lower CPI than low BCS ewes ($P < 0.01$), while ewes that gave birth to high BW lambs had higher CPI than low BW lambs ($P < 0.05$). High BW ewes had higher IgG yield than medium and low BW ewes ($P < 0.05$). Ewes with long gestation lengths tended to have lower IgG yield than those with short gestation ($P < 0.10$), and high BCS ewes tended to have higher IgG yield than low BCS ewes ($P < 0.10$). However, large BW ewes had higher colostrum yield than ewes with a low BW ($P < 0.05$). Ewes with low BW lambs tended to produce more colostrum than ewes with high BW lambs ($P < 0.10$). The data show that ewe profile influences feed intake and colostrum production. A better understanding of these may lead to an improvement in late pregnancy nutrition and reductions in lamb mortality.

Key Words: dry matter intake, immunoglobulin, colostrum

ADSA Production Division Symposium: Driving Forces in the Dairy Industry That Will Change Dairy Farm Management

597 The dairy scientist's role in re-connecting the dairy food-chain. K. Murphy*, *Food-Chain Communications, Lee's Summit, MO*.

The ideal food-chain is defined as the group of people and organizations working together to effectively respond to the demands of food consumers. Recent actions by grocery retailers, quick-service restaurants and branded product manufacturers have caused the food-chain to instead function more antagonistically, more closely resembling nature's food chain, in which each species within the chain cannibalizes the other in order to survive. Dairy scientists play—and will continue to play—an increasingly important role in returning the food chain to the cooperative effectiveness indispensable to feeding a growing population. To be effective in their role, scientists and their institutions must appreciate the necessity to communicate science beyond their own bounds, learn to effectively communicate and translate the complexities of science into a common consumer vernacular, understand the nature of "my science vs. your science" characteristic of post-modernism, understand how physical science must mesh with humanities and social science in communicating with consumers.

Key Words: food chain, consumer communication

598 The welfare of dairy cattle: Problems and solutions for the coming decade. M. A. G. von Keyserlingk*[1], R. Rushen[2], A. M. de Passillé[2], and D. M. Weary[1], [1]*University of British Columbia, Vancouver, BC, Canada*, [2]*Agriculture and Agri-Food Canada, Agassiz, BC, Canada*.

Recent interest in animal welfare stems often from concerns related to intensive farming techniques. In many modern farms, especially in the industrialized world, dairy cattle are housed indoors, a system perceived by some as "unnatural" as it provides limited space and often a limited ability to engage in some natural behaviors. In contrast, many within the dairy industry see advantages to intensive, indoor systems, including protection of cows from the elements and the provision of high quality diet. Thus different people can reach different conclusions about management systems by favoring different welfare indicators. Clearly the best solutions will be those that satisfy the range of concerns (in this case allowing for natural behaviors that are important to the animal, along with good health and production). Taking this approach we provide a critical summary of the available welfare literature on intensively managed dairy cattle and show how scientific research can provide ways of resolving current concerns. Specifically we address dairy cattle welfare from three perspectives: improving health, reducing pain and distress, and facilitating natural behavior. Four major areas of concern are reviewed: 1) calf health and rearing practices, 2) lameness and transition cow disease, 3) housing, including access to pasture and, 4) painful procedures like dehorning that cause considerable pain that can be avoided using the right techniques and analgesics, or like tail docking that prevents the animal from performing natural fly avoidance behaviors, and fails to provide clear advantages to either the animal or the producer. In each example we show how research can identify solutions that improve dairy cattle welfare while remaining practical for dairy producers. We also identify some of the major welfare concerns for intensively managed dairy cattle where research is still required.

Key Words: welfare, dairy cattle, behavior

599 Accelerating genetic improvement with SNP chips and DNA sequencing. C. P. Van Tassell*[1], P. R. VanRaden[1], G. R. Wiggans[1], L. K. Matukumalli[1,2], S. Schroeder[1], J. O'Connell[1,3], R. D. Schnabel[4], J. F. Taylor[4], E. J. Pollak[5], M. Munson[6], D. Bailey[6], and T. S. Sonstegard[1], [1]*USDA-ARS, Beltsville, MD*, [2]*George Mason University, Manassas, VA*, [3]*University of Maryland School of Medicine, Baltimore*, [4]*University of Missouri, Columbia*, [5]*Cornell University, Ithaca, NY*, [6]*Illumina, Inc., San Diego, CA*.

