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Strengthening US organic standards on animal health and welfare

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Abstract

Organic livestock production has been increasing in the US, although it still merely constitutes a small fraction of total production. Its success will require detailed standards supported by scientific knowledge and consistent with organic farming principles. However, such standards, mandated under the Organic Foods Production Act of 1990, are yet to be fully developed. Regulations issued by the USDA's National Organic Program identify livestock health and welfare concerns that must be addressed in a farmer's organic farm plan (eg that there be appropriate housing). However, specifics regarding achievement of these goals are not provided in the form of clear standards for organic livestock production. This paper provides a new starting point to further the development of such standards. First, we outline a rationale based upon the legal context and state of the organic livestock industry detailing the reasons why development of these standards is timely. Second, using a review of existing organic and non-organic national and international animal health and welfare standards, a search of available scientific research, and a consensus of key stakeholders, we identify areas in which organic standards should be readily adopted. We conclude by presenting one example of a plausible organic standard for each of four major US livestock categories: minimum space for feedlot beef cattle; prohibition of routine tail-docking in dairy cows; provision of perches for laying hens and prohibition of gestation crates for sows.

Keywords: *animal health, animal welfare, National Organic Program, organic livestock production, organic standards, US livestock systems*

Introduction

Organic livestock production in the US is a young but growing industry. When the Organic Foods Production Act (OFPA) passed in 1990, the number of livestock producers was estimated to be as low as one hundred (S Rep No 302 1990). The number of livestock in US certified organic production has grown, increasing by 485% from 1997 to 2002 and by another 81% from 2002 to 2005 (USDA 2005a). NB 'Livestock' in this statistic refers to beef and dairy cattle and swine; poultry were not included in the data. The term 'livestock' in the rest of this paper refers to beef and dairy cattle, swine, and poultry.

However, the impact of this growth on overall production remains small, as only 0.12% of US livestock in 2005 were certified organic (USDA 2005b). Before 1999, organic livestock production was limited in part because US Department of Agriculture (USDA) prohibited retail meat from being labeled as 'organic'. Since the removal of this prohibition, the proportion of organic livestock production on US farms has increased. However, detailed national organic standards for animal health and welfare have yet to be established, but are required for success of the US National Organic Program (NOP).

Setting health and welfare standards since passage of the OFPA in 1990 has proven difficult for many reasons. The prohibition on labeling meat as organic meant that livestock producers were not quick to enter the organic market, so that it was not urgent to innovate and develop best welfare practices specific to organic production. Another reason is that US research institutions have not focused traditionally on organic production systems; in an analysis of 30,000 USDA research summaries, Lipson (1997) found that less than 0.1% of federal agricultural research funding was going to organic research. Moreover, the small amount of organic research is devoted mainly to crops, not livestock; in Lipson's (1997) search of the USDA database, the 'organic-livestock' keyword did not return any research summaries.

Finally, the idea that organic food production embodies the concept of 'naturalness' has been linked to the idea that livestock in organic systems should be able to engage in and express natural behaviours (Alrøe *et al* 2001). However, relating the concept of 'natural' to a verifiable welfare standard for livestock has proved challenging, slowing the NOP's progress toward elaborated standards. This is further complicated by the myriad ways that animal welfare is defined and assessed in the literature.

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Research on animal welfare often makes the valid distinction between the animals' needs, priorities and preferences. Weighing the relative importance of behaviours can elucidate such distinctions; as one example, Weeks and Nicol (2006) describe behaviours such as perching, dust-bathing and nesting as being animal needs (ie the hen performs the activity even in suboptimal conditions), but explain that these behaviours may also be considered priorities (ie the hen is willing to perform work to exhibit the behaviour). Since needs, priorities and preferences can all be directly relevant to setting welfare standards, we have taken an inclusive approach that covers research on any of these aspects of welfare.

Defining welfare can involve a range of indicators including production levels and the animal's general physical health (eg freedom from morbidity: Hewson 2003; Dawkins 2004), pain and stress levels and feelings (eg fear: Hewson 2003; Dawkins 2004), and whether the animal lives 'naturally' with access to its full range of natural behaviours (Stinner 2007). For the purposes of this paper, we considered these indicators to the extent that research was available upon which to base our thinking. Although 'naturalness' is a key principle for organic farming, in many cases there was only sparse research on this concept in the context of US organic farming systems, reinforcing our earlier discussion on the limited organic research available to guide the development of standards.

