



# Animal Welfare Institute

## Fact Sheet: The Welfare of Dairy Cattle

### INTRODUCTION

The U.S. Department of Agriculture (USDA) counted over 9.1 million cows used for dairy production in 2010.<sup>1</sup> In comparison, over 12 million cows were used in dairy production in 1970.<sup>2</sup> Far fewer animals are now producing twice as much milk as they did just 35 years ago.<sup>3,4</sup> Most dairy cattle today are confined in animal feeding operations,<sup>5</sup> where natural behaviors are stifled and the animals often suffer from health problems like lameness and mastitis.

Higher welfare dairy farming does exist however. For example, the Animal Welfare Approved (AWA) program is the most stringent third-party welfare food certification program in the U.S., maintaining species-specific standards with which participating farmers must comply.<sup>6,7</sup> All around good animal welfare takes into account: 1) animal functioning (good health, productivity) 2) animal feeling (absence of pain, fear, stress) and 3) animal living according to natural behaviors.<sup>8</sup> Conventional industrial farming prioritizes the “animal functioning” component by emphasizing that productivity directly corresponds to economics, and thereby creating animal welfare deficits in terms of animal feeling and the ability of animals to live according to natural behaviors. This fact sheet compares practices in intensive industrial dairy farming to higher-welfare alternatives as they relate to specific welfare impacts for dairy cattle.

### HIGH MILK PRODUCTION

As soon as a dairy cow becomes mature, from about 15 months-2 years of age, producers put the animal through 2-3 cycles in a row of gestation (pregnancy), parturition (giving birth) and lactation (producing milk), followed by a short 3-4 month period before the cow becomes pregnant again.<sup>9</sup> Although they have a natural life expectancy of over 20 years,<sup>10</sup> dairy cows

are sent to slaughter around 5 years of age and replaced with young heifers after these cycles, mostly due to poor health or production.\*

A significant decrease in longevity isn't the only consequence of milk production per animal more than doubling in the last 40 years; an increase in the overall incidence of health problems and decline in reproduction have also plagued dairy cows in recent years.<sup>11</sup> Modern dairy cows even look different today than they did prior to industrial farming, appearing much heavier, with huge, sagging udders that weigh on the cow's frame and alter her gait. Due to genetic selection and breeding, today's dairy cow can produce up to 12 times the amount of milk she would naturally produce to feed a calf.<sup>12</sup> This is especially alarming considering that cows are more susceptible to stress and disease when the majority of their metabolic energy must be used for milk production.<sup>13</sup> Increasing milk yield has been identified as a risk factor for acute mastitis, ovarian cysts, anestrus among older cows, and milk fever among younger cows.<sup>14</sup>

### BOVINE GROWTH HORMONE

Recombinant bovine somatotropin (known as rbST, bST, or rbGH) is a synthetic version of a naturally occurring hormone that is administered to dairy cattle via injection to increase milk yields. Controversy surrounding the practice has led both the EU and Canada to reject its use on the basis of animal welfare concerns. Even so, a total of more than 30 million cows in the U.S. had been treated with rbST as of a

---

\* In a 2007 survey of the 17 major dairy producing states, reasons for culling included (given in % of cows culled): udder or mastitis problem (23%), lameness or injury (16%), reproductive problems (26.3%), and poor production not in relation to the previously mentioned problems (16.1%). See U.S. Department of Agriculture, Dairy 2007 (Part I), op cit.

