in satiety and reduced food intake in humans. These findings suggest that the lower postprandial PYY levels observed in the obese subjects might account for their reduced satiety response. Obese subjects may have a weaker PYY induced satiety signal for an equivalent meal, which could reinforce obesity. Current findings are consistent with PYY being a factor in appetite regulation.

Key Words: PYY, Obesity, Weight Loss

14 Proglucagon: A gene with diverse metabolic functions. D. Burrin*, *USDA/ARS Children's Nutrition Research Center, Baylor College of Medicine, Houston, TX.*

The proglucagon (PG) gene is expressed in the gastrointestinal tract (GI) and brain in several animal species. The PG gene is differentially translated in the GI tract by specific endocrine cells to produce glucagon in the pancreas and glucagon-like peptides 1 and 2 (GLP-1/GLP-2), glicentin, and oxyntomodulin in the intestine. These PG-derived peptides have diverse functions involving insulin secretion, motility, and tissue growth within the GI tract, but also have systemic actions on glucose homeostasis and appetite regulation. There is considerable interest in the therapeutic potential of GLP-1 and GLP-2 in respective treatment of type-2 diabetes and intestinal dysfunction, including short-bowel syndrome and inflammatory bowel disease. GLP-1 and GLP-2 are co-secreted from the gut in response to enteral nutrition, particularly fat and carbohydrate, but are suppressed by total parenteral nutrition. GLP-1 and GLP-2 secretion are also stimulated by short-chain fatty acids that are produced by colonic fermentation of malabsorbed carbohydrate and dietary fiber. GLP-1 is a key incretin hormone that increases insulin secretion, islet neogenesis, b-cell proliferation. GLP-2 is a potent intestinotrophic hormone that increases intestinal mucosal cell proliferation, blood flow and suppresses apoptosis and inflammation. The GLP-1/2 receptors are G-protein-coupled membrane proteins that signal via intracellular cAMP release. The GLP-1/2 receptors are expressed in the brain and GI tract; however, the cellular localization is poorly understood. There is limited information on the biological function of GLP1/2 in the growth and development of domestic animals. However, these hormones may be possible therapeutic targets for modulation of feed intake and intestinal dysfunction in production animals.

Key Words: Gut Hormone, Proglucagon, Metabolism

15 Gut peptides and feed intake regulation in lactating dairy cows. C. K. Reynolds*[1] and J. A. Benson[2], [1] *The Ohio State University, Wooster,* [2] *The University of Reading, Reading, UK.*

For the modern dairy cow to achieve her potential for production with minimal body energy loss, nutritionists seek to maximize feed intake in early lactation. In contrast, a goal of modern human nutritionists is to reduce obesity by limiting appetite and energy intake in excess of requirement. In both cases, a clearer understanding of the factors regulating short- (meal size) and long-term (body fat) appetite and nutrient intake is needed. In future, new findings regarding the role of gut and hypothalamic peptides in rodents will undoubtedly prove relevant to the dairy cow. The portal-drained viscera (gut, pancreas, spleen and associated fat) produce a number of peptides which are demonstrated regulators of appetite, intake and nutrient utilization, and for many their release to peripheral tissues is modulated by liver removal. Insulin regulates acute and chronic intake in part through effects on nutrient use and the hypothalamus. Insulin secretion is modulated by a variety of nutrients, as well as 'incretin' peptides from the gut, such as glucose-dependent insulinotropic polypeptide and glucagon-like peptide 1 (GLP-1). In cattle, over half of immunoreactive glucagon released by the PDV is of gut origin (presumably oxyntomodulin and glicentin). Other products of proglucagon processing released by the PDV include pancreatic glucagon, GLP-1 and GLP-2. The active form of GLP-1 (7-36 amide) is one of an emerging group of gut peptides that inhibit intake through effects on gut function and the hypothalamus, which include cholecystokinin-8 (CCK8) and peptide YY (PYY). Evidence suggests an increase in CCK8 may be responsible for decreased DMI in lactating dairy cows fed fat, but in lactating cows abomasally infused with vegetable oils decreased DMI was associated with increased net PDV release and arterial concentration of GLP-1, while portal vein CCK8 concentration was reduced. Considering effects in other species, it is highly likely that PYY regulates intake and gut function in lactating dairy cows as well, but further research on the roles of gut peptides in ruminants is needed.