Acknowledging that livestock pose a particular challenge for setting organic standards, this paper details the legal rationale for inclusion of animal health and welfare standards within the NOP. We argue that now is the opportune time for inclusion of such standards because of the relatively undeveloped nature of the organic livestock sector in the US.

We then present an overview of international and private sector animal health and welfare standards that facilitated the identification of issues for each type of livestock (beef cattle, dairy cattle, poultry and swine) where consensus (or near consensus) exists. We propose these as examples where standards could be quickly established for the NOP, and provide support for our recommendations through evidence in the scientific literature and discussions held with key stakeholders. The goal of this research was to identify areas where science and existing standards can serve together as a guide for advancing US standards for organic livestock. This paper provides an overview of the project and offers examples of such standards; future papers for beef cattle, dairy cattle, poultry and swine will provide detailed analyses of standard setting for each livestock type based upon scientific evidence and stakeholder dialogue.

Challenges for health and welfare standards in US organic livestock production

A challenge in setting standards for any industry is to develop rules that are buttressed by scientific evidence and sufficient consensus among stakeholders. In the case of organic livestock, standards have proven more difficult to elaborate than for crops, mainly because of uncertainty in the science related to animal health and welfare, which in turn complicates efforts to reach consensus.

The purpose of the OFPA was to establish US standards for foods produced organically, including livestock. When Congress passed the OFPA, widespread consensus existed within the US on the broad features as well as the details of organic crop production. But little was written into law regarding livestock production because of the paucity of expertise in organic husbandry in the US. Lawmakers nevertheless envisioned a time when livestock standards would become as comprehensive as crop standards. To gain expertise and provide a focal point for public debate, Congress created a 15-member National Organic Standards Board (NOSB). The Committee Report accompanying the OFPA directed the USDA to consult with the NOSB and develop additional livestock standards: "More detailed standards are enumerated for crop production than for livestock production. This reflects the extent of knowledge and consensus on appropriate organic crop production methods and materials. With additional research and as more producers enter into organic livestock production, the Committee expects that USDA, with the assistance of the National Organic Standards Board will elaborate on livestock criteria" (S Rep No 101-357 1990).

In 2000, USDA published its final rule to implement the OFPA; the rule became effective in 2002. NB Author Merrigan was the administrator of the USDA agency that included the NOP, and author Lockeretz was a member of the NOSB when the final rule for the NOP was published.

While USDA anticipated the need to elaborate animal health and welfare standards in the NOP, as discussed in the Preamble accompanying the NOP Final Rule, a beginning list of regulations, albeit somewhat vague, was included. According to the regulations (7 CFR 205.238 and 205.239) an organic livestock producer must:

- select species and types of livestock with regard to suitability for site-specific conditions and resistance to prevalent diseases and parasites;
- provide a feed ration including vitamins, minerals, protein, and/or amino acids, energy sources, and, for ruminants, fibre;
- establish appropriate housing, pasture conditions and sanitation practices to minimise the occurrence and spread of diseases and parasites;
- maintain animals under conditions which provide for exercise, freedom of movement, and reduction of stress appropriate to the species;
- conduct all physical alterations to promote the animals' welfare and in a manner that minimises stress and pain;
- establish and maintain livestock living conditions which accommodate the health and natural behaviour of the livestock;
- provide access to the outdoors, shade, shelter, exercise areas, fresh air, and direct sunlight suitable to the species, its stage of production, the climate, and the environment;

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• provide shelter designed to allow for the natural maintenance, comfort level, and opportunity to exercise appropriate to the species.

This list essentially laid out a broad and challenging outline for further development of standards, but many of the above provisions have yet to be fully described under the NOP. Furthermore, in sections relating to comments, the Preamble describes several issues that USDA understood would require elaboration in the short-term, but which the Department had insufficient expertise to deal with. For example, the Preamble identified species-specific guidelines to address confinement (eg length of time cattle can be confined prior to slaughter) and space requirements as issues necessitating further public comment and elaboration by the NOSB (NOP 2002). This lack of precision in livestock standards has led and will continue to lead to legal battles and trade confusion. For example, animals are required to have 'access to outdoors', but no further guidance is given. Does providing a sun porch for poultry satisfy the standard, or must poultry be given an outdoor hen run? Many other areas of animal health and welfare — such as the roughage content in the diet of ruminants, preventive health management practices, physical alterations, and space requirements in animal housing — are all referred to in the standards but do not have the accompanying specificity that producers seek.

