

Public concerns about dairy-cow welfare: how should the industry respond?

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Abstract. Common practices on dairy farms have fallen out of step with public values, such that the dairy industry has now become a target for public criticism. In the present paper, we describe some of the forces that have led to the current situation, and various potential methods to rectify the situation. One approach is to shield industry practices from public scrutiny, for example, by using ‘ag-gag’ legislation to stem the flow of videos exposing contentious practices. Another is to educate members of the public so that they better understand the nature of these practices and the reasons that they are used on farms. The literature we reviewed indicated that neither of these approaches is likely to be successful. Instead, we suggest that the dairy industry needs to develop methods of meaningful two-way engagement with concerned citizens, including research using social-science methods to document the values of different stakeholders and examine approaches to resolving conflicts. We also reviewed how biological research can help resolve issues, for example, by developing rearing systems that address public concerns around freedom of movement and social contact without putting animals at an increased risk of disease. We end with a discussion of how policy efforts by the dairy industry can be used to ensure compliance with commonly accepted standards, and more ambitiously, develop a common vision of dairying that positions the industry as a leader in animal welfare.

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Greater scrutiny and a black eye for the industry

The positive image of the dairy farm is under threat. People are becoming increasingly interested in how their food is produced (Cembalo *et al.* 2016), and in some cases, their introduction to the modern dairy farm comes in the form of videos documenting abuse and other contentious practices.

These types of images can have a profound impact. For example, in February 2014, an undercover video taken on a New Zealand owned dairy farm operating in Chile reported that over 6000 calves had been killed using blunt force trauma (Gulliver 2014). This video resulted in public outcry in New Zealand and a change in law protecting farm animals; the *New Zealand Animal Welfare Act* (New Zealand Ministry of Primary Industries 2016) states that ‘it is illegal to kill a calf by blunt force to the head, except in emergency circumstances’.

Another undercover video, also released in 2014, showed footage of disturbing animal handling on a dairy farm in British Columbia, Canada (Clark 2014). The largest Canadian milk processor, Saputo Inc., a company that had remained largely silent on the issue of farm animal welfare, revised its animal-welfare policy in response to the consequent public outcry:

Saputo has zero tolerance for any act of animal cruelty. This includes, but is not limited to, wilful

mistreatment and neglect of animals and acts that maliciously cause pain, injury or suffering. We expect all dairy cattle workers (employers and employees) to adopt and adhere to proper animal care and handling methods at all times (Saputo 2015, p. 1).

In addition to documenting disturbing practices, these videos also show other examples of workers interacting with animals, and allow the viewer to see how animals are housed and cared for. In this way, the video on calves can lead viewers to wonder why the calves are separated from the cow, how they are cared for, and why the male calves are of so little value that they are killed on farms. Similarly, the video on cows (focussed especially on downer and cull cows) raises questions about why many cows are sick and lame, and how these vulnerable animals are cared for.

Video exposés may be especially effective because they resonate with public concerns about the intensification of agriculture. Intensification can mean different things, including increased farm size, automation, confinement and corporate versus family ownership (Thompson 2008). Each of these factors can be a cause for concern. For example, people tend to think that larger farms are worse for animal welfare (even though there is little empirical evidence that animals fare worse on these farms; see review by Robbins *et al.* 2016a).

In countries such as the United States, few dairy cows have access to pasture; less than 5% of the lactating dairy herd in the USA is able to graze routinely, in direct contrast to what the public wants and expects for dairy cows (Cardoso *et al.* 2016). Early cow–calf separation provides another example of this divergence between public views and industry practice (Ventura *et al.* 2013). There is evidence that the public is often unaware of common practices on farms (Ventura *et al.* 2016a) and failure to address these gaps may affect public trust when the public does become aware (Robbins *et al.* 2016b).

Willingness to trust is often rooted in shared values (Robbins *et al.* 2016b), and when it comes to animal welfare, the values of farmers can differ from those of the general public. In contrast to the public, farmers tend to express less concern over animal welfare (Vanhonacker *et al.* 2008), and to rate different dimensions of animal welfare differently from the lay public (Te Velde *et al.* 2002; Lassen *et al.* 2006; Vanhonacker *et al.* 2008; Bergstra *et al.* 2015). The public's perspective of good welfare includes that animals live a reasonably natural life (Lassen *et al.* 2006; Prickett *et al.* 2010; Verbeke *et al.* 2010; Cardoso *et al.* 2016; see review by Clark *et al.* 2016).

Different stakeholders vary in the amount of trust extended to them by the public. Farmers are often viewed as trustworthy (e.g. Coleman *et al.* 2015), perhaps because farmers are perceived as being especially knowledgeable about animal production (reviewed by Clark *et al.* 2016). However, judgments of trustworthiness are also affected by the extent to which individuals or organisations are perceived to be transparent about their practices (Peters *et al.* 1997; Fisman and Khanna 1999; Maeda and Miyahara 2003; Rawlins 2008). This may explain why animal-protection groups are considered more credible sources of information than are livestock industry groups (McKendree *et al.* 2014), and why this positive perception increases following animal-abuse scandals (Scudder and Bishop-Mills 2009; Tiplady *et al.* 2013). These results are consistent with other research, showing that whistle-blowers are viewed favourably by society (Callahan and Dworkin 2000), despite the short-term upheaval caused by exposés (Hersh 2002).

In the following sections of the paper, we review and evaluate various approaches to how the dairy industry might respond to criticism. For example, should dairy practices be concealed behind closed doors in the hope that concerns will fade, should the industry attempt to educate people about common practices in the hope that any concerns are rooted in ignorance, or should the industry attempt to engage with citizens to better understand and address their concerns? We also discuss how research can be used to create solutions that address certain welfare concerns. We end with a discussion on policy interventions that may be required to bring farms into compliance with widely held expectations for good care, and, more broadly, how the dairy industry might develop a vision that allows it to take leadership on animal-welfare issues.

How to respond to the critique?

Close the barn doors

A natural response to criticism is hiding in the shadows; if people cannot see the practices, then there will be nothing to criticise.

