was used to map corpus luteum development until return to estrus. No difference in estrous cycle length was observed between the two groups ($P > 0.05$), indicating trophoblastic vesicle lifespan may be limited to 14-20 days and therefore does not significantly delay luteolysis when transferred on day seven of the estrous cycle.

Key Words: trophoblastic vesicle, P4, dairy

Animal Health: Immunity and Swine Health

189 Pea dietary fiber for adhesion and excretion of enterotoxigenic *E. coli* K88 to prevent intestinal colonization. P. M. Becker*, P. G. van Wikselaar, A. J. M. Jansman, and J. van der Meulen, *Animal Sciences Group of Wageningen UR, Lelystad, the Netherlands*.

Enterotoxigenic *Escherichia coli* (ETEC) expressing K88 (F4) fimbriae are associated with post-weaning diarrhea in piglets. Dietary components as well as feed additives can interfere with the colonization of the porcine intestine by ETEC. Digestion resistant fibers, for example, can competitively inhibit the adherence of ETEC to host intestinal tissues. Grain legumes such as peas or faba beans are alternative plant protein sources to soybeans in animal feed that can be cultivated in temperate climates. In fact, these crops are not only rich in protein, but also contain starch and fiber. The aim of this study was to test the binding capacity for ETEC O149:K91:K88ac (LT+/STb+) of pea (*Pisum sativum*, cv. Attika) and faba bean (*Vicia faba*, cv. Divine), and of different fractions of these grain legumes obtained before and after *in vitro* digestion. All products were milled to a particle size of less than 1 mm. *In vitro* digestion was performed using pepsin and pancreatin. Adhesion of ETEC K88 to the pea and bean materials was determined in a microplate-based binding assay. When comparing the raw products, pea hulls, pea inner fiber, whole pea, pea starch and pea protein scored higher in terms of adhesion of ETEC K88 than faba bean starch, whole faba bean, faba bean protein and faba bean hulls. Pea hulls proved even superior to a commercial yeast cell wall product in terms of the binding capacity for ETEC K88. After *in vitro* digestion, the binding capacity for ETEC K88 remained preserved in washed digestion remnants of both pea hulls and whole pea, indicating the potential of these products to offer alternative adhesion sites for ETEC K88 to host receptors in the piglet small intestine.

Key Words: anti-adhesion, *E. coli* K88, grain legumes

190 Health benefits of yeast derivates: in vitro and in vivo investigation. A. Ganner* and G. Schatzmayr, *BIOMIN Research Center, Tulln, Lower Austria, Austria*.

Yeasts have been used for fermentation and baking as well as for health aids throughout the history. In animal nutrition yeast products have been discussed as replacements of preventive antibiotics and as health promoting feed additives for over 20 years. Yeast products which are primarily promoted on the market are cell walls, beta-glucans, nucleotides and autolysed yeast. According to literature, yeast cell walls can prevent colonization of the intestinal tract by pathogens (binding of pathogens trough mannose-specific type I fimbriae); β-glucan and nucleotide products are described as immune stimulants by activating phaogocytic cells, but little research has been conducted regarding specific pathogen binding capabilities. Therefore, in vitro pathogen binding assays and immunological assays were conducted with subsequent in vivo feeding trials to gain more profound knowledge on health benefits of yeast products. The pathogen binding capacity of yeast cell wall was investigated with microplate-based assays by measuring the OD as growth parameter of adhering bacteria. Several *E. coli* and *Salmonella* strains adhered to a particular cell wall product with an amount between 1000 and 1000000 CFU/mg. As immunological parameters the nitric oxygen-production of a chicken macrophage cell line (HD11) stimulated with yeast nucleotides and yeast beta-glucans was analyzed. Production of NO was enhanced up to 100% relative to the positive control (LPS *E. coli* 0127). In an ex vivo trial with piglets fed yeast beta glucan in concentrations of 250 and 500 mg/kg, beneficial effects on lymphocyte viability and an increase of IL-18 could be demonstrated, however, animal performance was not affected. In an in vivo trial, broilers received yeast cell wall at a concentration of 2kg/T. Body weight was improved with statistical differences ($P<0.05$) compared to the control (+10%) and mortality reduced (-2%), also FCR (-5.8%) was improved to 35 days of age. In vitro and in vivo results suggest that yeast derivates are promising health and growth promoters for animal husbandry.