2009 report.<sup>15</sup> The use of rbST in lactating dairy cows results in a 50 percent increased risk of lameness, likely due to the subsequent increased milk production that forces changes in the animals' nutritional management.<sup>16</sup> Research also suggests that rbST correlates with a 25 percent increase in the frequency of clinical mastitis during the treatment period.<sup>17</sup> Lameness and mastitis aside, rbST still poses significant threats to animal welfare, contributing to a reduced lifespan of treated cattle through an increased risk of both culling and non-pregnancy.<sup>18</sup>

## MASTITIS

High milk production, the use of milking machines, and confinement housing support the microbial growth that make cows more likely to contract mastitis, a painful swelling of the cow's mammary glands that occurs when pathogens enter and infect the udder.<sup>19,20</sup> In 2006 producers reported that 23 percent of their cows needed to be permanently removed from the herd (slaughtered) due to clinical mastitis.<sup>21</sup> The disease is one of the most common facing lactating dairy cows,<sup>22</sup> and is more likely to occur within intensive systems.<sup>23</sup> While many studies have strongly related the incidence of mastitis to both housing and management factors,<sup>24,25</sup> the role such factors play depends upon the type of bacteria responsible for the infection.<sup>26</sup>

## Welfare alternative

Alternative farming systems like those in the Animal Welfare Approved, Certified Humane, American Humane Certified and USDA Organic programs raise dairy cattle in ways that alleviate some of the welfare problems associated with modern intensive milk production. Under the high standards of the AWA program, dairy cow breeds must be chosen so that welfare is not negatively affected and is suitable for pasture-based conditions.<sup>27</sup> Although Holsteins comprise over 90 percent of dairy cows in the U.S.,<sup>28</sup> other breeds may be better suited to higher-welfare farming since they are smaller, may be more sound,

and have better udder conformity. The use of growth hormones or other substances promoting weight gain and high milk production are prohibited under the National Organic Program<sup>29</sup> and all animal welfare certification programs.<sup>30,31,32</sup> Furthermore, all welfare certification programs specify that measures must be taken to minimize the risk/incidence of mastitis.<sup>33,34,35</sup>

## INDOOR CONFINEMENT

Concentrated animal feeding operations confine dairy cows indoors for most of their lives, inciting a host of welfare problems. Although roughly half of lactating cows from the 17 major dairy-producing states in the U.S. have access to pasture during the summer, less than 10 percent of dairies are raising their animals primarily on pasture.<sup>36</sup> A startling 13 percent of dairies – accounting for almost 900,000 animals – don't allow animals any outdoor access even in the summer.<sup>37</sup> The rest of the dairy population is housed in tie-stalls (stanchions), free stalls, straw yards, and drylots.<sup>38</sup>

Dairy cows have limited space and restricted movement in all of these confinement systems, although there are differences among the types. In tie-stall systems, cows are tethered by the neck to a stall where they must stand in place and only have the ability to lie down and get back up, although even this action can be difficult in such systems. Not only does this prohibit cows from engaging in normal exercise and behavior, but they are unable to groom and their social needs as herd animals are frustrated.<sup>39</sup> As an alternative to the problems of tie-stalls (extremely restricted movement, decreased lying time, and increased lameness), *properly designed* free stalls with suitable bedding can increase the amount of lying time for cows.<sup>40</sup> Greater cud chewing and decreased lameness are associated with greater lying time, which achieves overall superior cow comfort.<sup>41</sup>

## LAMENESS

Conditions in confinement housing are so unnatural and poorly designed that cows are more susceptible

to lameness, consistently ranked as one of the most serious welfare problems for cattle.<sup>42</sup> Part of the problem is foot trauma, often associated with the design of indoor housing facilities that leave cows standing on concrete flooring and spending less time lying down, subsequently adding to hoof stress.<sup>43</sup> A survey of dairies in the U.S., published in 2007, showed that of cows needing to be culled from the herd, 16 percent were culled due to lameness.<sup>44</sup> Even though concrete flooring is associated with increased lameness, injuries, and decreased expression of estrus, approximately half of operations within the 17 major dairy-producing states house lactating cows on concrete flooring, representing 55 percent of all dairy cows in the U.S.<sup>45</sup>

