

## **Approaching the Functionality of Chlorella through Genomics & Metabolomics!**

Presented at the 64<sup>th</sup> Annual Meeting of the Japanese Society of Nutrition and Food Science (2010)

Chlorella contains nutrient components such as proteins and vitamins as well as a variety of other components, which act on a large number of metabolic pathways comprehensively exhibiting a wide variety of functions.

We have examined such activities of Chlorella comprehensively by genomics<sup>1)</sup> and metabolomics<sup>2)</sup> and published the results (“Effects of Chlorella Consumption in Mice Evaluated by Gene Expression Analysis” at the 32<sup>nd</sup> Annual Meeting of the Molecular Biology Society of Japan ([document 1](#)) and “Effects of Consumption of Chlorella and C.G.F. on Metabolism” at the 4<sup>th</sup> Metabolome Symposium ([document 2](#))). We announce here our presentation of the results of comprehensive analysis of the activities of Chlorella and C.G.F. based on these data together with the results of analysis of miRNA<sup>3)</sup> at the Annual Meeting of the Japanese Society of Nutrition and Food Science.

### **[Method of experiments]**

Healthy male ICR mice aged 10 weeks were randomized to groups fed a basic food or basic food containing 5% Chlorella or C.G.F.. After one-month breeding, blood and liver were collected and mRNA<sup>4)</sup>, miRNA, and metabolites were comprehensively analyzed.

### **[Results]**

A series of analyses performed in this study demonstrated that consumption of Chlorella and C.G.F. led to a variety of changes in the levels of mRNA, miRNA, and metabolites.

The clearest effect was a transition in the energy metabolism involved in primary vital activities including metabolism of branched chain amino acids and fatty acids at all levels of mRNA, miRNA, and metabolites from the glucose metabolism-dependent type to the branched chain amino acid and fatty acid metabolism-dependent type. The effects of Chlorella and C.G.F. were also confirmed in functions involved in biological defense such as immunity and antioxidation.

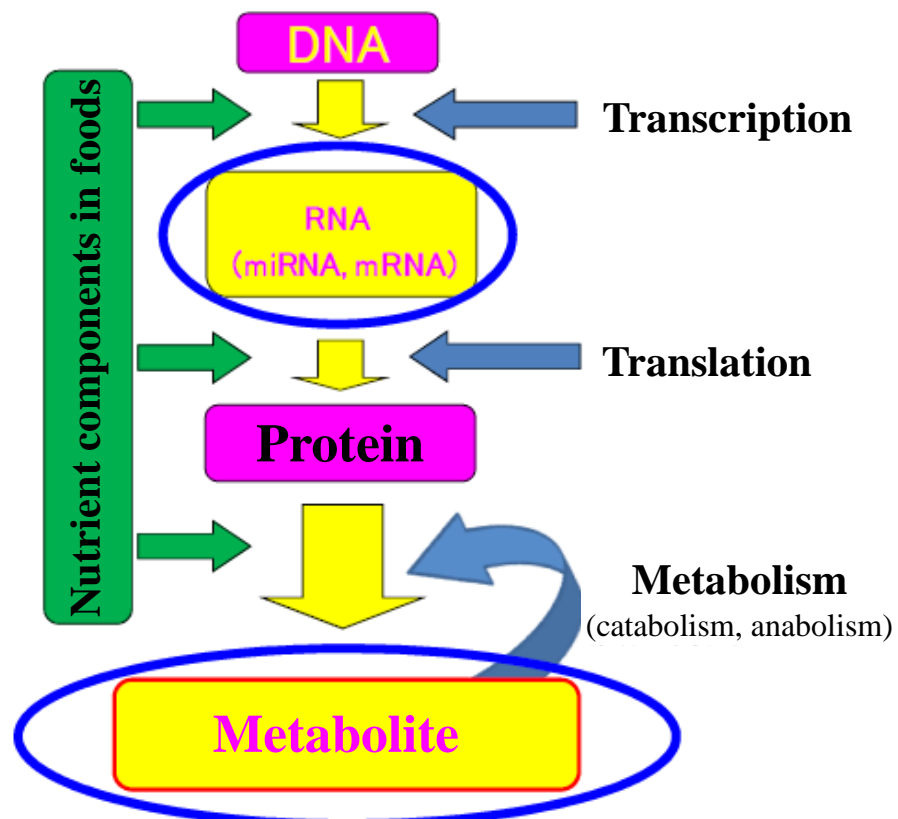
While they must be verified further in animal pathology models and humans, it may be said that the results of this study support the effects of Chlorella at the levels of mRNA, miRNA, and metabolites reported in animal and human studies thus far including improvement of lipid metabolism, improvement of metabolic syndrome, antiinflammatory effects, anti-fatigue effects, and immunoregulatory effects ([Documents 3, 4, 5, 6, and 7](#)).

A wide variety of changes in gene expression and metabolites have also been observed apart from the above, suggesting the occurrence of a wide range of metabolic changes through Chlorella consumption. In the future, the extraordinary effects of Chlorella may be further revealed.

<<**Description of terms**>>

- 1) Genomics: This is a method to comprehensively evaluate in integral fashion the genetic information possessed by living bodies. The genetic information to be evaluated is necessary for life activities.
- 2) Metabolomics: This is a method to comprehensively measure and evaluate metabolites produced as a result of life activities.
- 3) mRNA: mRNA is produced (transcribed) as a complement of DNA and to act as 'design drawings' for substances necessary for life activities. Proteins are produced by reading (translating) mRNA.
- 4) miRNA: miRNA is a factor that regulates activities of mRNA.

The general flow of metabolic activities in the body is shown below with the parts analyzed circled in blue.



<<Details>>

Name of meeting:	The 64 <sup>th</sup> Annual Meeting of the Japanese Society of Nutrition and Food Science (2010)
Title:	Study on functionality of Chlorella by genomic and metabolomic analyses using ICR mice
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