This approach may work in the short term; starved of material, including fresh video, the news cycle may pass onto other items. But this approach is less likely to work in the long term. Interest about where food comes from appears to be on the rise (Wheale and Hinton 2007), and this demand for information will likely be filled even if only by stories about secrecy in agriculture and any videos and images that continue to leak out.

An example of how this 'closed door' approach has been unsuccessful comes from laboratory animal use. Fear of criticism has largely driven the use of animals in biomedical research 'underground'. Underground figuratively in the sense that little information about research animal use is publically available, including which animals are used, where they are used and when they are used, but also underground literally, in that these laboratories are often in university basements, away from the prying eyes of the critics. This has not made the criticisms of laboratory animal use disappear, and may even encourage the use of misinformation leading people to evaluate conditions to be worse than they really are (Ormandy *et al.* 2013).

The appearance of secrecy can also accentuate concerns, as closed doors give the outside viewer the sense that there must be something to hide (Broad 2016). Thus, efforts to reduce the risk of reputational harm that results from bad stories getting out can have the perverse effect of eroding public trust in the individuals and institutions that are preventing access to the information.

An example of how efforts to reduce transparency can harm the reputation of agriculture comes from the so-called 'ag-gag' laws; legislative attempts to prevent the publication of undercover videos. One study experimentally assessed the views of participants that were told about these laws (Robbins *et al.* 2016b), and found that when people were made aware of ag-gag restrictions they were less likely to trust farmers and more likely to support the introduction of new animal-welfare laws (Fig. 1). Knowing about the ag-gag laws also resulted in respondents believing that the welfare of the animals on farms was poorer, and even that environmental conditions were poorer. These results indicated that laws intended to protect livestock industries from public scrutiny lower public trust and support for farmers and farming practices.

Of course, individual farmers may not support ag-gag laws or other industry and government attempts to reduce transparency. But our most recent results suggest that just working in more secretive settings can reduce trust in the individuals working there, such that these workers are viewed as less warm, and having less integrity. It seems that agriculture has much to lose from closing the barn doors.

Educate the public

If hiding does not solve the problem of public criticism, then perhaps telling others about industry practices will help. Many within the livestock industries believe that the public is ignorant of farming practices, a view consistent with the limited research available on this topic (Harper and Henson 2001; Boogaard *et al.* 2008; Coleman *et al.* 2015), so educating the public may be a way of increasing acceptance of animal agriculture (Croney *et al.* 2012; You *et al.* 2014; Pieper *et al.* 2016).

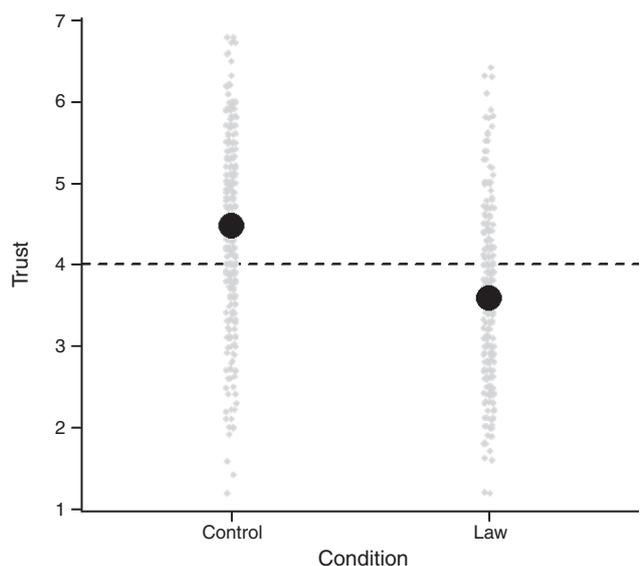


Fig. 1. Trust (measured on a Likert scale from a low of 1 to a high of 7) in farmers decreased after learning about laws that restrict the flow of information coming out of farm facilities (i.e. ag-gag), demonstrating that even the intention to restrict access to information can undermine trust (redrawn from Robbins *et al.* 2016b). Small grey dots show the responses of individual participants and the large grey dot shows the treatment mean.

Unfortunately, there are several reasons why efforts to educate the public are unlikely to successfully resolve concerns about practices on farms. One limitation is the ratio of mostly naïve public to industry insiders. In most developed economies, the proportion of the population involved with agriculture is small, such that few citizens feel that they are connected with animal production practices (e.g. Frewer *et al.* 2005). Can a small minority involved with agriculture really achieve much when trying to ‘educate’ the mass of others? Perhaps targeted campaigns directed at one or two issues that resonate with scientific evidence and widely held community values may stand a chance, but relying on public education as a way to resolve most concerns is unlikely to be successful.

Second, the public seems to be adopting an increasingly jaded view when it comes to the advertising efforts of specific industries, so the intended beneficiaries of educational efforts may be resistant to industry talking points. This resistance is likely to be increased as a result of the reputational damage already suffered by the livestock industries. Animal-advocacy organisations are seen as more trustworthy sources of information than are animal industries (McKendree *et al.* 2014), and this difference in credibility is magnified in the wake of animal-abuse exposés when attitudes towards the livestock sector are especially negative (Tiplady *et al.* 2013). This may explain why negative press has a much greater impact on consumer behaviour than has any positive effect from advertising (Verbeke and Ward 2001).

Research within our group has found that efforts to educate the public about livestock farming can increase criticism of farming practices. In one study, Ryan *et al.* (2015) asked Canadian and American respondents about their attitudes to various housing systems for pregnant sows, and found that

people became less willing to accept the use of gestation crates after they learnt more about the various options (including viewing photographs, videos and text information).

In another relevant study, Ventura *et al.* (2016a) examined the views of individuals with little previous exposure to dairy, before and after they toured a working dairy farm. Visiting this farm seemed to address certain concerns, including that cows did not have adequate access to food and water and that they were not handled appropriately. However, when the visitors learned more about the details of the production system, they identified new concerns, including the lack of pasture access and early separation of cow and calf.

