

Tropomyosin and triosephosphate isomerase are upregulated proteins affecting Ginseng treatments in chicken muscle

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Abstract

The present study was aimed to investigate proteome affected by *Panax ginseng* extracts in chicken muscles. More than 300 protein spots were detected on silver staining gels. Among them, four protein spots were distinctively up-regulated by *Panax ginseng* treatments. The up-regulated proteins were finally identified as tropomyosin (2 spots), triosephosphate isomerase, and one unknown protein. Based on the known functions of the identified proteins, they are highly related to the muscle development and enhanced immunity in chicken. These proteins can give valuable information of biochemical roles for *Panax ginseng* in chicken meats.

Key Words : Chicken, muscle, MALDI-TOF MS, 2DE, *Panax ginseng*

Introduction

Meat market requires secure and safe meat products as well as functional meat products. One good example of functional meat products is pork fed on diet containing ginseng leaf and stem extracts. When the pigs were fed on the diet comprising ginseng extracts, their porks showed higher levels of growth hormone to lead faster

growth and high ability of water holding capacity, compared with their control. In this present study, we aimed to investigate differentially expressed proteins in chicken muscles affecting edible *Panax ginseng* extracts as well as address the possibility for functional chicken meat products.

Materials and Methods

Water containing boiled extracts of 0 %, 1 %, 3 %, 5 % *Panax ginseng* were given to three-breed-cross chickens (Korean Native Chicken × Rhode Island Red × Cornish) for two weeks before slaughter. Muscles from chicken breast were immediately removed just after slaughter and quenched in liquid nitrogen for subsequent 2-DE gel analysis. Obtained 2DE gels were stained with silver and analysed with ImageMaster 2D Elite Software (Amersham, USA). The differentially expressed proteins were analysed with MALDI-TOF Mass spectrometry for detailed verification of the proteins.

Results

With replicated experiments, four differentially expressed protein spots induced by boiled ginseng

extracts in water were identified on 2-DE gels. These proteins were further analyzed by MALDI-TOF MS and searched against protein database using Mascot search engine. These up-regulated proteins for the ginseng treatments were identified as tropomyosin(2spots), triosephosphate isomerase and one unknown protein(Fig. 1). All four protein spots identified were significantly increased based on the dose-dependent manner when supplemented with *Panax ginseng* extracts.

To estimate biological roles in chicken muscles, the proteins identified were carefully investigated. Tropomyosins are ubiquitous proteins of 35~45 kD associated with the actin filaments of myofibrils and stress fibers(Lees-Miller & Helfman 1991). Another up-regulated protein, triosephosphate isomerase acts as important role in glycolytic pathway and mutation of this gene can cause degeneration of brain and muscle dystonia.

Interestingly, this gene causes eye tumors and CD4+ T cells were activated for suppression of the eye tumors. Therefore, this protein is highly related with immune responses and supports the

results that ginseng treatments elevate immune ability(Moon, 1999).

적 요

본 연구는 proteomics의 방법을 이용하여 가금의 육질과 관련된 단백질을 찾고자 수행하였다. 인삼 부산물을 급이한 실용재래계와 대조구와의 비교에서 육질과 관련된 3개의 후보 단백질이 이 연구를 통해 밝혀졌다. 이 유전자들은 tropomyosin, triosephosphate isomerase와 한 개의 기능이 밝혀지지 않은 단백질이었다.

각각의 기능을 살펴볼 때 이 유전자들은 근육의 성장과 면역의 증강에 관여하며 이 결과는 인삼 부산물을 이용하여 가금의 육질을 향상시키는 단백질 마커로 중요하게 이용이 될 수 있을 것으로 추정된다.

References

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Figure 1. Comparative analysis of four identified protein affecting ginseng treatments. All four protein spots identified are up-regulated when the ginseng concentration in water is increased. Spot volumes and areas are indicated on the right. Spot numbers 1 and 2 are tropomyosin, 3 is unknown protein and 4 is triosephosphate isomerase.

