HISTOCHEMICAL COMPARISION OF FIGHTING CAPABILITY OF TWO COCK BREEDS OF ODISHA

B.R. Behera , R.K. Das, T.K.Palai, U.K. Mishra and A.K. Mandal

Department of Anatomy and Histology,

College of Veterinary Science and A.H.

OUAT Bhubaneswar-751003

Recevied 18-6-2011 Accepted 25-10-2011

ABSTRACT

A comparative histochemical study between Aseel (Fighting cock) and Kalahandi (Nonfighting cock) was carried out. Glycogen and mucopolysaccharide content was studied which revealed higher amount of these compounds in almost all studied muscles and tendons in case of Aseel than that of Kalahandi cocks. Glycogen and carbohydrate which are instant source of energy available in muscle of Aseel make it capable to engage in burst activity for a longer period than its counterpart. These characteristics might attribute to the fighting ability of Aseel cocks.

KEYWORDS : Aseel cock, Kalahandi cock, Histochemical study, Muscle.

INTRODUCTION

Aseel and Kalahandi are two fowl breeds of Orissa popular for their specific characters. Aseel cock is a famous show bird and known for its fighting nature, whereas Kalahandi cock is primarily reared for meat purpose. The fighting power of Aseel cock greatly depends on the nimbleness in locomotion, degree of structural and physiological development of its muscles. Amount of glycogen and mucopolysaccharide in the muscle is also a very important determining factor for the fighting ability of a bird.

Glycogen is the instant source of energy available in muscle and higher content of it make the bird capable to engage in burst activity for a longer period (George and Berger 1966). Along with leg muscles the wing and Pectoral muscles are very important flight muscles which play the pivotal role during fighting (Dial et al., 1988). The present study was designed to elucidate the histochemical character of certain important locomotory muscles and associated tendons in these two breeds of cocks so as to unravel the mystery of fighting ability of Aseel cocks.

MATERIALS AND METHODS

A total number of sixteen cocks , eight from each of two breeds of fowl i.e Aseel and Kalahandi were used in the present study. All the birds were healthy and normal. They were reared under conventional feeding and husbandry practices for one month in the Department of Anatomy and Histology, Orissa Veterinary College, Bhubaneswar. The birds were sacrificed humanely and were dissected carefully to identify different leg muscles. Four small pieces of tissue were collected, which included one piece from origin, one from insertion and two pieces of the belly region to obtain cross and longitudinal sections. Tissues were then fixed in 10 per cent buffered neutral formalin (BNF) and Carnoy's fluid for histochmeical staining. Fixed tissues were routinely processed as per the recommended techniques (Humason, 1962 and Luna, 1968) to obtain serial paraffin sections of 5-6 micron thickness. The sections were then subjected to staining for glycogen, sulfated and acid mucopolysaccharides and for neutral mucopolysaccharides.

RESULTS AND DISCUSSION

Eighteen different locomotory muscles of wing and leg were studied. The wing muscles were Pectorails, Supracoracoideus, Deltotdeus major, Tricep brachii, Bicep brachii, Extensor digitorum

communis, Flexor carpi ulnaris, Flexor digitorum superficialis and Flexor digitorum profundus. The leg muscles studied were Iliotibialis cranialis, Iliotibialis lateralis, Iliofibularis, Femmorotibialis, Fibularislongus, Tibialicranialis, Extensor digitorom longus, Gastrocnemius and Flexor digitorom longus. Six tendons out of which three from each leg and wing were studied in both Aseel and Kalahandi cocks. Those were Extensor digitorum communis , Flexor digitalis superficialis , Flexor digitalis profundus, Flexor digitalis longus, Gastrocnemius and Extensor digitalis longus tendons.

Glycogen

Glycogen deposits were mostly localized at the periphery of fibers in cross sections and in a wavy manner in longitudinal sections. All the muscle sections revealed moderate to high glycogen concentration and PAS positive materials in the sarcoplasm of the muscle of Aseel cocks. But the glycogen concentration in the corresponding muscle of Kalahandi cocks was comparatively weak to moderate. (Fig.1). The collagen fibers of the tendons were strongly PAS positive indicating the presence of neutral mucopolysaccharides. The higher concentration of these mucopolysaccharides was present in Aseel birds (Fig.2).The larger white muscle fibers were very rich in glycogen, followed by intermediate and small (red) fibers in both the breeds. The higher glycogen containing white fibers are otherwise known as fast twitch muscle or Fast Glycolytic Muscles. In this way the Intermediate and red fibers are known as fast oxidative glycolytic and slow oxidative fibers respectively. Such fibers typing on the basis of glycogen content and their functional correlation are similar to that of Velotto and Castro (2004), Butler (1991), Kovacs and Meyers (2000).

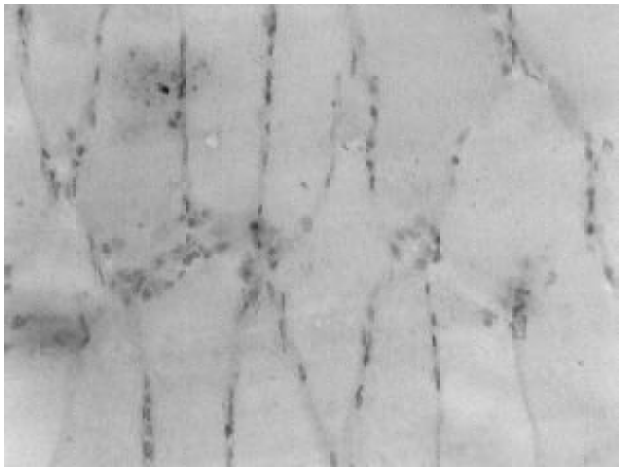

Figure 1. Photomicrograph of cross section of m. gastrocnemius of Kalahandi bird, showing lower concentration of glycogen in myofibers Bests caramine x400