Key Words: Glucagon-like peptide-1, Cholecystokinin, Insulin

Antibiotics in Animal Feeds: Are There Viable Alternatives?

16 Novel preharvest strategies involving the use of inorganic and nitro-based compounds to prevent colonization of food producing animals by foodborne pathoge. R. C. Anderson*, Y. S. Jung, J. A. Byrd, K. J. Genovese, T. R. Callaway, T. S. Edrington, R. B. Harvey, and D. J. Nisbet, *USDA-ARS, Food & Feed Safety Research Unit, College Station.*

Foodborne diseases caused by enterohemorrhagic *Escherichia coli, Salmonella* and *Campylobacter* are of public health and economic significance. Shedding of these pathogens during production and slaughter are critical risks for contamination of products for human consumption. Consequently, strategies are sought to prevent or reduce the carriage of these pathogens in food animals before slaughter. Experimental products containing chlorate salts have been proven efficacious in reducing, by several hundred-fold, concentrations of *E. coli* and *Salmonella* in the gut of cattle, sheep, swine and poultry when administered as feed or water additives. Mechanistically, chlorate selectively targets bacteria expressing respiratory nitrate reductase activity, such as most members of the family *Enterobacteriaceae*, as this enzyme catalyzes the reduction of chlorate to lethal chlorite. Most beneficial gut bacteria lack respiratory nitrate reductase activity and thus the technology appears compatible with many bacteria exhibiting competitive exclusion capabilities. Research and development of the chlorate technology continues and a much improved product has been designed to increase passage of the active ion to the lower gut. More recently, select oxidized nitrogen compounds are being investigated as potential feed additives and while these nitrocompounds significantly reduce pathogens on their own, evidence indicates that they may most effectively be used to complement the bactericidal activity of chlorate. A particular attractive aspect of the nitrocompound technology is that as potent inhibitors of ruminal methanogenesis, they may allow producers the opportunity to recoup costs associated with their use. At present, neither chlorate nor the nitrocompounds have been approved as feed additives by the U.S. Food and Drug Administration and consequently, they are not yet available for commercial use.

Key Words: Food Safety, Foodborne Pathogen, Nitrocompound

17 Alternative to Antibiotics - Utilization of bacteriophage to prevent foodborne pathogens. W. E. Huff*, G. R. Huff*, N. C. Rath, J. M. Balog, and A. M. Donoghue, *USDA/ARS/PPPSRU Poultry Science Center, University of Arkansas, Fayetteville.*

Bacteriophage are potentially a safe alternative to antibiotic therapy. Bacteriophage lytic to a non-motile, serotype O2 isolate of *Escherichia coli* were isolated from municipal waste water treatment plants and poultry processing plants. This *E. coli* isolate is pathogenic to poultry, causing a severe respiratory and systemic infection. Two bacteriophage isolates were selected to use in studies designed to determine the efficacy of these bacteriophage to prevent and treat severe colibacillosis in poultry. Colibacillosis is induced by injecting 6 X 10^4 cfu of *E. coli* into the thoracic airsac when the birds are 1 week of age. Initial studies demonstrated that mortality was significantly reduced from 85% to 35% when the challenge culture was mixed with equal titers of bacteriophage, and the birds were completely protected when the challenge culture was mixed with 10^8 pfu of bacteriophage. In subsequent studies, we have shown that an aerosol spray of bacteriophage given to the birds prior to this *E. coli* challenge could significantly reduce mortality even when given 3 days prior to the *E. coli* challenge. Our research on treating colibacillosis in poultry has demonstrated that an intramuscular injection of bacteriophage given 24 or 48 h after the birds were challenged rescued the birds from this severe *E. coli* infection. Our research has

demonstrated that bacteriophage can be used to both prevent and treat colibacillosis in poultry and may provide an effective alternative to antibiotic use in animal production.