Key Words: yeast, pathogens, immunology

191 Use of *Saccharomyces cerevisiae* fermentation product during *Salmonella* infection in weaned pigs. K. L. Price*, H. R. Totty, H. B. Lee, M. D. Utt, M. A. Ponder, and J. Escobar, *Virginia Polytechnic Institute and State University, Blacksburg*.

Fermented yeast products are rich in mannanoligosaccharides, β-glucans, and other compounds that may optimize gut health and immunity, which can translate into better growth performance and a lower risk of food borne pathogens. The objective of this study was to quantify the effects of *Saccharomyces cerevisiae* fermentation product (Original XPC, Diamond V Mills, Inc., Cedar Rapids, IA) inclusion in nursery diets on pig performance before, during, and after an oral challenge with *Salmonella*. Pigs (n=10/treatment) were weaned at 21 d of age, blocked by BW and randomly assigned to treatments. The experimental design was a complete randomized design in a 2×2 factorial treatment arrangement consisting of diet (control or 0.2% XPC) and inoculation (broth or *Salmonella*). Pigs were fed a 3-phase nursery diet (0-7 d, 7-21 d, and 21-35 d) with ad libitum access to water and feed. On d 14, pigs were orally inoculated with 1×10^9 CFU of *Salmonella enterica* serovar Typhimurium or sterile broth. From d 17-20, all pigs were treated with an antibiotic (10 mg/kg BW i.m. ceftiofur). Growth performance was measured during pre-inoculation (PRE; 0-14 d), SICK (14-21 d), and post-inoculation (POST; 21-35 d) intervals after weaning. Rectal temperature (RT), BW, and ADG were measured weekly and daily during SICK. Diet had no effect on BW, ADG or RT during any period (P = 0.12 to 0.95) or frequency of *Salmonella* shedding in feces (P = 0.14 to 1.00) during SICK. Pigs inoculated with *Salmonella* had decreased ADG and BW, and elevated RT during SICK ($P < 0.001$). Furthermore, fecal CFU (log transformed) was correlated with ADG ($r = -0.50$, $P < 0.001$) and RT ($r = 0.63$, $P < 0.001$) during SICK. During POST, an interaction between diet and inoculation ($P = 0.009$) on ADG indicated that pigs infected with *Salmonella* grew better while consuming Original XPC compared to the control diet. The addition of XPC to the diets of weaning pigs can result in greater compensatory gains after infection with *Salmonella* than pigs fed conventional nursery diets.

Key Words: pig, *Salmonella* challenge, *Saccharomyces cerevisiae* fermentation product

192 Effects of feeding OmniGen-AF on neutrophil-mediated killing of *Archanobacterium pyogenes*. A. Rowson*, Y.-Q. Wang, S. B. Puntenney, and N. E. Forsberg, *OmniGen Research*, *Corvallis, OR*.

Arcanobacterium pyogenes is a filamentous gram-positive bacterium formerly classified as a fungus. It is a widely distributed inhabitant of mucus membranes and can infect animals following a precipitating injury. Economically important diseases in dairy cattle associated with A. pyogenes infection include mastitis, metritis and abortion. The organism is associated with liver abscesses in feedlot cattle. OmniGen-AF is a commercially-available feed additive which has been widely adopted within the US dairy industry. Recent studies (Wang et al., 2007, 2009) have shown that OmniGen-AF increases markers of immunity. Unpublished studies have also shown that neutrophils isolated from animals fed this product have enhanced ability to kill pathogens including Streptococcus uberis and Escherichia coli. The goal of this study was to determine whether neutrophils of OmniGen-AF-fed animals exhibited enhanced killing of A. pyogenes. Male CD rats (ca. 250 g, 8 per treatment) were assigned to a control ration or the same ration containing 0.5% (w/w) OmniGen-AF (Prince Agri Products, Quincy, IL). Animals were maintained on rations for 14 days after which they were anesthetized with xylazine and acepromazine and blood (10 ml) was taken via cardiac puncture. Neutrophils were prepared via Percoll gradient centrifugation. A. pyogenes was recovered from a clinical case of bovine metritis and cultured to known density. Neutrophils and A. pyogenes were combined in a ratio of 1:30 for 2 hr after which ability of A. pyogenes to metabolize MTT (3-(4,5-Dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide) to formazin was assessed as an index of A. pyogenes viability. Formazin concentration was assessed spectrophotometrically. Addition of OmniGen-AF caused a significant ($P<0.05$) 45% reduction in viability of A. pyogenes. This implies that one of the neutrophil killing mechanisms (NET formation, phagocytosis or ROS generation) was enhanced by feeding rats the product for 14 d. Field studies have shown that OmniGen-AF reduces incidence of metritis in dairy cattle. A possible mechanism for this may be via enhanced neutrophil-mediated killing of A. pyogenes.

