ranked decreased milk production as the most important consequence of an unhealthy cow (44%). Thirty-eight percent of the respondents ranked the costliness of an unhealthy cow as least important. An even number of respondents (31%) ranked decreased milk quality as the second and third most important consequence, while 30% of respondents ranked the potential for a cow to experience pain as third most important.

Responders' familiarity with farm animal welfare initiatives. Respondents were asked to indicate their familiarity with recent farm animal welfare initiatives in Wisconsin as well as nation-wide animal welfare-friendly labeling schemes. The Wisconsin-based initiatives included the Midwest Beef and Dairy Husbandry Conference, which focuses on the care and well-being of beef and dairy cattle; and the Dairyland Initiative, a guide to welfare-friendly dairy cattle housing design developed by the University of Wisconsin–Madison. The National Dairy FARM Program was designed to promote consistent and uniform management practices that ensure animal well-being

and that can be used to conduct voluntary, third-party animal welfare assessments. As described in Chapter 1, animal welfare labeling schemes, primarily developed by food retailers and industry-independent organizations (e.g., non-profit animal welfare groups), allow producers to display welfare assurance labels on their products if they meet certain animal welfare criteria. Examples of these labeling programs include American Humane Certified (formerly Free Farmed), Humane Farm Animal Care's (HFAC) Certified Humane Raised and Handled, and Animal Welfare Institute's Animal Welfare Approved (AWA).

Farm type and farm size impacted respondents' familiarity with some of these initiatives. Overall, respondents (n = 481) were most familiar with the Midwest Beef and Dairy Husbandry Conference (31%) and the Dairyland Initiative (32%); however, respondents who owned a combination tie stall and freestall operation (n = 140) were most familiar with the FARM Program (53%). Producers who owned a combined operation were also, on average, more familiar with the other initiatives than producers who operated other farm types (e.g., tie stall, freestall, organic and/or pasture based) (Table 5).

Table 5. Responder familiarity with farm animal welfare initiatives by farm type

	Percentage of responders				
Farm animal welfare initiative	Combination	Freestall	Tie stall	Other	*P*
Midwest Beef & Dairy Husbandry Conference	47.2	33.3	29.8	18.6	0.03
The Dairyland Initiative	47.2	39.4	29.0	22.0	0.01
The National Dairy FARM Program	52.8	34.1	25.8	18.6	<0.01
Animal welfare-friendly labeling schemes	41.7	31.8	24.2	23.7	0.08

Producers who owned over 500 cows (n = 30) were more familiar with the Midwest Beef and Dairy Conference (60%) and the Dairyland Initiative (47%) than

producers who operated farms in the size ranges of 1–50, 51–100, and 101–500 head. While farm type influenced familiarity with the FARM Program (P < 0.01), farm size did not (P = 0.16) (Table 6).

Table 6. Responder familiarity with farm animal welfare initiatives by farm size

	Percentage of responders				
Farm animal welfare initiative	1–50	51–100	101–500	501–1000+	*P*
Midwest Beef & Dairy Husbandry Conference	24.8	32.4	28.1	60.0	<0.01
The Dairyland Initiative	24.1	34.1	35.9	46.7	0.04
The National Dairy FARM Program	23.4	29.1	33.6	40.0	0.16
Animal welfare-friendly labeling schemes	21.2	29.7	28.9	36.7	0.21

Participation in any of the initiatives was low, ranging between as little as 4% to no more than 17%. The National Dairy FARM Program claimed the most participants overall, with 17% of respondents (n = 481) participating. Approximately 28% of all respondents were familiar with animal welfare-friendly labeling schemes, but farm type and size did not impact respondents' familiarity with this initiative (P = 0.08 and 0.21, respectively) (Tables 4 and 5 above). About 7% of respondents claimed to have participated in a labeling scheme.

Responders' preferred information sources for on-farm management practices. Respondents were asked to indicated their preferred information sources from the following list: farm magazines, agricultural newspapers, university extension newsletters, other farmers, university extension agent, veterinarian, nutritionist, university extension-sponsored conferences, television, radio, university websites, commercial websites, other. Farm type, farm size, age of producer, and producer education level impacted preferred information sources.

