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# An HSUS Report: The Welfare of Animals in the Meat, Egg, and Dairy Industries

The Humane Society of the United States

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## An HSUS Report: The Welfare of Animals in the Meat, Egg, and Dairy Industries

### Abstract

Each year in the United States, approximately 11 billion animals are raised and killed for meat, eggs, and milk. These farm animals—sentient, complex, and capable of feeling pain and frustration, joy and excitement—are viewed by industrialized agriculture as commodities and suffer myriad assaults to their physical, mental, and emotional well-being, typically denied the ability to engage in their species-specific behavioral needs. Despite the routine abuses they endure, no federal law protects animals from cruelty on the farm, and the majority of states exempt customary agricultural practices—no matter how abusive—from the scope of their animal cruelty statutes. The treatment of farm animals and the conditions in which they are raised, transported, and slaughtered within industrialized agriculture are incompatible with providing adequate levels of welfare.

### Birds

Of the approximately 11 billion animals killed annually in the United States,<sup>1,2,3,4,5</sup> 86% are birds—98% of land animals in agriculture—and the overwhelming majority are “broiler” chickens raised for meat, approximately 1 million killed each hour.<sup>6</sup> Additionally, approximately 340 million laying hens<sup>7</sup> are raised in the egg industry (280 million birds who produce table eggs and 60 million kept for breeding), and more than 270 million turkeys<sup>8</sup> are slaughtered for meat.

On factory farms, birds raised for meat are confined by the tens of thousands<sup>9,10</sup> in grower houses, which are commonly artificially lit, force-ventilated, and completely barren except for litter material on the floor and long rows of feeders and drinkers. The most significant assault on their welfare is fast growth.<sup>11</sup> The poultry industry has used selective breeding to produce birds whose bodies “are on the verge of structural collapse.”<sup>12</sup> Studies consistently show that approximately 26-30% of broiler chickens suffer from gait defects severe enough to impair walking ability,<sup>13,14,15</sup> and additional research strongly suggests that birds at this level of lameness are in pain.<sup>16,17</sup> On October 14, 1991, *The Guardian* quoted professor John Webster of the University of Bristol School of Veterinary Science who stated, “Broilers are the only livestock that are in chronic pain for the last 20 per cent of their lives. They don’t move around, not because they are overstocked, but because it hurts their joints so much.”<sup>18</sup>

Market weight is reached after 6-7 weeks for broiler chickens,<sup>19</sup> approximately 99 days for turkey hens, and 136 days for tom turkeys.<sup>20</sup> The birds are hastily caught and can suffer dislocated and broken hips, legs, and wings, as well as internal hemorrhages during the process.<sup>21,22,23</sup> The birds are put into crates stacked one atop another on trucks.<sup>24</sup> During their journey to slaughter, they are not given any food or water and are afforded little if any protection from extreme temperatures.<sup>25,26</sup>

Like birds raised for meat, chickens in the egg industry suffer immensely—beginning right after hatching. Male chicks are considered byproducts, as they are unable to lay eggs and are not bred for meat production. Millions each year are gassed, macerated, sucked through a vacuum system, or thrown into garbage bins<sup>27,28,29</sup> where they are left to die from dehydration or asphyxiation. Most female chicks are mutilated without any pain relief.<sup>30,31,32</sup> To help prevent potential outbreaks of feather-pecking and other injurious behavior that can result

from intensive confinement in barren conditions, tips of their sensitive beaks are seared off with a hot blade.<sup>33,34,35,36</sup>

More than 95%<sup>37</sup> of egg-laying hens in U.S. animal agriculture are intensively confined in small, wire “battery cages” stacked several tiers high and extending down long warehouses.<sup>38</sup> Hens are given less space than the area of a letter-sized sheet of paper<sup>39</sup> in which to eat, sleep, lay eggs, and defecate. The intensive confinement makes it impossible for them to engage in nearly all of their natural behavior, including dustbathing, foraging, or nesting, the most significant source of frustration for battery caged hens.<sup>40,41</sup> While many countries are phasing out the abusive battery cage system, U.S. egg producers still overcrowd hens in barren cages so small the birds can’t even spread their wings.<sup>42,43,44</sup>

When their productivity wanes, hens may be “force molted” through low-nutrient feed, until they lose 30-35% of their body weight<sup>45,46</sup>—to induce another laying cycle. After two years when hens may no longer be profitable, the majority are “depopulated,” removed from their cages, a process that can cause broken limbs in nearly one in four hens, and then sent to slaughter or gassed on farm.<sup>47,48,49</sup> As with broiler chickens and other animals, egg-laying hens are given little protection from extreme temperatures during their journey to slaughter.<sup>50</sup>

At the slaughter plant, the birds are uncrated, dumped onto conveyors, and hung upside-down in shackles by their legs. In the United States, birds are typically not rendered unconscious before they are slaughtered, as the U.S. Department of Agriculture (USDA) does not interpret the federal Humane Methods of Slaughter Act to extend to farmed birds.<sup>51</sup>

Shackled and inverted, their heads pass through an electrified water bath before their throats are cut, usually by machine.<sup>52</sup> As slaughter lines run at rapid speeds (up to 8,400 chickens per hour<sup>53</sup>), mistakes can occur and up to 3%<sup>54</sup> of birds may still be conscious as they enter tanks of scalding water intended to loosen their feathers.<sup>55,56,57,58,59,60,61</sup>

Although chickens, turkeys, and eggs are the more common products from farmed birds, *pâté de foie gras* is another food item produced from birds. French for “fatty liver,” foie gras is made from the livers of overfed ducks and geese. Ducks and geese are force-fed via a long tube inserted down their esophagi with an unnatural quantity of food pumped directly into their stomachs.

Force-feeding birds to produce foie gras is detrimental to their welfare, causing the birds’ livers to become diseased.<sup>62</sup> Birds force-fed for foie gras may suffer from a number of significant welfare problems, including frustration of natural behavior,<sup>63</sup> injury,<sup>64</sup> liver disease, lameness,<sup>65</sup> diseases of the respiratory and digestive tracts,<sup>66,67</sup> and higher rates of mortality compared to non force-fed ducks.<sup>68</sup>

The majority of the world’s foie gras is made from duck livers, and approximately 80% is produced in France.<sup>69</sup> In the United States, three facilities produce livers for foie gras,<sup>70,71,72,73</sup> slaughtering in total more than 500,000 ducks annually.<sup>74</sup>

## Pigs

More than 116 million pigs,<sup>75</sup> intelligent and highly social animals,<sup>76,77,78,79</sup> are slaughtered annually in the United States.

In industrial pig production, sows (adult female pigs) are customarily put through consecutive cycles of impregnation, giving birth, and nursing, all while intensively confined. During their four-month pregnancies, approximately 80% of sows<sup>80</sup> are kept in stalls—individual metal “gestation crates” that are 0.6 m (2 ft) wide and 2.1 m (7 ft) long<sup>81</sup>—so small, the animals are unable to turn around. The USDA’s Agricultural Research Service reported in its March 2005 issue of *Agricultural Research*, “Confining pregnant sows in stalls is a major well-being issue. It curtails movement and social interaction and fails to provide dirt or hay to satisfy their

instincts to use their snouts to root for food.”<sup>82</sup> Despite this understanding about the welfare issues arising from confinement in gestation crates, their use is still prevalent throughout much of the U.S. pork industry, although they have been banned in other countries.<sup>83</sup> However, there is a growing concern in the U.S. with confining sows in gestation stalls and many states and companies are phasing out the practice.<sup>84,85,86,87,88,89,90,91,92,93</sup>

Right before giving birth, the sows are moved into equally restrictive “farrowing crates,” stalls designed to separate the mother pig from her nursing piglets, to protect them from crushing, but are so small she can only stand up and lie down.<sup>94</sup> After the piglets are weaned prematurely,<sup>95</sup> the cycle begins again for the mother pig, who averages 2.1-2.5 litters each year.<sup>96</sup> Once they can no longer reproduce efficiently, the sows are sent to slaughter.<sup>97</sup>

Pigs raised for meat undergo mutilations—including castration and tail docking—without any pain relief.<sup>98</sup> For six months, they are confined in pens<sup>99,100</sup> until they reach the average market weight around 122 kg (270 lb).<sup>101</sup> As with birds, the pigs are given little protection from extreme heat or cold while on the trucks transporting them to slaughter.<sup>102</sup>

According to the federal Humane Methods of Slaughter Act, pigs and other animals considered “livestock” are to be “rendered insensible to pain” before they are shackled and killed.<sup>103</sup> However, a January 2004 report by the U.S. General Accounting Office on the USDA’s enforcement of the Act found that some animals are still conscious as they are hung upside down and their throats are being cut.<sup>104</sup>