Key Words: OmniGen-AF, metritis, neutrophil killing

193 Influence of an *in vivo* endotoxin challenge on *ex vivo* phagocytic and oxidative burst capacities of bovine neutrophils. M. A. Ballou*[1], L. E. Hulbert[2], L. R. Schwertner[1], J. A. Carroll[2], L. C. Caldwell[3,4], R. C. Vann[5], T. H. Welsh Jr.[3], and R. D. Randel[4], [1]*Texas Tech University*, *Lubbock*, [2]*Livestock Issues Research Unit, USDA-ARS*, *Lubbock, TX*, [3]*Texas AgriLife Research, Texas A&M System*, *College Station*, [4]*Texas A&M System*, *Overton*, [5]*MAFES, Mississippi State University*, *Raymond*.

Neutrophils promote health by reducing the early growth of invading pathogens. The objective of this study was to elucidate the temporal effects of an endotoxin (lipopolysaccharide; LPS) challenge on neutrophil function. Brahman heifers (186.1±11.8 kg; n=6) were challenged with LPS (0.25 μg IV/kg BW). Immediately before and at 1, 2, 4, 6 and 24 h relative to challenge, peripheral blood samples were collected to analyze phagocytic and oxidative burst capacities of neutrophils following 15–min or 60–min incubation periods with pre–opsonized *Mannheimia haemolytica*. Data are presented as the percentage and mean fluorescence intensity (MFI) of neutrophils phagocytizing or undergoing an oxidative burst. In addition, overall indices of phagocytosis and oxidative burst were calculated as the percentage of neutrophils multiplied by their respective MFI. The percentage as well as the MFI of phagocytizing neutrophils increased ($P < 0.001$) following the LPS challenge. Therefore, the phagocytic index increased ($P < 0.001$), peaking at 1 and 2 h for the 15– and 60–min incubations, respectively. Within 24 h the phagocytic index returned to baseline for the 15–min incubation, but there was a tendency ($P < 0.06$) for the phagocytic index to remain elevated for the 60–min incubation, reflecting an increased ($P < 0.01$) percentage of phagoycytizing neutrophils. The percentage of neutrophils producing an oxidative burst increased ($P < 0.001$), but only in the neutrophils incubated for 15–min. The MFI of the neutrophils producing an oxidative burst decreased ($P < 0.001$) rapidly for both incubation times and remained suppressed 24 h after the challenge. These data indicate that an LPS challenge stimulates the phagocytic capacity of neutrophils. However, despite more early-responding neutrophils undergoing an oxidative burst, the MFI and overall oxidative burst index are suppressed and remain so 24 h following an LPS challenge. The suppressed oxidative burst capacity may compromise the ability of neutrophils to control the growth of pathogens; alternatively, it may be a compensatory mechanism limiting excessive pathology.

Key Words: bovine, endotoxin, neutrophil

194 Influence of an *in vivo* corticotropin–releasing hormone (CRH) challenge on *ex vivo* phagocytic and oxidative burst capacities of bovine neutrophils. M. A. Ballou*[1], L. E. Hulbert[2], L. R. Schwertner[1], J. A. Carroll[2], L. C. Caldwell[3,4], R. C. Vann[5], T. H. Welsh Jr.[3], and R. D. Randel[4], [1]*Texas Tech University*, *Lubbock*, [2]*Livestock Issues Research Unit, USDA-ARS*, *Lubbock, TX*, [3]*Texas A&M System*, *College Station*, [4]*Texas A&M System*, *Overton*, [5]*MAFES, Mississippi State University*, *Raymond*.

