histochemical and biochemical analyses. At the end of the treatment, both maternal body weight (90.4 ± 7.7 kg vs. 107.6 ± 7.1 kg, $p < 0.05$) and body condition score (6.1 ± 0.4 vs. 8.5 ± 0.4, $p < 0.05$) were higher in OB than Con groups. Intriguingly, there was no significant difference in fetal body weight (5205.7 ± 282.9 g vs. 5113.4 ± 283.2 g) as well as St muscle weight (8.7 ± 0.3 g vs. 8.2 ± 0.5 g) between these two groups. Fetal St muscle from OB mothers contained more large adipocytes, with the total relative area of fat cells increased by 26.3 ± 3.4% ($P < 0.05$). Corresponding to that, the number of muscle cells in a certain area was decreased by 11.6 ± 1.7% ($P < 0.05$) in OB fetal St muscle, as well as a decreased average diameter by 11.1 ± 3.7% ($p<0.05$). OB enhanced the expression of peroxisome proliferator-activated receptor γ (PPARγ) and Preadipocyte factor-1 (Pref-1) in fetal muscle by 23.8 ± 3.9% ($P < 0.05$) and 14.0 ± 5.7% ($P=0.09$), indicating enhanced adipogenesis. The protein content of Glut 1 and Glut 4 was decreased by 22.1 ± 4.8% and 13.9 ± 1.3% in OB fetal muscle respectively ($P < 0.05$). In conclusion, maternal over-nutrition during fetal stage dramatically increases the number and size of intramuscular adipocytes, which will provide sites for intramuscular fat accumulation in offspring, and could effectively improve marbling and quality grade of the resulting carcasses.

Key Words: adipogenesis, fetus, marbling

Nonruminant Nutrition: Improving the Nutritional Value of Alternative Feed Ingredients

234 Carbohydrates in alternative feed ingredients. B. M. Vester Boler and G. C. Fahey Jr.*, *University of Illinois*, *Urbana*.

With the fluctuating prices of commodity ingredients fed to livestock, poultry, and companion animals, alternative feed ingredients are of interest as partial substitutes for more traditional ingredients used in animal diets. Many of these alternative ingredients have carbohydrate concentrations and profiles different from those of traditional ingredients. Indeed, greater proportions of fermentable carbohydrates (i.e., dietary fibers) often are found. Popular alternative ingredients include corn co-products (e.g., distillers dried grains, distillers dried grains with solubles, corn germ, corn germ meal, corn gluten feed, corn gluten meal, corn bran), legumes (e.g., peas, soybean hulls), wheat middlings, canola meal, sunflower meal, and even grains other than corn (e.g., barley, oats, rice, sorghum, wheat) and co-products from the bakery industry (e.g., bakery by-product meal). Good analytical techniques exist for the measurement of all categories of carbohydrates, but for these values to be meaningful, further characterization of carbohydrates is needed that emphasizes their nutritional/physiological relevance for a particular animal species. Starch, hydrolyzable carbohydrates, rapidly and slowly fermentable carbohydrates, non-starch polysaccharides, total dietary fiber, and detergent fibers are carbohydrate fractions affecting select aspects of animal metabolism such as nutrient intake and digestion, glycemic response, immune response, and gut microbiota modulation. Most contain multiple carbohydrate moieties, and various analytical techniques exist for their quantification. To fully appreciate the importance of carbohydrates in alternative feed ingredients, integration of information related to chemical composition, analytical methodology, and nutritional/physiological outcomes must occur.

Key Words: carbohydrates, alternative feeds, nutrition

235 Mycotoxins in alternative ingredients. T. K. Smith*, *University of Guelph*, *Guelph, ON, Canada*.

Mycotoxins are metabolites produced by fungi (molds) that can infest crops pre-harvest and can continue to flourish under sub-optimal storage conditions. Grains with a high moisture content are particularly unstable and prone to mold proliferation and possible mycotoxin production. Excess rainfall at harvest and at key periods during the growing season can be a major promoter of mycotoxin contamination of feedstuffs. The most significant species of mycotoxin-producing fungi that have an impact on livestock production would include *Aspergillus* and *Fusarium*. The most significant mycotoxin produced by *Aspergillus* fungi are the aflatoxins and these are most commonly found in tropical and semi-tropical climates. The *Fusarium* mycotoxins include the trichothecenes such as deoxynivalenol (DON, vomitoxin), zearalenone and the fumonisins. The major economic cost of feed-borne mycotoxins is immunosuppression. This results in lingering herd health problems, animals that do not respond to medication and failure of vaccination programs. Other more specific symptoms of mycotoxicoses include behavioral changes arising from altered brain neurochemistry including loss of appetite, loss of muscle coordination and lethargy; impaired reproduction and gastrointestinal tract pathology resulting in reduced efficiency of nutrient absorption. Recent increases in fuel ethanol production have diverted feed grains away from the animal industries. This has increased the price and reduced availability of traditional feedstuffs while alternative feed ingredients such as distillers dried grains and corn and wheat gluten by-products have become more attractively priced and more available. Such products, however, have an increased likelihood of mycotoxin contamination. The use of alternataive feed ingredients, therefore, requires increased monitoring for mycotoxin contamination.