## Cattle

Every year in the United States, approximately 35 million cattle are raised for beef,<sup>105</sup> 9 million cows for milk,<sup>106</sup> and 450,000 calves for veal.<sup>107</sup>

Most cattle raised for beef are castrated, de-horned, and branded,<sup>108</sup> painful procedures often performed without any anesthesia.<sup>109,110</sup> For seven months, calves graze on the range<sup>111</sup> before they are transported to feedlots,<sup>112,113</sup> where they are fattened on unnatural diets.<sup>114</sup> Within six months, they reach market weight of 544 kg (1,200 lb)<sup>115</sup> and are trucked to slaughter. As with other animals to be killed for food, cattle are not given any food, water, or protection from the elements during the journey.<sup>116</sup>

Cows in the dairy industry endure annual cycles of artificial insemination, mechanized milking for 10 out of 12 months<sup>117</sup> (including 7 months of their 9-month pregnancies), and giving birth. Many are routinely given hormones to increase milk yield.<sup>118</sup> According to John Webster, “[t]he amount of work done by the [dairy] cow in peak lactation is immense. To achieve a comparable high work rate a human would have to jog for about six hours a day, every day.”<sup>119</sup> In the U.S. industry, cows, overwhelmingly Holsteins,<sup>120</sup> produce an average of 729 days of milk,<sup>121</sup> which corresponds to 2.4 lactations, before they are considered “spent” and are sent for slaughter at an average of less than 5 years of age.<sup>122</sup> Cows can naturally live more than 20 years.<sup>123</sup>

A byproduct of the dairy industry is a calf per year per cow. According to a U.S. Department of Agriculture fact sheet, “[m]ale dairy calves are used in the veal industry. Dairy cows must give birth to continue producing milk, but male dairy calves are of little or no value to the dairy farmer.”<sup>124</sup> As a result, within their first few days of life, the calves are taken from their mothers.<sup>125,126</sup> Females will likely join the dairy line, while some males are sold to veal farmers. Indeed, the veal industry would likely not exist without the dairy industry. Calves raised for veal are intensively confined and tethered in individual stalls so small they can’t turn around during their entire 16- to 18-week lives before slaughter.<sup>127,128</sup> Veal crates are widely known for their inherent cruelty. As with conventional battery cages and gestation crates, veal crates are being phased out in Europe,<sup>129,130,131</sup> yet are still in use in the United States, though some states and companies are beginning to phase them out.<sup>132,133,134,135,136</sup>

Cattle suffer the same mistreatment as pigs during both their transport and slaughter. Additionally, typically during or after transport, some cattle can have difficulty getting up from a recumbent position. Nonambulatory cattle—referred to as “downers” by the industry—are animals who collapse for a variety of metabolic,

infectious, toxic, and/or musculoskeletal reasons and are too sick or injured to stand or walk on their own. Data from federally inspected slaughter facilities estimate 1.1-1.5% of U.S. dairy cows go down in a year, but this does not include those who collapse on-farm. A 2007 review of nonambulatory cattle suggests that the number of downed cattle on U.S. farms or feedlots or who are sent to slaughter in any given year may approach 500,000.<sup>137</sup> It has been reported that dairy cows account for approximately 75% of downed cattle.<sup>138</sup>

## Aquatic Animals

A significant animal welfare problem in the U.S. is aquaculture—the factory farming of fish. According to the USDA’s Census of Aquaculture completed in 2005, nearly 1.3 billion fish were raised for human consumption annually, with the industry dominated by catfish, trout, tilapia, bass, and salmon.<sup>139</sup> Aquaculture production systems can cause great suffering for farmed fish.<sup>140</sup>

Since the mid-1980s, the aquaculture industry has expanded approximately 8% per year,<sup>141</sup> and the numbers of farmed fish are expected to continue to increase, perhaps surpassing the numbers of wild-caught animals from the world’s fisheries. Tore Håstein of Norway’s National Veterinary Institute addressed the World Organisation for Animal Health (OIE) Global Conference on Animal Welfare in 2004 and reported that aquaculture has “developed to become the fastest growing food production sector in the world...and it will continue to grow in the years to come.”<sup>142</sup>

With the expansion of the fish farming industry comes growing concern for the well-being of increasing numbers of aquatic animals raised and killed for human consumption.<sup>143</sup> A review of recent scientific literature on fish welfare<sup>144,145,146,147,148,149,150,151,152,153</sup> and stress,<sup>154,155,156,157,158</sup> as well as debates on pain and consciousness in fish,<sup>159,160,161,162,163,164,165,166</sup> reflect the escalating interest in the well-being of farm-raised fish.

The welfare of farmed fish may be most easily observed through their response to stressors.<sup>167</sup> Their environment can affect welfare if water quality is degraded or if stocking densities are inappropriate for the species in question.<sup>168</sup> Additionally, farmed fish are vulnerable to a variety of diseases and parasites which can degrade their health, and susceptibility to these problems increases with stress.<sup>169</sup> Handling fish throughout the many stages of production may introduce more challenges to their well-being.<sup>170</sup> And, as with other species, both transport<sup>171,172,173,174</sup> and slaughter<sup>175,176,177,178,179,180</sup> pose potential problems for farmed fish.

## Productivity and Welfare

Domesticated animals have been selectively bred, over many generations, with an aim toward improving productivity and feed efficiency. Breeders have been highly successful in creating genetic lines of animals who rapidly gain weight, grow to unprecedented sizes, lay greater numbers of eggs, produce higher milk yields, and give birth to larger litters.

The breeding goal of pushing animals toward their biological limit and seeking maximum output with minimum input has been pursued without due regard to animal welfare. According to Donald Broom, Colleen Macleod Professor of Animal Welfare in the Department of Clinical Veterinary Medicine at Cambridge University. “efforts to achieve earlier and faster growth, greater production per individual, efficient feed conversion and partitioning, and increased prolificacy are the causes of some of the worst animal welfare problems.”<sup>181</sup> Indeed, problems and diseases can result as genetic side-effects of selective breeding programs that attempt to improve production efficiency.<sup>182</sup> One of the worst production diseases, in scope and severity, is debilitating leg problems and lameness (the inability to walk normally) for broiler chickens,<sup>183,184,185</sup> turkeys,<sup>186,187</sup> pigs, and dairy cows.<sup>188,189</sup> Intense selection for high milk yield has also led to an increase in the incidence of clinical mastitis.<sup>190,191,192,193</sup> For egg-laying hens, the increase in production has caused osteoporosis-induced loss of structural bone mass<sup>194</sup> so severe that these birds commonly experience bone fractures.<sup>195</sup> Such selective breeding for economically important traits at the expense of overall health is a blight on the animal production industries.

Productivity is often touted as a sign of good welfare. The logic rests on the preposition that animals who are healthy and unstressed are able to channel more of their metabolic resources toward reproduction and growth. While it is true that individuals who are sick or stressed may suffer setbacks in growth or become less likely to reproduce, the tie between productivity and welfare is severed when economic returns on whole herds or flocks are used as the evidence that productivity is high. This is because crowding more animals into smaller spaces can result in more meat or eggs per unit of space (and thus, high productivity), but individual animals' welfare may be severely compromised by increasing stocking density, and may actually result in a slight decline in individual productivity.

Asserted agricultural ethicist Bernard Rollin, University Distinguished Professor, Professor of Philosophy, Professor of Animal Sciences, and Professor of Biomedical Sciences at Colorado State University, "in industrial agriculture, this link between productivity and well-being is severed. When productivity as an economic metric is applied to the whole operation, the welfare of the individual animal is ignored."<sup>196</sup>

## Conclusion

There are no federal laws regulating the treatment of the billions of animals raised for meat, eggs, and milk while they are on the farm, and the federal Humane Methods of Slaughter Act has been interpreted by the USDA as not affording minimal protections to farmed birds or fish, animals who make up the overwhelming majority of those raised for consumption. Many of the conditions and customary industrial agricultural practices endured by farm animals must fundamentally change to enable higher standards of welfare.

For more detailed information on animal agriculture and its impacts,  
please see [www.FarmAnimalWelfare.org](http://www.FarmAnimalWelfare.org).

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<sup>1</sup> U.S. Department of Agriculture National Agricultural Statistics Service. 2009. Milk production, disposition and income: 2008 summary. <http://usda.mannlib.cornell.edu/usda/current/MilkProdDi/MilkProdDi-05-29-2009.pdf>. Accessed July 13, 2009.

