22 to 35 and 35 to 40 days. A Positive Control feeding program was formulated with ME levels as follow: 2,950; 3,050; 3,100 and 3,150 kcal ME/kg. Three Negative Controls had 60, 90, and 120 kcal ME/kg graded reductions related to the Positive Control. Supplementation of the lowest energy Negative Control with 200, 300 and 400 g/Ton of an alpha amylase â€“ beta glucanase blend (Ronozyme A - 200 kilo-Novo alpha-amylase units and 350 fungal beta-glucanase units per g) was used in the other three feeding programs. All diets had nutrients to meet or exceed NRC (1994). Body weight, feed intake and feed conversion were weekly evaluated. At the end of the study, broilers demonstrated gradual losses in their performance in parallel with the graded reductions in feed energy. However, including the enzyme at 300 and 400 g/Ton of feed partially alleviated these negative effects. Taking the overall feed conversion in consideration, benefits of enzyme inclusion were similar to those obtained with feeding programs having 30 and 60 kcal ME/kg higher than the Negative Control, respectively for 300 and 400 g/Ton. The observation of the weekly results indicated that enzyme efficacy was mainly demonstrated after 21 days of age. Mortality was not affected by the treatments.

Key Words: Broiler, Enzyme, All Vegetable Feed

Physiology & Endocrinology - Livestock and Poultry: Role of Lipids and Fatty Acids in Regulation of Reproductive Function

492 The role of omega-3 and -6 fatty acids in regulation of reproductive function in horses. E. L. Squires*, *Colorado State University*, *Fort Collins*.

Semen contains high levels of polyunsaturated fatty acids (PUFA), in particular the long-chain fatty acids docosapentaenoic acid (DPA) and docohexaenoic acid (DHA). Ability of sperm to resist cold shock is related to lipid composition of the sperm membrane. Approximately 30% of stallions have sperm that do not withstand the rigors of cooling and/or freezing. Three studies have focused on the effect of DHA supplementation to stallions. Brinsko et al. (2005) used 8 stallions in a 2×2 cross-over design. Stallions served either as control or were fed a DHA-enriched product for 14 weeks. They reported a 3-fold increase in the semen levels of DHA. Although DHA supplementation had no effect on fresh semen, it did increase total, progressive and rapid motility after 48 hr of cooling and after freezing and thawing. The most dramatic response to DHA was seen in those stallions that prior to treatment had <40% motility after 24 hr of cooling. Harris et al. (2006) conducted a similar study in which 6 stallions were fed either a basal diet with no supplementation or a basal diet supplemented with 29 g of PUFA. Supplementation resulted in a 46% increase in daily sperm output at the end of the 90-day trial. Supplemented stallions also had a higher percentage of morphologically normal spermatozoa. In the third trial, conducted at Colorado State University, 10 stallions were collected daily for 8 days and the data used to establish baseline values for seminal characteristics. Stallions were assigned to either a control diet or control diet containing 270 g DHA product. There was a significant increase in the daily number of motile sperm in the ejaculate of fresh semen, as well as semen stored for 24 hr at 5°C. These combined studies demonstrated that supplementation of stallions with PUFA containing DHA resulted in improvement in sperm numbers and semen quality.

Key Words: Stallion, Omega-3 Fatty Acid, Semen

493 Addition of protected fat in ewes with different corporal condition on superovulation and conception rate. P. Molina[1], T. Sánchez[1], O. Mejía[2], J. Nuñez[2], E. García*[3], O. D. Montañez-Valdez[4], J. Cordero[1], J. Peralta[1], M. E. Ortega[1], R. Nieto[5], E. Mendoza[1], and R. Avila[1], [1]*Colegio de Postgraduados*, *Montecillo, Estado de México, México*, [2]*Facultad de Medicina Veterinaria y Zootecnia, UNAM*, *Tres Marías, Municipio de Huitzilac, México*, [3]*Centro Universitario de la Costa Sur de la Universidad de Guadalajara*, *Autlán, Jalisco, México*, [4]*Centro Universitario del Sur de la Universidad de Guadalajara*, *Ciudad Guzmán, Jalisco, México*, [5]*Instituto Tecnológico Agropecuario No.6*, *Huejutla, Hidalgo, México*.