Key Words: alternative ingredients, mycotoxins, immunosuppression

236 Anti-nutritional compounds and other limitations to the use of alternative feed ingredients. H. H. Stein*, *University of Illinois*, *Urbana*.

Alternative feed ingredients that are used in the swine industry may be categorized in 4 groups: 1) Intact ingredients such as field peas, canola seeds, barley, wheat, and oats; 2) Processed ingredients that are by-products from other industries such as distillers dried grains with solubles (DDGS), high protein distillers dried grains, corn gluten meal, hominy feed, corn gluten meal, corn germ, wheat middlings, soybean hulls, alfalfa meal, canola meal, de-hulled sunflower meal, cotton seed meal, glycerol, and liquid whey; 3) Off-spec products from other industries such as pet food, cookies, bread, etc, and 4) Left-overs from other industries such as outdated bread, out dated milk, left-over chocolate, etc. Anti nutritional compounds may be present in some of these ingredients such as gossypol in cottonseed products, glycosinolates in canola products, tannins in field peas, alkaloids in lupins, and mycotoxins in many cereal grains and by-products of grains. However, these anti-nutritional compounds can usually be managed and in most cases, they do not represent major limitations to the use of alternative feed ingredients, although there are exceptions to this rule. Many alternative feed ingredients, especially from the group of processed ingredients, contain relatively large concentrations of dietary fiber, which on many occasions limits the inclusion rate of these ingredients in diets fed to swine. This is true in particular for ingredients such as alfalfa meal and soybean hulls. Undesirable characteristics of the carcass of pigs fed alternative ingredients may also limit the inclusion rate of ingredients such as DDGS with high concentrations of unsaturated fatty acids.

Another major limitation to the inclusion rate of alternative ingredients is variability in the concentration and digestibility of the nutrients in the ingredient. This concern limits the inclusion rate of many ingredients in group 3) and 4), and the ingredients in these groups are usually only attractive if some guarantees for consistency can be obtained from the supplier of the ingredients.

Key Words: alternative ingredients, anti-nutritional compounds, pigs

237 Phytase and NSP-degrading enzymes for alternative feed ingredients. R. T. Zijlstra*[1], E. Beltranena[1,2], C. M. Nyachoti[3], and S. W. Kim[4], [1]*University of Alberta*, *Edmonton, AB, Canada*, [2]*Alberta Agriculture and Rural Development*, *Edmonton, AB, Canada*, [3]*University of Manitoba*, *Winnipeg, MB, Canada*, [4]*North Carolina State University*, *Raleigh*.

Co-products from cereal and oilseed crops processed for food, biofuel, or bio-industrial purposes are attractive feed ingredients to manage feed costs per unit of gain in swine. These alternative feed ingredients may contain more phytate and non-starch polysaccharide (NSP) than traditionally measured in cereal grains that may limit nutrient digestibility or feed intake. Supplemental feed enzymes combined with feed processing technologies and advanced feed quality evaluation techniques are important components of a strategy to mitigate risks of high dietary inclusion of co-products. Supplemental enzymes have been studied for decades in combination with cereal grains; however, more recently, specific efforts have started to apply enzyme technology to co-products. Some important considerations are: a) the substrate for the enzyme must be the main limitation for digestibility of the nutrient of interest, b) effects of enzyme must be clarified for the co-product vs. the rest of the diet, and c) processing technology may affect the content and functional characteristics of phytate and NSP in the co-product. Thus, analysis of phytate and NSP content should be part of feed quality evaluation. Generally, phytase improves P digestibility and its effects on energy and AA digestibility are variable depending on trial conditions. Generally, NSP-degrading enzymes improve energy digestibility and their effects on AA and P digestibility are variable depending on trial conditions. Due to the altered nutrient flow through the intestinal tract, supplemental enzymes may also alter nutrient availability to intestinal microbes, and hence alter microbial populations. Application of enzyme technology combined with modern feed processing and feed quality evaluation technologies may provide the pig with additional energy, AA, and P resulting in cost-effective, predictable growth performance and carcass quality.

Key Words: alternative feedstuff, enzyme, pig

Physiology and Endocrinology: Dairy Cattle Reproduction

238 Effect of PRID administered 5-12 days post-insemination on progesterone levels and pregnancy risk in previously inseminated dairy cows. S. J. Scott*, K. E. Leslie, R. B. Walsh, J. S. Walton, and S. J. LeBlanc, *University of Guelph*, *Guelph, ON, Canada*.

