

Poultry Science

Annual Meeting Abstract



Poultry Science
Association
88th Annual Meeting
August 8-11
Springdale, Arkansas

Also Contains Abstracts from
1999 Concurrent Meetings

Southern Poultry Science Society
Southern Conference on Avian Diseases

Poscal 78 (Supplement 1) Pages 1-165, 1999



249 Luminal fluid composition in the small intestine of the broiler chicken under thermoneutral and heat stress conditions. M. A. Mitchell* and R. R. Hunter, *Roslin Institute (Edinburgh), Midlothian, UK.*

It is recognised that the absorption of sugars and amino acids from the small intestine is accomplished by both high affinity transporters and high capacity //passive// systems. Uncertainty about luminal substrate concentrations makes it difficult to calculate the relative contributions of mediated vs non-mediated absorption. In the present study therefore the composition of bulk phase luminal fluid has been determined in three regions of the small intestine of broilers (n=12) fed *ad libitum* under thermoneutral (TN) and moderate heat stress (HS) conditions. Luminal glucose ranged from 68 ± 22 mM in the duodenum to 8 ± 5 mM in the ileum in TN and from 56 ± 23 mM to 12 ± 8 mM during HS in the corresponding regions. Luminal methionine concentration exhibited a similar proximal-distal gradient in TN (11 ± 3 to 3 ± 2 mM) but concentrations were < 2 mM throughout in HS. Sodium concentration was highest in ileum (84 ± 22 mM) in TN but in the duodenum (118 ± 10 mM) in HS. Potassium concentration was consistently greater in the lower small intestine in both thermal environments being 27-37 mM in the ileum and 12-20 mM in the duodenum. The proximal-distal gradient was more pronounced in HS. The duodenal and jejunal contents were acid (pH = 6.4-6.8) in both TN and HS but ileal chyme was alkaline (pH = 7.7-8.2) the higher value occurring in HS. Total osmolarity ranged from 389 ± 58 mOsm in the duodenum to 430 mOsm in the jejunum of TN birds but was elevated throughout the small intestine of the heat stressed group (413 ± 47 to 463 ± 24 mOsm in ileum and duodenum respectively). Thus luminal fluid tends to be hyperosmolar compared to plasma, has a much elevated potassium and reduced sodium concentration and contains high concentrations of both glucose and methionine favouring non-transporter mediated absorption. Heat stress may alter the luminal fluid composition substantially. The findings have important implications the study and understanding of nutrient absorption in both *in vivo* and *in vitro* systems.

Key Words: Luminal fluid, Intestinal absorption, Heat stress, Broiler

250 Echocardiographic evaluation of heart function in normal chickens and chickens with heart failure and ascites. A. A. Olkowski* and H. L. Classen, *Department of Animal and Poultry Science, University of Saskatchewan.*

Landmarks of ascites in broiler chickens include severe changes in the ventricular chamber dimensions and chamber geometry. Most of the current knowledge on patho-physiology of the heart in ascitic chickens is derived from studies on surgically altered subjects or using post-mortem material. Hence, there is a shortage of information on heart function *in vivo* obtained using non-invasive methods. In the present study we used echocardiography to evaluate heart function *in vivo* in 5 leghorn chickens, 6 feed restricted broilers, 4 *ad-libitum* fed broilers, and 10 ascitic broilers. The birds were 35 to 42 days of age at the time of examination. The Doppler study revealed left and right atrio-ventricular valve regurgitation in 8 out of 10 chickens showing clinical signs of heart failure, whereas there was no evidence of faulty valves in normal broilers or leghorn chicks. A typical M-mode echocardiogram from a chicken showing clinical signs of heart failure demonstrated impaired ventricular wall motion and severely dilated left and right ventricular chambers. Fractional shortening (FS) was considerably reduced ($p < 0.001$) in ascitic birds (mean: 19.5 ± 2.0 SE) in comparison to normal birds (mean: 39.1 ± 3.6 SE). Four apparently normal broilers had lower FS in comparison to leghorn chickens. Two dimensional echocardiography revealed that prominent pericardial effusion (PE) is commonly present in affected birds and some apparently birds. This was later confirmed on post mortem examination. The present study indicates that clinical features such as valve incompetence, left and right ventricular chamber dilation, impaired ventricular wall motion, and reduced FS are common in ascitic birds. Also, heart function appears to be considerably reduced in some apparently normal broilers. These birds may be at high risk of heart failure and ascites. The reduction in FS is consistent with decreased cardiac output. The significance of PE is not known at present, but this issue deserves more attention because accumulation of fluid around the heart muscle may impair diastolic function.