### UNNATURAL DIET

Despite being yet another contributor to the high incidence of lameness, cows are generally fed concentrate, or grain-based feed, in confinement systems rather than the forage they would get from pasture.<sup>46</sup> Cows have evolved to eat forage, and grain-based diets are simply not as digestible, causing stomach ulcers and other painful health problems. High producing dairy herds, consuming high-energy diets (more specifically, high starch/low fiber diets) are continually confronted with subclinical acidosis and laminitis.<sup>47,48</sup>

### Welfare alternative

High-welfare, pasture based farms like those certified by the Animal Welfare Approved program allow cattle continuous year-round access to pasture. Other certification programs such as USDA Organic,<sup>49</sup> Certified Humane,<sup>50</sup> and American Humane Certified<sup>51</sup> specify that year-round outdoor access must be provided for dairy cows, though definitions of “year-round outdoor access” differ amongst programs. Access to pasture is an important component of a cow’s life, since cattle are naturally grazing animals who spend 8-10 hours a day grazing when given the opportunity.<sup>52</sup> In pasture-based systems cattle get

more exercise, which correlates with better gait, increased hoof health, and decreased lameness.<sup>53</sup> Provision of pasture access has also been associated with a decreased incidence of teat injuries, fewer abnormal behaviors, longer bouts of resting, and lower culling rates.<sup>54,55,56</sup> In one study, confined cows had 1.8 times more clinical mastitis and 8 times the rate of culling for mastitis than cows on pasture.<sup>57</sup>

The most comprehensive model developed to date for scientifically calculating dairy cattle welfare scores (COWEL) identifies pasture based housing systems as providing the highest welfare benefits and lowest risk when compared to straw yards, cubicle housing, and tie-stalls.<sup>58</sup> Animal Welfare Approved standards specify that the goal with pasture access is to “satisfy the herd’s food seeking behaviors” and instinct to explore. The pasture area must be large enough to maintain both the health of the animals and the range, which could become polluted or denuded if space is inadequate.<sup>59</sup> Shelter must be provided to dairy cattle in inclement weather, and AWA standards specify sufficient space requirements for cattle to maintain natural behaviors and have loafing areas indoors. For instance, cattle between 440–770 pounds are required to have 43 square feet of indoor, bedded lying space.<sup>60</sup>

### PAINFUL PRACTICES: TAIL DOCKING

Tail docking is a painful and unnecessary “management practice” utilized by some dairy farmers in the U.S. The procedure consists of cutting off up to two-thirds of the cow’s tail, typically by placing a tight rubber ring around it to restrict blood flow until the tissue becomes necrotic and falls off 3-7 weeks later.<sup>61</sup> The practice was originally thought to prevent the transmission of leptospirosis from dirty tails coming into contact with workers, but studies have disproven any correlation.<sup>62</sup> Other common beliefs about the benefits of tail docking dairy cattle include: improved comfort for milking personnel, enhanced udder cleanliness, reduced incidence of mastitis, and

improved milk quality and hygiene. Research has not shown significant differences between cow and udder cleanliness or Somatic Cell Counts (SCC) of docked versus intact heifers however.<sup>63</sup> Furthermore, tail docking has been shown to have no significant impact on the prevalence of contagious, environmental, or minor pathogens, and no differences in udder or leg hygiene or milk quality have been found.<sup>64</sup> Given the fact that a majority of modern milking parlors prevent contact with cow's tails, the argument that tail docking improves milker comfort is also no longer valid.<sup>65</sup>

In the USDA's 2007 survey, almost half of all dairy farms had one or more tail-docked cows.<sup>66</sup> The practice was more common on farms in Eastern regions of the U.S. versus Western regions (48.5 percent of Eastern operations did NOT have cows with docked tails, versus 81.3 percent of Western operations).<sup>67</sup> Although studies have determined the practice causes pain during and after the procedure, over 90 percent of dairy producers failed to use any type of anesthetics or analgesics to mitigate the pain.<sup>68</sup> Other harmful effects of tail docking include cattle suffering fly bites without the ability to swat them away with their tails, and the formation of painful neuromas at the tail stump.<sup>69</sup> The AVMA states that not only are there no apparent animal health, welfare, or human health justifications to support the practice, but tail docking of dairy cattle is actually detrimental to both cattle welfare and comfort and should be discouraged.<sup>70</sup>