Various stressors are linked in the etiology of disease states. The adverse actions of pathogens are limited by the ability of neutrophils to phagocytize and neutralize them. The objective of this study was to elucidate the temporal effects of an exogenous CRH challenge on neutrophil function. Brahman heifers (193.2±9.4 kg; n=6) were challenged with an intravenous bolus of bCRH (0.5 μg/kg BW). Immediately before (baseline) and at 1, 2, 4, 6 and 24 h relative to the challenge peripheral blood samples were collected to analyze phagocytic and oxidative burst capacities of neutrophils following 15–min or 60–min incubation periods with pre–opsonized *Mannheimia haemolytica*. Data are presented as the percentage and mean fluorescence intensity (MFI) of neutrophils phagocytizing or undergoing an oxidative burst. In addition, overall indices of phagocytosis and oxidative burst capacities were calculated as the percentage of neutrophils multiplied by their respective MFI. The percentage of neutrophils phagocytizing at the 15–min incubation was rapidly suppressed following the CRH challenge, but within 24 h values were not different from baseline. Neutrophils incubated for 60–min were initially suppressed, but compensated with more phagocytizing neutrophils 2 h after the challenge and within 4 h there was no difference relative to baseline. Mean fluorescence intensities of phagocytizing neutrophils were less responsive to the CRH challenge. The percentage of neutrophils producing an oxidative burst was suppressed at the 15–min incubation reaching the nadir at 2 h and returning to baseline at 6 h after the challenge. However, the MFI and the oxidative burst capacity index of neutrophils producing an oxidative burst for both incubation times decreased rapidly and remained suppressed 24 h after the challenge. These data indicate that both phagocytosis and oxidative burst capacities of neutrophils are suppressed by an *in vivo* administration of CRH. Diminished neutrophil capacities concurrent with or subsequent to a stressful event may contribute to increased susceptibility to pathogens.

Key Words: bovine, neutrophil, stress

195 Bovine adipose tissue depot inflammatory gene expression responsiveness to lipopolysaccharide (LPS) in vitro. M. Mukesh, D. E. Graugnard*, M. Bionaz, J. K. Drackley, and J. J. Loor, *University of Illinois*, *Urbana*.

In addition to its fundamental role as energy storage depot, studies with non-ruminants have reported a strong pro-inflammatory potential of adipose tissue. The transcriptional response of adipose tissue with respect to its immune responsiveness in dairy cows remains poorly characterized. Thus, we sought to examine mRNA expression and responsiveness of subcutaneous (SUBQ) and mesenteric (MES) adipose tissue from non-pregnant dairy cows to a short-term (2 h) in vitro LPS challenge (20 μg/mL). mRNA abundance of tumor necrosis factor-α (TNF), interleukin-6 (IL6), serum amyloid A1 (SAA1), toll-like receptor 4 (TLR4), monocyte chemoattractant protein-1 (MCP-1 or CCL2), RANTES/chemokine C-C motif ligand 5 (CCL5), and the lipogenic transcription regulator Lipin 1 (LPIN1) were analyzed using quantitative PCR. Tissue samples were collected at slaughter from 5 non-pregnant/non-lactating Holstein cows fed a diet containing 1.61 Mcal/kg NE_L for 8 wk. Basal (prior to LPS challenge) mRNA abundance of SAA1, CCL5, and LPIN1 was ca. 5-, 1.4-, and 3-fold, respectively, greater ($P \leq 0.07$) in MES than SUBQ. Regardless of depot site, LPS increased ($P \leq 0.06$) mRNA abundance of TNF, IL6, and CCL5. We also observed tendencies (interaction $P \leq 0.09$) for increased expression of CCL2 and IL6 primarily due to LPS in MES. Overall, data suggest that mesenteric adipose tissue has greater lipogenic and immune-response potential than subcutaneous adipose. Results provided initial evidence that adipose depots of dairy cows are immune-responsive and capable of synthesizing pro-inflammatory cytokines and chemokines rapidly when exposed to inflammatory conditions that can arise from a pathogenic insult (e.g., mastitis) or normally as it occurs during the onset of parturition.

