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865 Effects of heating broiler hatching eggs during 6 or 11 days of storage on hatchability. J. T. Brake^{*1}, M. Güçbilmez², S. Özlü², R. Shiranjang², and O. Elibol², ¹*North Carolina State University, Department of Poultry Science, Scott Hall, Raleigh*, ²*Department of Animal Science, Faculty of Agriculture, University of Ankara, Ankara, Turkey*.

The effects of heating hatching eggs during pre-incubation storage was studied. Freshly collected hatching eggs from 2 young broiler breeder flocks were stored for 1 d in a hatchery egg storage room at 18°C and 75% RH in paper egg flats. The eggs were then transferred to plastic setter trays and either remained in the storage room (Control) or were subjected to a heat treatment regimen of 26°C for 2 h, 37.8°C for 3 h, and 26°C for 2 h in a Petersime setter at either 1 or 6 d of storage before being returned to the storage room. A portion of the eggs were heated when transferred to setter trays (Heat 1-6 d) and stored for 5 d more while a portion of the eggs were heated at transfer to setter trays and then stored for 10 d more (Heat 1-11 d). Another group of eggs was heated after 6 d of storage (Heat 6-11d) and then stored 5 d more before incubation. Control eggs stored for 6 d or 11 d were o-incubated in each experiment. The same process was repeated for Experiments 1 and 2 (29 and 28-wk-old breeders, respectively). All eggs were set in a single incubator. A tray of 150 eggs constituted a replicate and 6 or 12 replicate trays (900 or 1800 eggs in total) were set per heating treatment in Experiments 1 and 2, respectively. Data for 6 d and 11 d of storage were subjected to a one-way ANOVA separately where storage treatments were compared to heating treatments. The hatchability of fertile eggs decreased ($P < 0.05$) with length of egg storage in both experiments due to increased ($P < 0.05$) early deaths (Exp. 1 and 2) and late deaths (Exp. 2). There was no benefit of heating eggs during 6 d of storage (Heat 1-6d) but hatchability of fertile eggs stored for 11 d was increased ($P < 0.05$) by heating at either 1 (Heat 1-11d; 89.2%) or 6 d (Heat 6-11d; 92.4%) of storage as compared to control (83.8%). The heating at 6d of the 11 d storage period produced the numerically best results in both experiments. These data demonstrated that heating eggs before and/or during storage for 11 d reduced early embryonic mortality and increased fertile hatchability of eggs from younger broiler breeder flocks.

Key Words: egg storage incubation, egg storage, egg storage time

866 Assessment of microbial communities involved in decomposition of specified risk material using a passively aerated laboratory-scale composter. S. Xu^{*1,2}, T. A. McAllister², J. J. Leonard¹, and O. G. Clark³, ¹*University of Alberta, Edmonton, AB, Canada*, ²*Agriculture and Agri-Food Canada, Lethbridge Research Centre, Lethbridge, AB, Canada*, ³*McGill University, Ste-Anne-de-Bellevue, QC, Canada*.

The occurrence of bovine spongiform encephalopathy (BSE) in Canada has resulted in the implementation of regulations to remove specified risk material (SRM) from the food chain. Composting may be a viable alternative to rendering for SRM disposal. A study was conducted to assess SRM decomposition during composting, as well as the microbial communities involved. Two matrices (beef manure + barley straw or beef manure + wood shavings) were composted in 6 passively aerated, laboratory-scale composters ($n = 3$ per matrix) with SRM samples and thermocouples implanted at 3 depths. Data were analyzed using the Mixed procedure of SAS, with time and compost depth treated as repeated measures. Both compost types heated rapidly, exceeding 55°C after 3 d, with oxygen concentration remaining over 16% on 12 out of 15 d. At completion, wood shavings compost had higher water ($P < 0.001$) and total carbon ($P = 0.005$) contents and lower electrical conductiv-

ity ($P < 0.001$) as compared with straw compost. Approximately 50% of SRM was decomposed after 15 d of composting, with 30% of this occurring within the first 5 d. Phospholipid fatty acid (PLFA) analysis revealed that gram-positive bacteria were predominant in compost at d 5. Gram-negative bacteria had declined by d 5 but recovered by d 15. Fungi appeared to be suppressed at temperatures above 55°C and did not appear to recover in wood shavings compost. At d 5, Actinomycetes had increased in straw compost, but declined in wood shavings compost. By d 15, they had increased in both compost types. Although temporal changes were evident, compost matrices or depth within the composter did not obviously influence microbial communities or SRM decomposition. These results suggest that SRM decompose rapidly during composting and that both mesophilic and thermophilic microbial communities play a role in this decomposition.

Key Words: bovine spongiform encephalopathy, composting, phospholipid fatty acid analysis

867 Effect of improved production efficiency on pork's carbon footprint: Derived environmental benefits of ractopamine in the US swine herd. G. Boyd^{*1}, D. Anderson², A. Sutton³, C. Hogan¹, and A. Marks-Callahan⁴, ¹*Camco, Broomfield, CO*, ²*Colorado State University, Fort Collins*, ³*Purdue University, West Lafayette, IN*, ⁴*Elanco Animal Health, Greenfield, IN*.