Thirty days before synchronization there were two groups of Dorset ewes in very good body condition: In T1 ewes were fed with commercial supplement and oat straw, and in T2 ewes were fed with oats straw to lower the body condition of this group and both groups received this diet for a month. Then six ewes of each group were superovulated (donors) and the rest remained as receptor ewes (T1 n=20; T2 n=16). At the beginning of the superovulation treatment dorsal fat of the ewes was measured with ultrasound and body weight was recorded. During the first 8 days of synchronization and superovulation treatment both groups received 100 g of protected fat and same diet as T1, synchronization for donors and receptors was performed by sponges of fluorogestone acetate (FGA, 40 mg) during 12 days. Receptor ewes received 200 U.I of eCG 12 h before sponges removal. Donor ewes were superovulated with decreasing doses of FSHp two days before and after sponges removal and embryos were obtained and transferred seven days later. Average weight of ewes at the beginning of estrus synchronization was 68.9 and 64.6 kg, for T1 and T2, respectively (P=0.07), while average dorsal fat was 2.5 and 1.97 mm for T1 y T2, respectively (P<0.05). At synchronized estrus ewes of T1 and T2 weighted 71.69 and 69.03 kg (P>0.05) and dorsal fat measures were 3.5 and 3.29 mm (P>0.05). All ewes from T1 (100%) showed response to superovulation, while in T2 only 66.7%. Ewes from T1 showed an average of 9.5 ± 0.85 corpus luteum, compared to T2 with 14.75 ± 2.36 (P<0.05). Number of embryos recovered for T1 was 7.17 ± 1.10 and 11.5 ± 2.36 for T2 (P=0.09). Average number of good quality embryos was 6.7 ± 0.84 for T1 and 8 ± 2.86 for T2 (P>0.05). Percentages of conception rate were 35% and 31.5%, for T1 and T2, respectively (P>0.05). Under the conditions of the present experiment was observed that ewes with lower dorsal fat, with the addition of protected fat for a short period increased ovulation rate but not gestation rate.

Key Words: FSH, Embryos, Dorset

494 Dietary omega-3 and omega-6 fatty acids and reproduction in dairy cattle. L. Badinga* and C. Caldari-Torres, *University of Florida*, *Gainesville*.

Fat supplementation has become a common practice in the dairy industry due to the inability of high-producing dairy cows to maintain a positive energy balance during the transition to lactation. Available

evidence indicates that dietary supplementation of long-chain fatty acids stimulates ovarian follicular development, increases serum progesterone concentration, attenuates eicosanoid synthesis, and improves fertility rates in cattle. In several animal models, supplemental n-3 polyunsaturates inhibit prostanoid synthesis, whereas n-6 polyunsaturated fatty acids tend to increase peripheral prostaglandin $F_{2\alpha}$ concentration. A recent study indicated that the net inhibitory effect of n-3 fatty acids on eicosanoid synthesis may vary, depending on the ratio of n-6 and n-3 fatty acids in the uterus. Evidence also is rapidly accumulating that supplemental polyunsaturated fatty acids not only regulate prostaglandin biosynthesis, but may also affect the production of inflammatory biomarkers in livestock. This may lead to earlier recovery of immune functions in lactating dairy cows fed a fat-supplemented diet. The objective of this review is to summarize the effects of dietary n-3 and n-6 polyunsaturates on reproductive efficiency and to discuss the putative mechanisms by which these fatty acids may affect reproductive responses in dairy cattle.

Key Words: Omega Fatty Acid, Reproduction, Dairy Cow

495 Reproductive function in dairy cows fed a lipid encapsulated conjugated linoleic acid supplement. G. E. Mann*[1], A. L. Lock[2], D. E. Bauman[3], and N. R. Kendall[1], [1]*University of Nottingham*, *Sutton Bonington, Loughborough, UK*, [2]*University of Vermont*, *Burlington*, [3]*Cornell University*, *Ithaca, NY*.

In attempting to address the problem of poor energy status during the early post partum period the intrinsic drive of the modern Holstein to partition energy intake toward increased milk output has exasperated attempts to reduce negative energy balance through improvements in diet. However, recent studies have shown that feeding of lipid encapsulated conjugated linoleic acid (LE-CLA) during the early post partum period can reduce milk fat and thus milk energy. In this study we have investigated reproductive function in multi parous Holstein-Friesian dairy cows fed LE-CLA. The study was carried out between September and March in cows individually fed a typical TMR ration based on maize and grass silage including rolled wheat, sugar beet pulp nuts, molasses and minerals. From day 21 following calving until day 100, cows received 84g of either LE-CLA containing a 50:50 mixture of cis-9, trans-11 and trans-10, cis-12 CLA supplying 7.5g of each isomer (n=13) or an equivalent amount of rumen-inert fat (Megalac; n=13) top dressed onto the standard ad lib TMR. Throughout the study daily milk samples were collected for progesterone analysis in order to accurately monitor reproductive function. During the study cows were inseminated at natural oestrus, observed by skilled stockmen according to the normal herd management routine. The proportion of LE-CLA cows showing normal cycles (12/13) was greater ($P<0.05$) than that seen in the control cows (6/13). During the trial period a greater ($P<0.05$) proportion of LE-CLA cows were inseminated (11/13) than control cows (5/13) and by the end of the trial period 7/13 LE-CLA cows had conceived compared with 4/13 control cows. The mean day of first insemination was 66±4 for the CLA treated cows and 75±9 for the control cows. These results show improved reproductive function in post partum dairy cows during the feeding of LE-CLA. The LE-CLA used in this trial was supplied by BASF.