Key Words: acute phase response, inflammation

196 Genotypic profiling of enterococci isolated from bovine origin. B. A. Stewart*[1], T. H. Yang[1], J. S. Hogan[2], and C. S. Petersson-Wolfe[1], [1]*Virginia Tech, Blacksburg*, [2]*The Ohio State University, Ohio Agricultural Research and Development Center, Wooster*.

The objective of the current study was to test enterococci isolated from milk, bedding and feed samples for the presence of genes related to virulence, the ability to form biofilm and resistance to a variety of commonly used antibiotics. A collection of 390 environmental streptococci and enterococci isolates were identified using standard bacteriology techniques as described by the National Mastitis Council and confirmed using the API 20 STREP test. A total of 164 of the 390 isolates were identified as enterococci using the *tuf* gene to distinguish from other environmental streptococci. Of the 164 isolates determined to be enterococci, the API 20 STREP test inaccurately identified 12 (7.3%) isolates as other environmental streptococci. Standard PCR procedures were used to detect the following virulence genes; *esp, efaAfs, gelE, efaAfm, agg, ace* and *fsr*. A total of 47 of the 164 isolates had at least 1 of the 7 tested virulence genes within the genome. The most virulence genes any isolate contained was 5 of the 7 that were tested. The majority of those isolates containing 5 virulence genes were *Enterococcus faecalis*, based on API identification. Only 2 of the tested isolates displayed the ability to form biofilm based on the published optical density cut-off value of 0.1. Furthermore, wide ranges in antibiotic sensitivity profiles were observed. A greater understanding of the genetic makeup of enterococci from bovine origin will provide knowledge regarding the pathogenesis of these bacteria and may lead to novel therapeutic options.

Key Words: *Enterococcus* spp., mastitis, virulence factors

197 Protective effect of polysaccharide produced by *Enterobacter cloacae* Z0206 on cyclophosphamide-induced suppression of immune functions in mice. M. Jin*, Y. Wang, X. Yang, C. Xu, and Z. Lu, *Institute of Feed Science, Zhejiang University*, *Hangzhou, Zhejiang Province, China*.

Polysaccharides are a complex group of important biological molecules known to enhance the immune functions. The objective of this experiment was to investigate the immunomodulatory effects of polysaccharide (EPS-1) produced by *Enterobacter cloacae* Z0206 on immunosuppressed mice. A total of 40 ICR male mice (18 ± 2g) were randomly allocated to four treatments of ten each. Three immunosuppressed groups were administered by gavage once daily with EPS-1 (0, 200 and 400 mg/kg body weight (B.W.)) for 14 days, and cyclophosphamide (CP) was given intraperitoneally at 50 mg/kg B.W. on the 12th day. The control mice received same volume of normal saline. Immune organ index, splenic lymphocyte proliferation induced by concanavalin (ConA) and lipopolysaccharide (LPS), and serum hemolysin concentration were detected in these animals. CP, as expected, showed suppressive effects on immune functions of mice. Polysaccharide treatment itself produced no toxicity and showed protection in CP-treated animals. Results showed that ESP-1 (Treatment with 200 and 400 mg/kg B.W.) significantly ($P<0.05$) increased spleen and thymus index in CP-treated animals. Moreover, EPS-1 (400 mg/kg B.W.) increased LPS-induced splenic lymphocytes proliferation ($P<0.05$) and serum hemolysin concentration ($P<0.05$) respectively compared with CP-treated animals alone. Together, this data implied that EPS-1 produced by *Enterobacter cloacae* Z0206 could provide protection against CP-induced immunosuppression in mouse model and it may act as potent immunomodulatory agent.