This study also tested how knowledgeable participants were about production practices, and found that although participants varied in both knowledge and attitudes there was little association between the two. The lack of relationship makes sense when we consider the broader literature about attitudes and knowledge (Hansen *et al.* 2003); people’s views are highly related to their values, and these values are not easily shifted. Moreover, there is also some evidence suggesting that moral values appear to have a greater impact on negative attitudes towards farm-animal welfare than does factual knowledge (Boogaard *et al.* 2011), which may explain why criticisms regarding production practices fail to disappear following an educational intervention. As Ventura *et al.* (2016a) concluded (p. 15), ‘livestock industries cannot expect one-way education efforts (even immersive experiences such as a farm tour) to resolve societal concerns about animal welfare’.

Engage with the public

Two-way conversations with the public, including the consumers who purchase dairy products and the citizens that provide a social licence for the dairy industry to operate, may provide a more productive approach. Much of the earlier work on social attitudes to agriculture focussed on the consumer, including studies of what people actually buy at the grocery store. In other work, the focus has shifted to the citizen, often assessing attitudes via interviews and surveys. The two types of data are sometimes at odds, as choices at the grocery store may be affected by several factors, including price (Harvey and Hubbard 2013) and labelling (Hoogland *et al.* 2007).

Those interested in maintaining the status quo have taken some comfort from this disconnect, believing that little will change without direct consumer pressure, but others argue that the consumer’s role is overstated. Most people buy their food from retailers, who hire a few buyers to source products that fit with their corporate values and the needs of their customers. As argued by Aerts (2013) ‘it is easier [for citizen advocacy groups] to convince five (or fifteen) buying directors than five (or twenty five) million consumers’, driving a shift to welfare friendly practices that happens long before the food arrives at the store. Thus, engagement efforts must extend beyond consumers of dairy products, to include citizens that are interested in the issues and who influence corporate and government responses.

Citizen engagement can take many forms, but one of our favourites is the ‘open house’, in part because this is something that almost any dairy farmer can do. Inviting citizens onto farms

allows farmers to explain their practices and to hear the concerns of their visitors. When done right, this type of engagement can feed into a cycle of continuous improvement, starting with a conversation, leading to reflection on the practice, developing and implementing a solution, and then going back for more engagement to ensure that the modified practice resolves the initial concern without creating new issues.

As an example, consider the feedback we get during the public events we host at The University of British Columbia's Dairy Education and Research Centre (where cows are housed in a conventional free-stall barn). During these events, visitors often ask why the cows are not on pasture. This comment reflects what we know to be a widely held concern about the importance of pasture access for cows (Schuppli *et al.* 2014). As part of our on-going research on the topic, we have experimented with different types of pasture access (such as free choice between the barn and pasture) during the pasture season (Legrand *et al.* 2009), ways of managing pasture that also result in high levels of milk production (Chapinal *et al.* 2010), and other types of outdoor (non-pasture) access when the pasture is too wet to use. Although some of these approaches may differ from what the public imagines as ideal (i.e. that cows are on pasture all the time; Cardoso *et al.* 2016), we have found that people are often receptive to these hybrid solutions when the constraints and context is provided (e.g. that cows often prefer to come inside during the day and escape the hot sun, and that allowing cows to use pasture when the soil is too wet can damage the pasture).

Thus, the good news is that the urban public seems open to hearing about the perspective of the farmer, and thus being able to consider solutions that take this perspective into account. The bad news is that people working within production agriculture seem to be less able to consider the citizen's perspective as legitimate (Benard and de Cock Buning 2013). Poor ability to see the citizen's perspective may be a serious problem for engagement, as simply listening to the concerns will be of little help if these are not taken seriously.

Engage in social science research

Engaging in the substantive conversations will allow individuals within the dairy industry to better understand public concerns, and to develop practices on their farms that begin to address these concerns. Further progress will also require collecting data in a more rigorous fashion. This means investing in social science research that identifies key areas of public concern and perceived barriers to change on the part of the industry. Only a tiny fraction of dairy research focuses on these questions, but a considerable proportion of our own work now includes at least some social science component. We have summarised highlights from our work in a recent review paper (Weary *et al.* 2016), so here we briefly summarise just a few of the key methods, findings and conclusions from this work.

One obvious approach to research on human attitudes is to conduct some type of survey, and indeed much research examining attitudes around animal welfare is based on quantitative surveys (for example, asking whether respondents eat meat; Prickett *et al.* 2010). Unfortunately, this type of quantitative approach is limited when trying to address more complex

issues. Animal welfare is a multi-dimensional and value-laden concept, and even experts disagree about which attributes to consider and how these should be weighted in welfare assessments (Fraser *et al.* 1997). For this reason, we believe that qualitative approaches are more likely to be useful for identifying and understanding different types of welfare concerns.

Qualitative studies typically use interviews or focus groups to allow participants to talk through issues, allowing researchers to better understand their meaning. One useful approach is to begin with qualitative studies to better understand the context, and then proceed to quantitative work to document the prevalence of different views within a population. Another approach is to employ a mixed methodology, asking participants to both state their views and to provide some explanation. For example, in some of our work we have allowed participants to interact online, such that they could read, vote and comment on the reasoning of other participants.

One interesting finding from several studies is that public views often align with those of dairy producers even when discussing contentious practices within the dairy industry. For example, even though tail docking is still common on dairy farms in the USA, both producers and the public tend to agree that the practice is not acceptable (Weary *et al.* 2011). Similarly, although many calves are still disbudded without any form of pain relief, producers and the public widely agree that pain relief should be provided (Robbins *et al.* 2015). Finally, even though only a small minority of dairy farms in the USA provide routine access to pasture, producers and the public seem to agree that pasture access is desirable (Schuppli *et al.* 2014).

In cases where the views of farmers and citizens are in close agreement, the question becomes why are producers continuing to employ the contentious practice? Here, the qualitative responses of producer and other industry participants have been especially informative, as they illustrate some of the perceived barriers to adopting less contentious alternatives. For example, our work has shown that some producers (likely those who continue to dock their cows' tails) believe that docking results in cleaner, healthier cows. These producers would benefit from targeted extension efforts that show why docking is ineffective (and sometimes counterproductive), and that provide examples of more effective strategies for improving cow cleanliness and udder health (Weary *et al.* 2011). Similarly, some producers stated that they believed that effective methods of pain mitigation for disbudding were either not available, or were prohibitively expensive (Robbins *et al.* 2015). Here too, targeted producer extension events could help overcome these barriers by showing the efficacy of pain mitigation provided by various agents, and documenting the costs involved. In the case of pasture access, some producers argued that pasture access was impractical, due to various constraints including land access and production requirements (Schuppli *et al.* 2014). We have argued that these perceived barriers can also be addressed, in this case, through targeted scientific projects designed to develop different approaches to providing outdoor access, including hybrid systems that allow cows free choice between the barn and pasture (Legrand *et al.* 2009).

