M304 In vitro investigation of anti-*Escherichia coli* O157:H7 effects of free fatty acids under acidic conditions. J. Yang*[1,2], X. Hou[1], P. S. Mir[2], and T. A. McAllister[2], [1]*Inner Mongolia Agricultural University*, *Hohhot, P. R. China*, [2]*Agriculture and Agri-Food Canada Research Centre*, *Lethbridge, AB, Canada*.

Preventing acid-tolerant *Escherichia coli* O157:H7 from colonizing the lower gut of cattle could reduce fecal shedding of this zoonotic pathogen. This study aimed to test the antimicrobial effects of fatty acids (FA) against *E. coli* O157:H7 at acidic pH. From 4 strains of *E. coli* O157:H7 (E32511, E318N, H4420N and R508N) screened for acid tolerance, strain H4420N was selected for further study of the influence of pH on bactericidal activities of 6 FA (capric, lauric, palmitic, oleic, linoleic, and linolenic). Strain H4420N was cultured at pH 2.5, 4.3 and 7 for 6 h at 37°C in the presence (20 m*M*) of selected FA in Luria-Bertani broth containing 4% (v/v) Tween 80. Triplicate cultures were prepared for each FA × pH combination, and the entire experiment was repeated. Bacterial numbers were $\log_{10}$ transformed for statistical analysis. Differences were identified using the Least Squares Means of GLM (SAS Institute, Cary, NC). None of the FA exhibited bactericidal activity at pH 7.0. At pH 4.3, capric acid (C10:0) caused a 5 $\log_{10}$ reduction in cfu/mL and both lauric and linoleic acids reduced ($P < 0.001$) viability of H4420N. None of the other FA showed bactericidal activity at pH 4.3. At pH 2.5, oleic (C18:1) and linolenic acids (C18:3) had modest effects on the H4420N viability, whereas capric (C10:0), lauric (C12:0) and linoleic acids (18:2) resulted in ≥ 5 $\log_{10}$ reductions in cfu/mL. Capric and lauric acids were examined further at pH 2.5 at concentrations ranging from 0.15 to 20 m*M*. After 10 min of exposure, 5 $\log_{10}$ cfu/mL reductions were achieved by lauric acid at 2.5 m*M* and by capric acid at 0.31 m*M*. Acid stress increased the sensitivity of *E. coli* O157:H7 to FA, particularly capric, lauric and linoleic acids. Thus, the ability of this pathogen to survive passage to the lower gut may be reduced if these fatty acids are included in diets for cattle.

Key Words: fatty acids, pH, *E. coli* O157:H7

M305 A more specific and sensitive detection method for avian influenza H5N1 using antibodies against N1 subtype and red blood cell amplification in an impedance biosensor. J. Lum*[1], R. Wang[1], D. Abi-Ghanem[2], B. Hargis[1], L. Berghman[2], S. Tung[1], and Y. Li[1], [1]*University of Arkansas*, *Fayetteville,* [2]*Texas A&M University*, *College Station*.

Avian influenza (AI) H5N1 was first discovered in the 1990s and since then has become a likely source of a global pandemic and economic loss. Current specific detection methods are time consuming, expensive, and require special training or facilities. A rapid, sensitive, and specific screening method is needed for in-field or bedside testing of AI virus to implement quarantines and medications. An impedance biosensor has been developed to meet this need, but it is not ready to detect AI H5N1 subtype at very low concentrations. Therefore, the objective of this study was to improve the specificity and sensitivity of this impedance biosensor for rapid screening of AI H5N1 using secondary antibody against N1 subtype and red blood cell (RBC) amplification. Three major components of the developed biosensor are immunomagnetic nanoparticles for separation of AI virus, a microfluidic chip for sample control, and an interdigitated microelectrode for impedance measurement. In this study, polyclonal antibody against N1 subtype was immobilized on the surface of the microelectrode to generate more specific impedance signal, and red blood cells were mixed with the sample to amplify impedance value. The impedance of the nanoparticle-virus-RBC complex was measured and compared with the negative control. The change in impedance could be correlated with the concentration of AI H5N1 virus. Using polyclonal anti-N1 along with red blood cell amplification, the impedance biosensor was capable of detecting AI H5N1 at levels down to 100 EID50/ml in less than 3 h. Red blood cell amplification caused a significant increase ($P < 0.001$) in impedance change as compared with antibody immobilization alone.