Key Words: polysaccharide, *Enterobacter cloacae*, immunomodulation

198 Effects of recombine porcine Lactoferrin–N on growth performance and immune function of weanling piglets. L. Yifan, H. Feifei, X. Yonggang, and W. Yizhen*, *Zhejiang University*, *Hangzhou, Zhejiang, China*.

A total of ninety weanling piglets (Duroc×Landrace×Yorkshire) at an average initial body weight of 8.0±0.23 kg were used in a 15–d growth experiment to investigate the effect of recombine porcine Lactoferrin–N (rPLFN) on growth performance and immune function. The pigs were allocated on the basis of bodyweight and litter to 3 treatments in a randomized complete block design. The dietary treatments were:control group (basal diet), antibiotics group (basal+100 mg/kg aureomycin), and rPLFN group (basal diet+50 mg/kg rPLFN). There were 3 replicated pens per treatment, and pigs were grouped with 10 pigs per pen. Six pigs, randomly selected from each treatment (2 pigs/pen), were slaughtered for serum and spleen samples on d 15. Results showed that supplementation with 50mg/kg rPLFN improved growth performance, significantly increased the average daily gain (ADG) by 31.67% ($P\leq0.01$),decreased the feed efficiency (F/G) by 11.22% ($P\leq0.05$) and the diarrhea by 66.25% ($P\leq0.01$). Adding 50mg/kg rPLFN to base diet increased concanavalin A(ConA)–and lipopolysaccharide (LPS)–induced spleen lymphocyte proliferation by 9.40% ($P\leq0.05$) and 7.70% ($P\leq0.05$) respectively on d 15 as compared with the control group. 50mg/kg rPLFN supplementation enhanced serum IgG by 28.34% ($P\leq0.05$), IgA by 7.10% ($P\leq0.05$), IgM by 12.47% ($P\leq0.05$), complement 3 (C3) by 7.10% ($P\leq0.05$) , complement 4 (C4) by 15.22% ($P\leq0.05$), IL-2 by 40.81% ($P\leq0.01$), IL-18 by 41.06% ($P\leq0.01$) relative to the control group on d 15. Compared with the control group, supplemental with 100mg/kg aureomycin also increased ADG, the ConA-and LPS-induced spleen lymphocyte

proliferation, serum IgG, IgA, IgM,C3,C4 ($P \leq 0.05$), and increased IL-2,IL-18 ($P \leq 0.01$), decreased F/G and diarrhea ($P \leq 0.05$), while there was no significant difference between rPLFN group and antibiotics group. These results imply that rPLFN would be used as an additive to improve growth performance and immune functions of weanling pigs. This would seem to be a good method for defending weanling piglets from infections and weanling stress.

Key Words: recombine porcine Lactoferrin-N(rPLFN), growth performance, immune function

199 Effects of α-ketoglutarate on mucosal morphology and function of small intestine in piglets. Q. Hu, Y. Hou*, B. Ding, H. Zhu, Y. Liu, M. Wang, and H. Xiao, *Hubei key Laboratory of Animal Nutrition and Feed Science, Wuhan Polytechnic University*, *Wuhan, Hubei, P. R. China*.

Three experiments were conducted to evaluate the effects of dietary supplementation of α - ketoglutarate (AKG) on mucosal morphology and function of small intestine in piglets. Both the experiment 1 and experiment 2 included 32 piglets, and they were weaned at 21 ± 2 days and randomly allotted to 4 treatment groups with dietary supplementation of AKG at 0, 0.5%, 1.0% and 2.0% respectively. On the 14th day of the experiment, the piglets were infused 10% D-xylose solution at 1 ml per kg of body weight, after 60 minutes, blood samples were collected from anterior vena cava, the concentration of D-xylose and activity of diamine oxidase and the content of endotoxin in plasma were determined. In the experiment 3, twelve piglets were weaned at 21 ± 2 days and randomly divided into 2 treatment groups, one group was fed with basal diet and the other were fed with basal diet +1.0% AKG. On the 14th day, all pigs were sacrificed to observe the mucosal morphology. The small intestine was cut off three 5 cm segments at distal duodenum, mid-jejunum and mid-ileum. The segments were processed, embedded, and stained to make tissue sections, the villus height (VH) and the associated crypt depth (CD) were measured, and then the ratio of villus height to crypt depth (VH/CD) were calculated. Differences among groups were analyzed by one-way analysis of variance and subsequent Duncan's multiple range test. The results showed that, in the groups of 1.0% AKG, crypt depth and activities of diamine oxidase were decreased ($P < 0.10$), VH/CD was increased; compared to 0% group, in the groups of 1.0% AKG, the contents of endotoxin were decreased by 33.41% ($P < 0.05$), and plasma D-xylose contents were increased by 21.02% ($P < 0.05$). These results indicated that dietary supplementation of AKG could improve histological morphology and function of the small intestine of piglets and dietary supplementation of 1.0% AKG was better relatively.

