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In this issue

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Effects of high fat diets or prednisolone treatment on femoral head separation in chickens.

Durairaj V, Clark FD, Coon CC, Huff WE, Okimoto R, Huff GR, Rath NC.
Poultry Production and Product Safety Research Unit, Agricultural Research Service, USDA.

Br Poult Sci. 2012 Apr;53(2):198-203.
http://www-ncbi-nlm-nih-gov.libproxy.unm.edu/pubmed/22646785

ABSTRACT

The effects of high fat diets and prednisolone treatment were studied to understand the etiology of femoral head separation (FHS) in fast growing broiler chickens. Dietary effects on production parameters such as growth, feed conversion ratio (FCR) and blood chemistry were also measured. 2. Three groups of chickens, consisting of 30 birds each, in two replicate pens, were fed isonitrogenous diets containing 40 (control), 60, or 80 g poultryfat supplements per kg feed. The birds were fed a starter diet containing the fat supplements for the first three weeks, then switched to a grower diet containing the same supplements for the rest of the experimental period. Two groups of birds were also raised with the control diets, but were administered either cholesterol or prednisolone intramuscularly at 30 and 32 days of age to evaluate their effects on FHS incidences. 3. The chickens were euthanised and necropsied at 37 d of age. The presence of femoral head weakness was determined by applying mild pressure on the pelvic joint to cause the growth plate to become detached from its articular cartilage in affected cases. 4. High fat diets did not change FHS incidences, but increased 28 d body weights (BW) and FCR. At 37 d of age the BW differences were not significant but the FCR (gain: feed ratio) remained higher in high fat fed groups. Prednisolone treatment, by contrast, resulted in decreased BW, decreased feed efficiency, increased FHS index, and elevated blood lipid levels. 5. The results suggest that high dietary fats do not affect FHS incidence in broilers. Prednisolone treatment causes hyperlipidaemia and increases FHS index, and may therefore provide a suitable experimental model of FHS pathogenesis in growing chickens.

Performance, egg quality, and immune response of laying hens fed diets supplemented with mannan-oligosaccharide or an essential oil mixture under moderate and hot environmental conditions.

Bozkurt M, Küçükyilmaz K, Catli AU, Cinar M, Bintas E, Cöven F.
Poultry Research Institute, Erbeyli, Aydın 09600, Turkey.
Poult Sci. 2012 Jun;91(6):1379-86
http://www-ncbi-nlm-nih-gov.libproxy.unm.edu/pubmed/22582296

ABSTRACT

In total, 432 thirty-six-week-old laying hens were fed a basal diet supplemented with mannan-oligosaccharide (MOS) or an essential oil mixture (EOM) from 36 to 51 wk of age. Hens were divided into 3 equal groups replicated 6 times with 24 hens per replicate. No significant difference was observed among the dietary treatments in terms of performance indices. Different from the dietary manipulation, high environmental temperatures negatively influenced all of the laying performance traits except the feed conversion ratio in association with the diminished feed consumption. The MOS, and particularly the EOM, tended to alleviate the deleterious effect of heat stress on BW gain. Mortality was higher in MOS-fed hens than with other treatments. A supplementation diet with MOS or EOM provided increments in eggshell weight ($P < 0.01$). Relative albumen weight was significantly decreased ($P < 0.05$) in response to EOM or MOS supplementation; however, this was not the case in the yolk weight rate. The MOS decreased albumen height and Haugh unit ($P < 0.05$). High environmental temperatures hampered entire egg quality characteristics except for the eggshell breaking strength and egg yolk weight. These results indicated that heat stress adversely affected both productive performance and egg quality. As for the results of this study, neither MOS nor EOM was efficacious in improving efficiency of egg production and stimulating humoral immune response in laying hens reared under moderate and hot climatic conditions. However, the ameliorative effect exerted by MOS and EOM on eggshell characteristics is conclusive..

Effects of ad libitum and restricted feeding on early production performance and body composition of Yorkshire pigs selected for reduced residual feed intake.

Boddicker N, Gabler NK, Spurlock ME, Nettleton D, Dekkers JC.
Department of Animal Science, Iowa State University, Ames, IA 50011, USA.
Animal. 2011 Aug;5(9):1344-53.
http://www-ncbi-nlm-nih-gov.libproxy.unm.edu/pubmed/22440279