Producers of combination freestall/tie stall (n = 36) and freestall operations (n = 132) indicated a stronger preference than other farm types for university extension newsletters (69% and 53%, respectively), university extension agents (41%), veterinarians (94% and 92%), nutritionists (94% and 93%), conferences (31% and 39%), and websites (19% and 13%) (Table 7).

Table 7. Responders' preferred information sources by farm type

	Percentage of responders				
Information source	Combination	Freestall	Tie stall	Other	*P*
Extension newsletters	69.4	53.4	38.5	47.5	<0.01
Extension agent	41.7	40.9	23.0	25.4	<0.01
Veterinarian	94.4	92.4	85.3	69.5	<0.01
Nutritionist	94.4	93.2	66.7	59.3	<0.01
University extension-sponsored conferences	30.6	38.6	18.3	18.6	<0.01
University websites	19.4	12.9	6.0	3.4	0.01
Commercial websites	19.4	12.9	6.0	5.1	0.01

Producers on larger farms with over 500 cows (n = 29) indicated a stronger preference for Extension agents (60%), conferences (67%), and websites (20%) than producers of smaller operations. Farmers with over 500 cows and farmers with over 100 cows (n = 128) both indicated a stronger preference for nutritionists (90% and 88%, respectively) and Extension newsletters (57% and 56%) than those operating smaller farms (fewer than 100 cows) (Table 8).

Table 8. Responders' preferred information sources by farm size

	Percentage of responders				
Information source	1–50	51–100	101–500	501–1000+	*P*
Extension newsletters	34.3	45.9	55.5	56.7	<0.01
Extension agent	21.2	25.3	37.5	60.0	<0.01
Nutritionist	59.9	75.8	87.5	90.0	<0.01
University extension-sponsored conferences	12.4	20.9	33.6	66.7	<0.01
University websites	4.4	7.1	11.7	20.0	0.02

Producers between the ages of 18–49 (n = 167) and 50–64 (n = 243) relied more on other farmers (82% and 78%, respectively) than did producers aged 65 and over (n = 62, 53%). This older generation was, however, almost twice as likely (32%) to use the radio for information, while the youngest generation (18–49) indicated a stronger preference for websites (14%) as compared to the 50–64 age group (7%) and the 65 and over group (3%) (Table 9). That farm size and producer age impact preference for online resources is consistent with studies that have found these factors to "play a positive role in farm Internet use" (Mishra & Williams, 2006).

Table 9. Responders' preferred information sources by producer age

	Percentage of responders			
Information source	18–49	50–65	65 and over	*P*
Other farmers	81.7	78.1	53.2	<0.01
Radio	17.2	15.0	32.3	0.01
Commercial websites	13.6	6.9	3.2	0.02

Producers who completed high school (n = 257) and who hold bachelor's and/or postgraduate degrees (n = 73) were more likely to rely on veterinarians as their primary source of information (90% and 89%, respectively). High school graduates were also the most likely demographic to rely on the radio for information (22%). Those who completed a 2-year degree or university short course (n = 85) were most likely to attend university extension-sponsored conferences (39%) while producers holding bachelor's and/or postgraduate degrees were most likely to rely on university and commercial websites (19% and 16%, respectively) (Table 10).

Table 10. Responders' preferred information sources by producer education level

Information source	Percentage of responders				P
	Bachelor's and/or postgraduate degree	2-yr degree/ short course	High school diploma	Some high school	
Veterinarian	89.0	80.0	90.3	71.7	0.02
University extension-sponsored conferences	31.5	38.8	21.8	10.9	<0.01
Radio	11.0	18.8	22.2	8.7	0.05
University websites	19.2	9.4	7.4	0.0	<0.01
Commercial websites	16.4	4.7	9.3	4.4	0.05

Independent of farm type, farm size, producer age, and producer education level, veterinarians were the most frequently cited information source (86%), followed by farm magazines (79%), other farmers (76%), and agricultural newspapers and nutritionists, which respondents preferred equally (75%). Though a preferred information source on larger farms, for younger producers, and for producers holding bachelor's and/or postgraduate degrees, websites were the least popular information source overall (9%). These results are consistent with previous studies on producers' preferred industry-related information sources. For example, Jordan and Fourdraine (1993) found that the largest US dairy producers relied primarily on veterinarians for information, and Russell and Bewley (2011) reported that a majority of Kentucky milk producers prefer print media, including farm magazines and agricultural newspapers.

