pically labeled amino acids provides an in vivo model that can distinguish the proportion of amino acids that are derived from the diet and arterial input. Using this technique in fed infant pigs, we found that 30-40% of the total amino acid intake is used by gastrointestinal tissues. The relative PDV utilization of individual amino acids from the diet and arterial inputs varies widely and dietary amino acids are the preferred fuel over dietary glucose. Stable isotopically labeled amino acids also enable the determination of the metabolic fate of individual amino acids. These studies have shown that insufficient protein supply or mode of feeding affects PDV amino acid utilization and consequently has a bearing on whole-body growth.

Key Words: Intestine, Swine, Nutrition

403   Mineral bioavailability and metabolism determined using stable isotope tracers. J. R. Turnlund*, *USDA/ARS/Western Human Nutrition Research Center, University of California*, *Davis*.

Definitive data on mineral bioavailability in humans and animals can be obtained by using isotopic tracers. The use of stable isotope tracers to study important issues in mineral nutrition has expanded rapidly in the past two decades, particularly in humans. Stable isotopes have a number of advantages over radioisotopes. There is no exposure to radiation with stable isotopes and some minerals have no radioisotope that can be used satisfactorily as a tracer. Multiple stable isotopes of one mineral and isotopes of multiple minerals can be administered simultaneously or sequentially. The analytical methods of choice for stable isotopes are thermal ionization mass spectrometry (TIMS) and inductively coupled plasma mass spectrometry (ICPMS). TIMS offers the highest precision and accuracy, but is slower, more labor intensive, and more costly than ICPMS. Bioavailability data are critical to establishing reliable dietary mineral requirements and recommendations. Combined with a computer program for compartmental modeling, mineral kinetics can be studied, including mineral turnover, pool sizes, and transfer rates between compartments. Our laboratory conducts studies using stable isotopes of zinc, copper, iron, calcium, magnesium, and molybdenum. We have studied the effect of the amount of dietary intake of minerals on bioavailability and utilization, pregnancy and aging, and interactions between minerals. The work resulted in establishing new dietary recommendations in humans for copper and molybdenum and compartmental models were developed for these minerals. While stable isotopes have been used more extensively to date in humans than in animals, the techniques applied to humans can be used to study a number of issues important to optimizing feeding strategies for animal production.

Key Words: Stable Isotopes, Mineral Bioavailability, Mineral Metabolism

404   Measuring nitrogen-containing polymer synthesis rates by using stable isotope tracers. M. Z. Fan*[1], L. I. Chiba[2], P. D. Matzat[3], and Y. L. Yin[4], [1]*University of Guelph, Guelph, ON, Canada*, [2]*Auburn University, Auburn, AL*, [3]*Elanco Animal Health, Greenfield, IN*, [4]*The Institute of Subtropical Agricultural Research, the Chinese Academy of Sciences, Changsha, Hunan, China*.

The major nitrogen (N)-containing polymer compounds in the body include DNA, RNA, and proteins. The gastrointestinal endogenous secretions as well as the portal-drained visceral and the peripheral immune responses are of basic physiological functions. Elevated endogenous secretions and immune activities, as affected by developmental stages, diets and environmental factors, decrease the efficiency and availability of the major dietary nutrients for peripheral muscle synthesis and deposition. Measurements of in vivo fractional DNA (cell proliferation), RNA (transcriptional efficiency/mRNA stability) and protein (translational efficiency/metabolism) synthesis rates associated with the visceral organs, peripheral immune cells and skeletal muscles should, in principle, be the sensitive biochemical and cellular endpoints for studying factors affecting monogatric animal nutrition and metabolism. The selection of precursor stable isotope tracers, routes of tracer delivery and the gas chromatography-mass spectrometric (GC-MS) analyses of tracer enrichments are the major methodological considerations. Oral feeding the heavy water (^2H_2O) and intravenously continuous infusion of [U-^{13}C]glucose and [^{15}N]glycine for labeling the ribose and deoxyribose sugar moieties, de novo base synthesis, and non-essential amino acids have been established to measure in vivo fractional DNA, RNA, and protein synthesis rates. Flooding doses of tracer phenylalanine (Phe), e.g., L-[ring-$^2H_5$]Phe, via i.v. and i.p. routes, are reliable and cost-effective for measuring fractional protein synthesis rates especially for the visceral organs in suckling and weanling pigs. Therefore, measuring the major N-containing polymer fractional synthesis rates in the visceral organs and the peripheral immune cells through oral feeding ^2H_2O and/or ip flooding doses of tracer Phe are the emerging powerful tools for studying monogastric animal nutrition and metabolism under controlled experimental and field conditions.