Key Words: Broiler, Heart failure, Ascites, Echocardiography

251 Effects of NH_4Cl , KCl and $\text{NH}_4\text{Cl} + \text{KCl}$ on Serum Blood Electrolytes and Performance of Broilers Under Chronic Heat Stress. H. Kermanshahi*¹, J. Arshami¹, and A. Hessabi Nameghi¹, ¹*Ferdowsi University of Mashhad, Faculty of Agriculture, Dept. Animal Science.*

To study nutritional-physiological effects of NH_4Cl and KCl on serum electrolytes and the performance of broilers, 560 meat type chicks from 35-56 days of age were kept under Chronic Heat Stress (CHS) at 35°C for 4 hours per day using completely randomized design containing 5 replicates per treatment, 14 birds per replicate. With a 2x4 factorial arrangements, male and female birds were separately divided in pens and received the following treatments adding to their drinking water: I) 0.3% NH_4Cl ; II) 0.3% KCl; III) I + II; IV) Control. Feed and water provided *ad libitum*. Blood was collected on days 42, 49, and 56 days in order to determine the levels of K^+ , Cl^- , Ca^{++} , and Na^+ in serum. In a descending manner, with increasing age, CHS decreased the levels of K^+ , Ca^{++} , and Na^+ and increased the level of Cl^- in all treatments. Sex showed the same trend except for Na^+ that the results for females were inconsistent. A significant increase of K^+ in serum was seen at day 42 in NH_4Cl and KCl treatments ($P \leq 0.05$) and this effect reversed at day 56. Sex had no effect on K^+ level in each period. Combination of $\text{NH}_4\text{Cl} + \text{KCl}$ decreased the level of K^+ on days 49 and 56 while the levels of Ca^{++} and Cl^- in the serum increased ($P \leq 0.05$). The levels of Ca^{++} and Na^+ were higher in male chickens on days 42, 49, and 56 ($P \leq 0.05$) but no significant difference were seen in K^+ and Cl^- levels in all periods except for males at day 56 that the level of K^+ was higher. NH_4Cl decreased feed intake and body weight during 35-56 days of age. KCl increased body weight of chickens during this period ($P \leq 0.05$). Daily gain also significantly increased during 42-56 days of age. KCl numerically increased daily feed intake but had no effect on feed conversion ratio. Male chickens were heavier and consumed more feed ($P \leq 0.05$). Under CHS conditions of this experiment, NH_4Cl had no considerable effect on the broiler performance. KCl improved feed intake and thus its use in drinking water might be useful in chickens under CHS.

Key Words: Chronic Heat Stress, NH_4Cl and KCl, Electrolytes, Broilers

252 Ultrastructural and Molecular Changes in the Heart Tissue From Ascitic Broiler Chickens. A. A. Olkowski*¹, B. M. Rathgeber², and H. L. Classen¹, ¹*Department of Animal and Poultry Science, University of Saskatchewan, Saskatoon, SK, S7N 5B5.*

This study examined ultrastructural and molecular features of cardiomyocytes in leghorn chicks, (resistant to heart disease), slow growing broilers (low incidence of heart disease), fast growing broilers (high incidence of heart failure), and chickens with heart failure and ascites. There were considerable differences in the extra-cellular matrix (ECM) and the myofibrillar contractile apparatus architecture between normal and abnormal hearts. A significant reduction in the myofibrillar component was seen in the hearts from ascitic broilers. The fine network of collagen struts was disrupted and the mesh of endomyocardial collagen encompassing cardiomyocytes was considerably reduced in the affected hearts. Most extensive changes in the ECM were observed in the myocardium from ascitic birds. The activity of matrix metalloproteinase (MMP) in the cytosolic fraction of ventricular myocardium homogenates revealed the presence of both pro MMP-2 (72 KDa), and active MMP-2 (69 KDa). The relative gelatinolytic activity of pro MMP-2 was higher in preparations from broilers, particularly in the preparations from the left ventricle (LV) of fast growing broiler chicks in comparison to slow growing chicks ($p < 0.03$). SDS-PAGE profile of washed myofibrils from LV myocardium of ascitic birds showed several distinctly different features not seen in other preparations. Western blot analysis of these samples showed several fragments of myosin heavy chain, M-protein, and titin. The content of titin was 10 to 30% lower in myofibrils preparations from broilers in comparison to leghorn chickens. Titin content was lowest in preparations from the LV of broilers with advanced heart failure and ascites, and constituted approximately 43% of titin present in the preparation from leghorn chicks. These data indicate that heart pump failure in ascitic broilers is associated with extensive remodeling of ECM and molecular changes in contractile apparatus.

Key Words: Broiler, Ascites, Extra-cellular matrix, Ultrastructural, Molecular