This historical documentation from the policy-making process demonstrates that animal health and welfare issues were identified explicitly for inclusion in the NOP and that the NOSB is charged with making recommendations to the USDA on organic health and welfare standards. While the NOSB has made some progress by responding to several challenges specified by the Final Rule (eg soliciting comments and developing a rule on what is meant by 'access to pasture'), generally the USDA has been slow in incorporating NOSB recommendations into the NOP through agency rulemaking.

Difficulty in setting functional standards for organic livestock is not uncommon, as shown by experience internationally. For example, European crop standards were issued in 1991, while those for animals were not finally decided until 1999 (EC 1999). Similarly, Japan issued standards for organic crop production in 2000, but took until 2005 to release organic livestock standards (MAFF 2005). However, now that organic livestock standards have been set and implemented abroad, the US is under pressure to undertake its own effort. Trade partners to the US may perceive US organic livestock standards as inadequate because of the lack of detail within the current NOP. This lack of detail also makes it difficult for trade negotiators to account for and resolve conflicts. Similar to the expectations set by the OFPA and NOP Final Rule, the potential trade implications of delaying setting these standards is a motivator to develop health and welfare standards for organic livestock in the US.

At the same time, the US organic livestock sector is undeveloped, particularly for swine and poultry, so that there is not yet large investments in facilities that would have to be changed to comply with new standards. This means the NOSB and the Secretary of Agriculture, if they act expeditiously, need not be overly constrained by the impact new standards would have on existing industry practices and infrastructure. By law, the US rulemaking process must consider the impact a proposed rule will have on the regulated industry. For example, all regulatory proposals must be accompanied by a cost-benefit analysis (CBA) (Executive Order No 12866 1993). The CBA provides a measure to help policy-makers decide whether a regulatory proposal is worth supporting. In the case of livestock standards, the CBA for new standards would likely be favourable since there are few existing organic producers whose operations would be disrupted by new standards. The more developed the industry becomes, the more costly it may be to comply with new regulations, thereby increasing the hurdles to the passage of well-defined standards for organic livestock.

Acting early in the formation of an industry such as organic may limit the reach of other regulatory analyses such as that required by the Regulatory Flexibility Act (1980) or 'reg-flex.' Reg-flex requires agencies to evaluate whether their regulations place a disproportionate burden on small entities. This rulemaking requirement can slow down or restrict imposition of new standards in a mature industry with diverse firm sizes (such as small- and large-scale livestock producers). Therefore, an ideal time to set standards is before the US organic livestock industry grows to a size where standard setting will become costly and difficult.

Rulemaking is a dynamic process, and standards can and will be amended as science advances and consensus shifts toward new strategies for ensuring sound health and welfare in organic livestock production. Because this flexibility does exist in the policy process, there is little reason to delay setting standards on issues well supported by science and stakeholder consensus. For these reasons, now is the optimal time for the NOSB to advise the Secretary on health and welfare issues and facilitate the USDA's establishment of livestock standards. That said, the question remains as to which health and welfare issues are best suited to having standards set quickly and with little opposition.

Methods: a review of existing standards and research

To facilitate the identification of suitable health and welfare issues, we first conducted a detailed review of current livestock standards to identify the breadth of animal health and welfare issues deemed important by one or more significant organisations. This process enabled us to highlight gaps and inconsistencies as well as commonalities in standards, and helped identify topics that required further investigation. Several authors have documented the considerable variation in organic livestock standards (Schmid 2002; Padel *et al* 2004). We complemented this work by undertaking a systematic examination of health and welfare practices supported by a wider range of organic programmes as well as several non-organic livestock organisations.

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Table 1 Animal health and welfare standards reviewed.