The development of high-density single nucleotide polymorphism (SNP) assays is expected to have a profound impact on genetic progress in the U.S. dairy industry. In the 16 months since its initial availability, the Illumina BovineSNP50 BeadChip has been used to genotype nearly 20,000 Holsteins. These genomic data were included for the first time in the national dairy cattle genetic evaluation published by the USDA in January 2009. Substantial increases in genetic improvement have been predicted through the implementation of genome enabled selection. Currently, however, validation results are available only from the analysis of historic data, where populations have somewhat arbitrarily been divided into past and "future" populations. Availability of low-density but targeted SNP data could also dramatically impact genetic improvement. Low-density SNP data could be used to validate reported parentage and correct pedigree errors if comprehensive genotyping were conducted. These data could also be used to discover parentage and to more accurately characterize the degree of relatedness among animals in the population using genomics-based relationship coefficients. By accurately charactering the fractions of the genome inherited from each grandparent, genetic similarity that is currently described by statistical averaging using the pedigree could be refined to more accurately predict genetic merit early in life. Finally, individual animal genome sequencing is on the scientific horizon. Availability of such data could have implications beyond genetic improvement, and result in deeper understandings of basic biology, consequences of selection, and even animal and human health. Our ability to fully utilize these data will present enormous statistical and computational challenges.

Key Words: SNP, selection, genome

600 Affects of climate change and environmental regulation on management of dairy farms. W. Powers*[1] and D. Meyer[2], [1]*Michigan State University*, *East Lansing*, [2]*University of California*, *Davis*.

The dairy industry faces increasing environmental challenges. This is coupled with retailer pressure to discontinue use of bST, which will likely increase nutrient excretion per unit of milk produced and/or result in an increase in cow numbers to meet increasing product demand. As states adopt their own greenhouse gas reduction strategies, there is greater emphasis on adoption of a national policy. However, at the present time it is uncertain whether such a policy would include animal agriculture in a cap (e.g. a cow tax) or provide opportunities to the dairy industry to generate credits to be sold in a carbon market. Furthermore, the question remains as to whether or not greenhouse gas reduction strategies will result in increased emissions of criteria pollutants. Air quality issues remain at the forefront of challenges for the dairy industry. Recent reporting requirements under the Emergency Planning and Community Right-to-know Act (EPCRA) for large concentrated animal feeding operations (CAFOs) signifies that regulation of air pollutants may intensify for animal agriculture. Yet, it is uncertain what pollutants will be targeted and how standards will be established. As the Environmental Protection Agency winds down its National Air Emissions Monitoring Study many are eager to see how the data will translate to policy and what pollutants will be addressed. In the meantime, states continue to set their own policies, targeting a wide array of pollutants such as odor (PA), volatile organic compounds (CA) and hydrogen sulfide (IA and MN). In the face of all these changes is the increasing activity associated with adoption of practices to promote animal well-being and the uncertainty of how those practices affect the welfare of the environment. While many are discussing and calculating the carbon footprint of the U.S. dairy industry many holes in the data exist, making it all the more difficult to manage conflicting objectives.

Key Words: air, environment, water

Animal Health: Calf Health, Respiratory Disease, etc.

601 Calf enteric mortality etiologies 2004–2008. T. J. Baldwin, D. J. Wilson*, R. T. Skirpstunas, J. D. Trujillo, and E. J. Kelly, *Utah State University*, *Logan*.

