

the inclusion levels of CNM in the diet significantly reduced cholesterol content and percentage of some fatty acids but there was no significant effect due to enzyme supplementation or to the interaction (CNM x Enzyme). Levels of cholesterol, palmitic acid and linoleic acid in abdominal broiler fat decreased oleic acid increased as the inclusion level of CNM increased in the diet.

Key Words: Cashew nut meal, Enzyme, Abdominal fat, Cholesterol

335 Lipid oxidation decreases metabolizable energy value of dietary poultry fat for growing broilers. A. M. C. Racanici, J. F. M. Menten*, M. A. B. Regitano-D'Arce, J. B. Gaiotto, A. A. Pedroso, F. A. Longo, and J. O. B. Sorbara, *Escola Superior de Agricultura Luiz de Queiroz - USP - Piracicaba - SP - Brasil.*

In order to determine the apparent metabolizable energy (AME) and nitrogen corrected apparent metabolizable energy (AMEn) of fresh and oxidized poultry fat a metabolic assay with forty-eight AgRoss male broilers from 31 to 34 days of age was conducted. The birds were fed a basal

diet or this diet replaced by 10% of fresh or oxidized fat and the total excreta collection method was applied. The birds were housed in metabolic cages and each diet was supplied for four replications of four birds. Fresh poultry fat was supplied by a local rendering and then stored frozen (-18 OC). The oxidized fat was obtained by heating and specific absorbances were measured frequently to control fat quality. Specific absorbances at 232 and 270 nm were, respectively, 4.64 and 0.47 for fresh fat and 18.54 and 3.76 for oxidized fat, which suggest higher levels of conjugated dienes in the oxidized poultry fat. The results of AME and AMEn were 9,240 and 9,150 kcal/kg (as feed-basis) when fed as fresh poultry fat and 7,770 and 7,595 kcal/kg (as feed-basis) when fed as oxidized poultry fat. AME and AMEn values were statistically different ($p < 0.0001$) and indicate a decrease from the fresh poultry fat to the oxidized fat due to the oxidation

Key Words: Metabolic assay, Oxidized dietary fat, Lipid oxidation, Peroxidation, Broilers

Pathology

336 Immortalisation of avian cells by ectopic expression of telomerase. G. Michailidis*, C.J. Nile, C. Townes, B. Brown, and J. Hall, *The University of Newcastle Upon Tyne, UK.*

Primary cultures of eukaryotic cells have a finite life span due to the process termed replicative senescence. This phenomenon is linked to progressive telomere shortening. Telomeres are found at the chromosome ends of most species and consist of tandem repeats of the sequence TTAGGG. Telomerase is a ribonucleoprotein that adds telomeric DNA repeats onto the 3' ends of chromosomes. It consists of a template RNA (TR) and the telomerase reverse transcriptase (TERT). Recent studies have shown that ectopic expression of (human) hTERT extends the life-span of human and other mammalian cells without causing a loss of differentiation. We attempted to investigate whether primary cultures of avian cells could be immortalised by ectopic expression of hTERT. Primary cultures of chicken embryonic epithelial (kidney and pancreatic acinar) cells, and fibroblast cells were established in vitro. Senescence of the cells was observed within 15 population doublings. Data from telomere length and TRAP (telomerase repeat amplification protocol) assays indicated that cell division was associated with telomere shortening and reduced telomerase activity. In addition RT-PCR analyses revealed reduced expression of the TR gene. To immortalise the cells the hTERT and avian TR genes were stably introduced into the cells by retroviral transfection. The resultant cell lines were analysed for telomere length, TERT activity, TR expression and cell survival. This system provides a novel approach to develop lines of immortalised avian cells.