Key Words: E. coli, Bacteriophage, Therapy

18 Antibodies: an alternative for antibiotics?. L. R. Berghman*[1] and S. D. Waghela[2], [1]*Departments of Poultry Science and Veterinary Pathobiology, Texas A&M University, College Station,* [2]*Department of Veterinary Pathobiology, Texas A&M University, College Station.*

Infectious diseases of both humans and farm animals are re-emerging as significant problems, because our arsenal of effective anti-infective tools is not expanding proportionally. Thus, there is an urgent need for new approaches to the treatment of infectious disease, especially in cases of drug-resistant microbes, microbes for which therapy is not available, or in cases of host immune impairment. Recently developed technologies have opened up new avenues for the use of immunotherapy with pathogen-specific antibodies. While the idea is far from new (serum therapy in the early 1900s preceded the advent of antibiotics), for the approach to be affordable, an inexpensive, abundant source of specific antibodies is required. Polyclonal antibody sources therefore are limited to chicken egg yolk antibodies (also called IgY) and bovine colostral antibodies. Numerous successful applications have been reported, ranging from treatment of rotaviral and cryptosporidial diarrhea to prophylaxis against dental caries. Monoclonal antibodies, while offering enhanced specificity, have long been disqualified, even for human treatment, due to lack of economical production systems. The recent introduction of transgenic animals and especially transgenic plants for production of therapeutic proteins has dramatically changed this perspective. Molecular farming of antibodies has made it possible to produce antibodies as complex as secretory IgA (sIgA) at a fraction (estimated at between 2 10 %) of the cost of the conventional production systems. The plantibody approach is especially attractive for the production of recombinantly simplified antibodies, the so-called single chain variable fragments (scFvs). With decreasing cost of production, the potential to tailor antibodies to very precise specifications and our increasing molecular knowledge of host-pathogen interactions, antibodies seem to have a bright future ahead as a redesigned tool for prophylaxis and treatment of infectious disease, both in animals and in humans.

Key Words: Antibodies, Therapy, Prophylaxis

19 Alternatives to Antibiotic Use - Natural food and feed amendments. S. C. Ricke* and M. M. Kundinger, *Texas A&M University.*

Successful control of foodborne pathogens requires placement of antimicrobial hurdles during preharvest and postharvest food production. Chemical additives have traditionally included organic acids to control microbial contamination in animal feeds. However, there is some concern that continuous application of chemical antimicrobials can lead to a buildup of microbial resistance. This creates problems if foodborne pathogens evolve survival/resistance to a variety of environmental stressors that organisms encounter in pre- and postharvest animal production. To expand the diversity of potential antimicrobials that would have practical application for food animal production requires exploring the interaction between the food matrix and foodborne pathogens that become associated with it. Of particular interest is the potential for generating natural antimicrobial compounds during processing that originate from the food or feed. Possibilities include natural compounds formed during heating such as Maillard products and other chemically altered complexes and derivatives from foods and feeds which may possess antimicrobial properties for specific foodborne pathogens. Pathogens may also encounter natural antimicrobials in food products such as certain botanical compounds where they have historically been used for flavor enhancement as well as preservatives. Understanding the potential application for these natural compounds in foods and feeds will require examination of foodborne pathogen response under experimental conditions comparable to the environment where the pathogen is most likely to occur.