Calves (1-90 d old, < 137 kg body wt) submitted dead to the Utah Veterinary Diagnostic Laboratory from 2004-2008 and diagnosed with enteric disease were retrospectively studied. 180 dairy and 123 beef (mainly Holstein or Jersey, Angus, respectively) calves from Utah and Idaho had post-mortem enteric cause(s) of death diagnosed. Agents of mortality included: Bovine Viral Diarrhea (BVD) 38% of cases, cryptosporidia 22%, coronavirus, rotavirus, E. coli each 20%. 10 different single agents killed 52% of calves; most common were BVD 21%, E. coli 9%. There were 21 combinations of 2 agents (28% of cases) and 12 combinations of 3 agents (9%). For calves 1-7 d old, common mortality causes were: dairy-coronavirus, rotavirus, cryptosporidia; beef - BVD, E. coli. 8-14 d, dairy - rotavirus, cryptosporidia, coronavirus; beef - BVD, E. coli. 15-45 d, dairy - BVD, Salmonella; beef - BVD, coccidia. From 45-90 d old, there was little beef calf mortality, but dairy calves died mainly from E. coli and BVD. Recent literature reports the vast majority of calf diarrhea cases are antibiotic-treated. The main causes of enteric mortality are viral, protozoal or a combination thereof. There are implications for therapy and importance of BVD control.

Key Words: calf, mortality, BVD

602 Assessment of the health status of newborn dairy replacement and veal calves. K. Waalderbos*[1], K. Leslie[1], T. Duffield[1], T. DeVries[2], and B. McBride[2], [1]*Department of Population Medicine, University of Guelph*, *Guelph, Ontario, Canada*, [2]*Department of Animal and Poultry Science, University of Guelph*, *Guelph, Ontario, Canada*.

Successful raising of healthy calves can be a challenge for dairy and veal producers. To date, in Ontario calves, little research has been reported on how the transfer of passive immunity and other health indicators may relate to calf health. A cross-sectional study is being conducted with 2306 newborn calves from 16 herds in southwestern Ontario. The objectives are to determine the health status of newborn dairy replacement and veal calves, with emphasis on quantifying transfer of passive immunity; to assess the influence of other metabolic and physiological indicators on calf health; and to evaluate differences between heifer and bull calves for these health indicators. During the study period of January to December 2008, weekly enrollment of heifer and bull calves, 1 to 7 days of age, occurred on commercial dairy farms in southwestern Ontario. At enrollment, calves were given a health score, measured for height, weight and body temperature, and two blood samples were collected. The whole blood sample was analyzed for complete blood count and selenium. Serum was harvested and analyzed for total protein, haptoglobin, magnesium and globulins. Birth records were completed for each study calf. Calves were followed until four months of age for disease events, treatment information and growth. Data analysis is in progress. In current results, the serum total protein values for 2306 calves ranged from 3.6 to 9.7g/dL, with a mean of 5.7g/dL (SD 0.68). Using a cut-off of >5.2g/dL to indicate success of passive transfer, 482 calves (20.9%) had a failure rate. Farm of origin and gender have an effect ($P<0.01$) on the distribution of serum total protein in calves. The distribution of whole blood selenium status for 876 newborn calves shows values ranged from 0.09 to 0.40 mg/mL, with a mean of 0.21 mg/mL (SD 0.05). Of note, the lab-provided reference interval for whole blood selenium is 0.20 to 1.2 mg/mL. Calves in this study tend toward the lower reference limit, with 369 calves (42.1%) falling below a 0.2 cut-off. These results suggest there is considerable variability in serum total protein and selenium levels of newborn calves both within and between farms.

Key Words: calf, total protein, selenium

603 Targeting therapy to minimize antimicrobial use in pre-weaned dairy calves: effects on health and occurrence of antimicrobial resistance in fecal *Escherichia coli*. A. C. B. Berge, D. A. Moore*, T. E. Besser, and W. M. Sischo, *Washington State University*, *Pullman*.

Antibiotics should be used prudently in production agriculture to reduce risks for antimicrobial resistance. The objectives of this study were to assess effects of raising pre-weaned calves without antimicrobials in the milk and reducing therapeutic antimicrobial treatment for diarrhea on morbidity, mortality, weight gain and antimicrobial resistance fecal *Escherichia coli*. Newborn calves (N=358) were randomly allocated to 4 groups, housed in individual hutches and observed for 28 days. Day