### **PAINFUL PRACTICES: CASTRATION**

Castration is another "management procedure" that is performed on the bull calves born on many dairy farms.<sup>71</sup> The most common methods of castration include surgical removal of the testicles, crushing the spermatic cords through the Burdizzo method, and the most utilized method – constricting blood supply to the testes through the use of rubber rings or latex bands.<sup>72,73</sup> Despite evidence that the procedure causes

pain, only 3 percent of operations surveyed in the USDA's 2007 dairy survey utilized any pain mitigation strategies (analgesics or anesthetics) for the animals.<sup>74</sup>

### **PAINFUL PRACTICES: DEHORNING**

Dehorning is another painful management procedure done to prevent injury to humans and other cattle from horns and reduce the amount of space required by each animal.<sup>75</sup> The industry recommends disbudding, or removing the horn bud on a calf before it becomes a hard horn, over dehorning (of an older animal).<sup>76</sup> Methods of disbudding include hot iron cauterization, scooping out the bud, and applying caustic paste. Over 60 percent of dairy operations surveyed by the USDA used the hot iron method, but only about 17 percent used any pain management, despite concrete evidence that anesthetics and analgesics would alleviate the animals' pain.<sup>77,78</sup>

#### ***Welfare alternative***

Tail docking is not allowed under Animal Welfare Approved,<sup>79</sup> Certified Humane,<sup>80</sup> or American Humane Certified<sup>81</sup> standards for dairy cattle welfare, and even the National Milk Producers Federation<sup>82</sup> discourages the practice. The Animal Welfare Approved program recommends farmers choose polled cattle (breeds without horns) for their dairies in order to avoid the painful practice of disbudding/dehorning completely.<sup>83</sup> While both Certified Humane<sup>84</sup> and American Humane Certified<sup>85</sup> recommend against dehorning cattle unless absolutely necessary and performed by a veterinarian under anesthesia, the Animal Welfare Approved<sup>86</sup> program prohibits the practice altogether. All welfare certification programs recommend best practices for disbudding in order to reduce pain and stress to the animals; however the Animal Welfare Approved standards are highest, requiring that disbudding occur before 2 months of age with appropriate anesthesia and sedation.<sup>87</sup> Castration is permitted under all programs, but the methods used and age of the animal are restricted (generally calves must be less than 7 days old for the

rubber ring method and under 2 months of age for both the Burdizzo and surgical methods). While castration after 2 months is allowed when performed with local anesthesia under Certified Humane<sup>88</sup> and American Humane Certified<sup>89</sup> standards, Animal Welfare Approved strictly prohibits castration after this late stage.<sup>90</sup> Currently, the National Organic Program has no specific standards regarding best practices for painful mutilations in dairy cattle such as tail docking, dehorning/disbudding and castration.<sup>†,91</sup>

## CONCLUSION

The welfare of dairy cows varies greatly between the conventional industry practices of concentrated animal feeding operations that make up the vast majority of dairies, and higher welfare farms that can be certified by standardized programs such as Animal Welfare Approved. Other third-party certification labels such as USDA Organic, American Humane Certified, and Certified Humane have different levels of standards that fall somewhere between conventional industry practices and AWA in regards to the level of welfare animals experience. Overall, serious welfare problems exist for the vast majority of cattle on dairies due to inadequate industry animal care standards, but high welfare farms prove that better welfare is possible. Informed consumers can choose not to purchase dairy products that come at the cost of inhumanely raised animals.

---

## References

<sup>1</sup> U.S. Department of Agriculture, National Agricultural Statistics Service. 2011. Milk cows: Inventory by year, U.S. [http://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 December 28, 2011.