The last survey item asked respondents to share comments and/or concerns about the survey or about dairy cow welfare. Responses (n=99) were analyzed and organized into categories based on common themes. The following primary themes emerged:

- Cow comfort is important.
- It is the producer's moral responsibility to treat cows humanely and with patience and respect.

- If the farmer takes care of the cow, she will take care of the farmer.
- Sometimes forceful or negative physical contact is necessary to establish dominance and gain a cow's respect.
- Cows should not be confined to barns and concrete because it causes foot, leg, and calving problems.
- The quality of care that producers provide their cattle is dependent on the producer's financial situation (i.e., producers do what they can with the resources that are available and affordable).
- Good welfare requires quality inputs (feed, bedding, ventilation, etc.).
- Bigger farms treat their cattle with less care.
- Bigger farms do a better job of caring for the animals, as do farms with newer facilities.
- Education about production practices needs to occur outside the industry more than within. (These types of statements were often paired with sentiments of resentment toward third parties, such as government agencies, dictating acceptable management practices.)
- Fear that survey responses may be used against producer.

The following categories represented the most frequent responses:

- If the farmer takes care of the cow, she will take care of the farmer. (n=25)
- The quality of care that producers provide their cattle is dependent on the producer's financial situation (i.e., producers do what they can with the resources that are available and affordable). (n=17)

- It is the producer's moral responsibility to treat cows humanely and with patience and respect. (n=12)

These categories represent what Driessen (2012) refers to as the "mixed motives" of producers. In other words, producers are not guided solely by matters of production efficiency and profit. So in the present survey, the economic benefits of quality animal care emerged as the most popular theme, but producers also acknowledged a moral responsibility to treat their cows humanely, a not likely driven by a profit motive. That said, modern farming practices are firmly rooted in an industrialized culture. Moreover, agricultural markets have gained a reputation for being "highly regulated, organized, monopolized, and subsidized" (Driessen, 2012, p. 173). As such, it is not surprising that studies demonstrate the publics' increasing interest in the protection of farmed animals (Rauch & Sharp, 2005; European Commission, 2007) as well as their negative perception of the livestock industry (Te Velde, Aarts, & Van Woerkum, 2002; Vanhonacker, Verbeke, Van Poucke, & Tuyttens, 2007). And while the dairy industry has not been targeted as particularly problematic, controversial issues such as dehorning and tail docking have been challenged on both ethical and scientific grounds (Croney & Anthony, 2010).

Conclusions

Farm type, farm size, producer age, and producer education level impacted survey recipients' opinions about a cow's ability to feel pain and fear, the necessity of tail docking, and milk production as an indicator of welfare. These demographics also impacted the respondents' level of familiarity with state and national farm animal welfare

initiatives as well as their preferred information sources for on-farm management practices.

Tail docking and milk production as indicators of welfare are controversial issues in the dairy industry. Notably, free stall farms, larger farms (101–500 head and 501–1000+ head), and producers who completed a short course or who hold 2-year degrees were more likely to agree or strongly agree with the statement that tail docking is necessary to maintain cow cleanliness ($P<0.01$). Free stall farms were more likely to agree that milk production is the best indicator of a cow's welfare ($P = 0.05$), as were producers aged 65 and older ($P=0.02$).

Overall, farms that had a combination of freestall and tie stall housing were most familiar with farm animal welfare initiatives, including university extension-sponsored conferences ($P=0.03$), a university-sponsored welfare-friendly cattle housing guide ($P=0.01$), and the National Dairy FARM Program ($P<0.01$). Farm size also impacted respondents' familiarity with local animal welfare initiatives. Producers with over 500 cows were most familiar with the local Midwest Beef and Dairy Conference, which focuses on the care and well-being of dairy cattle ($P<0.01$).

Producers of combination tie stall and freestall operations, as well as those operating larger farms (> 500 cows), were most likely to consult university extension resources (agents and newsletters) and nutritionists ($P<0.01$). Though websites were the least popular information source overall, younger producers between the ages of 18 and 49, as well as producers holding bachelor's and/or postgraduate degrees, were more likely to consult the Internet.