Key Words: Cow, CLA, Reproduction

496 Dietary lipids and reproduction in beef cattle. R. N. Funston*, *University of Nebraska*, *West Central Research and Extension Center, North Platte*.

Inadequate dietary energy intake and poor body condition can negatively affect reproductive function. Supplemental lipids have been used to increase energy density of the diet and may also have direct positive effects on reproduction in beef females. Several fatty acid sources have been studied as they relate to reproductive function. Plant derived oils appear to have the greatest impact on reproduction, common sources include: sunflower, safflower, cottonseed, rice hulls, and soybeans. Animal tallow and calcium salts of fatty acids escape rumen biohydrogenation to a greater extent and are incorporated into adipose tissue and milk. Effects on reproductive function appear to be more variable. Polyunsaturated fatty acids such as those in fishmeal also bypass the rumen but have been documented to affect reproductive processes. Lipids have been fed before and after calving, during the breeding season, and during heifer development. Response to lipid has been investigated through measuring: body weight and body condition score, age at puberty, postpartum interval, first service conception rates, pregnancy rates, calving interval, mammary gland development, milk yield, milk composition, calving difficulty, and calf birth and weaning weight. Animal response appears to be dependent on body condition score, age (parity), nutrients available in the diet (pasture or range conditions), and type of lipid supplemented. To elucidate potential mechanisms of action scientists have investigated: changes in follicular and uterine development, hormonal profiles, brain function, and embryonic development. Feeding supplemental lipid has resulted in varied and inconsistent results on reproductive function. Elucidating mechanisms of action on how supplemental lipid can influence reproductive function has been a difficult process. The complexity of the reproductive system and makeup of lipid supplements are often confounded by management conditions and forage quality both in research and commercial feeding situations. This has contributed to inconsistencies in research findings.

Key Words: Lipid Supplementation, Beef Cattle, Reproduction

497 The role of dietary omega-3 and omega-6 fatty acids in swine reproduction. S. K. Webel*, J. D. Spencer, and A. M. Gaines, *JBS United, Inc.*, *Sheridan, IN*.

The positive impact on reproduction of altering the omega-3:6 ratio by including supplemental omega-3 fatty acids (FA's) from marine sources has been reported for both the boar and sow. The lipid components of the spermatozoa plasma membrane contains a high level of polyunsaturated FA's. Inclusion of dietary omega-3 FA's to increase the ratio of decohexaenoic acid (DHA) in the plasma membrane has been associated with improved sperm cell viability as measured by motility, cytology, storability and increased number of AI doses obtained per ejaculate collection (Maldjian et.al. 2003, AOCS Press). Increasing the ratio of marine source omega-3 FA's in sow diets from day 60 of gestation to farrowing improved piglet prenatal survival (Rooke, 2003 Minn. Nut. Conf). Further positive effects of altering the omega-3:6 ratio were discussed and reviewed by Levis and Reese (AASV, 2003). Research in our laboratory has demonstrated the benefits of increasing dietary levels of marine sourced omega-3 FA's

on litter size in gilts (Spencer, et.al. JAS 82, Suppl. 2, p81) and sows (Webel, et.al. 2003, JAS 81, Suppl 1, p18). Improved embryo and fetal survival is the hypothesis for the observed increase in litter size. Additional recent research has demonstrated alteration in tissue concentrations and ratios of specific omega3 FA's in the fetus and newborn piglets, when gestation diets of dams were supplemented with dietary sources of marine omega-3 FA's. This enrichment of tissue omega-3 has been associated with increased preweaning survival, weaning weight, immune function and grow-finish performance. The authors will review and discuss relevant literature as well as additional unpublished research.

Key Words: Omega-3, Reproduction, Swine

Production, Management & the Environment - Livestock and Poultry: Poultry Production and Reproduction

498 Influence of hatching egg weight and Japanese quail breeder flock age on embryonic mortality stages, hatchability and chick quality measurments. T. M. El-Sheikh*, *Sohag University*, *Sohag, Egypt*.