---

<sup>†</sup> The National Organic Standards Board is in the process of drafting Animal Welfare Recommendations that will give more detailed requirements, both in regulation and producer guidance, to ensure animal welfare.

---

<sup>2</sup> U.S. Department of Agriculture, Economics Research Service. 2007. Profits, costs, and the changing structure of dairy farming.

<http://www.ers.usda.gov/publications/err47/err47b.pdf>. Accessed December 28, 2011.

<sup>3</sup> U.S. Department of Agriculture, Statistical Reporting Service. 1976. Milk Production.

<http://usda01.library.cornell.edu/usda/nass/MilkProd//1970s/1976/MilkProd-12-13-1976.pdf>. Accessed January 23, 2012.

<sup>4</sup> U.S. Department of Agriculture, National Agricultural Statistics Service. 2011. Milk Production.

<http://usda01.library.cornell.edu/usda/current/MilkProd/MilkProd-12-19-2011.pdf>. Accessed January 23, 2012.

<sup>5</sup> U.S. Department of Agriculture, Natural Resources Conservation Service. 2005. Concentrated animal feeding operations: NRCS Nevada Fact Sheet. [ftp://ftp-fc.sc.egov.usda.gov/NV/web/publications/CAFO\\_factsheet.pdf](ftp://ftp-fc.sc.egov.usda.gov/NV/web/publications/CAFO_factsheet.pdf). Accessed December 28, 2011.

<sup>6</sup> Animal Welfare Approved. About.

<http://www.animalwelfareapproved.org/about/>. Accessed December 28, 2011.

<sup>7</sup> Animal Welfare Institute. 2011. Animal welfare standards: a comparison of industry guidelines and independent labels. <http://www.awionline.org/sites/default/files/uploads/legacy-uploads/documents/Web-StandardsComparisonfactsheet2-1293133314-document-33104.pdf>. Accessed December 28, 2011.

<sup>8</sup> Weary DM and Fraser D. 2006. Scientific methods of assessing animal well-being. SCAW Newsletter, Volume 28 Number 2. <http://www.scaw.com/assets/files/1/files/06-summer-newsletter-.pdf>. Accessed December 28, 2011.

<sup>9</sup> U.S. Department of Agriculture. 2007. Dairy 2007. Part I: reference of dairy cattle health and management practices in the United States.

[http://www.aphis.usda.gov/animal\\_health/nahms/dairy/downloads/dairy07/Dairy07\\_dr\\_PartI.pdf](http://www.aphis.usda.gov/animal_health/nahms/dairy/downloads/dairy07/Dairy07_dr_PartI.pdf). Accessed December 28, 2011.

<sup>10</sup> Nowak RM. 1997. Walker's Mammals of the World 5.1. Baltimore, Maryland: Johns Hopkins University Press.

<sup>11</sup> Oltenacu PA and Algers B. 2005. Selection for increased production and the welfare of dairy cows: are new breeding goals needed? *Ambio* 34(4-5): 311-315.

<sup>12</sup> Lyons DT, Freeman AE and Kuck AL. 1991. Genetics of health traits in Holstein cattle. *Journal of Dairy Science* 74(3): 1092-100.

<sup>13</sup> Rauw WM, Kanis E, Noordhuizen-Stassen EN, et al. 1998. Undesirable side effects of selection for high production efficiency in farm animals: a review. *Livestock Production Science* 56(1): 15-33.