For some other contentious issues, there are important disagreements between individuals working within the dairy

industry and the general public. A particularly interesting example concerns the early separation of the cow and calf. In this case, the majority of the public sees early separation as a threat to the welfare of both cow and calf, while most working within the industry believe that later separation creates greater problems (Ventura *et al.* 2013). In the following section, we describe how animal-welfare science can be used to address this and a few other examples. We also discuss some of the limitations of scientific approaches in addressing welfare issues.

Animal-welfare science: approaches and limits

Scientific research on the welfare of dairy cattle has a well established track record in providing evidence useful for addressing welfare issues (von Keyserlingk *et al.* 2009). For example, a series of studies have shown that tail-docking has little or no positive effect on cow cleanliness and udder health (reviewed by Sutherland and Tucker 2011), indicating that producers wanting cleaner cows and lower rates of mastitis will need to use other approaches. Similarly, a series of studies have examined the pain associated with various methods of disbudding and dehorning and have documented the efficacy of methods for controlling intra-operative and post-operative pain responses (reviewed by Stafford and Mellor 2011).

These examples are especially clear because these issues are, relative to some other welfare issues, simple and one-dimensional. For example, if the concern is that whether cows are dirty, then all that needs to be measured is cow cleanliness. In this case, authors may still disagree (for example, some using a clinical scale and others quantifying the surface area with faecal contamination), but these disagreements tend to be technical as all agree that cleanliness is relevant. Pain is an affective state (or 'feeling'), and, thus, more difficult to study scientifically, but here too, there is wide agreement that pain (however it is measured) is the relevant consideration (Robbins *et al.* 2015).

Finding scientific solutions to welfare concerns becomes more difficult when practices affect multiple dimensions of animal welfare (Fraser *et al.* 1997). Understanding the welfare consequences of early cow–calf separation provides a good example. As described by Ventura *et al.* (2013), early separation is a concern to some because they see this as unnatural, preventing the natural bonding and interactions between cow and calf. These individuals may also believe that early separation is harmful because it robs cows and calves of the opportunity to experience the positive affective states associated with these affiliative relationships. In contrast, those in favour of early separation argue that this benefits the calf by reducing the distress response to separation when it does occur, and by reducing the risk of disease transmission between cows and calves. These differences in values mean that different scientists may study completely different outcomes, and that there is no value-free way of balancing the various outcome measures.

Even within one sphere of concern there may be biases. For example, research on the affective component has focussed almost entirely on the acute distress response at separation, with little research addressing positive emotions associated

with maternal–filial interactions (Flower and Weary 2003). Although recognising these biases is important, this does not mean that scientific research on such topics is futile. Indeed, we would suggest that properly recognising biases can inspire new research, for example, examining the positive emotional responses of cows and calves kept together.

The multiple dimensions of animal welfare should not be seen as problematic if we think of these as forming the basis for a check list of issues that need to be addressed, rather than a zero-sum trade-off that requires value-laden assessments and compromise. We are especially interested in the development of systems that work well from the perspective of biological functioning, naturalness and affective state. This includes methods to keep cows and calves together that maintain health and minimise the distress response to separation when it does occur (Johnsen *et al.* 2015), as well as the development of other types of social housing for young calves that can provide some of the same benefits as does cow–calf rearing (Meagher *et al.* 2015).

From this perspective of developing systems that resolve multiple types of concern, we have argued elsewhere (Weary *et al.* 2016) that scientists should be sceptical of welfare 'solutions' that attempt to resolve one type of welfare concern (e.g. disease transmission) at the expense of another (e.g. freedom of movement, a key issue of key public concern; Boogaard *et al.* 2011; Popescu *et al.* 2013). Examples abound, but a relevant case for dairy is the calf hutch. Producers and citizens agree that animal health is of fundamental importance, but 'solutions' to health problems that require restrictions of movement (and, in this case, restricted social contact) create new types of concern. In the worst case, the proposed 'solution' introduces new concerns (i.e. restricted movement and social contact), without actually achieving the desired health outcome. The use of individual hutches and pens is standard on dairy farms in the USA, but calf mortality remains high. A recent survey reported that dairy heifer mortality, from 48 h to weaning, is at ~7%, with this number increasing to ~15% if the first 2 days of life are included (USDA/NAHMS 2016), and there is little evidence of increase in disease risk (and many benefits) of keeping calves in pairs or small social groups (Costa *et al.* 2016).

A more controversial example is the early separation of cow and calf. This is often argued to provide health improvements (e.g. reduce the risk of Johne's disease being transmitted to the calf; Windsor and Whittington 2010). Unfortunately, early separation increases the risk of other ailments, including metritis and mastitis in early lactation (Krohn *et al.* 1990), and there is little evidence that early separation provides any general benefit to the health of either cow or calf (Flower and Weary 2003). Research on other species has shown that early separation from the young causes neurochemical alterations that have been related to depression in the dam (von Poser Toigo *et al.* 2012), potentially placing the dam at a greater risk for other diseases.

Recognising that systems need to work well from the perspective of biological functioning, naturalness and affective state can inform the development of new research priorities for the industry. For example, in some regions such as eastern Canada, the north-eastern United States and parts of Europe, many dairy farms still use tie stalls, where cattle are restricted to a single stall for most of their life. Growing concern is

expected to lead to a decline in this type of restrictive housing (Spooner *et al.* 2014). Building new tie stall barns has been outlawed in Norway, with a complete ban scheduled for 2023 (Simensen *et al.* 2010). The proportion of farms using tie stalls is likely to decline due to market factors driven by changes in farm size (Barkema *et al.* 2015), but research efforts that help producers transition to less restrictive housing should become a priority.