ABSTRACT

Residual feed intake (RFI), defined as the difference between observed and expected feed intake based on growth and backfat, has been used to investigate genetic variation in feed efficiency in cattle, poultry and pigs. However, little is known about the biological basis of differences in RFI in pigs. To this end, the objective of this study was to evaluate the fifth generation of a line of pigs selected for reduced RFI against a randomly selected Control line for performance, carcass and chemical carcass composition and overall efficiency. Here, emphasis was on the early grower phase. A total of 100 barrows, 50 from each line, were paired by age and weight (22.6 ± 3.9 kg) and randomly assigned to one of four feeding treatments in 11 replicates: ad libitum (Ad), 75% of Ad (Ad75), 55% of Ad (Ad55) and weight stasis (WS), which involved weekly adjustments in intake to keep body weight (BW) constant for each pig. Pigs were individually penned (group housing was used for selection) and were on treatment for 6 weeks. Initial BW did not significantly differ between the lines ($P > 0.17$). Under Ad feeding, the low RFI pigs consumed 8% less feed compared with Control line pigs ($P < 0.06$), had less carcass fat ($P < 0.05$), but with no significant difference in growth rate ($P > 0.85$). Under restricted feeding, low RFI pigs under the Ad75 treatment had a greater rate of gain while consuming the same amount of feed as Control pigs. Despite the greater gain, no significant line differences in carcass composition or carcass traits were observed. For the WS treatment, low RFI pigs had similar BW ($P > 0.37$) with no significant difference in feed consumption ($P > 0.32$). Overall, selection for reduced RFI has decreased feed intake, with limited differences in growth rate but reduced carcass fat, as seen under Ad feeding. Collectively, results indicate that the effects of selection for low RFI are evident during the early grower stage, which allows for greater savings to the producer.

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Opportunities to improve nutrient efficiency in pigs and poultry through breeding..

Kyriazakis I.
University of Thessaly, 43100 Karditsa, Greece.
Animal. 2011 May;5(6):821-32.
http://www-ncbi-nlm-nih-gov.libproxy.unm.edu/pubmed/22440020

ABSTRACT

Efficiency of food and nutrient (including energy) use are considered the key factors in the economic and environmental performance of livestock systems. The aim of this paper is to consider the basis of genetic variation in the components that constitute dietary nutrient efficiency; and to conclude whether there would be benefit, in any relevant terms, in including these components in breeding programmes that aim to improve nutrientefficiency within pig and poultry systems of production. The components considered are (i) external, pre-ingestion losses, such as food spillage and its relation to feeding behaviour traits, (ii) digestive efficiency, (iii) maintenance requirements, (iv) net efficiency of energy and nutrient utilisation and (v) partitioning of scarce resources within productive and between productive and fitness functions. It is concluded that opportunities to exploit genetic variation exist mainly in the potential to improve the digestive efficiency of pigs and to reduce the maintenance requirements for resources mainly in hens, but also potentially in pigs. Current evidence suggests that there are very weak genetic and phenotypic correlations between components of feeding behaviour and productive traits, and little genetic variation in the net efficiency of nutrient utilisation among poultry and pig genotypes. The implication of the latter is that there would be little exploitable genetic variation in the partitioning of scarce nutrients between productive functions. Currently, there is a lack of understanding of the genetic basis of the partitioning of scarce nutrients between productive and fitness functions, and how this may impact upon the efficiency of nutrient use in pig and poultry systems. This is an area of research to which further effort might usefully be devoted.

Evaluation of trace mineral source and pre-harvest deletion of trace minerals from finishing diets for pigs on growth performance, carcass characteristics, and pork quality.

Ma Y, Lindemann M, Cromwell G, Cox R, Rentfrow G, Pierce J.
Department of Animal and Food Sciences, University of Kentucky, Lexington 40546. J Anim Sci. 2012 Jun 4.
http://www-ncbi-nlm-nih-gov.libproxy.unm.edu/pubmed/22665651

ABSTRACT

Weanling crossbred pigs [72 barrows and 72 gilts; BW = 7.4 ± 1.1 kg] were used to evaluate dietary supplemental trace mineral (Cu, Fe, Mn, and Zn) source (inorganic vs. organic) and deletion (0, 2, 4, and 6 wk pre-harvest) on growth performance, carcass characteristics, and pork quality. Pigs were blocked by BW, ancestry, and sex, and randomly allotted to 24 pens, and fed a diet containing either inorganic or organic trace minerals supplemented at the 1998 NRC requirement estimates for each of 5 BW phases from 7 to 120 kg (equivalent to 14, 14, 42, 28, and 42-d periods, respectively). Two pigs were removed from each pen at the end of Phase IV (BW = 82.6 ± 6.0 kg) and 2 other pigs were removed at the end of Phase V (BW = 128.0 ± 8.3 kg) for collection of various tissues and for determination of carcass characteristics and pork quality. On d 1, 15, and 29 of Phase V, 3 pens within each source of minerals were switched to a common diet without supplemental trace minerals, whereas the remaining 3 pens within each source of minerals were fed diets containing trace minerals throughout the Phase V period. This resulted in 4 groups within each mineral treatment, in which trace mineral supplementation was deleted for 6, 4, 2, or 0 wk of Phase V. Trace mineral source (inorganic vs. organic) did not affect ADG, ADFI, and G:F (773 vs. 778 g/d, 1,680 vs. 1,708 g/d, and 461 vs. 456 g/kg, respectively) during the first 4 phases. During the mineral deletion period, ADG and G:F were not affected by the duration of trace mineral deletion, but ADFI increased when trace minerals were removed from the diet for 6 wk (6 vs. 0 wk, 3,393 vs. 3,163 g/d; P = 0.05). Hot carcass weight, cold carcass weight, carcass shrink, dressing percent, LM area, 10(th) rib and midline average backfat, and carcass fat-free lean weight and percentage were not affected by the source of mineral or length of mineral deletion but carcass length tended to decrease (P = 0.09) when time of trace mineral deletion increased. Increasing mineral deletion from 0 to 6 wk tended to reduce linearly (P = 0.08) Hunter a* scores on the day of carcass processing (24 h after slaughter), as well as 2 d after processing, and Hunter b* scores on d 2 and d 6 after processing. Results of this experiment indicate that use of organic trace minerals, rather than inorganic trace minerals, did not influence pig growth performance or carcass characteristics and quality; however, deletion of minerals during the last 6 wk before harvest increased ADFI and affected drip loss, some color scores of the LM, and carcass length.