- <sup>14</sup> Rajala PJ and Gröhn YT. 1998. Disease occurrence and risk factor analysis in Finnish Ayrshire cows. *Acta Veterinaria Scandinavica* 39(1): 1-13.
- <sup>15</sup> Raymond R, Bales CW, Bauman DE, et al. 2009. Recombinant Bovine Somatotropin (rbST): a safety assessment. <http://www.ads.uga.edu/documents/rbstexpertpaper-6.26.09-final.pdf>. Accessed December 28, 2011.
- <sup>16</sup> Dohoo IR, DesCôteaux L, Dowling P, et al. 1998. Report of the Canadian Veterinary Medical Association expert panel on rbST. [http://www.hc-sc.gc.ca/dhp-mps/vet/issues-enjeux/rbst-stbr/rep\\_cvma-rap\\_acdv\\_tc-tm-eng.php](http://www.hc-sc.gc.ca/dhp-mps/vet/issues-enjeux/rbst-stbr/rep_cvma-rap_acdv_tc-tm-eng.php). Accessed December 28, 2011.
- <sup>17</sup> Ibid.
- <sup>18</sup> Ibid.
- <sup>19</sup> Rushen J, de Passillé AM, von Keyserlingk MAG, et al. 2008. *The Welfare of Cattle*. Springer, Dordrecht, the Netherlands.
- <sup>20</sup> Tyler JW and Cullor JS. 2002. Bovine mastitis. In: Smith BP (ed.), *Large Animal Internal Medicine* (St. Louis, MO: Mosby Inc., pp. 1019-32).
- <sup>21</sup> U.S. Department of Agriculture, Dairy 2007 (Part I), op cit.
- <sup>22</sup> Rajala and Gröhn, op cit.
- <sup>23</sup> Fourichon C, Beaudeau F, Bareille N, et al. 2001. Incidence of health disorders in dairy farming systems in western France. *Livestock Production Science* 68(2-3): 157-170.
- <sup>24</sup> Waage S, Svidland S, Odegaard SA. 1998. Identification of risk factors for clinical mastitis in dairy heifers. *Journal of Dairy Science* 81(5):1275-1284.
- <sup>25</sup> Barkema HW, Schukken YH, Lam TJ, et al. 1999. Management practices associated with the incidence rate of clinical mastitis. *Journal of Dairy Science* 82(8): 1643-1654.
- <sup>26</sup> Ibid.
- <sup>27</sup> Animal Welfare Approved. 2011. Dairy cattle and calf standards, section 2.0 Breed and Origin of Animals. <http://www.animalwelfareapproved.org/standards/dairy-cattle-2011/>. Accessed January 5, 2012.
- <sup>28</sup> U.S. Environmental Protection Agency. 2009. Dairy production systems. <http://www.epa.gov/agriculture/ag101/dairysystems.html>. Accessed December 28, 2011.
- <sup>29</sup> National Organic Program regulations, 7 CFR 205.238 as of January 1, 2011. <http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=85bb871f3efe60615bc80286df1cfc67&rgn=div8&view=text&node=7:3.1.1.9.32.3.354.12&idno=7>. Accessed January 5, 2012.
- <sup>30</sup> Animal Welfare Approved, op cit., section 3.0 Health management.