Progesterone (P_4) concentration in the days following AI is one important factor in maintenance of the developing conceptus. The effects of a Progesterone-Releasing Intravaginal Device (PRID) inserted between 5 – 12 d after AI and removed 7 d later on serum P_4 concentrations and risk of pregnancy were studied in 671 lactating dairy cattle on 8 farms in Ontario. Cows were visited weekly and randomly assigned to receive PRID or PID (Placebo Intravaginal Device). Serum P_4 was measured at insertion and removal of the device. At insertion P_4 levels were similar between treatment groups (2.9 ± 1.7 ng/ml). The probability of pregnancy to the AI immediately before device insertion was not significantly different in PRID (36%) and PID (38%) treated cows, or between cows enrolled 5 - 8 and 9 - 12 days post-AI (P=0.8). Cows that received PRID had higher serum P_4 at device removal than controls (4.8 vs. 4.3 ng/ml, P=0.04, accounting for P_4 at insertion). Yet, change in P_4 concentration was only significant in cows that received PRID 9 - 12 days post-AI (3.7 versus 3.1 ng/ml in PRID and controls, respectively, P=0.05). Use of Ovsynch had confounding effects. Cows bred off natural heat detection (HD; n = 427) were 1.5 times more likely to become pregnant to that breeding than cows bred with Ovsynch (n = 234) (P=0.03). Cows bred on Ovsynch had 0.52 ng/ml less P_4 upon device removal (P=0.03), compared to cows bred on HD. BCS recorded at the time of enrolment was not significantly different between treatment groups (2.75 ± 0.3). There was no association of BCS with probability of pregnancy or P_4 at device removal, and no interaction of BCS with the effect of PRID. Average milk yield (41.2 ± 7 kgs) was positively associated with the probability of pregnancy (P=0.05). There was no interaction of milk yield with the effect of PRID. Under the conditions of this study administration of a P_4 device post-insemination increased circulating P_4 but was not associated with pregnancy to the preceding AI.

Key Words: PRID, progesterone, pregnancy

239 Plasma hormones and energy metabolites in postpartum lactating (L) and nonlactating (NL) Holstein cows that either conceived or failed to conceive at first insemination. A. N. Brauch*[1], J. C. Green[1], J. P. Meyer[1], A. M. Williams[1], C. S. Okamura[1], P. Taube[2], L. Goetze[2], and M. C. Lucy[1], [1]*University of Missouri-Columbia*, *Columbia*, [2]*Pfizer Animal Health*, *New York, NY*.

Lactation affects circulating concentrations of metabolic hormones involved in nutrient partitioning for milk synthesis. The objective was to examine hormones and energy metabolites in dairy cows that were either L or NL and either conceived [pregnant (P)] or failed to conceive [not pregnant (NP)] at first insemination. Primiparous Holstein cows were assigned to one of two treatments after calving [L (n=23) or NL (n=20), dried off immediately]. Blood was collected thrice weekly for 60 d postpartum. Cows were treated with Presynch-Ovsynch and inseminated with frozen semen from a single ejaculate. The interval to first insemination (61 ± 1 d) was similar for L and NL cows that were either P (n=16 L; n=11 NL) or NP (n=7 L; n=9 NL) at first insemination. The L cows averaged 30.4 ± 0.8 kg milk/d at 60 d postpartum. There was an effect of lactation on plasma growth hormone (GH) concentrations (P<0.01) because L cows had greater GH when compared with NL cows (14.9 ± 1.8 vs. 6.8 ± 1.8 ng/mL, respectively). Insulin-like growth factor 1 (IGF1) concentrations were affected by both lactation (P<0.001) and status (P<0.02). L cows had lesser IGF1 than NL cows and, regardless of treatment, NP cows had lesser IGF1 than P cows (L cows: 104.7 ± 12.3 and 125.2 ± 7.8 ng/mL for NP and P; NL cows: 167.4 ± 10.2 and 195.9 ± 9.3 ng/mL for NP and P). There was an effect of lactation (P<0.001) and a status by day interaction (P<0.01) for plasma glucose. L cows had lesser glucose compared with NL cows (65.7 ± 0.9 and 77.4 ± 0.8 mg/dL for L and NL, respectively). Plasma glucose was greater in P cows than NP cows during d 0 to 30 (72.6 ± 0.4 and 68.9 ± 0.5 mg/dL for P and NP cows) but was similar thereafter (d 31 to 60; 72.5 ± 0.3 and 72.2 ± 0.4 mg/dL for P and NP cows). L cows had greater (P<0.01) plasma non-esterified fatty acid (NEFA) than NL cows (436.6