

The use of proteomic techniques to assess the effect of a diet enriched with different levels of inulin-type fructans on changes in the aortic protein profile

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Abstract

Introduction: Diet can significantly impact the function of an organism. Undoubtedly, a well-balanced diet may positively affect a multiple physiological mechanisms. In recent years there has been an increased interest in the role of dietary supplements in health maintaining and enhancing animal performance. These "nutrition boosters" also include prebiotics, especially inulin. Data so far available have focused mainly on their prebiotic properties in modulating the microbiota composition in the gastrointestinal tract. In case of farm animals research have focused on improving production results (e.g. improve feed efficiency, increase weight gain). However, this issue is not widely investigated in terms of aortic functions. There are no reports on indirect effects of inulin-type fructans on the physiology of aorta. Changes in protein expression patterns which are involved in various cellular, biological or metabolic processes may serve as a potential markers reflecting functional changes in the aorta. Analysis of changes in protein expression in the aorta will allow for further assessment of the dietary inulin impact on aorta function, as well as finding explanation for the observed protein interaction.

Aim: The aim of the study was to evaluate the effect of dietary inulin or dried chicory root supplementation on changes in protein expression profile of aorta in growing piglets and creation of representative protein maps of this tissue.

Material and methods: The study was carried out on biological material (ascending aorta), collected from twenty four 50-day-old piglets, PIC x Penarlan P76 crossbred males (castrated). Animals were divided into 3 groups (n=8), and fed with: control diet (K group), experimental diet consisting of 2% of water solution of chicory inulin-type fructans (D1 group) and experimental diet with 4% dried chicory root (D2 group). Aortic proteins were separated using two-dimensional electrophoresis (2DE). Protein identification was performed with the aid of MALDI-ToF mass spectrometry. The UniProt databases, Euk-mPlock 2.0 and STRING v10 bioinformatics tools were used to determine the cellular localization of proteins and to connect them to specific biological processes.

Results: Diet supplemented with 4% of chicory root triggered changes in expression of 32 protein spots in aorta, representing 15 different gene products. Of these 19 proteins were identified. A diet supplemented with 2% water extract of inulin induced expression changes of 23 protein spots, representing 12 different gene products. Of these 13 proteins were identified. Identified proteins were found to be involved in the cellular stress response,

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cytoskeletal organization (maintenance, assembly and movement of cells), blood pressure regulating, supporting vascular tone and development of vascular endothelium. Moreover, reproducible protein profiles of aorta were obtained and global characteristics of the identified proteins was made.

Conclusions: Diet supplemented with water extract of inulin and dried chicory root triggered changes in aorta proteome of growing piglets. Moreover, dietary supplementation with inulin-type fructans did not affect total cholesterol and triglycerides values in the aorta of growing pigs. Obtained reproducible two-dimensional protein maps representing the characteristic pattern of the aorta for *Sus scrofa*, may be used to compare protein expression patterns in response to physiological conditions or/and experimental factors. Moreover, obtained results may be useful for diagnosis and prevention in zootechnics and veterinary science.

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