Finally, there are some issues for which scientific efforts may be counter-productive. For example, the non-farming public wants assurance that the people who care for dairy cattle, really do *care* about their animals (Ventura *et al.* 2016a). People may be tempted to use the argument that farmers care about their animals because good care translates into good productivity. Although the link between attitudes and outcomes is researchable, this approach turns ‘good care’ from a moral to an economic issue. The implicit contract of animal agriculture is ‘I take care of the animals, the animals take care of me’ (Rollin 1994), and the moral standing of this enterprise is undermined when this wording becomes ‘I provide care to the extent that this benefits me financially’.

Role for policy

People expect, at a minimum, humane care, appropriate hygiene and good husbandry (Cardoso *et al.* 2016), but how can the dairy industry prove that it lives up to these minimum standards? In addition, can the dairy industry position itself so that instead of simply responding to welfare concerns as external threats, it develops a vision that positions itself as a leader on welfare issues? We turn to these two issues below.

Demonstrating compliance with minimum standards

Different countries have used different vehicles to develop farm animal-welfare standards and ensure compliance (reviewed in part by von Keyserlingk and Hötzel 2015). In countries such as New Zealand, legislation has played a central role (e.g. the 1999 *Animal Welfare Act*, Parliamentary Counsel Office of New Zealand 1999). Similarly, legislation has been used to control how farm animals are cared for in many European countries. For example, Sweden passed its first dairy cattle welfare law in 1988, effectively ending zero-grazing systems for dairy cattle (Government of Sweden 1988). The European Union, through the European Commission Directive 2001/93/EC, has created provisions regarding housing and practices such as painful procedures. The lack of appropriate enforcement in some countries can undermine confidence in this legislative approach (e.g. Ventura *et al.* 2016b).

Other regions have relied on a combination of industry and retailer standards. For example, the Dairy Farmers of Canada (DFC) and Canada’s National Farm Animal Care Committee (NFACC) worked together to create code of practice for the care and handling of dairy cattle (DFC–NFACC 2009). The development of codes is a multi-step process involving a range of stakeholders, including producers, scientists, government officials, veterinarians, grocery-chain distributors and representatives of the humane movement (NFACC 2014). Before publication, the draft document is opened for public comment to allow for further input.

In the USA, the National Federation of Milk Producers (NMPF) created the FARM program (Farmers Assuring Responsible Management). The guidance document was written by an NMPF-appointed technical writing committee that included representatives from the NMPF board of directors, various milk cooperatives, the National Cattlemen’s Beef Association, an audit company as well as scientific and veterinary advisors. External stakeholders were also able to comment on the document (NMPF 2016).

Whether the process used by these dairy industry groups has merit in assuring those that buy their milk, remains to be seen, but standards are likely to be challenged on several fronts. There will be pressure from some to have standards sufficiently slack to allow almost all farms to comply, and pressure from others for stricter standards that keep products from ‘bad actors’ out of supply chain.

Another challenge will be to promote a culture of self-governance within the industry (Fraser 2014). This will be facilitated if farmers have access to critical feedback in a way that does not simultaneously put them at risk for being non-compliant. We see opportunities for rigorous but confidential first-party audits as a method for preparing farmers to meet standards. But these first-party audits will not be sufficient; third-party audits will also be required to provide external stakeholders confidence that standards are being met.

Developing a common vision

Instead of reacting to welfare issues as they emerge and treating these as external threats, can the dairy industry develop a vision that makes it a leader in animal welfare? The merits of developing a common vision would seem obvious, in part because engaging in big-picture discussions will also allow the industry to avoid problems facing other sectors.

Consider the sobering question ‘will my grand-daughter be able to (and want to) take over my farm 30 years from now?’. If current trends persist, the answer to this question is likely to be no (see MacDonald *et al.* 2016 for a description of trends in the USA), as only a small fraction of farms currently operating are likely to exist in 30 years. A powerful vision may be able to motivate actions that help preserve a meaningful proportion of farms.

First and foremost should be a culture of care. This means more than just providing access to food, water and shelter; it means avoiding easily preventable harms, especially those caused by farmers (e.g. dehorning without pain control) and providing care to the most vulnerable (e.g. the sick cow or calf and the cull cow). For those who work with farm animals, health is likely to be a key issue; no one wants to see calves scour and cows with mastitis. But the question is whether the industry is willing to devote the resources required to address these health issues, even if the payoff is long term (for example, in the case of research), or if there is likely to be little economic return (in the case of animals with low economic value, such as bobby calves and cull cows)?

Even a strong vision built around common values will not be enough if the industry lacks the policy instruments to make the plan reality. Canada has a policy framework that allows for implementing an ambitious vision. It maintains a supply

management system based on the cost of production (Skogstad 2008), making it feasible to manage a 'Made in Canada' brand for dairy products, produced according the common values of farmers and citizens. This not only provides an effective way of passing on the costs to consumers associated with improved welfare outcomes (via the cost of production formula), it provides a strong public-good argument in favour of maintaining supply management.

Conclusions

Animal agriculture is coming under greater public scrutiny. Hiding practices, for example, using ag-gag legislation, is unlikely to help and may contribute to a loss in public trust. One-way educational efforts are also unlikely to help, in part because new concerns emerge when people learn more about common practices. Instead, the industry needs to foster sustained engagement among producers, industry specialists, citizens, consumers and the general public. This will require conversations, in which the dairy industry listens to the concerns. The dairy industry will also need to make changes to accommodate public expectations. Developing solutions to animal-welfare issues will also require new biological research, especially studies focussed on developing systems that address multiple types of welfare concern (including biological functioning, naturalness and affective state). The industry requires policy instruments that will allow it to develop standards and put these into practice, including mechanisms to demonstrate that these standards are applied on farms. More ambitiously, we need to develop a common vision for what dairy farming should look like a generation from now, and use this vision as a basis for taking leadership on providing what we can all consider to be a good life for dairy cows.

