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Gene expression analysis in subjects taking chlorella: Comparison between groups of subjects with high risks of lifestyle-related diseases and healthy subjects

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[Objectives]

Continuous practice of taking chlorella has been shown to have various effects, such as those to improve hyperlipemia, diabetes, and hypertension and to stimulate the immune system. In order to overview the effects of chlorella on gene expressions, in this study, we have examined changes in gene expressions in the peripheral blood before and after taking Sun Chlorella A tablets. Whole blood samples were obtained from a group of healthy subjects (designated as N group) and a group of subjects with high risks of lifestyle-related diseases (designated as D group).

[Method]

Sixteen healthy subjects were enrolled in N group, and 17 subjects with high risks of lifestyle-related diseases in D group, as a result of the screening data on fasting blood glucose, total cholesterol, neutral fat, and glucose tolerance. All of these subjects took chlorella (20 Sun Chlorella A tablets) twice a day for 12 weeks. Blood samples were from the subjects at 4 timepoints, just before the initiation of taking chlorella tablets (at baseline), 4 weeks and 12 weeks after the initiation, and 4 weeks after the completion of taking chlorella tablets. Collected samples were subjected to the pretreatment and RNA extraction by using PAXgene (Qiagen K.K.), and then to gene expression analysis by using DNA tips (the number of loaded genes: 1,873, Hitachi Ltd.). Gene expression was analyzed by competitive hybridization. In all analysis, a commercially available preparation of total RNA derived from white blood cells was commonly used as the universal control. The data thus obtained were statistically compared between the groups and also subjected to cluster analysis (1) to identify gene groups showing changes in expression upon taking chlorella and (2) to identify gene groups showing significantly different changes in expression upon taking chlorella between N group and D group.

[Results]

Clinical examinations showed remarkable improvements in percent of body fat and serum total cholesterol after taking chlorella tablets. Gene expression analysis revealed that many genes showed changes upon taking chlorella tablets and recoveries to the baseline levels after the completion of taking chlorella. Many of such genes are involved in signal transfer, metabolizing enzymes, receptors, transporters, and cytokines. In addition, gene expression analysis revealed the presence of various genes showing significantly different expressions between N group and D group at the initiation of the study and remarkable changes in gene expression in D group after the completion of taking chlorella. Some of those genes are involved in lipid metabolism pathways and insulin pathway. Thus, chlorella was suggested to affect these pathways.

Epixegesis at the oral presentaion: Blood glucose at 8th week in D group after the initiation decreased significantly, and the decreasing trend still remained at 12 th week, and after the completion of taking chlorella, the blood glucose increased. This change was considered to be caused by taking chlorella.