

学位論文要約(英文)

Nutritional studies of “Vegetable First” for postprandial hyperglycemia and postprandial oxidative stress

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Human beings should take caloric nutrients like carbohydrates, lipids or proteins, for maintaining their life, every day. At meal time, we should be thinking about “what kind of meal eating”, “how much of eating” or “how order of the eating”, but little has been reported on the scientific evidence for eating. Carbohydrates which are the major caloric nutrients are oxidatively metabolized in our body to carbon dioxide to produce energy for life with production of the byproduct, the reactive oxygen species. Thus, we have been equipped the antioxidative enzyme system during our evolutionary process such as superoxide dismutase, catalase and glutathione peroxidase, and taken low molecular antioxidants like vitamin E, C and polyphenol compounds, every day.

Postprandial hyperglycemia or postprandial metabolic disorders are concerned with the important risk factors for the coronary artery disease because of the oxidative stress promoting atherosclerotic changes. Thus, the author focused, in this paper, the nitrate-rich green leafy vegetables like spinach for preventing the postprandial oxidative stress, with discussing the inhibitory effects on the postprandial glucose level of the extracts of *Aralia elata*.

Recently, “Vegetable First” is proposed for health preservation. However, the scientific evidence for this eating order could not be elucidated, even though the effectiveness by dietary fiber in vegetables would be considered.

In this paper, the purpose is to discuss inhibitory effect of the postprandial glucose level by *Aralia elata*, and also, to investigate green leafy vegetables for preventing glucose level and postprandial oxidative stress.

This paper consists of six chapters. The first chapter refers to background and purpose. The second chapter discusses the inhibiting extracts from *Aralia elata*. And the activity of disaccharides inhibition by these extracts was described in detail in the chapter the third. The forth chapter identifies the

extracts could prevent the postprandial glucose level in mice and human subjects under maltose or trehalose loaded. In the fifth chapter, postprandial hyperglycemia and postprandial oxidative stress were discussed with oral anaerobic microbes and nitrate/nitrite/nitric oxide eating by green leafy vegetable like spinach. And consequently, “green leafy vegetables first” would be effective for preventing such postprandial phenomenon because of the action by nitric oxide. Increment of glucose level at 15, 60 min after the intake of boiled rice (200 g) was significantly reduced by the eating first of 100 g of boiled spinach. In contrast, such changes were not detected in the boiled rice first prior to spinach. And, the satiety (VAS) were same scale between green leafy vegetable first or not. Postprandial hyperglycemia and postprandial oxidative stress were discussed with oral anaerobic microbes and nitrate/nitrite/nitric oxide circuit, after eating by green leafy vegetables like spinach.

In this dissertation, changes of photohemolytic profiles and the under area curve (% min) obtain from the singlet oxygen irradiation to the red blood cell samples after the intake of boiled rice was significantly reduced by the eating of 10~50g boiled spinach , dose dependently, where the nitrate levels in saliva were increased. When subjects were treated by the antibacterial mouth wash, povidone iodine before meal, such changes were not detected, even though the nitrate levels in saliva were enhanced to the high levels. Herein, the author demonstrates the real time measurements for the postprandial oxidative stress levels, by employing the AlPcS₄ photosensitization and one drop of fingertip red blood cells and clarifies the beneficial effects of dietary nitrate-rich vegetables for the postprandial oxidative stress.

These results suggest that the postprandial oxidative stress could be controlled by the dietary nitrate intake which induces the nitrate-nitrite-nitric oxide pathway with the oral bacteria, but not by the dietary fiber intake. And consequently, “Green Leafy Vegetables first” would be effective for preventing such postprandial phenomenon because of the action by nitric oxide.

This study could disclose the mechanism of “vegetable first” and “eating order” contributes to maintain the balance of reactive oxygen species produced during eating every day.