Abnormal morphology of skeletal muscles in meat-type chickens – ultrastructural observations

M. Polak¹, B. Przybylska-Gornowicz², A. Faruga¹

¹ Department of Poultry Science, Faculty of Animal Bioengineering
² Department of Histology and Embryology, Faculty of Veterinary Medicine, University of Warmia and Mazury in Olsztyn, Poland

Abstract

In order to determine the effect of different production systems on muscle ultrastructure in meat-type chickens, we examined m. gastrocnemius and m. pectoralis superficialis in two lines of chickens (Anak Titan and Isa 215) raised in three different technological systems (indoors in a conventional facility, indoors with limited outdoor access and outdoors with an umbrella roof). Our previous study showed some abnormalities in the histological structure of these muscles. We hypothesized that electron microscopy, having a strategic position in muscle examination, would provide insight into changes in muscle tissue revealed by light microscopy. The results of the study indicate that the muscles examined undergo ultrastructural alterations regardless of the muscle type, chicken line and production system. The abnormalities observed in the present study were found to affect many aspects of fiber ultrastructure impairing function of the myofibrillar apparatus – the structure of mitochondria and sarcoplasmic reticulum, defects of the sarcolemma as well as the appearance of remnants resulting from fiber disintegration. Abnormal responses were found primarily in myofibrils and mitochondria, and – to a lesser extent – in other structures of muscle fibers. We suggest that the majority of the changes observed may lead to muscle damage followed by pathology. The severity of these changes was particularly evident in the muscles of chickens of the Isa 215 line (highly selected) kept outdoors with an umbrella roof. The observations point to a dependence of the above changes on the line of chickens and rearing conditions. Therefore, the limited potential of highly selected broilers to adapt to different environmental conditions should be taken into account while selecting a new production technology.

Key words: muscle, ultrastructure, meat-type chickens, production system

Introduction

In our previous study we demonstrated some abnormalities in the histological structure of skeletal muscles in meat-type chickens of two lines (Anak Titan and Isa 215) raised in three different production systems (indoors in a conventional facility, indoors with limited outdoor access and outdoors with an umbrella roof). The relationships between the observed abnormalities and chicken lines and production systems were determined. A histological analysis revealed defects in both muscles examined, i.e. m. pec-