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Towards amino acid recommendations for specific physiological and patho-physiological states in pigs.

Le Floc'h N, Gondret F, Matte JJ, Quesnel H.
INRA, UMR1348 Physiologie, Environnement et Génétique pour l'Animal et les Systèmes d'Elevage (PEGASE), F-35590 Saint-Gilles, France.
Proc Nutr Soc. 2012 May 21:1-8.

http://www-ncbi-nlm-nih-gov.libproxy.unm.edu/pubmed/22607969

ABSTRACT

The objective of this review is to provide an overview of the implication of amino acids (AA) in important physiological functions. This is done in the context of pig production where the competition for AA utilisation is exacerbated by constraints to maximise productive responses and the necessity to reduce dietary protein input for environmental, economic and sanitary issues. Therefore, there is an opportunity to refine the nutritional recommendations by exploring the physiological roles of AA. For example, methionine and cysteine, either in selenised or sulfur forms, are directly involved in the regulation of the glutathione antioxidative system. In sows, glutathione antioxidative system may contribute to improving ovulation conditions through control of oxidative pressure. Supplementation of sow diets with l-arginine, a precursor of NO and polyamines, may stimulate placental growth, promoting conceptus survival, growth and tissue development. The beneficial effect of arginine supplementation has been also suggested to improve lactation performance. Feed intake is usually the first response that is impacted by an inadequate AA supply. Valine and tryptophan imbalances may act as signals for decreasing feed intake. AA are also important nutrients for maintaining the animal's defence systems. Threonine, one of the main constituents of mucin protein, is important for gut development during the postnatal period. It may exert a protective effect that reduces the impact of weaning on gut morphology and associated disturbances. Finally, tryptophan is involved in the regulation of the defence system through its action as a precursor of antioxidants and its effect on the inflammatory response.

In-feed antibiotic effects on the swine intestinal microbiome.

Looft T, Johnson TA, Allen HK, Bayles DO, Alt DP, Stedtfeld RD, Sul WJ, Stedtfeld TM, Chai B, Cole JR, Hashsham SA, Tiedje JM, Stanton TB.
Agricultural Research Service, National Animal Disease Center, US Department of Agriculture, Ames, IA 50010, USA.
Proc Natl Acad Sci U S A. 2012 Jan 31;109(5):1691-6.

http://www-ncbi-nlm-nih-gov.libproxy.unm.edu/pubmed/22307632

ABSTRACT

Antibiotics have been administered to agricultural animals for disease treatment, disease prevention, and growth promotion for over 50 y. The impact of such antibiotic use on the treatment of human diseases is hotly debated. We raised pigs in a highly controlled environment, with one portion of the littermates receiving a diet containing performance-enhancing antibiotics [chlortetracycline, sulfamethazine, and penicillin (known as ASP250)] and the other portion receiving the same diet but without the antibiotics. We used phylogenetic, metagenomic, and quantitative PCR-based approaches to address the impact of antibiotics on the swine gut microbiota. Bacterial phylotypes shifted after 14 d of antibiotic treatment, with the medicated pigs showing an increase in Proteobacteria (1-11%) compared with nonmedicated pigs at the same time point. This shift was driven by an increase in Escherichia coli populations. Analysis of the metagenomes showed that microbial functional genes relating to energy production and conversion were increased in the antibiotic-fed pigs. The results also indicate that antibiotic resistance genes increased in abundance and diversity in the medicatedswine microbiome despite a high background of resistance genes in nonmedicated swine. Some enriched genes, such as aminoglycoside O-phosphotransferases, confer resistance to antibiotics that were not administered in this study, demonstrating the potential for indirect selection of resistance to classes of antibiotics not fed. The collateral effects of feeding subtherapeutic doses of antibiotics to agricultural animals are apparent and must be considered in cost-benefit analyses.

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