Key Words: α-ketoglutarate, small Intestine, piglet

Breeding and Genetics: Whole Genome Selection - The New Frontier?

200 National and international genomic evaluations for dairy cattle. P. M. VanRaden*[1] and P. G. Sullivan[2], [1]*USDA Animal Improvement Programs Laboratory*, *Beltsville, MD*, [2]*Canadian Dairy Network*, *Guelph, ON, Canada*.

Genomic evaluations are rapidly replacing traditional evaluation systems used for dairy cattle selection. More than 35,000 dairy cattle worldwide have been genotyped for 50,000 markers. Reliabilities of 60-70% for young genotyped animals are now possible as compared to 35% for parent average. Gains depend on numbers of genotypes and are much less for Jerseys or Brown Swiss than for the large North American Holstein population. Accurate blending of genomic and non-genomic information is important because many animals are not genotyped. In U.S. evaluations, extra information from genotyped parents is transferred to non-genotyped descendants using the same formulas that adjust traditional evaluations for foreign parent data. Propagation from genotyped progeny to non-genotyped parents is more difficult because the extra information from genotyped progeny should not exceed the direct gain from genotyping the parent. Genomic information may be transferred across countries using simple conversion equations or by modifying multi-trait across-country evaluation (MACE) to account for correlated residuals and to account for genomic rather than pedigree relationships when deregressing national evaluations. In traditional MACE, residuals are independent because each daughter is measured in only one country. In genomic MACE, residuals may be correlated for two reasons: 1) multiple evaluation centers may include the same genomic and phenotypic data in national estimates of marker effects, and 2) genomic predictions act as repeated measures of the same portion of genetic merit rather than independent measures of total merit, especially for major gene marker(s) and low-density SNP panels. Marker effects in the U.S. and Canada are highly correlated because both countries share the same genomic data and include traditional MACE evaluations as input to their genomic equations. Residual correlations can be approximated using daughter equivalents from genomics as a fraction of the total in each country and proportions of common bulls shared. Economies of scale in genomics promote cooperation across country borders.

Key Words: genomic evaluation, MACE, SNP

201 Beef cattle industry structure: Implications for whole genome selection. A. Van Eenennaam*, *University of California*, *Davis*.

The breed diversity, lack of vertical-integration, and segmentation of the beef cattle industry present unique challenges for the implementation of whole genome selection. Under the current model of genetic improvement, the costs involved in phenotyping and objectively ranking breeding animals are mostly incurred by the seedstock sector in partnership with breed associations. Record-keeping focuses on traits that are of importance to bull-buyers who understandably select on traits that directly impact their profitability. However, downstream segments of the beef industry (feeder, processor, retailer) each have their own set of economically relevant traits, and market failure means breeders and cow-calf producers receive little or no reward for including traits that are of importance to these segments (e.g. tenderness) in their selection decisions. The promise of genomic selection to improve traits that are currently intractable (feedlot health, feed efficiency, eating experience) will require the development of training populations with appropriate phenotypes. Research suggests that the development of accurate genomic prediction equations will require training populations of thousands of phenotyped and genotyped animals. Developing these populations will be expensive and require increased collaboration between industry segments. Additionally, marketing systems will have to begin to appropriately reward the costs associated with the incorporation of new traits into breeding and cattle evaluation programs. Finally, genomic prediction equations will need to be validated in populations raised in different environments and made up of various breed combinations. These variables have frustrated the validation of the first generation of