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References

Aerts S (2013) The consumer does not exist: overcoming the citizen/consumer paradox by shifting focus. In 'The ethics of consumption: the citizen, the market and the law'. (Eds H Rocklinsberg, P Sandin) pp. 172–175. (Wageningen Academic Publishers, Wageningen, The Netherlands)

Barkema HW, von Keyserlingk MAG, Kastelic JP, Lam TJGM, Luby C, Roy JP, LeBlanc SJ, Keefe GP, Kelton DF (2015) Invited review: changes in the dairy industry affecting dairy cattle health and welfare. *Journal of Dairy Science* **98**, 7426–7445. doi:10.3168/jds.2015-9377

Benard M, de Cock Buning T (2013) Exploring the Potential of Dutch Pig Farmers and Urban-Citizens to Learn Through Frame Reflection. *Journal*

of Agricultural & Environmental Ethics **26**, 1015–1036. doi:10.1007/s10806-013-9438-y

Bergstra TJ, Gremmen B, Stassen EN (2015) Moral values and attitudes toward Dutch sow husbandry. *Journal of Agricultural & Environmental Ethics* **28**, 375–401. doi:10.1007/s10806-015-9539-x

Boogaard BK, Oosting SJ, Bock BB (2008) Defining sustainability as a socio-cultural concept: citizen panels visiting dairy farms in the Netherlands. *Livestock Science* **117**, 24–33. doi:10.1016/j.livsci.2007.11.004

Boogaard BK, Bock BB, Oosting SJ, Wiskerke JSC, van der Zijpp AJ (2011) Social acceptance of dairy farming: the ambivalence between the two faces of modernity. *Journal of Agricultural & Environmental Ethics* **24**, 259–282. doi:10.1007/s10806-010-9256-4

Broad GM (2016) Animal production, 'ag-gag' laws, and the social production of ignorance: exploring the role of storytelling. *Environmental Communication* **10**, 43–61. doi:10.1080/17524032.2014.968178

Callahan ES, Dworkin TM (2000) The state of state whistleblower protection. *American Business Law Journal* **38**, 99–175. doi:10.1111/j.1744-1714.2000.tb00286.x

Cardoso CS, Hötzel MJ, Weary DM, Robbins JA, von Keyserlingk MAG (2016) Imagining the ideal dairy farm. *Journal of Dairy Science* **99**, 1663–1671. doi:10.3168/jds.2015-9925

Cembalo L, Caracciolo F, Lombardi A, Del Giudice T, Grunert KG, Cicia G (2016) Determinants of individual attitudes toward animal welfare-friendly food products. *Journal of Agricultural & Environmental Ethics* **29**, 237–254. doi:10.1007/s10806-015-9598-z

Chapinal N, Goldhawk C, de Passillé AM, von Keyserlingk MAG, Weary DM, Rushen J (2010) Overnight access to pasture does not reduce milk production or feed intake in dairy cattle. *Livestock Science* **129**, 104–110. doi:10.1016/j.livsci.2010.01.011

Clark M (2014) Chilliwack cattle sales boycott threatened over animal abuse video. Available at <http://www.cbc.ca/news/canada/british-columbia/chilliwack-cattle-sales-boycott-threatened-over-animal-abuse-video-1.2676340> [Verified 10 February 2017]

Clark B, Stewart GB, Panzone LA, Kyriazakis I, Frewer LJ (2016) A systematic review of Public attitudes, perceptions and behaviours towards production diseases associated with farm animal welfare. *Journal of Agricultural & Environmental Ethics* **29**, 455–478. doi:10.1007/s10806-016-9615-x

Coleman G, Rohlf V, Toukhsati S, Blache D (2015) Public attitudes relevant to livestock animal welfare policy. *Farm Policy Journal* **12**, 45–57.

Costa JHC, von Keyserlingk MAG, Weary DM (2016) Invited review: effects of group housing of dairy calves on behavior, cognition, performance and health. *Journal of Dairy Science* **99**, 2453–2467. doi:10.3168/jds.2015-10144

Crony CC, Apley M, Capper JL, Mench JA, Priest S (2012) Bioethics symposium: the ethical food movement: what does it mean for the role of science and scientists in current debates about animal agriculture? *Journal of Animal Science* **90**, 1570–1582. doi:10.2527/jas.2011-4702

DFC-NFACC (2009) Code of practice for the care and handling of dairy cattle. Available at <http://www.nfacc.ca/pdfs/codes/Dairy%20Code%20of%20Practice.pdf> [Verified 17 October 2016]

European Commission Directive (2001) European Commission Directive 2001/93/EC 2001/93/EC. Available at <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A52006SC0065> [Verified 17 October 2016]

Fisman R, Khanna T (1999) Is trust a historical residue? Information flows and trust levels. *Journal of Economic Behavior & Organization* **38**, 79–92. doi:10.1016/S0167-2681(98)00123-1

Flower F, Weary DM (2003) The effects of early separation of the dairy cow and calf. *Animal Welfare* **12**, 339–348.

Fraser D (2014) Could animal production become a profession? *Livestock Science* **169**, 155–162. doi:10.1016/j.livsci.2014.09.017