Organisation	Standards
	Organic standards and recommendations
BioGro	BioGro NZ Organic Standards. BioGro New Zealand Inc, Wellington. www.Bio-Gro.co.nz
Codex	Codex Alimentarius, Organically Produced Foods. FAO and WHO, Rome 2001. www.fao.org/documents/show_cdr.asp?url_file=/DOCREP/005/Y2772E00.HTM
EU	Council Regulation (EC) No 1804/1999 of 19 July 1999, supplementing Regulation (EEC) No 2092/91 so as to include livestock production. Official Journal of the European Communities, L222/1-L222/28 http://europa.eu.int/eur-lex/pri/en/oj/dat/1999/l_222/l_22219990824en00010028.pdf
IFOAM	IFOAM Basic Standards for Organic Production and Processing; approved by the IFOAM General Assembly, Victoria, Canada, August 2002. International Federation of Organic Agriculture Movements, Bonn, Germany
KRAV	KRAV Standards, July 2004. KRAV, Uppsala, Sweden.* http://arkiv.krav.se/arkiv/regler/Standards2004EditionJuly.pdf
NOP	National Organic Program Final Rule. US Department of Agriculture, Washington DC, December 2002. www.ams.usda.gov/nop/NOP/standards.html
NOSB	National Organic Standards Board, recommendations to the US National Organic Program and records of meetings. www.ams.usda.gov/nosb/index.htm
SA	Soil Association Organic Standards. Soil Association, Bristol, UK*
	Non-organic standards and guidelines
ACC	Animal Care Certified (laying hens only). United Egg Producers. www.uepcertified.com/docs/2005_UEPanimal_welfare_guidelines.pdf
AMI	Animal Meat Institute. Recommended Animal Handling Guidelines and Audit Guide 2005 ed. www.animalhandling.org/guidelines/2005RecAnimalHandlingGuidelines.pdf
AVMA	American Veterinary Medical Association. Animal welfare position statements. www.avma.org/issues/policy/animal_welfare/default.asp
CH	Certified Humane. www.certifiedhumane.org/documentation.asp
NIAA	National Institute for Animal Agriculture (primarily swine). animalagriculture.org/pamphlets/pamphlets.asp
NPB	National Pork Board. Swine Care Handbook 2002. www.porkboard.org/SwineCareHandbook/default.asp

* European Union member countries standards must be compatible with the EU regulation, but some flexibility is allowed and countries may impose additional requirements. This includes derogations or special permission to deviate from a standard (eg shortage of organic feed or need to extend the time-period for phasing in a type of housing or meeting space requirements).

For the standards review, we selected seven organic standards or guidelines as well as the recommendations the NOSB has made to the USDA. We also examined standards and guidelines of six nationally prominent US trade associations, professional societies, or certifying organisations that are not specifically concerned with organic production. These standards, many of which were being developed long before the debate on organic livestock health and welfare began, embody considerable expertise and are of great potential value in organic standard setting. All the standards reviewed are shown in Table 1. To accommodate an in-depth review, we limited our analysis to beef, dairy, poultry (broilers and layers) and swine.

The selection of standards for review was purposeful. Both Codex and IFOAM were chosen because they provide guidance on organic production internationally and have served as guideposts for development of the NOP. Standards from the EU were included because they address an entire region that includes major US trading partners. To complete the analysis of organic standards, we had a wide range of national standard-setting bodies from which to choose, each with its own standards. The Soil Association (UK) was selected because they have the oldest organic standards in the world (not counting the special case of Biodynamic standards). KRAV (Sweden) has especially detailed and stringent standards, and BioGro (New Zealand) added geographic diversity to the analysis.

Non-organic standards (AVMA, AMI, ACC, NIAA and NPB) were selected because the sponsoring organisations are significant in the industry and because the standards have a substantial level of detail. Certified Humane (CH), a consumer certification and labeling programme for animal products, was included because its primary objective in issuing standards is the promotion of health and welfare.

To complement our review of these diverse standards, we surveyed the scientific literature to find research relevant to

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Table 2 Organisations with health and welfare standards or guidance for selected topics.