Key Words: Stable Isotope Tracers, Fractional Synthesis Rates, Pigs

405   Factors affecting in vivo fatty acid and triglyceride synthesis rates measured by stable isotope tracers. E. Murphy*, *University of California*, *San Francisco*.

Synthesis of fatty acids (de novo lipogenesis) and triglyceride synthesis are important factors in body fat accumulation. Recently, new stable isotope methods using heavy water (^2H_2O) have made possible the safe, and relatively easy, measure of both of these processes in vivo in animals and humans. New methods also provide information on the preferential use of specific triglyceride synthesis pathways under different physiological settings. Data suggest that numerous dietary factors may affect de novo lipogenesis including nutrient composition, fructose intake, caloric content and fatty acid composition. Significant differences in de novo lipogenesis have also been seen across species. Rates of triglyceride synthesis have been shown to differ significantly between different adipose depots with metabolically active depots (e.g., visceral fat) having much more rapid triglyceride turnover than subcutaneous depots. Dietary fat, leptin deficiency and treatment with insulin sensitizers such as the PPAR-γ agonist rosiglitazone have all been shown to influence triglyceride synthesis rates. Application of these new techniques to nonruminant animals other than rodents will undoubtedly enhance our understanding adipose biology.

Key Words: Lipogenesis, Stable Isotope, Triglyceride Synthesis

Physiology and Endocrinology IV

406   Effect of postpartum nutrition of primiparous beef cows on concentration of insulin in follicular fluid and abundance of mRNA for binding proteins (IGFBP) -4 and -5 and aromatase in granulosa cells of dominant follicles. I. Rubio*, R. P. Wettemann, F. J. White, P. Y. Aad, and L. J. Spicer, *Oklahoma Agricultural Experiment Station*, *Stillwater, OK*.

Greater nutrient intake increased concentrations of IGF-I and IGFBP-4 and -5 in follicular fluid (FF) of postpartum anovulatory primiparous cows. This experiment evaluated the effect of nutrient intake on insulin in FF, and abundance of mRNA for IGFBP-4 and -5 and aromatase in dominant follicles (DF) at 56 ± 9 d postpartum in the same anovulatory Angus x Hereford cows. Body condi-

tion score (BCS) at calving was 4.8 ± 0.2. Cows (n=28) were blocked based on BCS and randomly assigned to one of two nutritional treatments at calving; moderate (M), 2.3 kg/d of a 40% CP supplement and ad libitum hay, or high (H), ad libitum access to a 12% CP-50% concentrate diet and hay. Growth of DF was evaluated daily by ultrasonography for 5 d before aspiration. When growth of DF plateaued, FF was obtained by transvaginal ultrasound-guided aspiration. Data were analyzed using the MIXED procedure of SAS and Pearson correlations coefficients. Concentrations of insulin in FF were greater (P < 0.05) for H (1.59 ± 0.22) than M (0.97 ± 0.17 ng/ml) and H cows had greater (P < 0.01) insulin in plasma (1.61 ± 0.17) than M (0.97 ± 0.17 ng/ml). Concentrations of IGF-I in FF were greater (P < 0.01) for H than M cows. Abundance of

mRNA for IGFBP-4 and -5 and aromatase were not affected by treatment. Postpartum interval to luteal activity was longer (P < 0.05) for M cows (95 ± 24) than for H (80 ± 11 d). Postpartum interval to luteal activity was negatively correlated (P < 0.01) with BCS at aspiration. Although concentrations of IGFBP-4 and -5 in FF were greater in H than M cows, treatment did not influence mRNA for IGFBP-4 and -5. Concentrations of insulin and IGF-I in FF, and abundance of mRNA for aromatase and IGFBP-4 and -5 in DF of anovulatory cows at 56 d after calving were not related to the interval from calving to the onset of luteal activity. These results suggest that changes in FF IGFBP concentrations rather than local translational regulation may have a role in dietary-induced changes in postpartum follicular growth.

