

Results report

1. Title of Research and Development : Amazon fruits nano-supplements development: nutrigenomic and nutrigenetic effects on aging and health
2. Principal Investigator : Toshiro Aigaki (Professor, Department of Biological Sciences, Tokyo Metropolitan University)
3. Counterpart Principal investigator : Ivana Cruz (Professor, Health Science Center, Federal University of Santa Maria, (Brazil))
4. Results of Research and Development:

The goal of this project is to understand the functionality of the Amazonian Guaraná fruit (*Paullinia cupana*) at the molecular, cellular and organismal levels, and to develop nano-supplements that promotes health and longevity in humans. The Japanese team uses the fruit fly *Drosophila* as an experimental model system, whereas the Brazilian team works on humans and cultured cells. We exchange researchers and information between the two teams to promote the collaborative project efficiently. We made the following achievements this year.

I. Identification of genes affected by Guaraná fruit (GF) intake

We performed microarray experiments to investigate the effects of GF intake on gene expression in *Drosophila*. Flies were transferred from normal media to those containing GF powder at the concentration of 10mg/ml and kept for 24 hours. Control flies have been kept in normal media. Then mRNA was extracted and analyzed for gene expression with Agilent microarrays. We identified 195 and 203 genes whose expression levels were up- or down-regulated, respectively. Among the identified genes, four genes were selected and subjected to quantitative RT-PCR. The results were consistent with those of microarray.

II. Metabolomic changes induced by GF intake

Flies were treated with none (control), GF, caffeine, or catechin for 24hrs as described above, and extracted with 75% acetonitrile, and the soluble fractions were subjected to metabolomic analyse using an LC/MS system. Metabolomic profiles of GF treated flies were clearly different from those of control, indicating that GF has an impact on the metabolism of the animals. GF contains a high level of caffeine, and the metabolomics profiles were relatively close to that of GF-treated flies, suggesting some of the effects of GF may be caused by caffeine.

III. Tolerance to heavy metal (methyl mercury).

Flies were raised on medium containing methyl mercury with or without GF. No fly has developed from the medium with methyl mercury, whereas approximately 30 % flies hatched from the food containing both methyl mercury and GF. The data demonstrate that GF confers the tolerance to methyl mercury.

IV. Evaluation of nano-supplement containing GF

Nano particles containing GF (nano-supplement) was examined for their biological activity using *Drosophila*. Flies were kept on media with carrier only (control) or with GF nano-supplement, and measured their lifespan. There was no significant difference in adult life span between the two groups. Since the amount of GF in the nano-supplement was low, we need to develop nano-supplement containing a higher concentration of GF.