Topic	Organisation	
	Organic standards	**Non-organic standards/guidance**
Minimum space requirements for beef cattle	EU, SA, KRAV (quantitative); NOP, IFOAM, Codex (qualitative)	CH
Prohibition on tail docking for dairy cattle	BioGro, KRAV, IFOAM	CH, AVMA
Provision of perches for laying hens	EU, Codex, KRAV, SA	CH, ACC
Ban on gestation crates for sows	KRAV, IFOAM, Codex	AVMA, NPB

the major issues identified during our standards review. A systematic survey of the literature was conducted in selected databases, journals, bibliographies and major works in the field of livestock welfare. Using several keywords, we searched the following databases: *Science Citation Index*; *Organic Eprints Archive*; *Compendium of Animal Health and Welfare in Organic Farming*; *Science Direct*; *CAB Abstracts; Animal Behavior Abstracts* and *Agricola*. Each database was searched from inception to March 2007. Bibliographies on organic livestock production compiled by Gold (2004, 2007) were also reviewed. All issues of the following journals: *Animal Welfare, Livestock Science* (then *Livestock Production Science*), and *Journal of Animal Science* were searched. Major works reviewed as well as consulted for additional citations included Rollin (1995); Vaarst *et al* (2004); Appleby and Hughes (1997); Weeks and Butterworth (2004); *Network for Animal Health and Welfare in Organic Agriculture (NAHWOA) Reports* and *Sustaining Animal Health and Food Safety in Organic Farming (SAFO) Reports*.

We summarised the scientific literature under each major issue identified during the standards review and distilled the research into a discussion guide that served as the framework for a two-day stakeholder workshop with experts from the livestock industry, including scientists, organic certifiers, marketers, veterinarians, producers, and processors. The stakeholder workshop allowed us to confirm our work and conclusions and enabled the major health and welfare issues identified to be debated in the context of real production systems, as well as to consider the trade-offs among different standards when put into practice.

Opportunities for advancing animal health and welfare in US organic standards

Based upon the standards and scientific literature review and the consensus reached at the stakeholder workshop, we identified topics for which standards could be quickly established under the NOP. We sought to identify issues meeting three criteria: a standard to address a given topic exists elsewhere; scientific evidence is available that can support creation of a US standard; and the stakeholder group endorsed developing a standard. For four categories of livestock (beef cattle, dairy cattle, layers and swine), we present one such topic (Table 2). Table 2 also shows which standards or guidelines already cover each of these topics. The four topics presented were chosen from a longer list of possible issues and using the authors' judgment, were selected as illustrative examples to best highlight the kind of standards that could be implemented relatively easily under the NOP.

Beef cattle

The OFPA, the Preamble to the NOP, and the NOSB all indicate that the production environment should limit livestock stress and promote health. Given this, we anticipate that the NOP will eventually encompass standards regarding dry space, shade, cooling, mounds, and distances to water sources within all production systems, including beef cattle. In the meantime, existing standards, scientific papers, and stakeholder analysis all support elaborating the NOP to include space requirements for organic beef cattle in feedlot systems. While there are many ways to craft space requirements, the consensus is that, at a minimum, beef cattle should be provided adequate space to lie down.

Several of the organic standards we reviewed specify the minimum space for feedlot beef; EU standards set a minimum outdoor area for fattening bovines (with potential derogations until 2010). Codex requires that organic producers provide sufficient space for the animal to move freely and be able to express normal patterns of behaviour. IFOAM states that housing conditions must allow cattle to stand normally, lie down easily, turn around, groom themselves, and assume all natural postures and movements such as stretching.

Certain non-organic standards include details on space requirements for beef cattle. For example, CH requires that feedlots be constructed to provide adequate space, social and physical environment, and comfort for the cattle, based on requirements for the geographic region in which they are located, age, sex, liveweight, and behavioural needs. The Soil Association provides organic standards that outline specific space requirements for beef cattle:

- Up to 100 kg, must have 2.6 m^2 per head;
- Up to 200 kg, must have 4.4 m^2 per head;

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- Up to 350 kg, must have 7.0 m^2 per head;
- From 350 to 500 kg, must have 8.7 m^2 per head;
- Over 500 kg, must have 1.75 m^2 per 100 kg.

The importance of space in cattle health and welfare is confirmed by scientific research. Kondo *et al* (1989) found that increased social aggression occurs under high-density husbandry in cattle. The daily gain of bulls (and heifers) was found to be lower when animals have less space (Andersen *et al* 1997). This finding is complemented by that of Siegward *et al* (2006), who found that increasing the floor area for a group of cattle increased the time cattle spent lying down with legs outstretched, and that the cattle lay at greater distances from each other. The same study observed less stepping on lying animals and found that cattle avoided lying in the middle of the pen. As floor area increased, the soiling of floor and coat with faeces decreased and daily weight gain increased, both significantly.