Key Words: Beef Cows, Follicle, Ovary

407 Accessing the impact of faults in body condition score on reproductive performance in large commercial dairies. D. Caraviello*[1], K. Weigel[1], M. Florent[1], C. Rawson[2], N. Zwald[2], and M. Wiltbank[1], [1]*University of Wisconsin, Madison,*, [2]*Alta Genetics, Calgary, Alberta, Canada.*

The impact of body condition score (BCS) on 3 reproductive variables (conception at first service, conception at second service, and pregnancy status at 150 d postpartum) was evaluated. A total of 8,036 Holstein cows on 63 farms were scored on a 1 to 5 scale by a single, trained evaluator. A system was developed such that an individual cow's BCS was considered to be a "fault" if it fell below a predetermined threshold. These thresholds were 3.25, 2.75, 2.5, and 2.75, for cows that were -60 to 30, 30 to 50, 50 to 180, and 180 to 200 days postpartum, respectively. Only animals evaluated before 200 days postpartum were included in the analysis. In addition, the percentage of BCS faults was computed for each herd; this system allowed characterization of the BCS status of each herd in a single visit. Reproductive data were obtained close to the time of BCS evaluation, between March and September 2004, from dairy records processing centers and from on-farm computers using Dairy Comp 305, DHIPLUS, and PCDART. Data were precorrected for lactation number and temperature (using weather station data). The logistic regression model showed that there was a linear decrease in conception rate and pregnancy status at 150 d postpartum on herds with >25% BCS faults. Mean conception rates were approximately 23% for herds with <25% BCS faults and less than 20% for herds with >45% BCS faults. Likewise, 74% of cows were pregnant by 150 d postpartum in herds with <25% BCS faults, and less than 60% were pregnant in herds with >45% BCS faults. These results were confirmed by the "cow level" evaluation, with probabilities of conception at first service of 25% and 19% (p = 0.04), and probabilities of being pregnant at 150 d postpartum of 74% and 61% (p < 0.0001) for animals without and with a fault, respectively.

Key Words: Body Condition Score, Conception, Reproductive Performance

408 Prediction of reproductive performance on large commercial dairies. D. Caraviello*[1], K. Weigel[1], C. Rawson[2], N. Zwald[2], D. Gianola[1], and M. Wiltbank[1], [1]*University of Wisconsin, Madison,* [2]*Alta Genetics, Calgary, Alberta, Canada.*

Data from Holstein cows in large commercial herds that participated in the Alta Genetics' Advantage progeny testing program were analyzed to explain factors affecting conception at first, second, and third services, pregnancy status at 150 days in milk, and days open. Test day production records and reproductive events were obtained from a total of 127 herds that participated in the DHI milk recording program and used DHIPLUS, Dairy Comp 305, or PCDART software for herd management purposes. In addition, body condition scores (BCS) were measured directly on 63 farms. A survey regarding management factors that could affect reproduction was completed in 104 herds, with the help of Alta Genetics' consultants. Maximum daily temperature on each day of insemination was obtained from weather stations within 25 miles of each farm (via the National Climatic Data Center). A hash map implemented in JAVA was used as data structure to construct a merged data set including 604 explanatory variables and reproductive and milk yield data from 65,849 lactation records of 56,943 cows calving from January 2000 to August 2004. Stepwise model selection, partial least squares, Bayesian information criteria, and machine learning techniques were used to construct models explaining reproductive performance on these farms. The most important (p < 0.0001) explanatory variables affecting these response variables included milk yield, maximum temperature at day of the service, BCS, pens included on BCS evaluation, use of clean-up bull, use of bull fertility evaluations, amount of training of the technicians, method used to thaw semen, synchronization protocols used, number of pens holding the open cows, barn type, bedding type and renewing frequency, cleaning and disinfection of the maternity pen, who formulates the diets, benefits provided to full-time employees, and hoof trimming frequency.