Increasing production efficiency in swine can improve environmental stewardship. Ractopamine (RAC; Paylean) is an approved feed ingredient that enhances feed efficiency, increases growth rate and increases leanness in finishing swine. Assumptions driving derived environmental benefits are that (1) increased leanness of RAC-fed pigs results in fewer animals needed to produce the same amount of pork protein, and (2) improved feed conversion leads to lower land requirement for feed production thereby decreasing resource, energy, and fuel demands. These changes, in addition to a reduction in manure output, lower greenhouse gas (GHG) emissions. The objective was to quantify these annual savings in metric tons of CO₂-equivalents (tCO₂e). The derived environmental benefits associated with RAC were quantified using a published meta-analysis of RAC growth performance response and 2008 US swine production data, assuming that all finishing pig diets in the US included either 5 or 10 mg RAC/kg feed for the last 28 d. Total GHG emission savings were quantified using emission factors for energy and fossil fuel demands associated with the cradle-to-gate portion of the pork production chain. Results of the calculations are as follows: The number of finisher pigs and sows required to produce the same amount of pork protein was reduced by 5.3% and 6.3% with the inclusion of 5 or 10 mg RAC/kg feed, respectively. Days-to-market were reduced by 3.0 and 2.8, respectively. Derived GHG emissions savings were 1.87 million or 2.23 million tCO₂e/yr, respectively with approximately 63% from reduced manure, 32% from reduced feed production, and 4% from pig housing. The GHG emissions due to RAC manufacture and distribution accounted for less than 0.01% of the calculated savings. Use of 5 or 10 mg RAC/kg feed in finisher pig diets for the last 28 d of feeding significantly aids in mitigating GHG emissions from pork operations.

Key Words: production, environment, swine

868 Analysis of the association of number of piglets born alive with sow level and management factors. S. S. Anil^{*1}, L. Anil², J. Deen¹, S. K. Baidoo², M. E. Wilson³, and T. L. Ward³, ¹*Veterinary Population*

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Genetics, management and nutritional factors influence the production performance of breeding female pigs. Trace minerals are important to maintain high production performance and claw integrity. The bioavailability of trace minerals depends on both the quantity and form (organic or inorganic). This study analyzed the association of small litter size at birth (≤ 10 vs. > 10 piglets born alive) with factors of parity, mummies, stillborn, housing system, form of trace mineral supplementation and claw lesions (white line and side wall defects), using multivariate logistic regression model (Proc logistic, SAS v 9.1), using 1010 parity records. These records pertained to 1, 2 or 3 parities of 518 sows of mixed parity, housed in group pens with electronic sow feeders ($n = 296$) and conventional gestation stalls ($n = 222$). The sows were randomly allocated to 2 groups and fed either a control diet (ITM, inorganic sulfate minerals, $n = 257$; Zn -125 ppm, Mn - 40 ppm and Cu - 15 ppm) or a treatment diet containing complex trace minerals as a partial substitution of inorganic minerals (CTM, $n = 261$; Zn - 50 ppm, Mn -20 ppm and Cu - 10 ppm), fed at isolevels of total trace mineral supplementation. Information on farrowing performance was collected from the PigCHAMP database of the research unit. Claw lesions of these sows were assessed at mid-gestation by the same person in 1, 2 or 3 parities. Results indicated that the likelihood of < 10 live born piglets was lower ($P < 0.05$) in sows of parities 1 and 2 (OR 0.39) and in sows of parities 3–5 (OR 0.29) compared with sows of parity > 5 . Mummies and preweaning mortality were positively and total sidewall lesion was negatively associated with the likelihood of having < 10 live born piglets ($P < 0.05$ for all). Sows receiving the diet containing ITM were 40% more ($P < 0.05$) likely to have < 10 live born piglets compared with sows fed CTM. These results are indicative of the relationship between sow level and nutritional factors with litter size at birth.

Key Words: trace mineral supplementation, production, sow

869 Nutritional evaluation of kernel meal from non-toxic genotype and of detoxified kernel meal from toxic genotype of *Jatropha curcas* in rat. Y. Chen¹, J. X. Liu¹, H. Y. Liu*¹, H. P. S. Makkar², and

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Two genotypes of *Jatropha curcas* are known, toxic and non-toxic. Phorbol esters are main toxic substances in the seeds of the toxic genotype. *Jatropha* kernel meal after oil extraction is rich in protein (50–62%), and contents of essential amino acids except lysine are comparable to that of soybean meal. After removing phorbol esters and heat-labile antinutrients such as lectins, the meal could be used as a source of protein for animal feeding. Twenty-four male Sprague-Dawley (SD) rats, at an age of 21 d and weighting on average 70 g, were used to evaluate the nutritional value of the kernel meals from the non-toxic genotype and the toxic genotype after detoxification. Four dietary treatments were designed for growth and nitrogen balance trials. Protein-free basal diet consisted of following ingredients (%): cornstarch 80, oil 10, cellulose 5, salt 4 and multivitamin complex 1. In the other 3 diets, part of cornstarch was replaced by casein (CAS), heated meal from the non-toxic genotype (NTM), and detoxified *Jatropha* meal (DTM) at 10% crude protein in diets. Amino acid composition was similar among diets CAS, NTM and DTM. All data were analyzed using the GLM procedure of SAS software system with rat as the repeated subject. No significant difference was observed ($P > 0.05$) in feed intake of rats fed DTM and NTM (300 vs. 343 g) diets, but both intakes were significantly lower than that of rats on diet CAS (406 g). Weight gains of rats fed diets DTM (43 g) and NTM (62 g) were also significantly lower than that of rats on CAS (133 g). Protein efficiency ratio was 3.08, 1.35 and 1.78; and protein retention efficiency was 74.0, 37.8 and 45.1% for diets CAS, DTM and NTM, respectively. True digestibility and biological value of diet NTM were 84.5 and 65.6%, respectively, slightly higher ($P > 0.05$) than those of DTM (81.9 and 61.6%). In summary, the inferior growth rate in both diets containing NTM and DTM is attributed to low intake, while their digestibility and biological value are comparable to those of most of the seed meals.

Key Words: *Jatropha* kernel meal, toxicity, biological assay