Dairy cattle

Traditionally, tail docking of dairy cattle is routinely performed to improve cleanliness. Often the need for tail docking is driven by poor hygiene in animal housing (eg improper cleaning of stalls), which can lead to increased incidence of mastitis and high somatic cell counts. Because of this root cause, improving the management and housing conditions of the animals may be the best way to address tail docking. One way in which standards may encourage producers to make such improvements is to set requirements on cleanliness; however, these can be difficult to customise and enforce. Another way is by disallowing the practice of tail docking altogether, forcing producers to provide a clean environment. The NOP allows physical alterations as needed to promote animal welfare and stipulates that such alterations must be done in a manner that minimises pain and stress. However, the AVMA states that current scientific literature indicates that routine tail docking provides no benefit to the animal, and that tail docking can lead to distress during fly seasons. Various standards, scientific research, and participants at our stakeholder workshop support a prohibition on tail docking in organic dairy production unless ordered by a veterinarian for medical reasons.

BioGro, KRAV, IFOAM and CH all prohibit tail docking. Both Codex and the EU standards specify that tail docking must not be carried out systematically, but is allowed in exceptional circumstances when authorised by a competent authority to improve health and welfare. Research by Eisher *et al* (2001) scored docked and undocked cows for cleanliness; the results support the AVMA guidelines on tail docking. Docked cows were cleaner, but the total fly counts of docked cows were greater, especially on their rear legs. As fly counts increased, so did alternative methods of fly avoidance in the docked cows, especially foot stomping.

In another study, no significant differences were found between docked and non-docked lactating dairy cows with respect to somatic cell count or the prevalence of contagious, environmental, or minor pathogens (Schreiner & Ruegg 2002). No significant differences in milk quality, udder hygiene or leg hygiene could be attributed to tail docking. Tucker *et al* (2001) found similar results when monitoring milking cows after half the animals in the herd were docked. No differences were identified in four measures of cow cleanliness, two measures of udder cleanliness, or udder health. An analysis of a subsample of cows illustrated that any differences in cow cleanliness over time were attributed to individual differences rather than tail docking.

Poultry

The NOP requires that layers be provided 'adequate space,' which encompasses the quantity and quality of the birds' environment. Ultimately, the NOP will need to specify measurable indoor space allocations (eg 0.18 m^2 per bird); outside space allocations (including access to direct sunlight); size and placement of doors and the proportions of roost, floor, and nest area and perches per bird. Specifying 'adequate space' reasonably includes providing perches for layers (a pipe-shaped limb, as opposed to a flat roosting surface). Research supports the role of perches in bird health and socialisation, and a requirement for perches in the short-term can be a positive contributor to layer health and welfare in organic production while the details of other 'adequate space' issues are being resolved.

The EU, Codex, KRAV and the SA all require adequate perches for organic laying hens. Scientific research on perches indicates that laying hens seek out perches when they are made available. Olsson and Keeling (2002) found that hens push through significantly heavier doors to gain access to a perch than to a sham perch (a perch that cannot be accessed by the hen). They conclude that hens should be given access to perches, since they are highly motivated to use a perch for night-time roosting. A study by Carmichael *et al* (1999) found that hens have preferences on the position of perches in a pen as well; hens chose elevated perches 47% of the time compared to other pen areas at various stocking densities. The next most common choice was the litter area, chosen only 23% of the time.

In addition to evidence that hens desire perches, research on outcomes for hens with perches suggests their importance in achieving desirable health and welfare. Appleby *et al* (2002) found that foot and feather damage of layers was generally less in furnished than in conventional cages; furnished cages had nests, perches, and a dust bath. Another study found that tibia breaking strength was greater in birds from cages with perches (Duncan *et al* 1992).

The research on animal preferences and the positive health and welfare outcomes associated with perch provision should also be considered alongside studies that identify key risks that arise when perches are made available to layers. For example, layers provided access to perches may damage keel bones, compounding the existing concern of fracture risk due to weakened bones during lay periods (Whitehead 2004). Other considerations with provision of perches include the age at which perches are introduced; research has shown that beyond four weeks of age, the

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incidence of cloacal cannibalism in flocks can double if perches are suddenly provided (Gunnarsson *et al* 1999).