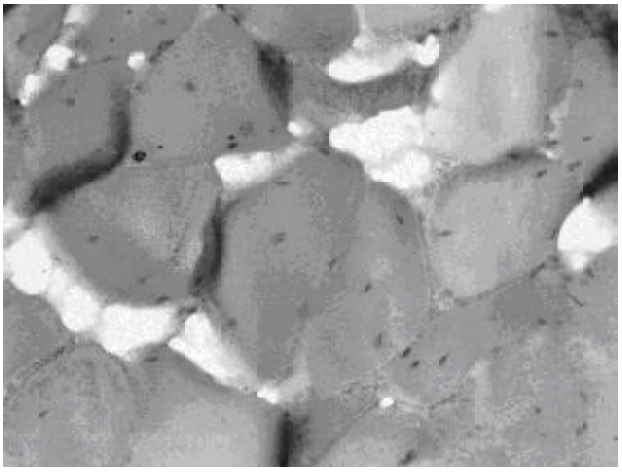

Figure 2. Photomicrograph of cross section of m.biceps brachi of Aseel bird, showing deposits of glycogen granules in myofibers subsarcolema Bests caramine x400

Acid Mucopolysaccharide

Alcian blue technique revealed the presence of very little acid mucopolysaccharides and mucin positive substances only in the endomysial and perimysial connective tissue in both the breeds. But higher quantity of such materials was observed in Aseel than its counterpart. They were found to be present between individual lamella and bundle of collagen in the connective tissue of the perimysium. This is in agreement with the findings of Panchal and Vyas (1990). In case of tendons the inter-collagenous substances were found to be alcianophilic which suggested the presence of mucin and acid mucopolysaccharides. The acid mucopolysaccharides and other alcianophillic substances were present in higher amount in Aseel than that of Kalahandi cock (Fig.3 and 4).

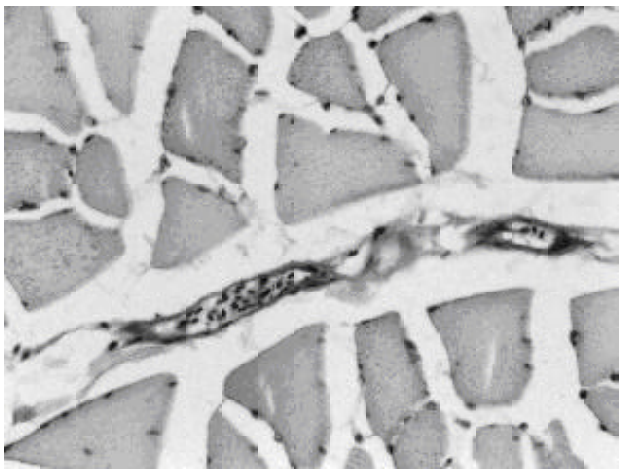

Figure 3. Photomicrograph of cross section of m. Fibularis longus of Kalahandi bird, showing moderate PAS positivity along with the muscle spindle. PAS-H x400

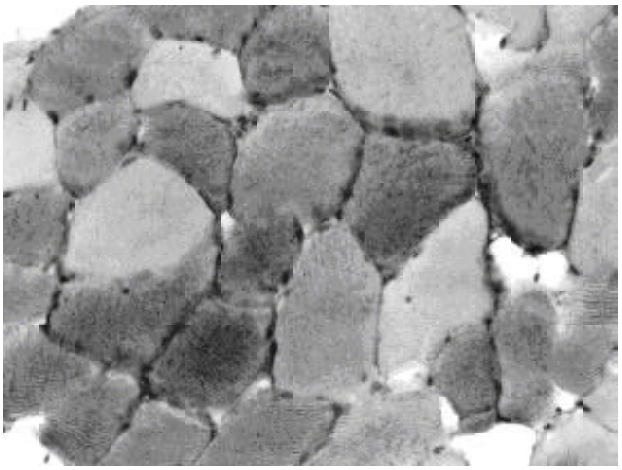

Figure 4. Photomicrograph of cross section of m.tibiais carnialis of Aseel bird, showing heavy concentration of PAS positive materialPAS-H x400

Higher amount of glycogen and carbohydrate which are instant source of energy available in muscle of Aseel make it capable to engage in burst activity for a longer period than its counterpart (George and Berger, 1966).

REFERENCES :

Butler ,P. J. (1991). J. exp. Biot., **160:** 233-262.

Dial, K. P., Kaplan, S. R., Goslow, G. E. Jr. and Jenkins, F. A. Jr. (1988).J. Exp. Biol.,**134**: 1-16.

George, J. C. and Berger, A. J. (1966). Avian Myology, New York: Academic Press.

Humason, G.L. (1962). Animal Tissue Techniques, W.H. Freeman and Co., London.

Kovacs, C. E.,and Meyers, R. A. (2000). Journal of Morpholog., **244**:109-125.

Luna, G.L. (1968). Manual of Histologic Staining Methods ofthe Armed Forces Institute Pathology, 3rd edn., McGraw-HiH Book Co., York.

Panchal, K.M. and Vyas, K.N. (1990). Ind. J. Anim. Sci., **60**(5): 510-513.

Velotto, S. and Crasto, A. (2004). Anatomia Histologia Embryologia, **33**(5): 251 - 256.

❑