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. Burini*, 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, ileal neogenesis, b-cell proliferation. GLP-2 is a potent intestino-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 GLP-1/2 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

### 16 Novel preharvest strategies involving the use of inorganic and nitro-based compounds to prevent colonization of food producing animals by foodborne pathogen. 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 chloride 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 chloride to lethal chloride. 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 chloride technology continues and a product has been shown to increase survival 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 nitrocompounds 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


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 10⁶ 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 85% when the challenge culture was mixed with equal titers of bacteriophage, and the birds were completely protected when the challenge culture was mixed with 10³ 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 indicated 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 antibiotics in animal production.

Key Words: E. coli, Bacteriophage, Therapy

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


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 d90, 97, 103, and 110 of gestation to evaluate cortisol (CORT), prolactin (Prl), total white blood cell counts (WBC), 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 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 productive efficiency. The objective of this study was to evaluate the impact of photoperiod manipulation pre- and post-gestation 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