<sup>2</sup> U.S. Department of Agriculture National Agricultural Statistics Service: 2009. Chicken and eggs, 2008 summary. <http://usda.mannlib.cornell.edu/usda/current/ChickEgg/ChickEgg-02-26-2009.pdf>. Accessed July 13, 2009.

<sup>3</sup> U.S. Department of Agriculture National Agricultural Statistics Service. 2009. Poultry Slaughter: 2008 Annual Summary. <http://usda.mannlib.cornell.edu/usda/current/PoulSlauSu/PoulSlauSu-02-25-2009.pdf>. Accessed July 13, 2009.

<sup>4</sup> U.S. Department of Agriculture National Agricultural Statistics Service. 2009. Livestock Slaughter: 2008 Summary. <http://usda.mannlib.cornell.edu/usda/current/LiveSlauSu/LiveSlauSu-03-06-2009.pdf>. Accessed July 13, 2009.

<sup>5</sup> U.S. Department of Agriculture. 2005. Census of Aquaculture (2005), Volume 3, Special Studies Part 2, 2002 Census of Agriculture. [www.agcensus.usda.gov/Publications/2002/Aquaculture/AQUACEN.pdf](http://www.agcensus.usda.gov/Publications/2002/Aquaculture/AQUACEN.pdf). Accessed July 13, 2009.

<sup>6</sup> U.S. Department of Agriculture National Agricultural Statistics Service. 2009. Poultry Slaughter: 2008 Annual Summary. <http://usda.mannlib.cornell.edu/usda/current/PoulSlauSu/PoulSlauSu-02-25-2009.pdf>. Accessed July 13, 2009.

<sup>7</sup> U.S. Department of Agriculture National Agricultural Statistics Service. 2009. Chickens and Eggs: 2008 Summary. <http://usda.mannlib.cornell.edu/usda/current/ChickEgg/ChickEgg-02-26-2009.pdf>. Accessed July 13, 2009.

<sup>8</sup> U.S. Department of Agriculture National Agricultural Statistics Service. 2009. Poultry Slaughter: 2008 Annual Summary. <http://usda.mannlib.cornell.edu/usda/current/PoulSlauSu/PoulSlauSu-02-25-2009.pdf>. Accessed July 13, 2009.

- 
- <sup>9</sup> Ernst RA. 1995. University of California Cooperative Extension, Poultry Fact Sheet No. 20, June. [animalscience.ucdavis.edu/Avian/pfs20.htm](http://animalscience.ucdavis.edu/Avian/pfs20.htm). Accessed July 13, 2009.
- <sup>10</sup> Voris JC. 1997. University of California Cooperative Extension, Poultry Fact Sheet No. 16c, September. [animalscience.ucdavis.edu/Avian/pfs16C.htm](http://animalscience.ucdavis.edu/Avian/pfs16C.htm). Accessed July 13, 2009.
- <sup>11</sup> Duncan IJH. 2004. Welfare problems of poultry. In: Benson GJ and Rollin BE (eds.), *The Well-Being of Farm Animals: Challenges and Solutions* (Ames, Iowa: Blackwell, p. 310).
- <sup>12</sup> Wise D and Jennings A. 1972. Dyschondroplasia in domestic poultry. *The Veterinary Record* 91:285-6.
- <sup>13</sup> Knowles TG, Kestin SC, Haslam SM, et al. 2008. Leg disorders in broiler chickens: prevalence, risk factors and prevention. *PLoS ONE* 3(2):e1545. doi:10.1371/journal.pone.0001545.
- <sup>14</sup> Kestin SC, Knowles TG, Tinch AE, and Gregory NG. 1992. Prevalence of leg weakness in broiler chickens and its relationship with genotype. *The Veterinary Record* 131:190-4.
- <sup>15</sup> Sanotra GS, Lund JD, Ersbøll AK, Petersen JS, and Vestergaard KS. 2001. Monitoring leg problems in broilers: a survey of commercial broiler production in Denmark. *World's Poultry Science Journal* 57:55-69.
- <sup>16</sup> Danbury TC, Weeks CA, Chambers JP, Waterman-Pearson AE, and Kestin SC. 2000. Self-selection of the analgesic drug carprofen by lame broiler chickens. *The Veterinary Record* 146:307-11.
- <sup>17</sup> McGeown D, Danbury TC, Waterman-Pearson AE, and Kestin SC. 1999. Effect of carprofen on lameness in broiler chickens. *The Veterinary Record* 144:668-71.
- <sup>18</sup> Erlichman J. 1991. The meat factory: cruel cost of cheap pork and poultry – factory methods have slashed meat prices in the last 30 years. *The Guardian*, October 14.
- <sup>19</sup> Scanes CG, Brant G, and Ensminger ME. 2004. *Poultry Science*, 4<sup>th</sup> Edition (Upper Saddle River, NJ: Pearson Prentice Hall, p. 260).
- <sup>20</sup> Ferket. 2002. Turkey growth statistics: growing bigger, faster. *WATT Poultry USA*, February, pp 40-9.
- <sup>21</sup> Gregory NG and Wilkins LJ. 1992. Skeletal damage and bone defects during catching and processing. In: Whitehead CC (ed.), *Bone Biology and Skeletal Disorders in Poultry* (Abingdon, England: Carfax Publishing).
- <sup>22</sup> Gregory NG. 1998. *Animal Welfare and Meat Science* (Wallingford, England: CABI Publishing, pp. 183-94).
- <sup>23</sup> Gregory NG and Austin SD. 1992. Causes of trauma in broilers arriving dead at poultry processing plants. *The Veterinary Record* 131(22):501-3.
- <sup>24</sup> Duncan IJH. 2004. Welfare problems of poultry. In: Benson GJ and Rollin BE (eds.), *The Well-Being of Farm Animals* (Ames, Iowa: Blackwell, pp. 307-23).
- <sup>25</sup> Weeks C and Nicol C. 2000. Poultry handling and transport. In: Grandin T (ed.), *Livestock Handling and Transport* (Wallingford, England: CABI Publishing, pp. 363-84).
- <sup>26</sup> Engebretson M. 2008. North America. In: Appleby MC, Cussen V, Garcés L, Lamber LA, and Turner J (eds.), *Long Distance Transport and Welfare of Farm Animals* (Cambridge, MA: CABI, pp. 218-260).
- <sup>27</sup> MacArthur M. 2002. Analyst says poultry growers oblivious to poor conditions. *Western Producer*, Dec. 12.
- <sup>28</sup> Fraser D, Mench J, and Millman S. 2001. Farm animals and their welfare in 2000. In: Salem DJ and Rowan AN (eds.), *State of the Animals 2001* (Washington, D.C.: Humane Society Press, p. 89).
- <sup>29</sup> Metheringham J. 2000. Disposal of day-old chicks—the way forward. *World Poultry* 16(11):25-6.
- <sup>30</sup> Duncan IJH. 2001. Animal welfare issues in the poultry industry: is there a lesson to be learned? *Journal of Applied Animal Welfare Science* 4(3):207-21.
- <sup>31</sup> Mench J. 1992. The welfare of poultry in modern production systems. *Poultry Science Review* 4:112.
- <sup>32</sup> Duncan IJH. 2004. Welfare problems of poultry. In: Benson GJ and Rollin BE (eds.), *The Well-Being of Farm Animals* (Ames, Iowa: Blackwell, pp. 307-23).
- <sup>33</sup> Mench J. 1992. The welfare of poultry in modern production systems. *Poultry Science Review* 4:112.
- <sup>34</sup> Lee HY and Craig JV. 1990. Beak-trimming effects on the behavior and weight gain of floor-reared, egg-strain pullets from three genetic stocks during the rearing period. *Poultry Science* 69:568-75.
- <sup>35</sup> Kuo FL and Craig JV. 1991. Selection and beak-trimming effects on behavior, cannibalism, and short-term production traits in white leghorn pullets. *Poultry Science* 70:1057-68.
- <sup>36</sup> Duncan IJH, Slee GS, Seawright E, and Breward J. 1989. Behavioural consequences of partial beak amputation (beak trimming) in poultry. *British Poultry Science* 30:479-88.
- <sup>37</sup> United Egg Producers. 2009. Housing, space, feed and water. <http://www.uepcertified.com/program/guidelines/categories/housing-space-feed-water>. Accessed July 13, 2009.