Key Words: avian influenza, biosensor, rapid detection

M306 Survival of *Escherichia coli* O157:H7 incubated with corn- or wheat-based dried distillers' grains with solubles in ruminal or fecal inoculum. H. E. Yang[1,2], W. Z. Yang[1], J. J. McKinnon[2], T. W. Alexander[1], Y. L. Li[1], and T. A. McAllister*[1], [1]*Agriculture and Agri-Food Canada Research Centre*, *Lethbridge, AB, Canada*, [2]*University of Saskatchewan*, *Saskatoon, SK, Canada*.

Including corn-based dried distillers grains with solubles (DDGS) in feedlot diets may increase fecal shedding of *E. coli* O157:H7 by cattle. In western Canada, wheat-based DDGS is also available to finishing cattle. This study investigated whether corn- or wheat-based DDGS (CDDGS, WDDGS) replacing 0, 20 or 40% of barley grain in substrate for in vitro batch culture affected survival of *E. coli* O157:H7 in ruminal content- or feces-based inoculum. Donors for ruminal and fecal inoculum were 2 ruminally cannulated non-lactating Holstein cows fed diets containing both corn- and wheat-based DDGS, in equal proportions, to ensure that microbial populations associated with digesta from both forms of DDGS were present in the digestive tract. Triplicate incubation vials (200 mg substrate + 20 mL ruminal or fecal inoculum) were prepared for time points 0, 4, 12 and 24 h and each of 5 substrates (ground barley grain replaced with 0, 20 or 40% CDDGS or WDDGS). After inoculation with a 4-strain (E318N, E32511, R508N, and H4420N) mixture of *E. coli* O157:H7 (total 10^8 cfu/mL), vials were sealed and incubated at 39°C. Neither type nor level of DDGS affected fermentation or survival of *E. coli* O157:H7 in ruminal contents. In fecal inoculum, however, a time × DDGS interaction ($P = 0.05$) was observed. At 4 and 12 h of incubation, numbers of *E. coli* O157:H7 in feces were similar across treatments, but at 24 h, they were greater in 40% WDDGS and 40% CDDGS than in other treatments. Additionally, *E. coli* O157:H7 concentrations at 24 h were greater in fecal incubations with CDDGS than with WDDGS. Differences in numbers of *E. coli* O157:H7 were not attributable to changes in pH or VFA concentrations. These results suggest that inclusion of high levels of either corn- or wheat-based DDGS in feedlot diets for cattle may encourage the persistence of *E. coli* O157:H7 in feces.

Key Words: *E. coli* O157:H7, distillers grains, ruminal contents

M307 The effect of fungus myceliated grain supplementation in different feeding phases on coccidiosis and production performance of broilers. W. L. Willis, O. S. Iskhuemhen, S. L. Hurley, D. Wall*, R. C. Minor, and E. I. Ohimain, *North Carolina Agricultural and Technical State University*, *Greensboro*.

A 49 d experiment was conducted to evaluate fungus myceliated grain (FMG) supplemental inclusion levels in different feed phases on coccidiosis and production performance in broiler chickens. This study utilized 294 straight-run broiler chicks that were randomly weighed and distributed into 7 treatment (trt) groups with 3 replications of 14 chicks each on recycled litter as follows: 1) Control- no myceliated grain, 2) Starter

feed-FMG 5%, 3) Grower feed-FMG 5%, 4) Starter/grower/finisher feeds-FMG 5%, 5) Starter feed-FMG 10%, 6) Grower feed-FMG 10% and 7) Starter/grower/finisher feeds-FMG 10%. Assessment data were taken on male/female BW, fecal *Eimeria sp.* egg count, bursa and spleen wts, and mortality. BW of males and females broilers was significantly depressed in trt 5 when compared with the control 2.00 vs. 2.52 kg males and 1.83 vs. 2.10 kg females. Treatments 1 and 2 had the highest growth of *Eimeria sp.* with the other trts had varying levels of reduced counts. Trts 6 and 7 had the lowest counts though not significantly different from trts 3, 4 and 5 ($P > 0.05$), but significantly ($P < 0.05$) different from trts 1 and 2. Male relative bursa wts were highest in trt 4 (0.021) vs the control (0.017), while trt 6 had the lowest (0.013) vs the control (0.017). Average feed consumed did not differ greatly among trts. The results from this study reflect a positive response of fungus myceliated grain fed at the 10% inclusion level throughout the entire feeding phases for anticoccidial control and production performance.

Key Words: broilers, fungus myceliated grain, coccidiosis