The comments and concerns that survey recipients shared in the open response item of the survey suggest that a number of farmers feel a moral obligation to treat cows humanely; that quality care increases cow comfort and, consequently, producer income; but that the degree of quality of care is dependent on the resources available to the farmer. These comments provide valuable insight into producer motivations and ethics and should be considered when approaching producers about implementing animal-welfare friendly management practices on their farms. Specifically, it is important to highlight not only the economic benefits of optimizing cattle welfare but also the benefits of a more favorable public perception of the industry. When producers openly demonstrate a moral obligation to treat their cattle humanely, they gain consumers' trust.

Directions for Further Research

Further research could illuminate why specific demographics influenced survey responses. For example, in-person interviews with focus groups based on producer age, producer education level, farm type, and farm size could help answer the following questions:

- Why are producers of larger farms (> 500 cows) and freestall operations more likely to believe that tail docking is necessary to maintain cow cleanliness?
- Why are larger farms more familiar with local animal welfare conferences, and how can these conferences attract producers that run smaller operations?
- How can the University of Wisconsin Cooperative Extension be a more relevant resource for not only smaller farms (< 500 cows) but for Wisconsin dairy producers overall? And, how can veterinarians and nutritionists—primary sources

of information for producers—work with Extension to disseminate information about welfare friendly on-farm management practices?

- Over half (54%) of the survey respondents agreed that cows can experience boredom, but how do they identify boredom in their cattle? Do they observe stereotypies and how frequently?

In addition, an increasing amount of research shows that stockperson attitudes toward their cattle are good predictors of their behavior toward the animals. This research also shows that stockperson behavior is strongly associated with cow behavior (Hemsworth & Coleman, 2011). More specifically, a number of studies demonstrate that stockpersons with positive attitudes about cows engaged in fewer negative tactile interactions (e.g., slapping, hitting, pushing) with the animals. Consequently, the cows are less fearful of their handlers, as is demonstrated by shorter flight distances from the handlers (Breuer et al., 2000; Hemsworth et al., 2000; Hemsworth et al., 2002; Waiblinger et al., 2002). Producer attitudes and behavior toward livestock is a recent and important area of study that has led to the development of training programs—primarily in Australia and the EU—aimed at educating stockpeople about handling animals in a manner that improves animal welfare and productivity. However, Hemsworth and Coleman (2011) contend that uptake of such training programs is largely dependent on support from respective livestock industries as well as animal welfare legislation that requires stockperson training. He points out that welfare legislation in the US has not addressed stockperson training despite that "most welfare incidents…reported in the media are a result of inappropriate behavior by stockpeople" (p. 163). US-based research on human-livestock

interaction in the dairy industry is minimal, yet the data from such studies could prove useful to stakeholders interested in developing welfare standards.

Despite that legislation in the US has not addressed stockperson training, recent activities suggest that farm animal welfare is becoming an important area of research in this country. A number of US universities have developed farm animal welfare programs and curricula, and university extensions and industry groups are hosting conferences targeting animal welfare. For instance, the American Dairy Science Association's 27th Discover Conference will focus on strategies to improve dairy cattle welfare. In addition, an increasing number of US-based studies explore animal pain using a variety of parameters. Millman (2009), for instance, describes multidisciplinary research on postsurgical pain in dairy calves following disbudding. In this study, dairy health managers, epidemiologists, endocrinologists, and applied ethologists worked together to assess pain via physiological (changes in serum cortisol, heart rates, and respiratory rates), mechanical (algometric measures of response to pressure around horn bud region), and behavioral (head shaking, head rubbing, tail flicking) parameters.

Though such research is necessary to inform best management practices, producer uptake of such practices still lags in the US. As both Heleski, Mertig, and Zanella (2004) and the Farm Animal Welfare Committee (2011) point out, there remains a gap between animal welfare science research findings and the application of these findings at the farm level. However, even if producers were widely adopting recommended practices, consumers would need access to food labels that differentiate animal welfare friendly products from other products. Moreover, consumers must be willing to pay a higher price for these items to offset production costs. Some studies (Rauch & Sharp, 2005; Prickett,

Norwood, & Lusk, 2010) have found that consumers consider animal welfare an important factor in their shopping decisions and would pay more for products sourced from animals that were treated humanely. Whether consumers will actually follow through on such claims remains to be seen.

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Appendix: Wisconsin dairy producer survey

Please indicate the extent to which you agree or disagree with the following statements. Please choose only one answer for each item.