Key Words: Conception, Model Selection, Reproductive Performance

409 Individual variation in production efficiency of beef and dairy cows. A. Brosh* and Y. Aharoni, *Newe Yaar Research Center, Beef Cattle Section, Institute of Animal Science, A.R.O Israel, Newe Yaar Israel.*

Most of the metabolizable energy (MEI) consumed by cattle is lost as energy expended (EE) as heat. The energy balance of animals is presented by the following equation: MEI=EE+Retained Energy (RE). Knowledge of any two of the above variables allows the solution of the equation and calculation of energy efficiency. The objective of this presentation is to characterize the repeatability of differences in energy efficiency among cows, measured repeatedly in four experiments (Exp). The EE (kJ/(kgBW0.75*day)) in all experiments was measured by means of the heart rate (HR) method, i.e. HR that was measured throughout 3-4 days was multiplied by the oxygen consumption (VO2) per heartbeat, measured throughout 10-15 min, and by 20.47 kJ per liter VO2. In Exp 1, EE and MEI were measured nine times in six beef cows in confinement during one year of their reproductive cycle. In Exp 2, EE and MEI were measured in six non-lactating, non-pregnant beef cows on six diets varying in ME content. In Exp 3, EE and MEI were measured in five grazing seasons on differing herbage quality in16 cows. The data were analyzed by the ANOVA procedure with correction by covariance to MEI, to analyze differences among cows on an equal MEI basis. The differences in EE among cows in all experiments were significant (P range from 0.006 to 0.037), with range of individual variation of 20% to 28% of the average EE. In Exp 4 we used 19 Holstein dairy cows. Their EE and the energy in their secreted milk were measured four times during four months. The predicted EE of these cows was calculated from their energy in milk and their BW, assuming 0.57 MJ/kgBW0.75 for maintenance and efficiency of 64% of ME for milk production, and was subtracted from their measured EE to calculate their residual EE (REE). Thus, an efficient cow has a negative REE (predicted EE higher than measured EE). The repeatability of the REE among cows was significant (P<0.001). The REE ranged from -17% to +13% of the measured EE, i.e., a range of 30%. We conclude that lower EE in relation to MEI or predicted EE is a repeatable trait that should be considered as a tool to select cows of higher energy efficiency.

Key Words: Energy Expenditure, Heart Rate, Efficiency

410 Fatty acid composition of the porcine conceptus in response to maternal omega-3 fatty acid supplementation. A. E. Brazle*[1], B. J. Johnson[1], E. C. Titgemeyer[1], S. K. Webel[2], and D. L. Davis[1], [1]*Kansas State University, Manhattan,* [2]*United Feeds, Inc., Sheridan, IN.*

Maternal omega-3 fatty acid supplementation is reported to increase litter size in pigs. Therefore we evaluated the hypothesis that omega-3 sources would affect the fatty acid composition of pig conceptuses and that the effects would differ with the omega-3 source. Diet treatments were control, corn-soybean meal diet; PFA, control plus a protected fish source of polyunsaturated omega-3 fatty acids (Fertilium®, 1.5% of diet); and flax, control diet plus ground flax (equivalent in total omega-3 fatty acids to PFA). Supplements replaced corn and soybean meal in the PFA and flax diets. When gilts reached 170 d of age PG600® was injected to induce puberty and dietary treatments initiated. At approximately 190 d of age gilts began a 14-d treatment with Matrix® to synchronize

their estrous cycles. When detected in estrus gilts were artificially inseminated. Experimental diets continued until d 40 to 43 of gestation when gilts were slaughtered and reproductive tracts removed to collect conceptuses. Pregnant gilts (7/8, 8/8, 5/8 for control, PFA, and flax, respectively) provided tissues to examine the fatty acid composition. Dietary treatments did not affect linolenic (P > 0.39) and arachidonic (P > 0.10) acid in conceptuses. However, eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) composition of fetuses was affected by flax and PFA. Flax increased EPA 32% (control: 0.73 mg/g dry tissue) in fetuses (P < 0.05) but only numerically increased EPA in the chorioallantois (P = 0.14) compared to the control diet. Gilts receiving PFA had 16% more (P < 0.006) DHA in their fetuses than fetuses in controls (control: 4.9 mg/g tissue). Therefore, initiating supplementation approximately 40 d before breeding with these omega-3 sources affected conceptus composition and the two sources affected fatty acid composition differently. Flax selectively increased EPA and PFA increased DHA. These results are relevant to other data indicating PFA increases prenatal survival in pigs.

