Gene – nutrient interactions

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Abstract — at the University of Primorska College of Health Care Izola the researchers are joined in an interdisciplinary team which will perform a research entitled ‘A multidisciplinary approach in the treatment of obesity’. Obesity and overweight pose a major risk for diet-related chronic diseases. So, understanding the role of obesity is of major importance in the prevention and treatment of these related diseases. It is known that genetic factors related to food intake, basal metabolic rate and adipocyte differentiation contribute, but also life style, psychological factors, and tradition, may provide to the etiology of obesity, that is why obesity will be studied from different aspects. The aim of the research is in addition to nutritional treatment also attempt to understand the regulation of the secretion of adipokines by different food components. Research is versatile and interdisciplinary, and is a challenge for researchers.

Index Terms — obesity, adipokines, gene-nutrient interactions, dietary fats

1 ACTIVITIES AND ROLES IN TRANS2CARE PROJECT

At the University of Primorska College of Health Care Izola interdisciplinary team of young researchers will use multidisciplinary approach in the treatment of obesity. Study corresponds to the trend of public-health problem. The goal is clear: to determine the appropriate diet to an individual, to improve the quality of life and maintain personal health. The project will be important also for the development of nutrigenomics at the University of Primorska College of Health Care Izola. Moreover, the knowledge obtained in this study will be useful also in the pedagogical processes that take place at the university of Primorska College of Health Care Izola.

1.1 Scientific background

The prevalence of overweight is increasing globally and has become a serious public health problem (1). Obesity is associated with low-grade chronic inflammation characterized by inflamed adipose tissue with increased macrophage infiltration.
This inflammation is now widely believed to be the key link between obesity and development of insulin resistance and metabolic disease development (2). Adipose tissue is crucial for the inflammatory status associated with obesity, primarily because of macrophage infiltration (3). Adipocytes secrete both pro- and anti-inflammatory adipokines, including pro-inflammatory tumor necrosis factor- (TNF-), interleukin-6 (IL-6), and the anti-inflammatory adiponectin. Reduced adiponectin and increased C-reactive protein (CRP) concentrations are associated with cardiovascular diseases and type 2 diabetes (4).

1.2 Presentation of the problem

A reduction in inflammatory status may prevent the occurrence of disorders and diseases related to overweight. Many food compounds have been reported to have anti-inflammatory and/or antioxidant effects in various populations and the hypothesis is that these specific dietary components (polyunsaturated fatty acids (PUFAs), vitamin C, vitamin E, ...) are able to reduce low-grade inflammation as well as metabolic and oxidative stress. For example anti-inflammatory effects of n–3 fatty acids have been shown by reduced plasma concentrations of CRP, TNF–, and IL–6 (5). But the border between health and disease is often set by a complex equilibrium between two elements, genetics on one hand, and lifestyle (including diet) on the other (Figure 1). So, heterogeneity in circulating plasma concentrations of CRP, TNF–, IL–6, adiponectin, and other adipokines in response to specific dietary compounds may be due, in part, to genetics variations. Therefore at the same dietary intake of specific compound, their respective health effects may differ due to genetic differences (6).

Fig. 1. Interactions between nutrients and biological macromolecules. Approaches to evaluate these interactions are genomics, transcriptomics, proteomics, and metabolomics.
1.3 Research objectives

In the study, we assume that changes in adipokines gene expression are caused by the ingestion of different kinds of nutrients and particularly of different types of fat. The objective of the study is to determine the relationship between TNF-, IL-6, adiponectin, resistin, and visfatin gene polymorphisms with obesity and investigate whether specific dietary compounds intake modulates these associations and how the specific dietary compound modulates adipokines secretion.

1.4 Methods

Different polymorphisms, and biochemical measurements, will be determined in the study of obese people and matched controls, comparable in age and sex. Dietary intake will be assessed on the basis of a food frequency questionnaire, adapted to Slovenian dietary patterns and with dietary record. Each participant in the study will be individually discussed. The nutritional status will be assessed, resting metabolic rate with indirect calorimeter will be measured and the proportion and distribution of fat will be determined with bioelectrical impedance analysis. DNA will be isolated from peripheral white blood cells and genotyping of different polymorphisms will be performed by using real time polymerase chain reaction. For the quantitative determination of adipokines in human plasma ELISA method will be performed. Moreover, all biochemical analysis will be done at the biochemical laboratory at Izola General Hospital following established procedures. In the end all results will be analyzed and evaluated using different statistical programs. Using various statistical analyses the interactions between food components and genes will be calculated.

2 CONCLUSION

Through the initiated Trans2Care project we intend at the University of Primorska College of Health Care Izola to contribute through the activities and studies to understand gene – nutrient interactions and, consequently, contribute to the improvement of the quality of life and to maintain personal health.

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REFERENCES


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