with the technique was made, resulting in a description of the "ethical landscape" of the technique. From the results it emerges that, seen from inside the practice of pig breeding, it is a skillful technique with clear economic and animal welfare advantages. But many of the contra arguments come from an outside perspective and are concerned mostly with the "unnaturalness" of the procedure and the negative impact that the technique may have on biodiversity. Also the technique is often associated with intensive farming which has for many a negative connotation. It is concluded that moral criticism is possible. Whether this criticism leads to an overall negative moral judgment remains to be seen; an overall judgment falls outside the scope of this study. It is stressed that in a pluralistic democratic society it is very important that agricultural professionals discuss these issues with the rest of society, each on the basis of their own ethical convictions. In such a discussion the strong and the weak points will emerge and a judgment can be made.

Key Words: Ethics, Non Surgical Embryo Transfer, Pigs

804 Animal welfare and the ethics of care: Towards a sustainable practice. R. Anthony*, *University of Alaska*, *Anchorage*.

Recently, the ethics of care has become part of the vocabulary in animal welfare ethics. It has gained momentum in animal welfare circles because the orientation that it takes best suits the apparent progress we've made in understanding animals' capabilities and how they are harmed, and because of its genuine desire to converge toward appropriate and sustainable ethical norms by appreciating the set of cultural and technological practices involved in farming. The ethics of care approach, in contrast with formal rule theories like utilitarian and rights-based approaches, begins not with the "what, if anything, do we owe animals" question, but instead with the context sensitive question of "how can we better meet our care responsibilities, to those who rely on us". After a brief consideration of the moral, political and technological contexts of agriculture, I attempt to show what it might take for an ethics of care to occupy a central role in our animal farming practices. Following scholars in this area, four key elements of an ethic of care will be delineated (i.e., attentiveness, responsibility, competence, and responsiveness) and applied to farmed animal welfare ethics.

Key Words: Animal Ethics, Animal Well-Being, Ethics of Care

805 Animal biotechnology: where to from here? A. L. Van Eenennaam*, *University of California*, *Davis*.

Biotechnology is defined as the application of science and engineering to living organisms. From this definition it is obvious that livestock breeders have been practicing animal biotechnology for many years. However, in recent years this term has been increasing associated with the technologies of cloning and genetic engineering. Products of these controversial technologies are slowly starting to move towards commercialization with the first human therapeutic compound derived from the milk of a genetically engineered animal being approved by the European Commission in 2006. The global market for recombinant proteins from domestic animals is predicted to reach US$18.6 billion in 2013. Similarly, the entry of products from cloned animals into the food supply also moved a step forward with the release of the FDA's draft risk assessment which found that edible products derived from marketable clones posed no additional food consumption risks relative to corresponding products from sexually-derived animals. However, the animal biotechnology industry still faces a variety of scientific, regulatory, ethical, and public acceptance issues. Many polls have concluded that the majority of people are opposed to 'animal biotechnology'. Closer examination reveals opinions are technology-dependent, with most people being favorably disposed towards the concept of genomics, and less supportive of genetic engineering and cloning. The industry is also faced with uncertainty arising from whether governmental agencies intend to consider moral and ethical factors, in addition to scientific evaluation of risks and benefits, when making regulatory decisions about cloned or genetically modified animals. Perhaps in response to public opposition or decreased funding support, the previously increasing numbers of published papers on cloning and genetic engineering have leveled off in recent years. Additionally, relatively few scientists have actively participated in the public discourse by articulating the science-based risks and benefits, in addition to the ethical issues, occasioned by these potentially-compelling technologies. It is currently unclear what role publicly-funded animal scientists will play in arriving at a societal consensus on the acceptable uses of animal biotechnology.

Key Words: Biotechnology, Cloning, Genetic Engineering

ADSA Production Division Symposium

806 Feeding programs that meet the challenges of heat stress. J. N. Spain* and D.E. Spiers, *University of Missouri*, *Columbia*.

Increased levels of milk production has increased the metabolic heat load lactating dairy cows must transfer to the environment to maintain thermal balance. As a result of this advanced genetic base, the incidence and severity of heat stress has increased. Heat stressed dairy cattle experience significant adverse responses including decreased milk production, increased incidence of mastitis, decreased fertility and lower reproductive success. Management strategies focus on reducing the thermal stress by decreasing heat load while concurrently increasing heat loss. Nutritional management strategies have been developed to support heat stressed dairy cows. Increased nutrient density and diets with a lower heat increment have been designed to decrease the heat load. Heat stressed cows have increased nutrient demands associated with higher requirement of electrolytes. Heat stress also alters rumen function. Decreased rumination, lower saliva secretion and lower buffering capacity of saliva increase the incidence of ruminal acidosis. Use of feed additives to help maintain a higher ruminal pH can provide important therapeutic support of the heat stressed cows. In addition, the lower rate of passage also decreases microbial efficiency and flow of microbial protein from the forestomachs. Therefore, the adjustment of protein supplementation can be made to maintain optimal amino acid flow to the small intestine. Therefore, seasonal adjustments of nutritional management strategies can be implemented to help mitigate the negative impact of elevated temperature and humidity on high producing dairy cattle.

Key Words: Dairy, Heat Stress, Nutrition

807 Environmental modifications to address heat stress. M. J. Brouk*[1], J. P. Harner, III[1], J. F. Smith[1], and D. V. Armstrong[2], [1]*Kansas State University*, *Manhattan*, [2]*University of Arizona*, *Tucson*.