- <sup>31</sup> Humane Farm Animal Care. 2004. Animal care standards: dairy cows, section FW4. <http://www.certifiedhumane.org/uploads/pdf/Standards/English/Microsoft%20Word%20-%20Std04.Dairy.3A.pdf>. Accessed January 5, 2012.
- <sup>32</sup> American Humane Association. 2010. American Humane Certified, Animal Welfare Standards for Dairy Cattle, Health section, under "Food and water".
- <sup>33</sup> Animal Welfare Approved, op cit.
- <sup>34</sup> Humane Farm Animal Care, op cit., section E36.
- <sup>35</sup> American Humane Association, op cit., under "Milking barn".
- <sup>36</sup> U.S. Department of Agriculture, Dairy 2007 (Part I), op cit.
- <sup>37</sup> U.S. Department of Agriculture. 2007. Dairy 2007. Part III: Reference of dairy cattle health and management practices in the United States. [http://www.aphis.usda.gov/animal\\_health/nahms/dairy/downloads/dairy07/Dairy07\\_dr\\_PartIII\\_rev.pdf](http://www.aphis.usda.gov/animal_health/nahms/dairy/downloads/dairy07/Dairy07_dr_PartIII_rev.pdf). Accessed December 28, 2011.
- <sup>38</sup> U.S. Department of Agriculture, Dairy 2007 (Part I), op cit.
- <sup>39</sup> Ibid.
- <sup>40</sup> Mcfadden M. 2011. Free stall bedding levels and cow comfort. *Dairy Herd Network*, April 30. <http://www.dairyherd.com/dairy-news/Freestall-bedding-levels-and-cow-comfort-120984764.html>. Accessed December 28, 2011.
- <sup>41</sup> Ibid.
- <sup>42</sup> Whay HR, Main DCJ, Green LE, et al. 2003. Animal-based measures for the assessment of welfare state of dairy cattle, pigs and laying hens: Consensus of expert opinion. *Animal Welfare* 12(2): 205-217.
- <sup>43</sup> Garry FB. 2008. Animal well-being in the U.S. dairy industry, in *The Well-Being of Farm Animals: Challenges and Solutions* (eds GJ Benson and BE Rollin), Blackwell Publishing, Oxford, UK.
- <sup>44</sup> U.S. Department of Agriculture, Dairy 2007 (Part I), op cit.
- <sup>45</sup> U.S. Department of Agriculture, Dairy 2007 (Part III), op cit.
- <sup>46</sup> Manson FJ and Leaver JD. 1989. Effect of concentrate, silage ratio and of hoof-trimming on lameness in dairy cattle. *Animal Production* 49: 15-22.
- <sup>47</sup> Oetzel GR. 2007. Subacute Ruminant Acidosis in Dairy Herds: Physiology, Pathophysiology, Milk Fat Responses, and Nutritional Management. American Association of Bovine Practitioners 40th Annual Conference, Vancouver, BC, Canada. <http://www.vetmed.wisc.edu/dms/fapm/fapmtools/2nutr/sara1aabp.pdf>. Accessed online January 24, 2012.