- 
- <sup>38</sup> Fraser D, Mench J, and Millman S. 2001. Farm animals and their welfare in 2000. In: Salem DJ and Rowan AN (eds.), *State of the Animals 2001* (Washington, D.C.: Humane Society Press, pp. 87-99).
- <sup>39</sup> United Egg Producers. 2008. *United Egg Producers Animal Husbandry Guidelines for U.S. Egg Laying Flocks, 2008 Edition* (Alpharetta, Ga.: United Egg Producers, p. 11). [www.uepcertified.com/media/pdf/UEP-Animal-Welfare-Guidelines.pdf](http://www.uepcertified.com/media/pdf/UEP-Animal-Welfare-Guidelines.pdf). Accessed July 13, 2009.
- <sup>40</sup> Duncan IJH. 2001. The pros and cons of cages. *World's Poultry Science Journal* 57:385.
- <sup>41</sup> Duncan IJH. 2004. Welfare problems of poultry. In: Benson GJ and Rollin BE (eds.), *The Well-Being of Farm Animals* (Ames, Iowa: Blackwell, pp. 307-23).
- <sup>42</sup> Stamp Dawkins MS and Hardie S. 1989. Space needs of laying hens. *British Poultry Science* 30:413-6.
- <sup>43</sup> Mench JA and Swanson JC. 2000. Developing science-based animal welfare guidelines. [animalscience.ucdavis.edu/Avian/mench.pdf](http://animalscience.ucdavis.edu/Avian/mench.pdf). Accessed July 13, 2009.
- <sup>44</sup> United Egg Producers. 2008. *United Egg Producers animal husbandry guidelines for U.S. egg laying flocks, 2008 Edition*. [www.uepcertified.com/media/pdf/UEP-Animal-Welfare-Guidelines.pdf](http://www.uepcertified.com/media/pdf/UEP-Animal-Welfare-Guidelines.pdf). Accessed July 13, 2009.
- <sup>45</sup> Fraser D, Mench J, and Millman S. 2001. Farm animals and their welfare in 2000. In: Salem DJ and Rowan AN (eds.), *State of the Animals 2001* (Washington, D.C.: Humane Society Press, p. 94).
- <sup>46</sup> Duncan IJH. 2001. Animal welfare issues in the poultry industry: is there a lesson to be learned? *Journal of Applied Animal Welfare Science* 4(3):207-21.
- <sup>47</sup> Duncan IJH. 2001. Animal welfare issues in the poultry industry: is there a lesson to be learned? *Journal of Applied Animal Welfare Science* 4(3):207-21.
- <sup>48</sup> Gregory NG and Wilkins LJ. 1989. Broken bones in domestic fowl: handling and processing damage in end-of-lay battery hens. *British Poultry Science* 30:555-62
- <sup>49</sup> Troller S. 2007. From eggs to landfills: live chickens at the dump? *The Capital Times*, August 7.
- <sup>50</sup> Weeks CA and Nicol C. 2000. Poultry handling and transport. In: Grandin T (ed.), *Livestock Handling and Transport* (Wallingford, England: CABI Publishing, pp. 363-84).
- <sup>51</sup> Wolfson DJ. 1999. Beyond the Law: Agribusiness and the Systemic Abuse of Animals Raised for Food or Food Production (Farm Sanctuary, Inc., p. 14).
- <sup>52</sup> Bilgili SF. 1999. Recent advances in electrical stunning. *Poultry Science* 78(2):282-6.
- <sup>53</sup> Bilgili SF. 1999. Recent advances in electrical stunning. *Poultry Science* 78(2):282-6.
- <sup>54</sup> Shane S. 2005. Future of gas stunning. *WATT Poultry USA* 6(4):16-23.
- <sup>55</sup> Higgins KT. 2002. Tools of the new trade. *Food Engineering* 4(1):46.
- <sup>56</sup> Boyd F. 1994. Humane slaughter of poultry: the case against the use of electrical stunning devices. *Journal of Agricultural and Environmental Ethics* 7(2):221-36.
- <sup>57</sup> Gregory NG. 1986. The physiology of electrical stunning and slaughter. In: *Humane Slaughter of Animals for Food Symposium* (Hertfordshire, U.K.: Universities Federation for Animal Welfare, pp. 3-14).
- <sup>58</sup> Raj ABM. 2004. Stunning and slaughter of poultry. In: Mead GC (ed.), *Poultry Meat Processing and Quality* (Cambridge, U.K.: Woodhead Publishing Ltd.).
- <sup>59</sup> Heath GBS, Watt DJ, Waite PR, and Ormond JM. 1981. Observations on poultry slaughter. *The Veterinary Record* 108(5):97-9.
- <sup>60</sup> Heath GBS, Watt DJ, Waite PR, and Meakins PA. 1983. Further observations on the slaughter of poultry. *British Veterinary Journal* 139(4):285-90.
- <sup>61</sup> Bolder NM. 1998. The microbiology of the slaughter and processing of poultry. In: Davies A and Board RG. (eds.), *The Microbiology of Meat and Poultry* (London U.K.: Blackie Academic and Professional, p. 163).
- <sup>62</sup> Scientific Committee on Animal Health and Animal Welfare (SCAHAW). 1998. Welfare aspects of the production of foie gras in ducks and geese. [http://ec.europa.eu/food/animal/welfare/international/out17\\_en.pdf](http://ec.europa.eu/food/animal/welfare/international/out17_en.pdf). Accessed July 13, 2009.
- <sup>63</sup> Scientific Committee on Animal Health and Animal Welfare (SCAHAW). 1998. Welfare aspects of the production of foie gras in ducks and geese. [http://ec.europa.eu/food/animal/welfare/international/out17\\_en.pdf](http://ec.europa.eu/food/animal/welfare/international/out17_en.pdf). Accessed July 13, 2009.
- <sup>64</sup> Beck Y. 1994. Force-feeding of palmipeds and foie gras production: the global review of a choice made by society. *Licence Interfacultaire en Environnement, Faculty of Sciences, Free University of Brussels*, pp. 39-40. Stroud A, trans.