Key Words: Embryo, Omega-3 Fatty Acids, Pig

411 Effects of stress on performance and the immune response in pigs infected with porcine reproductive and respiratory syndrome virus. M. Sutherland*[1], S. Niekamp[1], W. Van Alstine[2], and J. Salak-Johnson[1], [1]*University of Illinois*, *Urbana*, [2]*Purdue University*, *West Lafayette, IN*.

Changes in the thermal environment (e.g., heat) can invoke a stress response in pigs. Initiation of a stress response often leads to an increase in glucocorticoids, thus impacting the immune system. The objective of this experiment was to determine the effect of heat stress on the immune response and performance of pigs infected with porcine reproductive and respiratory syndrome virus (PRRSV). At 7 wk of age (d 0) Landrace × Yorkshire cross pigs were assigned to each of four experimental treatments: (1) PRRSV+, 24°C (n = 8); (2) PRRSV+, 32°C (n = 8); (3) PRRSV-, 24°C (n = 8); or (4) PRRSV-, 32°C (n = 8). Pigs were subjected to thermal stress for 14 d. Blood samples were taken prior to intranasal inoculation of the PRRSV or vehicle (baseline, d 0), and at d 7 and 14 post-inoculation to measure white blood cell counts (WBC), differentials, cortisol, lymphocyte proliferation (LPA), and natural killer cytotoxicity (NK). Body temperature and feed intake were recorded on a daily basis. Total WBC were decreased (P < 0.005) by d 7 in infected pigs, regardless of temperature and returned to baseline levels by d 14. The LPA response was greater (P < 0.01) in PRRSV+ pigs at 24°C than non-infected pigs. At 7 d, non-infected pigs kept at 32°C had lower (P < 0.05) NK compared to PRRSV+ pigs at 32°C and PRRSV- pigs at 24°C, but there was no differences by d 14. At 7 d, body temperature was greater (P < 0.05) in PRRSV- pigs kept at 32°C than in those infected and kept at 24°C, but by d 14 PRRSV- pigs kept at 24°C had the lowest (P < 0.05) body temperatures. Feed intake increased (P < 0.05) in non-infected pigs over the course of the experiment, but did not change among infected pigs. Body weight gain was reduced in PRRSV+ pigs kept at 32°C (P < 0.05). These results suggest that PRRSV can reduce body weight gain and influence the immune response of pigs but these effects can be affected further when thermal stress is applied.

Key Words: Immune, Pigs, Stress

412 Effects of albuterol on the physiology of finishing pigs. D. Lay*[1], J. Marchant Forde[1], B. Richert[2], R. Marchant Forde[1], and K. McMunn[1], [1]*USDA-ARS; Livestock Behavior Research Unit*, *W. Lafayette, IN*, [2]*Purdue University*, *W. Lafayette, IN*.

Several growth promoters for swine have been tried with variable success and there has been concern about compound efficacy and alterations of behavior or physiology. This experiment examined the physiological effects of a proposed growth promoter, albuterol - a beta-2 agonist. The study used 192 pigs (88.8±0.9 kg BW) housed in groups of six in 32 pens (1.4m x 4.1m) and assigned to one of four treatments: 1) Control - standard finishing ration, 2) ALB-R2 - diet with 2 ppm of the pure R-enantiomer of albuterol, 3) ALB-R4 - diet with 4 ppm of pure R-albuterol, or 4) ALB-RS8 - diet with 8 ppm of a racemic mix of R- and S-enantiomers. All diets supplied 18.3% CP, 1.1% lysine and 3534 kcal ME/kg and were offered ad libitum. One pig from each pen was chosen randomly and blood was collected four times: Week 0 - prior to treatment, Week 2 - at 10 days on treatment, Week 4 - at 24 days on treatment and, SAC - at exsanguination. All pigs were fed control diet for 24h (50% of pigs) or 48h (50% of pigs) prior to exsanguination. Blood was analyzed for NEFA, CK, glucose, lactate, BUN, ammonia, insulin, cortisol, norepinephrine, and epinephrine. Data for Weeks 0 to 4 were analyzed together using a repeated analysis of variance with Week 0 as a covariate. SAC data were analyzed separately as these data represent the difference in the 24h or 48h clearance. There were no treatment differences in epinephrine or norepinephrine concentrations at any point. During Week 4, Control pigs had lower CK (P<0.02) and greater BUN (P<0.005) compared to pigs fed all the albuterol treatments. A gender effect was found for CK and BUN (P<0.05) indicating that males had greater concentrations of CK and BUN than females. The ALB-R4, male pigs had greater concentrations of insulin than male pigs in the other three treatments during Week 2 (P<0.001). Control female pigs had lower concentrations of cortisol compared to female pigs in the other three treatments during Week 2 (P<0.02). Taken together these data indicate that albuterol altered protein metabolism, without altering catecholamine levels, at the doses administered in this experiment. Gender-specific effects of albuterol should be explored further.