- <sup>48</sup> Dohoo, et al., op cit.
- <sup>49</sup> National Organic Program regulations, op cit., 7 CFR 205.239.
- <sup>50</sup> Humane Farm Animal Care, op cit., FW 8.
- <sup>51</sup> American Humane Association, op cit., Food and Water section.
- <sup>52</sup> Kilgour and Dalton, op cit.
- <sup>53</sup> Hernandez-Mendo O, von Keyserlingk MA, Veira DM, et al. 2007. Effects of Pasture on Lameness in Dairy Cows. *Journal of Dairy Science* 90(3): 1209-14.
- <sup>54</sup> Krohn CC and Munksgaard L. 1993. Behaviour of dairy cows kept in extensive (loose housing/pasture) or intensive (tie stall) environments II. Lying and lying-down behavior *Applied Animal Behaviour Science* 37 (1): 1-16.
- <sup>55</sup> Krohn CC. 1994. Behaviour of dairy cows kept in extensive (loose housing/pasture) or intensive (tie-stall) environments. III. Grooming, exploration and abnormal behavior. *Applied Animal Behaviour Science* 42 (2): 73-86.
- <sup>56</sup> White SL, Benson GA, Washburn SP, et al. 2002. Milk production and economic measures in confinement or pasture systems using seasonally calved Holstein and Jersey cows. *Journal of Dairy Science*. 85:95-104.
- <sup>57</sup> Washburn SP, White SL, Green JT Jr., et al. 2002. Reproduction, mastitis, and body condition of seasonally calved Holstein and Jersey cows in confinement or pasture systems. *Journal of Dairy Science* 85:105-111.
- <sup>58</sup> Ursinus WW, Schepers F, Mol RM, et al. 2009. COWEL: A Decision Support System to Assess Welfare of Husbandry Systems for Dairy Cattle. *Animal Welfare* 18(4):545-552.
- <sup>59</sup> Animal Welfare Approved, op cit., section 7.0 Pasture Access.
- <sup>60</sup> Ibid.
- <sup>61</sup> Stull C, Payne MA, Berry SL, et al. 2002. Evaluation of the scientific justification for tail docking in dairy cattle. *Journal of the American Veterinary Medical Association* 220: 1298-1303.
- <sup>62</sup> Schreiner DA and Ruegg PL. 2002. Effects of tail docking on milk quality and cow cleanliness. *Journal of Dairy Science* 85 (10): 2503-2511.
- <sup>63</sup> Tucker CB, Fraser D and Weary DM. 2001. Tail docking dairy cattle: effects on cow cleanliness and udder health. *Journal of Dairy Science* 84: 84-87.
- <sup>64</sup> Schreiner and Ruegg, op cit.
- <sup>65</sup> Stull, et al., op cit.
- <sup>66</sup> U.S. Department of Agriculture. 2007. Dairy 2007. Part IV: reference of dairy cattle health and management practices in the United States. [http://www.aphis.usda.gov/animal\\_health/nahms/dairy/downloads/dairy07/Dairy07\\_dr\\_PartIV.pdf](http://www.aphis.usda.gov/animal_health/nahms/dairy/downloads/dairy07/Dairy07_dr_PartIV.pdf). Accessed December 28, 2011.
- <sup>67</sup> Ibid.
- <sup>68</sup> Ibid.
- <sup>69</sup> American Veterinary Medical Association. 2007. Policy statements: tail-docking of cattle. [http://www.avma.org/issues/policy/animal\\_welfare/tail\\_docking\\_cattle.asp](http://www.avma.org/issues/policy/animal_welfare/tail_docking_cattle.asp). Accessed December 28, 2011.
- <sup>70</sup> Stull, et al., op cit.
- <sup>71</sup> U.S. Department of Agriculture, Dairy 2007 (Part IV), op cit.
- <sup>72</sup> Rushen, et al., op cit.
- <sup>73</sup> U.S. Department of Agriculture, Dairy 2007 (Part IV), op cit.
- <sup>74</sup> Ibid.
- <sup>75</sup> National Milk Producers Federation, op cit., Ch. 4: Newborn Calves.
- <sup>76</sup> U.S. Department of Agriculture, Dairy 2007 (Part IV), op cit.
- <sup>77</sup> Ibid.
- <sup>78</sup> American Veterinary Medical Association. 2008. Policy statements: castration and dehorning of cattle. [http://www.avma.org/issues/policy/animal\\_welfare/dehorning\\_cattle.asp](http://www.avma.org/issues/policy/animal_welfare/dehorning_cattle.asp). Accessed December 28, 2011.
- <sup>79</sup> Animal Welfare Approved, op cit., section 5.9.3 Physical alteration of dairy cattle.
- <sup>80</sup> Humane Farm Animal Care, op cit., section H10.
- <sup>81</sup> American Humane Association, op cit., under “Husbandry procedures”.
- <sup>82</sup> National Milk Producers Federation, op cit., Ch. 4: Newborn Calves.
- <sup>83</sup> Animal Welfare Approved, op cit., section 5.9 Physical alteration of dairy cattle.
- <sup>84</sup> Humane Farm Animal Care, op cit., section H10.
- <sup>85</sup> American Humane Association, op cit., under “Husbandry procedures”.
- <sup>86</sup> Animal Welfare Approved program, op cit., section 5.9 Physical alteration of dairy cattle.
- <sup>87</sup> Ibid.
- <sup>88</sup> Humane Farm Animal Care, op cit., section H10.
- <sup>89</sup> American Humane Association, op cit., under “Husbandry procedures”.
- <sup>90</sup> Animal Welfare Approved, op cit., section 5.8 Castration.
- <sup>91</sup> National Organic Program regulations, op cit., 7 CFR 205.238.

(1/12)