This research indicates that additional guidance on management and husbandry techniques may be needed to address risks with perches once they are provided. We have suggested that mandating perches under the NOP would be an important first step for welfare in organic layers; this recommendation was fully embraced by our stakeholders. However, given the need for more specificity in how perches are provided, the NOP might detail the timing, placement and design of perches made available. Several studies including those discussed above could help support such an elaboration. Appleby (2004) states that perch and feed areas of cage systems should be provided at 14 cm or more per bird for most breeds. In addition, Scott and Parker (1994) found there is a threshold, at around 1.00 m, beyond which birds have difficulty in moving from perch-to-perch (successful movement between perches occurred at 0.50 and 0.75 m in this study).

Another study recommended that to minimise the risk of injury, the angle between perches at different heights should be no more than 45° and the horizontal and vertical distances between these perches should be minimised to allow the birds to move downwards easily (Scott *et al* 1997). Research suggests that foot damage was less in birds with rectangular perches than with circular perches (Duncan *et al* 1992). Lambe and Scott (1998) found that hens show no preference among perches made from wood, plastic, steel, or textured aluminum. Wet perches may aggravate foot-pad dermatitis (Wang *et al* 1998), indicating a need to describe how perches will be maintained over time. These studies collectively provide a starting point for NOP to consider in establishing standards around perch provision.

Swine

Still common in conventional systems, gestation crates in swine production are being phased out by state bans (Florida in 2004, Arizona in 2006) and corporate mandates (eg Smithfield Foods plans to phase out their use over the next decade; Kaufman 2007). The use of gestation crates in organic swine production has never been common practice in the US, perhaps because of the very small number of organic swine farms. Confining sows to such limited space is also not consistent with organic principles, as the animal will be unable to express natural behaviours (eg grooming) if restricted in its movement by a gestation crate. However, the fact that gestation crates are not common practice should not preclude prohibiting them in the NOP. KRAV, IFOAM and Codex explicitly prohibit them, and the swine experts at the stakeholder meeting believed that a ban would prevent gestation crates from ever becoming an issue in the organic sector.

The rationale for using gestation crates in swine production is to protect the production potential of the sow in a controlled environment (Rollin 1995). Sows kept in gestation stalls show lower rates of aggression toward conspecifics than sows in group housing (Jansen *et al* 2007). A task force organised by the AVMA evaluated the peer-reviewed literature on housing for pregnant sows and concluded that stress measures and production performance were similar in gestation stalls and group housing (AVMA 2005).

Research comparing production outcomes in different kinds of group housing and gestation stalls has had mixed findings. In Morris *et al* (1997), gilts reared using the Hurnik-Morris (HM) system (computer-controlled group housing) were compared with regard to production outcomes with gilts in a gestation crate confinement system. The type of housing system did not affect piglet mortality or viability. Morris *et al* (1998) did another study comparing the HM and gestation systems and found that the HM sows had higher average lifetime parity and higher lifetime number of piglets weaned per sow. Lammers *et al* (2007) got results similar to those of Morris *et al* (1998) — no difference in piglet mortality — in comparing deep-bedded hoop barns to gestation stall housing for sows. This study also found that the number of live piglets per litter was significantly higher in the hoop barns (10.0 [± 0.2] pigs) than in gestation stalls (9.3 [± 0.2] pigs).

Research on different welfare measures of sows in gestation stalls versus group-housing systems also gave mixed results. The AVMA task force concluded that rates of sow injury are lower in gestation systems but that aberrant behaviour such as stereotypies was observed less in pen-housed sows. Perhaps the most important conclusion reached by the AVMA task force was that gestation crates and other types of housing each have benefits and drawbacks, but that other factors such as the feeding system, breed of the sow, and environmental conditions interact with the housing system and should be considered as crucial for sow welfare. In the case of US organic production, the research suggests that prohibiting gestation crates in the NOP may logically lead to additional standards on feeding, breed choice and environmental conditions.

Additional areas for health and welfare standards in organic livestock

While there are opportunities to move forward quickly in setting standards for the specific examples given, there are major areas of animal health and welfare for which work in developing standards across all livestock types is necessary. Breeding and reproduction, general health care and disease prevention, feeding, housing, and handling are all broad categories in which international standards and research can guide the establishment of standards that apply to all species. A particular need is to develop standards for transport and slaughter of organic livestock. Many standards reviewed, including those of the NOP, do not cover these areas at all.