- 
- <sup>65</sup> Scientific Committee on Animal Health and Animal Welfare (SCAHAW). 1998. Welfare aspects of the production of foie gras in ducks and geese. [http://ec.europa.eu/food/animal/welfare/international/out17\\_en.pdf](http://ec.europa.eu/food/animal/welfare/international/out17_en.pdf). Accessed July 13, 2009.
- <sup>66</sup> Villate D. 1989. Manuel pratique des maladies des palmipèdes [Practical Manual of Diseases in Palmipeds]. Nouvelles Editions de Publications Agricoles.
- <sup>67</sup> Food and Agriculture Organization of the United Nations. 2002. Goose diseases. In: Buckland R and Guy G (eds.), Goose Production. FAO Animal Production and Health Paper 154 (Rome, Italy: FAO). [www.fao.org/docrep/005/Y4359E/y4359e00.HTM](http://www.fao.org/docrep/005/Y4359E/y4359e00.HTM). Accessed July 13, 2009.
- <sup>68</sup> Scientific Committee on Animal Health and Animal Welfare (SCAHAW). 1998. Welfare aspects of the production of foie gras in ducks and geese. [http://ec.europa.eu/food/animal/welfare/international/out17\\_en.pdf](http://ec.europa.eu/food/animal/welfare/international/out17_en.pdf). Accessed July 13, 2009.
- <sup>69</sup> Guémené D and Guy G. 2004. The past, present and future of forcefeeding and “foie gras” production. *World’s Poultry Science Journal* 60:210-22.
- <sup>70</sup> Sonoma Foie Gras. 2008. About us. [www.artisanfoiegras.com/about/](http://www.artisanfoiegras.com/about/). Accessed July 13, 2009.
- <sup>71</sup> Hudson Valley Foie Gras. [www.hudsonvalleyfoiegras.com/about/vfg.html](http://www.hudsonvalleyfoiegras.com/about/vfg.html). Accessed July 13, 2009.
- <sup>72</sup> Bella Bella Gourmet Foods. 2007. LaBelle Farm. [www.bellabellagourmet.com](http://www.bellabellagourmet.com). Accessed July 13, 2009.
- <sup>73</sup> D’Artagnan. 2009. What is foie gras, really? <http://www.dartagnan.com/foiegras.asp>. Accessed July 13, 2009.
- <sup>74</sup> Letter dated March 23, 2006, from C. A. Gargano, Hudson Valley Foie Gras, to Public Authorities Control Board.
- <sup>75</sup> U.S. Department of Agriculture National Agricultural Statistics Service. 2009. Livestock Slaughter: 2008 Summary. <http://usda.mannlib.cornell.edu/usda/current/LiveSlauSu/LiveSlauSu-03-06-2009.pdf>. Accessed July 13, 2009.
- <sup>76</sup> Dawkins MS. 1998. *Through Our Eyes Only? The Search for Consciousness* (Oxford, U.K.: Oxford University Press, pp. 156-7).
- <sup>77</sup> Špinko M, Duncan IJH, and Widowski TM. 1998. Do domestic pigs prefer short-term to medium-term confinement? *Applied Animal Behaviour Science* 58:221-32.
- <sup>78</sup> Wright D. 2005. Was your meat smarter than your pet? Research suggests farm animals are surprisingly intelligent. ABC News, May 22.
- <sup>79</sup> Signoret JP, Baldwin BA, Fraser D, and Hafez ESE. 1975. The behaviour of swine. In: Hafez ESE (ed.), *The Behaviour of Domestic Animals*, 3rd Edition (London, U.K.: Baillibre Tindall, p. 300).
- <sup>80</sup> U.S. Department of Agriculture. 2007. Swine 2006, Part I: Reference of swine health and management practices in the United States. USDA:APHIS:VS, CEAH. Fort Collins, CO, #N475.1007. [http://nahms.aphis.usda.gov/swine/swine2006/Swine2006\\_PartI.pdf](http://nahms.aphis.usda.gov/swine/swine2006/Swine2006_PartI.pdf). Accessed July 13, 2009.
- <sup>81</sup> McGlone J. 2003. The crate. In: Reynells R (ed.), *Proceedings: Symposium on Swine Housing and Well-being* (Des Moines, IA: USDA Agricultural Research Service, p. 35). [www.ces.purdue.edu/pork/sowhousing/swine\\_02.pdf](http://www.ces.purdue.edu/pork/sowhousing/swine_02.pdf). Accessed July 13, 2009.
- <sup>82</sup> Comis D. 2005. Settling doubts about livestock stress. *Agricultural Research* 53(3):4-7. [www.ars.usda.gov/is/AR/archive/mar05/stress0305.htm](http://www.ars.usda.gov/is/AR/archive/mar05/stress0305.htm). Accessed July 13, 2009.
- <sup>83</sup> Commission of the European Communities. 2001. Council Directive 2001/88/EC of 23 October 2001 amending Directive 91/630/EEC laying down minimum standards for the protection of pigs. *Official Journal of the European Communities* L316:1-4.
- <sup>84</sup> The Florida Constitution. 2002. Limiting cruel and inhumane confinement of pigs during pregnancy. Article X. Section 21. [www.leg.state.fl.us/Statutes/index.cfm?Mode=Constitution&Submenu=3&Tab=statutes#A10S21](http://www.leg.state.fl.us/Statutes/index.cfm?Mode=Constitution&Submenu=3&Tab=statutes#A10S21). Accessed July 13, 2009.
- <sup>85</sup> Arizona Revised Statutes. 2006. Cruel and inhumane confinement of a pig during pregnancy or of a calf raised for veal. Title 13. Chapter 29. [www.azleg.gov/FormatDocument.asp?inDoc=/ars/13/02910-07.htm&Title=13&DocType=ARS](http://www.azleg.gov/FormatDocument.asp?inDoc=/ars/13/02910-07.htm&Title=13&DocType=ARS). Accessed July 13, 2009.
- <sup>86</sup> 74th Oregon Legislative Assembly. 2007. Relating to confinement of animals. Senate Bill 694. <http://landru.leg.state.or.us/07reg/measures/sb0600.dir/sb0694.en.html>. Accessed July 13, 2009.
- <sup>87</sup> Office of Gov. Bill Ritter, Jr. 2008. Gov. Ritter signs agriculture bills into law. Press release issued May 14. [www.colorado.gov/cs/Satellite/GovRitter/GOVR/1210756531933](http://www.colorado.gov/cs/Satellite/GovRitter/GOVR/1210756531933). Accessed July 13, 2009.

- 
- <sup>88</sup> Smithfield Foods. 2007. Smithfield Foods makes landmark decision regarding animal management. Press release issued January 25. [www.prnewswire.com/cgi-bin/stories.pl?ACCT=104&STORY=/www/story/01-25-2007/0004512926&EDATE](http://www.prnewswire.com/cgi-bin/stories.pl?ACCT=104&STORY=/www/story/01-25-2007/0004512926&EDATE). Accessed July 13, 2009.
- <sup>89</sup> Colorado Livestock Association. 2007. Colorado pork producers announce new animal management procedures. Press release issued December 20. [www.coloradolivestock.org/controller/home/alerts.html?inet=aD11YnpyLW55cmVnZi15YXgmcmg9dWJ6ci15YXgmcnBsdWdpbi1hY3Rpb249ZGVmYXVsdCZwbHVnaW4tYWVN0aW9uPXJlYWQmY3BsdWdpbj1wbmkxJnJlY2lkPTE5NjI](http://www.coloradolivestock.org/controller/home/alerts.html?inet=aD11YnpyLW55cmVnZi15YXgmcmg9dWJ6ci15YXgmcnBsdWdpbi1hY3Rpb249ZGVmYXVsdCZwbHVnaW4tYWVN0aW9uPXJlYWQmY3BsdWdpbj1wbmkxJnJlY2lkPTE5NjI). Accessed July 13, 2009.
- <sup>90</sup> The Wolfgang Puck Companies. 2007. Chef Wolfgang Puck takes eating well to new level benefiting farm animals and customers. Press release issued March 22. [www.straussfreeraised.com/strauss\\_broadcast/wp\\_032207.pdf](http://www.straussfreeraised.com/strauss_broadcast/wp_032207.pdf). Accessed July 13, 2009.
- <sup>91</sup> Martin A. 2007. Burger King shifts policy on animals. The New York Times, March 28. [www.nytimes.com/2007/03/28/business/28burger.html?ei=5124&en=7104231631119310&ex=1332734400&pagewanted=print](http://www.nytimes.com/2007/03/28/business/28burger.html?ei=5124&en=7104231631119310&ex=1332734400&pagewanted=print). Accessed July 13, 2009.
- <sup>92</sup> California Health and Safety Code, Division 20, Chapter 13.8, Farm Animal Cruelty, Section 25990-25994. [www.leginfo.ca.gov/cgi-bin/displaycode?section=hsc&group=25001-26000&file=25990-25994](http://www.leginfo.ca.gov/cgi-bin/displaycode?section=hsc&group=25001-26000&file=25990-25994). Accessed July 13, 2009.
- <sup>93</sup> Maine Public Law. 2009. Chapter 127, An act to prohibit cruel confinement of calves raised for veal and sows during gestation. [www.mainelegislature.org/legis/bills/bills\\_124th/chapters/PUBLIC127.asp](http://www.mainelegislature.org/legis/bills/bills_124th/chapters/PUBLIC127.asp). Accessed July 13, 2009.
- <sup>94</sup> Fraser D, Mench J, and Millman S. 2001. Farm animals and their welfare in 2000. In: Salem DJ and Rowan AN (eds.), State of the Animals 2001 (Washington, D.C.: Humane Society Press, p. 87-99).
- <sup>95</sup> Rollin BE. 1995. Farm Animal Welfare: Social, Bioethical, and Research Issues (Ames, Iowa: Iowa State Press, p. 95).
- <sup>96</sup> See MT. 2006. Obtaining optimal reproductive efficiency. North Carolina State Cooperative Extension Service, Swine News 29(1):1-4. [mark.asci.ncsu.edu/Swine\\_News/2006/February/February06.pdf](http://mark.asci.ncsu.edu/Swine_News/2006/February/February06.pdf). Accessed July 13, 2009.
- <sup>97</sup> See MT. 2006. Obtaining optimal reproductive efficiency. North Carolina State Cooperative Extension Service, Swine News 29(1):1-4. [mark.asci.ncsu.edu/Swine\\_News/2006/February/February06.pdf](http://mark.asci.ncsu.edu/Swine_News/2006/February/February06.pdf). Accessed July 13, 2009.
- <sup>98</sup> Blackwell TE. 2004. Production practices and well-being: swine. In: Benson GJ and Rollin BE (eds.), The Well-Being of Farm Animals (Oxford, UK: Blackwell Publishing Ltd., pp. 241-69).
- <sup>99</sup> Blackwell TE. 2004. Production practices and well-being: swine. In: Benson GJ and Rollin BE (eds.), The Well-Being of Farm Animals (Oxford, UK: Blackwell Publishing Ltd., pp. 241-69).
- <sup>100</sup> McGlone J and Pond W. 2003. Pig Production: Biological Principles and Applications (Clifton Park, NY: Thompson Delmar Learning, p. 20).
- <sup>101</sup> U.S. Department of Agriculture National Agricultural Statistics Service. 2009. Livestock slaughter: 2008 summary. <http://usda.mannlib.cornell.edu/usda/current/LiveSlauSu/LiveSlauSu-03-06-2009.pdf>. Accessed July 13, 2009.
- <sup>102</sup> Engebretson M. 2008. North America. In: Appleby MC, Cussen V, Garcés L, Lamber LA, and Turner J (eds.), Long Distance Transport and Welfare of Farm Animals (Cambridge, MA: CAB International, pp. 218-260).
- <sup>103</sup> Humane Methods of Livestock Slaughter, 7 U.S.C.A. § 1902(a). Humane Methods. [www.animallaw.info/statutes/stusfd7usca1901.htm](http://www.animallaw.info/statutes/stusfd7usca1901.htm). Accessed July 13, 2009.
- <sup>104</sup> U.S. General Accounting Office. 2004. Humane Methods of Slaughter Act: USDA Has Addressed Some Problems But Still Faces Enforcement Challenges, GAO-04-247. Released January 30. [www.gao.gov/atext/d04247.txt](http://www.gao.gov/atext/d04247.txt). Accessed July 13, 2009.
- <sup>105</sup> U.S. Department of Agriculture National Agricultural Statistics Service. Beef Cows: Inventory on January 1 by Year, U.S.: 1928 to 2009. [www.nass.usda.gov/Charts\\_and\\_Maps/Cattle/bcow.asp](http://www.nass.usda.gov/Charts_and_Maps/Cattle/bcow.asp). Accessed July 13, 2009.
- <sup>106</sup> U.S. Department of Agriculture National Agricultural Statistics Service. Milk Cows: Inventory by Year, U.S.: 1998 to 2007. [www.nass.usda.gov/Charts\\_and\\_Maps/Milk\\_Production\\_and\\_Milk\\_Cows/milkcows.asp](http://www.nass.usda.gov/Charts_and_Maps/Milk_Production_and_Milk_Cows/milkcows.asp). Accessed July 13, 2009.
- <sup>107</sup> Keefe LM. 2008. The best of both worlds. Meatingplace, September, pp. 51-8.