Key Words: Albuterol, Pigs, Physiology

413 Evidence for coordinated regulation of IGFBP-5, four and a half lim (FHL) 2, and a disintegrin and metalloprotease (ADAM) 9 expression in osteoblasts. K. E. Govoni*[1], A. Kramer[1], E. Winter[1], D. J. Baylink[1,2], and S. Mohan[1,2], [1]*MDC, JL Pettis VAMC*, *Loma Linda, CA*, [2]*Loma Linda University*, *Loma Linda, CA*.

The role of IGFs in regulating growth and their modulation by six IGFBPs are well established. IGFBP-5, the most abundant IGFBP stored in bone, is an important regulator of bone formation and acts via IGF-dependent and -independent mechanisms. Two new proteins, FHL2, a transcription modulator that interacts with IGFBP-5, and ADAM9, an IGFBP-5 protease, have been identified as potential regulators of IGFBP-5 action in bone. We tested the hypothesis that agents which modulate bone formation by regulating IGFBP-5 expression would also regulate FHL2 and ADAM9 expression in a coordinated manner. We evaluated the expression of IGFBP-5, FHL2, and ADAM9 by real-time PCR during osteoblast differentiation of mouse bone marrow stromal cells and in response to treatment with bone formation modulators in osteoblast cells (LSaOS and MG63). IGFBP-5 and FHL2 increased 4.3 and 3.0 fold (P ≤ 0.01), respectively, during osteoblast differentiation. Dexamethasone (Dex), an inhibitor of bone formation, decreased IGFBP-5 and FHL2 and increased ADAM9 in LSaOS cells (P ≤ 0.05) and decreased FHL2 in MG63 cells (P ≤ 0.05). Bone morphogenic protein (BMP) 7, a stimulator of bone formation, increased IGFBP-5 and decreased ADAM9 in LSaOS and MG63 cells, respectively (P < 0.01). To determine if BMP7 would eliminate Dex inhibition of IGFBP-5, cells were treated with Dex+BMP7. The BMP7-induced increase in IGFBP-5 was reduced, but not eliminated, in the presence of Dex (P ≤ 0.01), indicating that BMP7 and Dex may regulate IGFBP-5 via different mechanisms. TGFβ, a stimulator of bone formation, increased IGFBP-5 and FHL2 (P ≤ 0.01) in LSaOS cells. In summary: 1) Expression of IGFBP-5 and FHL2 increased while no change in ADAM9 was observed during osteoblast differentiation; 2) Treatment with BMP7 and TGFβ increased IGFBP-5 and FHL2 expression, whereas Dex decreased IGFBP-5 and FHL2 and increased ADAM9 expression. In conclusion, our findings are consistent with the hypothesis that FHL2 and ADAM9 are important modulators of IGFBP-5 actions and are regulated in part, in a coordinated manner in bone.