This study was carried out to determine the effects of the breeder age and the egg weight of the Japanese quail on the hatchability, the embryonic mortality, and one-day old chick quality. twenty-four hundred eggs were obtained from the hens at the age of 8 weeks, at the age of 16 weeks and at the age of 24 weeks. The eggs were grouped according to their weight as follows; 8.5-10.5, 10.51-11.5 and 11.51-13.5 g. The traits measured were embryonic mortality, fertility, hatchability and hatching chick quality. Pre-incubation, early, mid and late embryonic mortality were 3.18, 5.81, 7.35 and 9.76%; 3.35, 5.56, 7.62 and 10.41 and 1.85,3.02, 3.99 and 5.21% respectively, for 8, 16 and 24 weeks parents age.The percent of pre-incubation, early, mid and late embryonic mortality were 1.96, 4.55, 5.85 and 7.61%, respectively for the smaller eggs, 3.12, 4.79, 6.86 and 8.98 for mid egg weight and 3.31,5.04, 6.25 and 8.79% for the largest egg weight. Malformation and malposition of the embryonic dead and piped eggs were affected by breeder age and egg weight. Fertility was decreased as the parents age increase while the opposite trend was found with hatchability. Fertility, hatchability of set eggs and hatchability of fertile eggs were 81.44, 58.81 and 73.43%, respectively, for the youngest flock, 78.51, 61.48, 78.31% for mid flock age and were 73.73,62.68, and 85.12% for the oldest flock age. The breeder age and egg weight had significant effect on fertility, hatchability hatched and chick quality ($P<0.05$). Abnormal chicks, dead in shell and naval wet were increased with older parents and small egg weights. It was observed that the chick weight increased in parallel with increasing egg weight. The average chick weight was 10.94, 11.06, and 12.32 for parent flock of 8, 16, and 24 weeks of age , respectively. The average chick weight was 9.88, 11.01, and 12.23 grams for smaller, mid and bigger egg weight, respectively. The incubation period was shorter with increasing egg weight and breeder age.

Key Words: Quail Breeder Age, Chick Quality, Hatchability

499 WITHDRAWN BY AUTHOR.

500 Effects of supplemental dietary phytase and 25-hydroxycholecalciferol on the digestive and reproductive organ characteristics of commercial layers inoculated Before or at the Onset of Lay with the F-Strain of *Mycoplasma gallisepticum*. E. D. Peebles*[1], S. L. Branton[2], M. R. Burnham[1], S. K. Whitmarsh[1], and P. D. Gerard[1], [1]*Mississippi State University*, *Mississippi State*, [2]*Poultry Research Unit, Agricultural Research Service, United States Department of Agriculture*, *Mississippi State, MS*.

In 3 trials, the effects of dietary supplementation with phytase (PHY) and 25-hydroxycholecalciferol (25-D3) on the digestive and reproductive organ characteristics of commercial layers that were inoculated pre-lay (12 wk of age) or at the onset of lay (22 wk of age) with the F-Strain of *Mycoplasma gallisepticum* (FMG), were assessed at 58 wk of age. Experimental layer diets which included either a basal control diet or a control diet supplemented with 0.025 % PHY (600 FTU / kg of diet) and 25-D3 (34.5 µg pure crystalline / kg of diet) were fed from 20 through 58 wk of age. As a percentage of total oviduct weight, magnum weight was lower in birds that were inoculated (sham or FMG) at lay onset compared to those that were inoculated pre-lay, and in FMG-inoculated birds, relative duodenum length was greater in those inoculated at 12 compared to 22 wk. Also, as percentages of organ weight or length, infundibulum length and isthmus weight were increased, whereas duodenum length was decreased by dietary supplementation with PHY and 25-D3. The overall timing (12 versus 22 wk) of inoculation can affect the reproductive organ characteristics of layers; whereas, more specifically, the timing of an FMG inoculation may affect their digestive organ structure. Furthermore, independent of inoculation timing and type, both the reproductive organ and digestive systems of laying hens may be influenced by dietary supplementation with PHY and 25-D3.

Key Words: *Mycoplasma Gallisepticum*, Phytase, 25-Hydroxycholecalciferol

501 Validity of fertilization assessment of broiler hatching eggs. R. W. Keirs*, P. D. Gerard, and E. D. Peebles, *Mississippi State University*, *Mississippi State*.

Validation of broiler breeder flock hatching egg fertilization is important for monitoring the efficacy of breeder programs, a hatchery's efficiency including each incubational unit, the variability of a flock's hatch in different machines, inventory accountability, and in developing pragmatic hatching parameter baselines. This study included eggs from 6 flocks set in multi-stage incubators, and filling all 90 trays (15,120 eggs) of a single hatcher. Total egg residue (non-fertilized and all embryos) left on trays after hatch pull were accounted for by the Hatching Efficiency Analysis System (HEAS). Validation of fertilization levels were obtained utilizing only 4 trays of hatch residue which were pre-selected under the HEAS program. These residue