- 
- <sup>108</sup> Goodrich R and Stricklin WR. 2004. South Dakota State University College of Agriculture and Biological Sciences Department of Animal and Range Sciences Extension & Research. Beef. Last updated October 19, 2004. [ars.sdstate.edu/animaliss/beef.html](http://ars.sdstate.edu/animaliss/beef.html). Accessed July 13, 2009.
- <sup>109</sup> Rollin BE. 1995. Farm Animal Welfare: Social, Bioethical, and Research Issues (Ames, IA: Iowa State Press, p. 64).
- <sup>110</sup> Friend TH. 1990. Teaching animal welfare in the land grant universities. *Journal of Animal Science* 68(10):3462-7.
- <sup>111</sup> Rollin BE. 1995. Farm Animal Welfare: Social, Bioethical, and Research Issues (Ames, IA: Iowa State Press, pp. 65-8).
- <sup>112</sup> Lawrence J, Shouse S, Edwards W, Loy D, Lally J, and Martin RE. 2000. Beef feedlot systems manual. [extension.iastate.edu/Publications/PM1867.pdf](http://extension.iastate.edu/Publications/PM1867.pdf). Accessed July 13, 2009.
- <sup>113</sup> Goodrich R and Stricklin WR. 2004. South Dakota State University College of Agriculture and Biological Sciences Department of Animal and Range Sciences Extension & Research. Beef. Last updated October 19, 2004. [ars.sdstate.edu/animaliss/beef.html](http://ars.sdstate.edu/animaliss/beef.html). Accessed July 13, 2009.
- <sup>114</sup> SCAHAW. 2001. The welfare of cattle kept for beef production. [http://ec.europa.eu/food/fs/sc/scah/out54\\_en.pdf](http://ec.europa.eu/food/fs/sc/scah/out54_en.pdf). Accessed July 13, 2009.
- <sup>115</sup> Goodrich R and Stricklin WR. 2004. South Dakota State University College of Agriculture and Biological Sciences Department of Animal and Range Sciences Extension & Research. Beef. Last updated October 19, 2004. [ars.sdstate.edu/animaliss/beef.html](http://ars.sdstate.edu/animaliss/beef.html). Accessed July 13, 2009.
- <sup>116</sup> Engebretson M. 2008. North America. In: Appleby MC, Cussen V, Garcés L, Lamber LA, and Turner J (eds.), *Long Distance Transport and Welfare of Farm Animals* (Cambridge, MA: CABI, pp. 218-260).
- <sup>117</sup> U.S. Department of Agriculture, Animal and Plant Health Inspection Service. 1996. Dairy, 1996 NAHMS Study, pp. 15-6. <http://www.aphis.usda.gov/vs/ceah/ncahs/nahms/dairy/>. Accessed July 13, 2009.
- <sup>118</sup> Losinger WC. 2006. Welfare effects of the use of recombinant bovine somatotropin in the USA. *Journal of Dairy Research* 73(2):134-45.
- <sup>119</sup> Webster J. 1986. Health and welfare of animals in modern husbandry systems—dairy cattle. *In Practice* May 8(3):85-9.
- <sup>120</sup> U.S. Department of Agriculture. 2007 Dairy 2007. Part I: Reference of dairy cattle health and management practices in the United States, 2007. [http://nahms.aphis.usda.gov/dairy/dairy07/Dairy2007\\_Part\\_I.pdf](http://nahms.aphis.usda.gov/dairy/dairy07/Dairy2007_Part_I.pdf). Accessed July 13, 2009.
- <sup>121</sup> Tsuruta S, Misztal I, and Lawlor TJ, 2005. Changing definition of productive life in US Holsteins: effect on genetic correlations. *Journal of Dairy Science* 88(3):1156-65.
- <sup>122</sup> Tsuruta S, Misztal I, and Lawlor TJ, 2005. Changing definition of productive life in US Holsteins: effect on genetic correlations. *Journal of Dairy Science* 88(3):1156-65.
- <sup>123</sup> Dewey T and Ng J. 2001. *Bos taurus*. Animal Diversity Web. [http://animaldiversity.ummz.umich.edu/site/accounts/information/Bos\\_taurus.html](http://animaldiversity.ummz.umich.edu/site/accounts/information/Bos_taurus.html). Accessed July 13, 2009.
- <sup>124</sup> U.S. Department of Agriculture Food Safety and Inspection Service Consumer Education and Information. 2005. Safety of Veal...from Farm to Table. Last updated May 2005. [www.fsis.usda.gov/Fact\\_Sheets/Veal\\_from\\_Farm\\_to\\_Table/index.asp](http://www.fsis.usda.gov/Fact_Sheets/Veal_from_Farm_to_Table/index.asp). Accessed July 13, 2009.
- <sup>125</sup> U.S. Department of Agriculture, Animal and Plant Health Inspection Service. 1996. Dairy, 1996 NAHMS Study, pp. 15-6. [www.aphis.usda.gov/vs/ceah/ncahs/nahms/dairy/](http://www.aphis.usda.gov/vs/ceah/ncahs/nahms/dairy/). Accessed July 13, 2009.
- <sup>126</sup> U.S. Department of Agriculture Food Safety and Inspection Service. 2005. Veal from Farm to Table. Last updated October 17, 2006. [www.fsis.usda.gov/Fact\\_Sheets/Veal\\_from\\_Farm\\_to\\_Table/index.asp](http://www.fsis.usda.gov/Fact_Sheets/Veal_from_Farm_to_Table/index.asp). Accessed July 13, 2009.
- <sup>127</sup> U.S. Department of Agriculture Food Safety and Inspection Service 2005. Veal from Farm to Table. Last updated October 17, 2006. [www.fsis.usda.gov/Fact\\_Sheets/Veal\\_from\\_Farm\\_to\\_Table/index.asp](http://www.fsis.usda.gov/Fact_Sheets/Veal_from_Farm_to_Table/index.asp). Accessed July 13, 2009.
- <sup>128</sup> Wilson LL, Stull CL, and Terosky TL. 1995. Veal perspectives to the year 2000: scientific advancements and legislation addressing veal calves in North America. Proceedings of the International Symposium in Le Mans, France, September 12-13. [http://www.vetmed.ucdavis.edu/vetext/INF-AN/INF-AN\\_VEAL95FRANCE.HTML](http://www.vetmed.ucdavis.edu/vetext/INF-AN/INF-AN_VEAL95FRANCE.HTML). Accessed July 13, 2009.