The standards that do address transport or slaughter in organic systems often specify that electric prods, tranquilisers, or stimulants may not be used to control the animals, and that stress and bullying must be minimised. Some organic standards do give relevant guidance. For example, SA and BioGro state that animals must be in fit condition to endure transport. IFOAM, KRAV, SA, and

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BioGro require that adequate food and water be provided and that animals be kept in appropriate groups during transport and while being held for slaughter. IFOAM, Codex, KRAV, SA and BioGro require that the length of journey be minimised or kept below a specified limit. As a minimum, similar standards could be incorporated into the NOP.

In addition, non-organic standards and guidance on this issue are limited. AVMA, AMI and NIAA state that provision must be made for non-ambulatory or sick animals but do not specifically address ensuring health and welfare for healthy animals in transit or at the point of slaughter. Transport and slaughter are points in production at which the welfare and health of animals are arguably at the greatest risk of being overlooked. There is scientific literature on welfare and health in transport and slaughter that could provide a basis for the development of organic standards for the US. For these reasons, development of transport and slaughter standards consistent with international standards should be a top priority for the NOP and the organic industry at large.

Animal welfare implications

There were many cases in which stakeholders agreed that more research on animal health and welfare for a particular topic was necessary for standard setting. For example, there was debate on teeth clipping of piglets. The expert group believed that banning teeth clipping would have both welfare benefits (eg avoiding the pain and stress of the procedure) and drawbacks (eg potential for biting herd mates). Yet there was general recognition that this practice is driven in part by other factors such as the animal's future housing, group size, and space allowance. The interrelated problems, complexity, and lack of consensus resulted in a list of detailed research questions that will be presented in a subsequent paper. Answering these questions will be crucial for future standards development and for furthering our understanding of animal welfare, particularly in organic systems.

It is also important to consider that in all four areas we identified as ready for standards development, it was clear that the standard would fit well within the concept of 'naturalness'. Docking tails in dairy cattle is not consistent with integrity or natural behaviour, nor is crating sows during gestation. However, we recognise that there are certainly topics where meeting the test of 'natural' will be much more difficult. For example, environmental causes and flock size can affect the incidence of cannibalism in poultry. It can be argued that cannibalism is 'natural' in that, while infrequent, it can occur in wild fowl under certain environmental conditions (eg high densities) (Elgar & Crespi 1992). Yet, in the context of livestock production, it can also be argued that cannibalism is a sign of poor welfare requiring beak trimming as an intervention. Beak trimming may not be natural, but it can reduce cannibalism in a flock. Thus, in deciding whether beak trimming should be disallowed under the NOP, these different arguments will need to be considered.

Another implication of our findings is that a significant opportunity exists to use the legislative and administrative directives already in place to create new models for livestock production. With detailed standards in place, organic producers will test different approaches for meeting these standards, and in doing so may identify practices that can influence conventional production. For example, rotational grazing was adopted early by organic producers, but became a mainstream practice in part because of its success. In a similar way, organic producers may come up with solutions to health and welfare challenges and thereby lead to new ideas for the husbandry of farm animals beyond the organic system.

We have also shown that rulemaking is an ongoing, dynamic process in which standards for livestock health and welfare can be updated as scientific and stakeholder support emerges. In some cases, as in the four standards highlighted in this paper, sufficient support for rulemaking is available. In other areas, such as the transport and slaughter of organic livestock, further debate and refinement of standards may be necessary. In all cases, it is time to do what is necessary to fulfill the promise of an organic livestock sector that adheres to strong health and welfare standards that embody the best practices and will contribute positively to the welfare of organic farm animals in the US.

Conclusion

This paper has identified four discrete standards to be adopted within the NOP. There are compelling reasons for adopting these specific standards and furthermore to begin aggressive efforts to elaborate organic livestock standards fully. First, standards from prominent organisations, the preponderance of scientific literature, and the stakeholders convened for our project, all support adoption of these four standards without delay. Second, the Congress, in writing the OFPA, and the Administration, upon implementing the NOP, mandated development of additional standards for the livestock sector. Third, other countries and organisations will continue to develop their own organic livestock standards to which the US, in the absence of its own deliberations and standards, will necessarily adhere regardless of whether such standards best meet the needs of US producers. Finally, the organic livestock sector is relatively undeveloped, allowing for flexibility in rulemaking because there is so little capital tied up in current organic livestock infrastructure.

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