- Fraser D, Weary DM, Pajor EA, Milligan BN (1997) A scientific conception of animal welfare that reflects ethical concerns. *Animal Welfare* **6**, 187–205.
- Frewer LJ, Kole A, Van De Kroon SM, De Lauwere C (2005) Consumer attitudes towards the development of animal-friendly husbandry systems. *Journal of Agricultural & Environmental Ethics* **18**, 345–367. doi:10.1007/s10806-005-1489-2
- Government of Sweden (1988) The Animal Welfare Act. Unofficial English translation. Available at <http://extwprlegs1.fao.org/docs/pdf/swe19544E.pdf> [Verified 10 February 2017]
- Gulliver A (2014) Manuka dairy firm under investigation in Chile. Available at <http://www.stuff.co.nz/business/farming/dairy/9634584/Manuka-dairy-firm-under-investigation-in-Chile> [Verified 17 October 2016]
- Hansen J, Holm L, Frewer L, Robinson P, Sandøe P (2003) Beyond the knowledge deficit: recent research into lay and expert attitudes to food risks. *Appetite* **41**, 111–121. doi:10.1016/S0195-6663(03)00079-5
- Harper G, Henson S (2001) Consumer concerns about animal welfare and the impact on food choice. EU FAIR CT98-3678 final report. Available at https://ec.europa.eu/food/sites/food/files/animals/docs/aw_arch_hist_eu_fair_project_en.pdf [Verified 10 February 2017]
- Harvey D, Hubbard C (2013) Reconsidering the political economy of farm animal welfare: an anatomy of market failure. *Food Policy* **38**, 105–114. doi:10.1016/j.foodpol.2012.11.006
- Hersh MA (2002) Whistleblowers: heroes or traitors?: Individual and collective responsibility for ethical behaviour. *Annual Reviews in Control* **26**, 243–262. doi:10.1016/S1367-5788(02)00025-1
- Hoogland CT, de Boer J, Boersema JJ (2007) Food and sustainability: do consumers recognize, understand and value on package information on production standards? *Appetite* **49**, 47–57. doi:10.1016/j.appet.2006.11.009
- Johnsen JF, Beaver A, Mejdell CM, Rushen J, de Passillé AM, Weary DM (2015) Providing supplementary milk to suckling dairy calves improves performance at separation and weaning. *Journal of Dairy Science* **98**, 4800–4810. doi:10.3168/jds.2014-9128
- Krohn C, Jonassen B, Munksgaard L (1990) Cow–calf relations. 2: The effect of 0 vs. 5 days suckling on behaviour, milk production and udder health of cows in different stabling. In ‘Report no. 678’. (National Institute of Animal Science: Foulum, Denmark)
- Lassen J, Sandøe P, Forkman B (2006) Happy pigs are dirty! Conflicting perspectives on animal welfare. *Livestock Science* **103**, 221–230. doi:10.1016/j.livsci.2006.05.008
- Legrand AL, von Keyserlingk MAG, Weary DM (2009) Preference and usage of pasture versus freestall housing by lactating dairy cattle. *Journal of Animal Science* **92**, 3651–3658.
- MacDonald JM, Cessna J, Mosheim R (2016) Changing structure, financial risks, and government policy for the US dairy industry. Available at https://www.ers.usda.gov/webdocs/publications/err205/56833_err205_errata.pdf [Verified 10 February 2017]
- Maeda Y, Miyahara M (2003) Determinants of trust in industry, government, and citizen’s groups in Japan. *Risk Analysis* **23**, 303–310. doi:10.1111/1539-6924.00310
- McKendree MGS, Cronley CC, Widmar NJO (2014) Effects of demographic factors and information sources on United States consumer perceptions of animal welfare. *Journal of Animal Science* **92**, 3161–3173. doi:10.2527/jas.2014-6874
- Meagher RK, Daros RR, Costa JH, Von Keyserlingk MAG, Hötzel MJ, Weary DM (2015) Effects of degree and timing of social housing on reversal learning and response to novel objects in dairy calves. *PLoS One* **10**, e0132828. doi:10.1371/journal.pone.0132828
- New Zealand Ministry of Primary Industries (2016) Animal welfare regulations. Available at <http://mpi.govt.nz/law-and-policy/legal-overviews/animal-welfare/animal-welfare-regulations/> [Verified 10 February 2017]
- NFACC (2014) NFACC code of practice development process. Available at http://www.nfacc.ca/resources/codes-of-practice/NFACC_Code_process_Jan_2014.pdf [Verified 10 February 2017]
- NMPF (2016) Animal care reference manual. Available at <http://www.nationaldairyfarm.com/sites/default/files/Version-3-Manual.pdf> [Verified 10 February 2017]
- Ormandy EH, Schuppli CA, Weary DM (2013) Public attitudes towards the use of animals in research: effects of invasiveness, genetic modification and regulation. *Anthrozoos* **26**, 165–184. doi:10.2752/175303713X13636846944240
- Parliamentary Counsel Office of New Zealand (1999) Animal Welfare Act 1999. Public Act 1999 no. 142. Available at <http://www.legislation.govt.nz/act/public/1999/0142/latest/DLM49664.html> [Verified 17 October 2016]
- Peters RG, Covello VT, McCallum DB (1997) The determinants of trust and credibility in environmental risk communication. *Risk Analysis* **17**, 43–54. doi:10.1111/j.1539-6924.1997.tb00842.x
- Pieper L, Doherr MG, Heuwieser W (2016) Consumers’ attitudes about milk quality and fertilization methods in dairy cows in Germany. *Journal of Dairy Science* **99**, 3162–3170. doi:10.3168/jds.2015-10169
- Popescu S, Borda C, Diugan EA, Spinu M, Groza IS, Sandru D (2013) Dairy cows’ welfare quality in tie-stall housing system with or without access to exercise. *Acta Veterinaria Scandinavica* **55**, 43. doi:10.1186/1751-0147-55-43
- Prickett RW, Norwood FB, Lusk JL (2010) Consumer preference for farm animal welfare: results from a telephone survey of US households. *Animal Welfare* **19**, 335–347.
- Rawlins BL (2008) Measuring the relationship between organizational transparency and employee trust. *The Public Relations Journal* **2**, 1–21.
- Robbins JA, Weary DM, Schuppli CA, von Keyserlingk MAG (2015) Stakeholder views on treating pain due to dehorning dairy calves. *Animal Welfare* **24**, 399–406. doi:10.7120/09627286.24.4.399
- Robbins JA, von Keyserlingk MAG, Fraser D, Weary DM (2016a) Farm size and animal welfare. *Journal of Animal Science* **94**, 5439–5455. doi:10.2527/jas.2016-0805
- Robbins JA, Franks B, Weary DM, von Keyserlingk MAG (2016b) Awareness of AG-GAG laws erodes trust in farmers and increases support for animal welfare regulations. *Food Policy* **61**, 121–125. doi:10.1016/j.foodpol.2016.02.008
- Rollin BE (1994) Animal production and the new social ethic for animals. *Journal of Social Philosophy* **25**, 71–83.
- Ryan EB, Fraser D, Weary DM (2015) Public attitudes to housing systems for pregnant pigs. *PLoS One* **10**, e0141878. doi:10.1371/journal.pone.0141878
- Saputo (2015) Animal welfare policy. Available at <http://www.saputo.com/uploadedFiles/Saputo/shared/social/Animal%20welfare%20policy.pdf> [Verified 10 February 2017]
- Schuppli CA, von Keyserlingk MAG, Weary DM (2014) Access to pasture for dairy cows: responses from an on-line engagement. *Journal of Animal Science* **92**, 5185–5192. doi:10.2527/jas.2014-7725
- Scudder JN, Bishop-Mills C (2009) The credibility of shock advocacy: animal rights attack messages. *Public Relations Review* **35**, 162–164. doi:10.1016/j.pubrev.2008.09.007
- Simensen E, Østerås O, Bøe KE, Kielland C, Ruud LE, Naess G (2010) Housing system and herd size interactions in Norwegian dairy herds; associations with performance and disease incidence. *Acta Veterinaria Scandinavica* **52**, 14. doi:10.1186/1751-0147-52-14
- Skogstad G (2008) Canadian agricultural programs and paradigms: the influence of international trade agreements and domestic factors. *Canadian Journal of Agricultural Economics* **56**, 493–507. doi:10.1111/j.1744-7976.2008.00143.x
- Spooner JM, Schuppli CA, Fraser D (2014) Attitudes of Canadian citizens toward farm animal welfare: a qualitative study. *Livestock Science* **163**, 150–158. doi:10.1016/j.livsci.2014.02.011