- 
- <sup>129</sup> House of Commons. 2004. Hansard. Written answers for 5 May 2004 (pt 4). [www.publications.parliament.uk/pa/cm200304/cmhansrd/vo040505/text/40505w04.htm](http://www.publications.parliament.uk/pa/cm200304/cmhansrd/vo040505/text/40505w04.htm). Accessed July 13, 2009.
- <sup>130</sup> Council of Europe. 1997. Council Directive 97/2/EC of 20 January 1997 amending Directive 91/629/EEC laying down minimum standards for the protection of calves. [http://ec.europa.eu/food/fs/aw/aw\\_legislation/calves/97-2-ec\\_en.pdf](http://ec.europa.eu/food/fs/aw/aw_legislation/calves/97-2-ec_en.pdf). Accessed July 13, 2009.
- <sup>131</sup> European Commission. 1997. Commission Decision of 24 February 1997 amending the Annex to Directive 91/629/EEC laying down minimum standards for the protection of calves (Text with EEA relevance) (97/182/EC). [http://ec.europa.eu/food/fs/aw/aw\\_legislation/calves/97-182-ec\\_en.pdf](http://ec.europa.eu/food/fs/aw/aw_legislation/calves/97-182-ec_en.pdf). Accessed July 13, 2009.
- <sup>132</sup> Arizona Secretary of State's Office. 2006. Ballot Proposition Guide. Official Proposition 204 language. [www.azsos.gov/election/2006/Info/PubPamphlet/Sun\\_Sounds/english/Prop204.htm](http://www.azsos.gov/election/2006/Info/PubPamphlet/Sun_Sounds/english/Prop204.htm). Accessed July 13, 2009.
- <sup>133</sup> Office of Gov. Bill Ritter, Jr. 2008. Gov. Ritter signs agriculture bills into law. Press release issued May 14. [www.colorado.gov/cs/Satellite/GovRitter/GOVR/1210756531933](http://www.colorado.gov/cs/Satellite/GovRitter/GOVR/1210756531933). Accessed July 13, 2009.
- <sup>134</sup> Salvage B. 2006. Revolutionizing the veal industry. *Meat Processing*, December, pp. 14-21
- <sup>135</sup> The Humane Society of the United States. 2007. Strauss Veal and Marcho Farms eliminating confinement by crate. [www.hsus.org/farm/news/ournews/strauss\\_and\\_marcho\\_veal\\_crates.html](http://www.hsus.org/farm/news/ournews/strauss_and_marcho_veal_crates.html). Accessed July 13, 2009.
- <sup>136</sup> Smith R. 2007. Veal group housing approved. *Feedstuffs*, August 6, p. 3.
- <sup>137</sup> Stull CL, Payne MA, Berry SL, and Reynolds JP. 2007. A review of the causes, prevention, and welfare of nonambulatory cattle. *Journal of the American Veterinary Medical Association* 231(2):227-34.
- <sup>138</sup> Grandin T. 1994. Farm animal welfare during handling, transport, and slaughter. *Journal of the American Veterinary Medical Association* 204(3):372-7, citing: McNaughton MT. 1993. Not for sale, mobile slaughterers: the meat industry's grey trade. *Meat and Poultry*, September, pp. 28-44.
- <sup>139</sup> U.S. Department of Agriculture. 2005. Census of Aquaculture (2005), Volume 3, Special Studies Part 2, 2002 Census of Agriculture. [www.agcensus.usda.gov/Publications/2002/Aquaculture/AQUACEN.pdf](http://www.agcensus.usda.gov/Publications/2002/Aquaculture/AQUACEN.pdf). Accessed July 13, 2009.
- <sup>140</sup> Hastein T. 2004. Animal welfare issues relating to aquaculture. Proceedings of the Global Conference on Animal Welfare: An OIE Initiative. World Organisation for Animal Health. Paris, France, February 23-25, pp. 212-20.
- <sup>141</sup> Food and Agriculture Organization of the United Nations. 2006. Nearly half of all fish eaten today farmed, not caught. FAONewsroom, September 14. [www.fao.org/newsroom/en/news/2006/1000383/index.html](http://www.fao.org/newsroom/en/news/2006/1000383/index.html). Accessed July 13, 2009.
- <sup>142</sup> Hastein T. 2004. Animal welfare issues relating to aquaculture. Proceedings of the Global Conference on Animal Welfare: An OIE Initiative. World Organisation for Animal Health. Paris, France, February 23-25, pp. 212-20.
- <sup>143</sup> Hastein T. 2004. Animal welfare issues relating to aquaculture. Proceedings of the Global Conference on Animal Welfare: An OIE Initiative. World Organisation for Animal Health. Paris, France, February 23-25, pp. 212-20.
- <sup>144</sup> Hastein T. 2004. Animal welfare issues relating to aquaculture. Proceedings of the Global Conference on Animal Welfare: An OIE Initiative. World Organisation for Animal Health. Paris, France, February 23-25, pp. 212-20.
- <sup>145</sup> Fisheries Society of the British Isles. 2002. Briefing Paper 2. Fish Welfare. Fisheries Society of the British Isles, Granta Information Systems. [www.nal.usda.gov/awic/pubs/Fishwelfare/FSBI.pdf](http://www.nal.usda.gov/awic/pubs/Fishwelfare/FSBI.pdf). Accessed July 13, 2009.
- <sup>146</sup> Huntingford FA, Adams C, Braithwaite VA, et al. 2006. Current issues in fish welfare. *Journal of Fish Biology* 68(2):332-72.
- <sup>147</sup> Conte FS. 2004. Stress and the welfare of cultured fish. *Applied Animal Behaviour Science* 86(3-4):205-23.
- <sup>148</sup> Lymbery P. 2002. In too deep: the welfare of intensively farmed fish (U.K.: Compassion in World Farming Trust). [www.ciwf.org.uk/includes/documents/cm\\_docs/2008/i/in\\_too\\_deep\\_2001.pdf](http://www.ciwf.org.uk/includes/documents/cm_docs/2008/i/in_too_deep_2001.pdf). Accessed July 13, 2009.
- <sup>149</sup> Schwedler TE and Johnson SK. 1999-2000. Animal welfare issues: responsible care and health maintenance of fish in commercial aquaculture. U.S. Department of Agriculture, Animal Welfare Information Center Bulletin 10(3-4). [www.nal.usda.gov/awic/newsletters/v10n3/10n3schw.htm](http://www.nal.usda.gov/awic/newsletters/v10n3/10n3schw.htm). Accessed July 13, 2009.
- <sup>150</sup> Wedemeyer GA. 1997. Effects of rearing conditions on the health and physiological quality of fish in intensive culture. In: Iwama GK, Pickering AD, Sumpter JP, and Schreck CB (eds.), *Fish Stress and Health in*

---

Aquaculture, Society for Experimental Biology, Seminar Series 62 (Cambridge, U.K.: Cambridge University Press, pp. 35-71).

<sup>151</sup> Håstein T, Scarfe AD, and Lund VL. 2005. Science-based assessment of welfare: aquatic animals. *Revue Scientifique et Technique-Office International des Epizooties* 24(2):529-47.

<sup>152</sup> Ashley PJ. 2007. Fish welfare: current issues in aquaculture. *Applied Animal Behaviour Science* 104(3-4):199-235.

<sup>153</sup> Damsgård B, Juell J-E, and Braastad BO. 2006. Welfare in farmed fish (Norway: Fiskeriforskning). [www.fiskeriforskning.com/nofima/publikasjoner/rapporter/welfare\\_in\\_farmed\\_fish](http://www.fiskeriforskning.com/nofima/publikasjoner/rapporter/welfare_in_farmed_fish). Accessed July 13, 2009.

<sup>154</sup> Schreck CB, Olla BL, and Davis MW. 1997. Behavioral responses to stress. In: Iwama GK, Pickering AD, Sumpter JP, and Schreck CB (eds.), *Fish Stress and Health in Aquaculture*, Society for Experimental Biology, Seminar Series 62 (Cambridge, U.K.: Cambridge University Press, pp. 145-61).

<sup>155</sup> Pickering AD. 1998. Stress responses of farmed fish. In: Black KD and Pickering AD (eds.), *Biology of Farmed Fish* (Sheffield, U.K.: Sheffield Academic Press, pp. 222-47).

<sup>156</sup> Pottinger TG and Pickering AD. 1997. Genetic basis to the stress response: selective breeding for stress-tolerant fish. In: Iwama GK, Pickering AD, Sumpter JP, and Schreck CB (eds.), *Fish Stress and Health in Aquaculture*, Society for Experimental Biology, Seminar Series 62 (Cambridge, U.K.: Cambridge University Press, pp. 171-93).

<sup>157</sup> Barton BA and Iwama GK. 1991. Physiological changes in fish from stress in aquaculture with emphasis on the response and effects of corticosteroids. *Annual Review of Fish Diseases* 1:3-26.