Key Words: Immortalised Cells, Transfection, TERT

337 Prevalence, distribution and diversity of pathogenic *E. coli* in commercial turkey poul production. S. Banach*, F. Lago, and T. Rehberger, *Agtech Products, Inc.*

Avian colibacillosis is a systemic infection caused by *Escherichia coli* and occurs most commonly in young broilers and poults. Previous research has identified virulence factors commonly associated with avian colibacillosis: *iss*, *iucC*, *tsh*, and *cvaC* and a multiplex PCR method to detect these factors. In this study, *E. coli* isolated from intestinal samples of poults were analyzed by multiplex PCR and randomly amplified polymorphic DNA (RAPD) PCR to determine the diversity of pathogenic *E. coli*. Three poults ranging from 17-36 days old were collected from each of 22 sites of an integrated turkey operation in Virginia. Intestinal scrapings of poults were plated onto CHROMagar for the enumeration of *E. coli*. Of the 22 sites, 19 contained one or more poults with *E. coli*

ranging from 1.0×10^3 to 7.7×10^5 cfu/g. The level of *E. coli* was not related to the age of the poults. *E. coli* levels varied between birds within a site and between sites. *E. coli* colonies from each poul were isolated for PCR analyses. Multiplex PCR analysis of the 147 *E. coli* indicated that 7.5% of the isolates had all four virulence genes present, while 32.0% had three of the genes, 24.5% had two of the genes, 30.6% had one of the genes and 5.4% had none of the four genes present. The *tsh* gene was the most common at 67.3% followed by the *iucC* gene at 64.6%, *cvaC* gene at 51.7%, and *iss* gene at 21.1%. RAPD PCR analysis using two primers indicated that the 147 isolates belonged to 75 clusters at a similarity coefficient of 80%. *E. coli* strains within a cluster did not contain the same pattern of virulence factors. Most sites contained pathogenic isolates with a variety of RAPD DNA fingerprints. These results indicate that the pathogenic *E. coli* at these sites were a heterogeneous population. Overall, the use of multiplex PCR combined with RAPD PCR was useful for studying the distribution and diversity of pathogenic *E. coli*.

Key Words: Poults, *E. coli*, Virulence

338 Co-infection of hens with *Salmonella typhimurium* and *S. enteritidis* reduces *S. enteritidis* infection severity during induced molt. P. S. Holt* and R. K. Gast, *Southeast Poultry Research Laboratory, Athens, GA USA.*

It has been shown previously in the field that multiple *Salmonella* serovars can infect laying flocks simultaneously. Such co-infections can have dramatic effects on the survival and persistence of other salmonellae, including *S. enteritidis*. Prior studies in our laboratory demonstrated that *S. enteritidis* infections in hens undergoing molt via feed withdrawal were substantially more severe than in their unmolted counterparts and we have been investigating various situations which may ameliorate this problem. In the current study, hens were infected with *S. typhimurium* 7 days prior to feed withdrawal and then challenged with *S. enteritidis* four days into the molt. Hens receiving the *S. typhimurium* shed significantly less *S. enteritidis* at day 10 post challenge in Trial 1 and days 3 and 10 post challenge in Trial 2. Significantly fewer *S. enteritidis* organisms were detected in livers and spleens in hens receiving the *S. typhimurium* prior to *S. enteritidis* challenge in Trial 2. These results indicate that the presence of other serovars of *Salmonella* can reduce potential *S. enteritidis* problems that may occur in hens during molt.

Key Words: Induced molting, Salmonella, Food safety

Physiology

339 Development of a cannulation procedure for broiler breeder hens. H.-K. Liu*, J. A. Anderson, and W. L. Bacon, *The Ohio State University.*

Restricted feeding of broiler breeder hen candidates during growth and reproductive periods is a standard industry practice to achieve increased reproductive efficiency. High resolution patterns of concentration change

of hormones associated with reproduction in restricted-fed in comparison to full-fed hens are poorly documented. To monitor the concentration change patterns of these reproductive hormones associated with oviposition and ovulation, we have developed a jugular vein cannulation and serial bleeding procedure. After cannulation, the hens were returned to individual cages equipped with a tether and swivel system for serial