1. Milk production is the best indicator of a cow's welfare.

☐ Strongly Disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly Agree

2. Tail docking is necessary to maintain cow cleanliness.

☐ Strongly Disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly Agree

3. It is necessary to provide calves with pain medication during disbudding and dehorning procedures.

☐ Strongly Disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly Agree

4. How important do you think it is for cows to have access to pasture?

☐ Not Important ☐ Somewhat Important ☐ Neutral ☐ Important ☐ Very Important

5. Cows can experience the following:

Pain.........	☐ Strongly Disagree	☐ Disagree	☐ Neutral	☐ Agree	☐ Strongly Agree
Fear.........	☐ Strongly Disagree	☐ Disagree	☐ Neutral	☐ Agree	☐ Strongly Agree
Boredom...	☐ Strongly Disagree	☐ Disagree	☐ Neutral	☐ Agree	☐ Strongly Agree
Frustration...	☐ Strongly Disagree	☐ Disagree	☐ Neutral	☐ Agree	☐ Strongly Agree

6. Please rank the following welfare issues according to how important they are to you. Do not consider the costs associated with these items as you rank them. [1 = most important; 4 = least important].

	1st	2nd	3rd	4th
Provide cows with a soft, clean surface to stand and lie on.	☐	☐	☐	☐
Adjust stocking density to ensure that cows have at least 120 square feet of resting space (at least 160 square feet for pregnant cows).	☐	☐	☐	☐

	1st	2nd	3rd	4th
Provide each cow with at least 24 inches of feed bunk space (at least 30 inches for pregnant cows).	☐	☐	☐	☐
Ensure staff handle cows in a manner that will minimize cows' fear of humans (i.e., avoid hitting, shouting, kicking, pulling, etc.)	☐	☐	☐	☐

7. The statements below present possible consequences of an unhealthy cow. Please rank each statement according to how important it is to you [1 = most important; 4 = least important].

	1st	2nd	3rd	4th
Unhealthy cows produce less milk.	☐	☐	☐	☐
Unhealthy cows produce lower quality milk.	☐	☐	☐	☐
An unhealthy cow may be experiencing pain.	☐	☐	☐	☐
It is costly to care for an unhealthy cow.	☐	☐	☐	☐

8. Please indicate which of the following programs you are familiar with and/or have participated in (please check all that apply):

	I am familiar with this	I have participated in this
Midwest Beef & Dairy Husbandry Conference (hosted by the UW Cooperative Extension)	☐	☐
The Dairyland Initiative (welfare friendly dairy cattle housing)	☐	☐
Animal welfare friendly third-party labeling schemes (e.g., Animal Welfare Approved (AWA), Certified Humane, etc.)	☐	☐
The National Dairy FARM Program (nation-wide, verifiable program that addresses animal well-being and can be used to conduct voluntary, third-party animal welfare assessments)	☐	☐

9. What sources do you prefer to consult for information about on-farm management practices? (Please check all that apply.)

☐ Farm magazines
☐ Agricultural newspapers
☐ County extension newsletters
☐ Other farmers
☐ University extension-sponsored conferences
☐ Television
☐ Radio
☐ University websites

☐ Consultation with county agent

☐ Commercial Internet websites

☐ Veterinarian

☐ Other ______________________

☐ Nutritionist

10. Please indicate how interested you would be in learning more about current research regarding on-farm management practices that impact cow well-being.

☐ Not interested ☐ Somewhat interested ☐ Interested ☐ Very interested

Please respond to the following demographic questions.

11. What type of farm do you operate? (Please check all that apply.)

☐ Organic ☐ Pasture based ☐ Tie stall ☐ Free stall

13. What is the size of your herd?

☐ 1-50 head ☐ 51-100 head ☐ 101-500 head ☐ 501-1000 head ☐ 1000+ head

14. Which of the following best describes your role on the farm?

☐ Owner ☐ Manager ☐ Employee

15. What is your gender?

☐ Male ☐ Female

16. In which of the following age ranges do you belong?

☐ 18-29 ☐ 30-49 ☐ 50-64 ☐ 65 and over

17. What is the highest level of education you have completed?

☐ Some high school ☐ High school diploma ☐ Bachelor's degree

☐ Master's degree ☐ Ph.D. ☐ Doctor of Veterinary Medicine

☐ Short course

Please use the space below and/or the back page of the survey to share any comments or concerns you may have about this survey or about dairy cow welfare.