Heat stress results in significant economic and production losses for dairy operations throughout the world each summer. Due to the continuous nature of dairy production, losses in the current lactation often result in losses in subsequent lactations or premature culling of animals. Reduction of losses due to heat stress represent an opportunity for dairy producers to gain a competitive edge. As a result, many producers have utilized different methods of heat abatement. In general these methods can be divided into two groups, those which enhance heat exchange between the cow and the environment or those which modify the environment to prevent or limit the degree of heat stress to which the animals are exposed. Increased heat exchange generally involves increasing heat loss from the body surface by enhancing heat loss mechanisms. The most common methods involve the addition of water to the hair coat and supplemental airflow to increase the rate of evaporation of the additional water and sweat enhancing heat exchange which reduces body temperature. Heat stress abatement with these systems is generally achieved by cooling heat stressed cattle. Environmental modifications attempt to reduce the potential for heat stress by lowering the temperature of the air around the cow. Evaporation of water into warm air reduces the temperature while increasing the relative humidity. Water evaporation can be achieved by high pressure fogging systems or by drawing warm air through evaporative pads. The challenge is to maintain an environment in which the temperature-humidity index is below the heat stress threshold for lactating dairy cattle. Critical factors for consideration when evaluating these systems is the air temperature and relative humidity of the environment. An inadequate or improperly designed system may actually increase the THI above the unmodified environment. When selecting a heat abatement system, one should consider production goals, facilities, environment, heat stress potential, water supply, and economic factors. In some very stressful environments, application of both environmental modifications and surface heat exchange may be beneficial.

Key Words: Cooling, Facilities, Environmental Stress

808 What we have learned about the genes involved in the response to heat stress. R. J. Collier* and R. P. Rhoads, *University of Arizona*.

Climate has profound effects on animal performance (i.e. growth, reproduction and lactation) and understanding the interaction between thermal environment and animal production has been the subject of intense research. Traditionally, examination of heat stress effects have focused on physiological and phenotypic changes, however, the development of molecular tools is allowing animal scientists to characterize transcriptional alterations across the genome and identify key cellular responses to heat stress. Gene expression changes associated with thermal environment may be grouped into 3 categories; acute, acclimatory and adaptive. Acute and acclimatory responses occur on a physiological and cellular level and decay with removal of the stress while adaptive responses involve short and long-term genetic alterations. At the systemic level, gene families associated with homeorhetic regulation of metabolism (growth hormone, prolactin, thyroxine, glucocorticoids) play an important role in heat stress acclimation. At the cellular level, thermal tolerance is maintained as long as heat shock family proteins are elevated and lost when expression of these genes declines in the face of continued stress. Cellular expression of heat shock proteins during thermal stress is altered by prolactin, IGF-I and prostaglandins E2 and A1. indicating that considerable opportunity may exist to improve thermotolerance. Evolutionary adaptation to heat stress involves genotypic differences associated with coat color, hair quality and density and sweat gland function which are related to inter-breed variation in heat gain and loss. Short-term genetic alterations involving epigenetic regulation of gene expression and thermal imprinting of the genome represent potentially promising but relatively unexplored areas in animal agriculture. Opportunities exist to improve thermal tolerance of animals by selection for specific hair coat characteristics, homeorhetic responses to thermal stress and improved heat shock response. The heat shock response opportunity is greatest during early embryonic development.

Key Words: Heat Stress, Gene Expression, Acclimation

Breeding and Genetics - Livestock and Poultry: Swine

809 Genetic factors affecting growth traits of Nili-Ravi Buffalo calves in Pakistan. P. Akhtar*, U. Kalsoom, S. Ali, M. Yaqoob, M. I. Mustafa, and J. I. Sultan, *Faculty of Animal Husbandry, University of Agriculture*, *Faisalabad, Punjan, Pakistan*.

Records on body weights at different ages of 624 Nili Ravi buffalo calves (from 1989 to 2002) kept at LES, Bahadurnagar, (Pakistan), were analyzed by computer programs LSMLMW and DFREML. Average weights at birth , weaning and yearling were 35.86±4.30, 66.12±9.16 and 145.82±19.50 kg. Pre-weaning average daily gain was 316 ± 88 gm, while post-weaning average daily gain was 301±29 gm. The ANOVA indicated that year and season of birth, age and weight of dam significantly effected the traits. Maximum weights were observed in spring season, while minimum gains were obtained in other seasons. Maximum heritability was 0.25±0.14 for birth weight, while minimum heritability was observed for weight at nine months of age that was 0.11±0.12 which indicates that growth traits were moderate to highly heritable suggesting that selection will be a best criteria for improvement. Among phenotypic correlations maximum correlation was 0.90 that was between weaning weight and weight at six months of age whereas minimum correlation was observed in birth weight. Environmental, phenotypic and genetic correlations were fairly large and positive indicating that selection for the improvement of one trait will positively affect the other trait.

Key Words: Genetic Factors, Growth, Buffalo Calves

810 Genetic analysis of ewe stayability and its association with lamb growth and adult body weight. R. C. Borg[1], D. R. Notter*[1], and R. W. Kott[2], [1]*Virginia Polytechnic Institute and State University*, *Blacksburg*, [2]*Montana State University*, *Bozeman*.

Records from 2,525 adult Targhee ewes and 10,099 lambs were used to estimate genetic parameters in an animal model for ewe stayability (STAY), weaning weight (WW), adult weight (AW), and number of lamb born (NB). Weaning weights were recorded at approximately 120