- Stafford KJ, Mellor DJ (2011) Addressing the pain associated with disbudding and dehorning in cattle. *Applied Animal Behaviour Science* **135**, 226–231. doi:10.1016/j.applanim.2011.10.018
- Sutherland MA, Tucker CB (2011) The long and short of it: a review of tail docking in farm animals. *Applied Animal Behaviour Science* **135**, 179–191. doi:10.1016/j.applanim.2011.10.015
- Te Velde H, Aarts N, Van Woerkum C (2002) Dealing with ambivalence: farmers' and consumers' perceptions of animal welfare in livestock breeding. *Journal of Agricultural & Environmental Ethics* **15**, 203–219. doi:10.1023/A:1015012403331
- Thompson PB (2008) 'The ethics of intensification: agricultural development and cultural change.' (Springer: Heidelberg, Germany)
- Tiplady CM, Walsh DAB, Phillips CJ (2013) Public response to media coverage of animal cruelty. *Journal of Agricultural & Environmental Ethics* **26**, 869–885. doi:10.1007/s10806-012-9412-0
- USDA/NAHMS (2016) Dairy 2014. Dairy cattle management practices in the United States, 2014. Available at https://www.aphis.usda.gov/animal_health/nahms/dairy/downloads/dairy14/Dairy14_dr_PartI.pdf [Verified 1 April 2016]
- Vanhonacker F, Verbeke W, Van Poucke E, Tuytens FAM (2008) Do citizens and farmers interpret the concept of farm animal welfare differently? *Livestock Science* **116**, 126–136. doi:10.1016/j.livsci.2007.09.017
- Ventura BA, Schuppli C, von Keyserlingk MAG, Weary DM (2013) Views on contentious practices in dairy farming: the case of early cow–calf separation. *Journal of Dairy Science* **96**, 6105–6116. doi:10.3168/jds.2012-6040
- Ventura BA, von Keyserlingk MAG, Wittman H, Weary DM (2016a) What difference does a visit make? Changes in animal welfare perceptions after interested citizens tour a dairy farm. *PLoS One* **11**, e0154733. doi:10.1371/journal.pone.0154733
- Ventura BA, Weary DM, Giovanetti AS, von Keyserlingk MAG (2016b) Veterinary perspectives on cattle welfare challenges and solutions. *Livestock Science* **193**, 95–102. doi:10.1016/j.livsci.2016.10.004
- Verbeke V, Ward RW (2001) A fresh meat almost ideal demand system incorporating negative TV press and advertising impact. *Agricultural Economics* **25**, 359–374. doi:10.1111/j.1574-0862.2001.tb00215.x
- Verbeke WF, Pérez-Cueto JA, Barcellos MD, Krystallis A, Grunert KG (2010) European citizen and consumer attitudes and preferences regarding beef and pork. *Meat Science* **84**, 284–292. doi:10.1016/j.meatsci.2009.05.001
- von Keyserlingk MAG, Hötzel MJ (2015) The ticking clock: addressing farm animal welfare in emerging countries. *Journal of Agricultural & Environmental Ethics* **28**, 179–195. doi:10.1007/s10806-014-9518-7
- von Keyserlingk MAG, Rushen J, de Passillé AM, Weary DM (2009) Invited review: the welfare of dairy cattle – key concepts and the role of science. *Journal of Dairy Science* **92**, 4101–4111. doi:10.3168/jds.2009-2326
- von Poser Toigo E, Diehl L, Ferreira A, Mackendanz V, Krolow R, Benitz A, Noschang C, Huffell A, Silveira P, Wyse A, Dalmaz C (2012) Maternal depression model: long lasting effects on the mother following separation from pups. *Neurochemical Research* **37**, 126–133. doi:10.1007/s11064-011-0590-3
- Weary DM, Schuppli CA, von Keyserlingk MAG (2011) Tail docking dairy cattle: responses from an online engagement. *Journal of Animal Science* **89**, 3831–3837. doi:10.2527/jas.2011-3858
- Weary DM, Ventura BA, von Keyserlingk MAG (2016) Societal views and animal welfare science: understanding why the modified cage may fail and other stories. *Animal* **10**, 309–317. doi:10.1017/S1751731115001160
- Wheale P, Hinton D (2007) Ethical consumers in search of markets. *Business Strategy and the Environment* **16**, 302–315. doi:10.1002/bse.484
- Windsor PA, Whittington RJ (2010) Evidence for age susceptibility of cattle to Johne's disease. *Veterinary Journal (London, England)* **184**, 37–44. doi:10.1016/j.tvjl.2009.01.007
- You X, Li Y, Zhang M, Yan H, Zhao R (2014) A survey of Chinese citizens' perceptions on farm animal welfare. *PLoS One* **9**, e109177. doi:10.1371/journal.pone.0109177