Key Words: Natural Antimicrobial Compounds, Foodborne Pathogens, Feed

Animal Behavior & Well Being I

20 Effects of photoperiod on the immune function of multiparous gestating sows. S. R. Niekamp*, M. A. Sutherland, G. E. Dahl, T. L. Auchtung, and J. L. Salak-Johnson, *Department of Animal Sciences, University of Illinois, Urbana.*

Photoperiod manipulation has provided a non-invasive, easily implemented, effective, method to improve immune status while enhancing productive efficiency in gestational dairy cattle. In this study, our objective was to evaluate the impacts of photoperiod manipulation on endocrine and immune responses of gestating sows. At d83 of gestation, sows were moved to gestation crates and kept on a 12L:12D photoperiod during an adjustment period. At d90, sows were allotted to either long day (LD; 16L:8D) or short day (SD; 8L:16D) photoperiod until farrowing. Blood samples were taken at d 90, 97, 103, and 110 of gestation to evaluate cortisol (CORT), prolactin (Prl), total white blood cell (WBC), lymphocyte (Lymph), and neutrophil (Neut) counts, IgG concentrations, lymphocyte proliferation (LPA), neutrophil chemotaxis (CHTX), and neutrophil phagocytosis (PHAG). At d97, IgG concentrations were higher ($p < 0.05$) in animals experiencing LD than those on SD. Sows on SD photoperiod had higher ($p < 0.05$) conacanavalin A and LPS-induced ($p < 0.01$) LPA responses compared to LD sows. CORT concentrations also tended to be higher ($p = 0.18$) in SD than LD animals. At d103, the only treatment effect was on LPA in response to LPS which was higher ($p < 0.05$) in LD sows than SD animals. There were no treatment differences at d110. While there were treatment differences at certain time points, there were no trends of treatment effects over the period of the experiment. It appears that photoperiod is affecting immune status and endocrine responses but may have no long term effects. Further investigation is needed to determine the precise effects of photoperiod on gestational sows and their piglets.

Key Words: Sows, Immune, Photoperiod

21 Effects of photoperiod on immune function in 7 and 21 day old piglets. S. R. Niekamp*, M. A. Sutherland, G. E. Dahl, and J. L. Salak-Johnson, *Department of Animal Sciences, University of Illinois, Urbana.*

Photoperiod manipulation provides a non-invasive, easily implemented, effective, method to improve immune status while enhancing production efficiency. The objective of this study was to evaluate the impact of photoperiod manipulation pre- and post-gestational on piglet immune responses. Piglets' dams were subjected to either long day (LD; 16L:8D) or a short day (SD; 8L:16D) photoperiod at d90 of gestation. During farrowing-lactation some of the sows remained on their original photoperiod (LD:LD or SD:SD) treatment while others were switched to the opposite treatment (LD:SD or SD:LD). Blood samples were taken from piglets at 7 d of age for cortisol (CORT), total white blood cell counts (WBC), and IgG concentrations. At 21 d of age, blood samples were obtained for CORT, WBC, neutrophil counts (Neut), lymphocyte counts (Lymph), lymphocyte proliferation (LPA), neutrophil chemotaxis (CHTX), and neutrophil phagocytosis (PHAG). At 7 d of age, piglets subjected to LD:SD had higher ($p < 0.05$) total WBC compared to all other treatment groups. Plasma CORT was higher ($p < 0.05$) among piglets kept under a LD:SD photoperiod but lower among SD:SD and SD:LD treated piglets. Plasma IgG tended to be lower ($p < 0.07$) for piglets on SD:SD and SD: LD compared to animals on LD:LD and LD:SD photoperiod. At 21 d of age, piglets whose dams were on SD:LD had higher total WBC ($p < 0.05$) compared to all other treatment groups. LPA response to conacanavalin A was higher ($p < 0.01$) among piglets on SD:SD than any other treatment group. A similar trend was apparent with LPA in response to LPS ($p < 0.07$). There was also a tendency for piglets subjected to LD:LD to have higher ($p < 0.1$) PHAG compared to animals on LD:SD. These data support the concept that photoperiod manipulation can alter immune function in piglets during gestation and before weaning.

Key Words: Piglet, Immune, Photoperiod