Key Words: IGFBP, IGF, Bone

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414 Immunization of pigs against chicken (c)GnRH-II and lamprey (l)GnRH-III: Effects on gonadotropin secretion and testicular function. A. Bowen*[1], S. Khan[2], L. Berghman[3], J. Kirby[4], and J. Vizcarra[1], [1]*Texas Tech University, Lubbock*, [2]*Clark Atlanta University, Atlanta, GA*, [3]*Texas A&M University, College Station*, [4]*University of Arkansas, Fayetteville.*

The objective of this experiment was to evaluate the effects of active immunization against two GnRH isoforms on gonadotropin secretion and testicular function in pigs. Synthetic cGnRH-II and lGnRH-III peptides, where the common pGlu-His-Trp-Ser sequence at the N-terminal was suppressed, were conjugated to BSA. Forty-eight male piglets were randomly assigned to 4 treatments. Pigs on treatment 1 were actively immunized against cGnRH-II, while pigs on treatment 2 were actively immunized against lGnRH-III. Pigs on treatment 3 were actively immunized against the carrier protein (BSA), and pigs on treatment 4 were castrated and actively immunized against BSA. The BSA conjugate was emulsified in Freund's incomplete adjuvant and diethylaminoethyl-dextran. The primary immunization was given at 13 weeks of age (WOA), with booster immunizations given at 16, 19, and 23 WOA. Body weight and plasma samples were collected weekly beginning at 11 WOA. Treatments did not affect BW during the experimental period. Titers were significantly increased in animals immunized against cGnRH-II and lGnRH-III (P < 0.01). Cross-reactivity of the antisera to mammalian GnRH or between cGnRH-II and lGnRH- III was minimal. At 26 WOA, pigs (n = 3/trt) were randomly selected, and serum samples were collected at 10 min intervals for 10 h. Concentrations of LH (P<0.01), FSH (P=0.137), and FSH pulse frequency and amplitude (P<0.10) appeared to be differentially regulated in immunized animals. At the end of the experiment, intact pigs were exsanguinated. Testes were immediately removed; Leydig cells were isolated and treated with 0, 1, or 10 ng/ml of LH. There was a LH x GnRH treatment effect on testosterone concentrations (P<0.01), indicating that Leydig cells were sensitive to the immunization protocol and LH doses. Taken together, these data suggest that gonadotropin secretion is differentially regulated in pigs immunized against GnRH isoforms. Additionally, immunization against cGnRH-II and lGnRH-III significantly reduced the ability of Leydig cells to respond to LH challenges.

Key Words: GnRH, LH, FSH

415 Application of glycerol as an optical clearing agent to enhance photonic transference and detection of *Salmonella typhimurium* through pig skin. K. Moulton*[1], F. Lovell[1], E. Williams[1], P. Ryan[1], A. Karsi[1], M. Lawrence[1], D. Lay[2], E. Jansen[3], and S. Willard[1], [1]*Mississippi State University, Mississippi State*, [2]*USDA-ARS Livestock Behavior Research Unit, West Lafayette, IN*, [3]*Vanderbilt University, Nashville, TN.*

The objective of this investigation was to evaluate glycerol (GLY) and GLY+DMSO (dimethyl sulfoxide) as agents to optically clear pig skin and increase photonic transference and detection of photon emitting *Salmonella typhimurium* (*S. typh* -lux; transformed with plasmid pAKnlux1), in a laboratory model for *Salmonella* detection in swine. Shoulder pig skin obtained after harvest and hair removal was further processed to remove the subcutaneous fat, and skin measured for thickness. A 96-well plate containing *S. typh*-lux was imaged for 5 min using a photon counting camera (Berthold/Nightowl) as a control reference. Skin (3 mm thick) was then placed over the plate containing *S. typh*-lux and imaged for 5 min. The skin was then treated with varying ratios of GLY, DMSO and PBS in a dose- and time-dependent manner and the plate imaged again for 5 min. The percent of photonic emissions (skin / no skin control x 100 was calculated and used for statistical analysis (n=8). Treatment for 4 h with 50% GLY-PBS and 50:30:20% GLY:DMSO:PBS increased (P<0.05) photonic emissions (4.9±0.8% and 6.5±0.9%, respectively) compared to untreated skin (0.24±0.05%), 100% PBS (0.20±0.03%) or 30:70% DMSO:PBS (0.50±0.08%). Altering the ratios of DMSO (10, 20, 30, 40, and 50%) in the presence of 50% GLY demonstrated that DMSO at 20 and 40% (13.8±1.2% and 14.4±1.1%, respectively) increased (P<0.05) photonic emissions compared to 10% DMSO (10.8±1.3%) and 50% GLY:PBS alone (10.4±1.0). Treatment of skin with 50% GLY and 50:30% GLY:DMSO did not differ (P>0.10) in photonic emissions at 30 min, 1, 2, 4, or 8 h post-treatment; and both treatment groups exhibited greater (P<0.05) photonic emissions than no treatment, DMSO alone, or PBS at 2, 4, and 8 h. These data indicate that GLY and GLY+DMSO may be used as effective optical clearing agents on pig skin when treated for 4 or 8 h to allow for an increased detection of emitted photons from *S. typh*-lux through the skin. [USDA-NRI grant # 2003-35201-13841; USDA-ARS funded Biophotonic Initiative # 58-6402-3-0120]

