Influence of Low Dose-Rate Radiation on Metabolism

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Abstract

To elucidate the influence of low dose-rate (LDR) radiation on metabolism, we have started quantitative analysis of the amount of low molecular-weight metabolites (metabolome analysis) in the liver of B6C3F1 male and female mice irradiated at a LDR of 20 mGy/day for 300 days (total dose: 6,000 mGy). Here we report preliminary results obtained this year. We observed changes in the amount of the compounds involved in the TCA cycle, gluconeogenesis and glycolysis (for example, fumaric acid, malic acid, glyceraldehyde triphosphate and phosphoenolpyruvate) in both male and female irradiated mice. These results suggest that metabolome analysis can be a useful tool for analyzing the biological effects of LDR radiation.

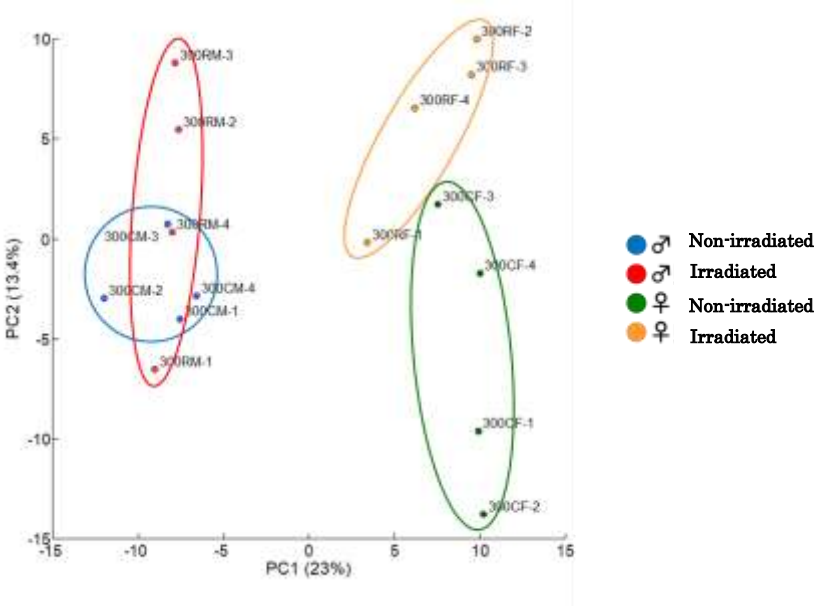

Fig.1. Score plot of principal component analysis of the metabolites in the liver of male and female mice irradiated or non-irradiated at 20 mGy/day for 300 days. n = 4.

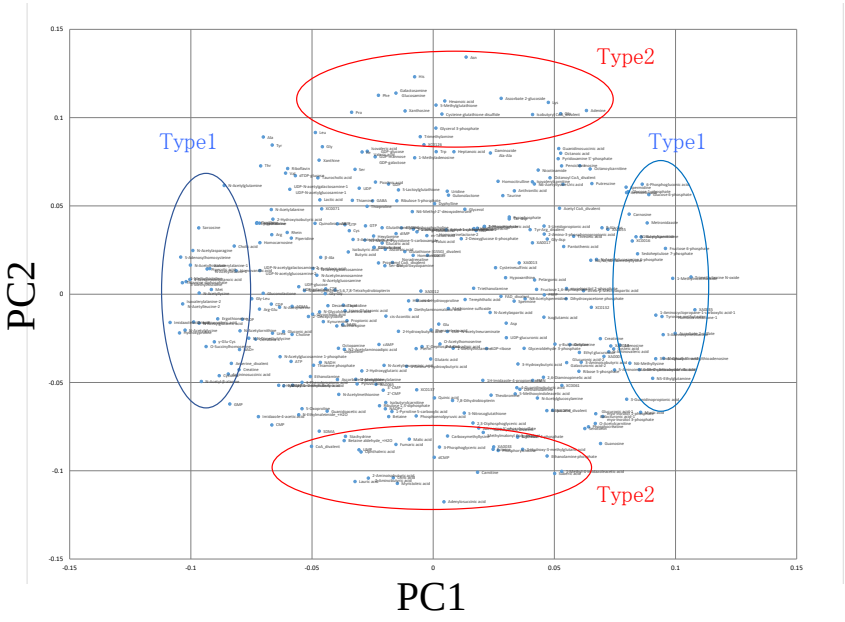

Fig.2. Loading plot of principal component analysis.
We define substances with strong association only with principal component 1 as Type 1 and substances with strong association only with principal component 2 as Type 2.

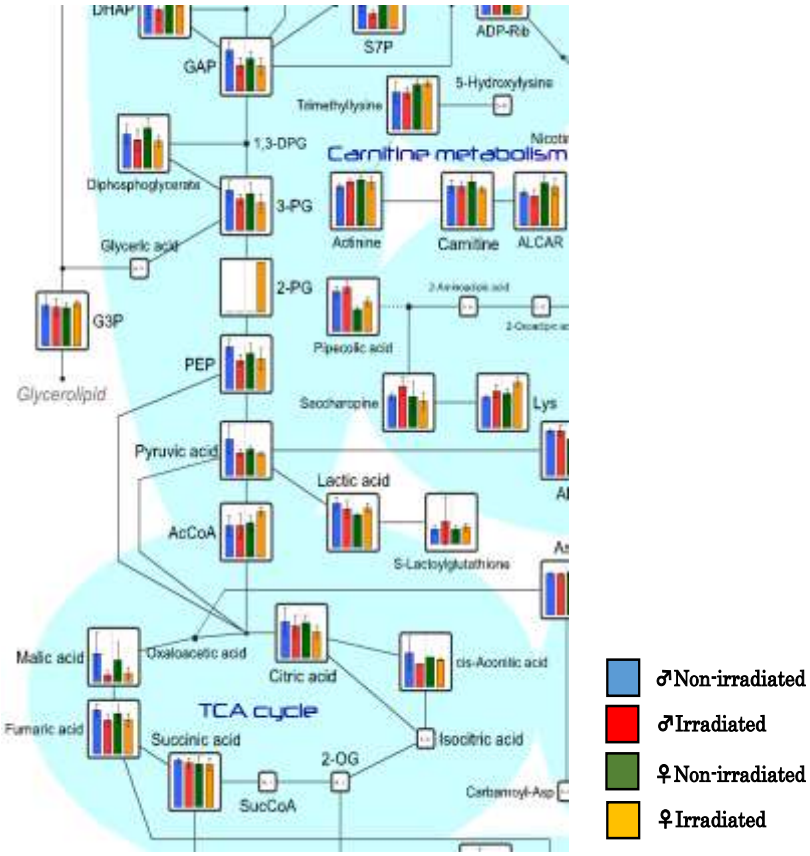

Fig.3. Relative amounts of metabolites illustrated on metabolic pathways (partial)