<sup>158</sup> Lemly AD. 1996. Winter stress syndrome: an important consideration for hazard assessment of aquatic pollutants. *Ecotoxicology and Environmental Safety* 34(3):223-7.

<sup>159</sup> Sneddon LU, Braithwaite VA, and Gentle MJ. 2003. Do fishes have nociceptors? Evidence for the evolution of a vertebrate sensory system. *Proceedings of the Royal Society London Series B: Biological Sciences* 270(1520):1115-21.

<sup>160</sup> Broom DM. 2001. The evolution of pain. In: Soulsby L and Morton D (eds.), *Pain: Its Nature and Management in Man and Animals* (U.K.: Royal Society of Medicine Press, pp. 17-25).

<sup>161</sup> Rose JD. 2002. The neurobehavioral nature of fishes and the question of awareness and pain. *Reviews in Fisheries Science* 10(1):1-38.

<sup>162</sup> Chandroo KP, Duncan IJH, and Moccia RD. 2004. Can fish suffer?: perspectives on sentience, pain, fear and stress. *Applied Animal Behaviour Science* 86(3-4):225-50.

<sup>163</sup> Chandroo KP, Yue S, and Moccia RD. 2004. An evaluation of current perspectives on consciousness and pain in fishes. *Fish and Fisheries* 5(4):281-95.

<sup>164</sup> Braithwaite VA and Boulcott P. 2007. Pain perception, aversion and fear in fish. *Diseases of Aquatic Organisms* 75:131-8.

<sup>165</sup> Rose JD. 2007. Anthropomorphism and 'mental welfare' of fishes. *Diseases of Aquatic Organisms* 75(2):139-54.

<sup>166</sup> Bshary R, Wickler W, and Fricke H. 2002. Fish cognition: a primate's eye view. *Animal Cognition* 5(1):1-13.

<sup>167</sup> Fisheries Society of the British Isles. 2002. Fish Welfare. Briefing Paper 2. Fisheries Society of the British Isles, Granata Information Systems. [www.nal.usda.gov/awic/pubs/Fishwelfare/FSBL.pdf](http://www.nal.usda.gov/awic/pubs/Fishwelfare/FSBL.pdf). Accessed July 13, 2009.

<sup>168</sup> Håstein T, Scarfe AD, and Lund VL. 2005. Science-based assessment of welfare: aquatic animals. *Revue Scientifique et Technique-Office International des Epizooties* 24(2):529-47.

<sup>169</sup> Wedemeyer GA. 1997. Effects of rearing conditions on the health and physiological quality of fish in intensive culture. In: Iwama GK, Pickering AD, Sumpter JP, and Schreck CB (eds.), *Fish Stress and Health in Aquaculture*, Society for Experimental Biology, Seminar Series 62 (Cambridge, U.K.: Cambridge University Press, pp. 35-71).

<sup>170</sup> Barton BA and Iwama GK. 1991. Physiological changes in fish from stress in aquaculture with emphasis on the response and effects of corticosteroids. *Annual Review of Fish Diseases* 1:3-26.

<sup>171</sup> Bandeem J and Leatherland JF. 1997. Transportation and handling stress of white suckers raised in cages. *Aquaculture International* 5:385-96.

<sup>172</sup> Barton BA and Iwama GK. 1991. Physiological changes in fish from stress in aquaculture with emphasis on the response and effects of corticosteroids. *Annual Review of Fish Diseases* 1:3-26.

- 
- <sup>173</sup> Barton BA. 2000. Salmonid fishes differ in their cortisol and glucose responses to handling and transport stress. *North American Journal of Aquaculture* 62:12-8.
- <sup>174</sup> Rouger Y, Aubin J, Breton B, et al. 1998. Response of rainbow trout (*Oncorhynchus mykiss*) to transport stress. *Bulletin Francais de la Peche et de la Pisciculture* 350-351:511-9.
- <sup>175</sup> van de Vis H, Kestin S, Robb D, et al. 2003. Is humane slaughter of fish possible for industry? *Aquaculture Research* 34(3):211-20.
- <sup>176</sup> Southgate P and Wall T. 2001. Welfare of farmed fish at slaughter. *In Practice* 23(5):277-84.
- <sup>177</sup> Robb DHF and Kestin SC. 2002. Methods used to kill fish: field observations and literature reviewed. *Animal Welfare* 11(3):269-82.
- <sup>178</sup> Robb DHF, Wotton SB, McKinsty JL, Sorensen NK, and Kestin SC. 2000. Commercial slaughter methods used on Atlantic salmon: determination of the onset of brain failure by electroencephalography. *The Veterinary Record* 147(11):298-303.
- <sup>179</sup> Håstein T, Scarfe AD, and Lund VL. 2005. Science-based assessment of welfare: aquatic animals. *Revue Scientifique et Technique-Office International des Epizooties* 24(2):529-47.
- <sup>180</sup> Farm Animal Welfare Council. 1996. Report on the Welfare of Farmed Fish.
- <sup>181</sup> Broom DM. 2000. Does present legislation help animal welfare? [www.agriculture.de/acms1/conf6/ws5alegisl.htm](http://www.agriculture.de/acms1/conf6/ws5alegisl.htm). Accessed July 13, 2009.
- <sup>182</sup> Rauw WM, Kanis E, Noordhuizen-Stassen EN, and Grommers FJ. 1998. Undesirable side effects of selection for high production efficiency in farm animals: a review. *Livestock Production Science* 56:15-33.
- <sup>183</sup> Knowles TG, Kestin SC, Haslam SM, et al. 2008. Leg disorders in broiler chickens: prevalence, risk factors and prevention. *PLoS ONE* 3(2):e1545. doi:10.1371/journal.pone.0001545.
- <sup>184</sup> Kestin SC, Knowles TG, Tinch AE, and Gregory NG. 1992. Prevalence of leg weakness in broiler chickens and its relationship with genotype. *The Veterinary Record* 131:190-4.
- <sup>185</sup> Sanotra GS, Lund JD, Ersboll AK, Petersen JS, and Vestergaard KS. 2001. Monitoring leg problems in broilers: a survey of commercial broiler production in Denmark. *World's Poultry Science Journal* 57:55-69.
- <sup>186</sup> Martrenchar A, Huonnic D, Cotte JP, Boilletot E, and Morisse JP. 1999. Influence of stocking density on behavioural, health and productivity traits of turkeys in large flocks. *British Poultry Science* 40(3):323-31.
- <sup>187</sup> Martrenchar A. 1999. Animal welfare and intensive production of turkey broilers. *World's Poultry Science Journal* 55(2):143-52.
- <sup>188</sup> Scientific Committee on Animal Health and Animal Welfare. 1999. Report on animal welfare aspects of the use of bovine somatotrophin. [http://ec.europa.eu/food/fs/sc/scah/out21\\_en.pdf](http://ec.europa.eu/food/fs/sc/scah/out21_en.pdf). Accessed July 13, 2009.
- <sup>189</sup> Rauw WM, Kanis E, Noordhuizen-Stassen EN, and Grommers FJ. 1998. Undesirable side effects of selection for high production efficiency in farm animals: a review. *Livestock Production Science* 56(1):15-33.
- <sup>190</sup> Rauw WM, Kanis E, Noordhuizen-Stassen EN, and Grommers FJ. 1998. Undesirable side effects of selection for high production efficiency in farm animals: a review. *Livestock Production Science* 56(1):15-33.
- <sup>191</sup> Tyler JW and Cullor JS. 2002. Mammary gland and health disorders. In: Smith BP (ed.), *Large Animal Internal Medicine* (St. Louis, MO: Mosby Inc., pp. 1019-32).
- <sup>192</sup> Sordillo LM, Shafer-Weaver K, and DeRosa D. 1997. Immunobiology of the mammary gland. *Journal of Dairy Science* 80(8):1851-65.
- <sup>193</sup> Akers RM. 2000. Selection for milk production from a lactation biology viewpoint. *Journal of Dairy Science* 83(5):1151-8.
- <sup>194</sup> Bishop SC, Fleming RH, McCormack HA, Flock DK, and Whitehead CC. 2000. Inheritance of bone characteristics affecting osteoporosis in laying hens. *British Poultry Science* 41(1):33-40.
- <sup>195</sup> Budgell KL and Silversides FG. 2004. Bone breakage in three strains of end-of-lay hens. *Canadian Journal of Animal Science* 84(4):745-7.
- <sup>196</sup> Rollin BE. Farm factories. *The Christian Century*. [www.religion-online.org/showarticle.asp?title=2194](http://www.religion-online.org/showarticle.asp?title=2194). Accessed July 13, 2009.

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