Key Words: Biophotonics, *Salmonella*, Glycerol

416 Factors affecting days open and days to first breeding in Iranian Holsteins. A. Heravi Moussavi*[1], M. Danesh Mesgaran[1], and R. Noorbakhsh[2], [1]*Ferdowsi University, Mashhad, Khorasan, Iran*, [2]*Institute of Standards and Industrial Research, Mashhad, Khorasan, Iran.*

Effects of several factors on days open (DO) and days to first breeding (DFB) in Iranian Holstein cows were evaluated. Data covered 10 years from 1994 to 2003. The period of evaluation was from 40 to 180 d after calving. After editing, the data set had 6000 and 6500 cows for days open and days to first breeding, respectively. Data were analyzed by mixed models. The model included lactation number, calving season, calving year, first 100 d cumulative milk production, sex of calf and postpartum health situation. The result showed that DO and DFB were impacted by year (P<0.001). While DO (109.5±6.9 vs. 114.4±6.9 d, respectively for years 1994 to 1998 and 1999 to 2003) was increased (P<0.001), DFB (75.6±3.5 vs. 70.7±3.6 d, respectively for years 1994 to 1998 and 1999 to 2003) was decreased during the recent years (P<0.001). First 100 d cumulative milk yield (2904±38, 3050±33, 3162±33, 3217±33, 3132±34, 3346±32, 3427±34, 3487±35, 3244±35, 3472±35 kg, respectively for years 1994 to 2003) was different among the years (P<0.001) and had impact on DO (r = 0.08; P=0.018) and DFB (r = -0.02; P<0.001). DO was not affected by season but DFB (75.8±1.3, 67.0±1.4, 72.7±1.4 and 79.1±1.5 d, respectively for spring, summer, autumn and winter) was affected by season (P<0.001). DO and DFB were increased due to metabolic and/or reproductive disorders (P<0.001). Sex of calf had no effect on DFB but impacted DO as cows with male calves had greater (P<0.01) DO than cows with female calves (103.1±1.4 and 98.7±1.4 d, respectively). DFB (75.4±3.6, 68.9±3.5, 70.6±3.5, 71.3±3.6, 75.7±3.7, 75.5±3.7, 78.8±3.7 d, respectively for lactation number from 1 to 7 and higher) was impacted by lactation number (P<0.001). DO was similar among different lactation numbers. In conclusion, DO was affected by year, postpartum disease, sex of calf, and milk yield, whereas DFB was affected by year, season, postpartum disease, lactation number and milk yield.

Key Words: Reproductive Efficiency, Days Open, Days to First Breeding

Production, Management and the Environment: Nutrition, Management, and Environment

417 Assessment of dairy farm management practices through internet connections. G. Licitra*[1,2], J. D. Ferguson[3], G. Azzaro[1], M. Caccamo[1], and A. Cappa[4], [1]*CoRFiLaC, Regione Siciliana, Ragusa, Italy*, [2]*D.A.C.P.A., University of Catania, Catania, Italy*, [3]*University of Pennyslvania,, Kennett Square*, [4]*APA, Vicenza, Italy.*

A major challenge in the dairy industry is transfer of information and technology to dairy farms. Extension systems have been reduced in size due to costs to maintain extensive systems. This reduces the ability to deliver technical assistance to many local dairy farms. The internet provides an opportunity to integrate farm records on health, reproduction, production, and costs. In addition digital video and photos can be used to form a visual data base of cows and farm facilities. Experts can then visit the farm virtually and have access to data to help troubleshoot and evaluate farm management. The system can be used to

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