

A redox-sensitive peroxiredoxin that is important for oxidative-stress resistance

Kimiko Yamakawa-Kobayashi^{1,2}, Yasunari Kayashima² and Toshinao Goda^{1,2}

¹Global COE Program, ²Department of Food and Nutritional Sciences, Graduate School of Nutritional and Environmental Sciences, University of Shizuoka

Oxidative damage caused by reactive oxygen species (ROS) and/or deficiencies in antioxidant capabilities is implicated in many diseases and aging. Peroxiredoxins (PRDX) are a family of multifunctional antioxidant thioredoxin-dependent peroxidases. The PRDX family includes six distinct isoforms. Among of them, the expression of PRDX3 is ubiquitous, and PRDX3 protein is abundantly localized in mitochondria. The specific localization of PRDX3 in mitochondria suggests that it might provide a primary line of defense against hydrogen peroxide (H₂O₂) produced by the mitochondrial respiratory chain.

We have investigated whether the common variations in the PRDX3 gene (*PRDX3*) are potential contributors to variations in susceptibility of common diseases such as hypertension, diabetes and obesity. Significant association was observed between the genotypes of *PRDX3* and obesity.

It is unknown in what manner the different activities of peroxiredoxin influence stress resistance or longevity in the context of whole animals. We have examined the roles of *Prx5037*, which is *Drosophila* homologue of human *PRDX3*, in stress responses and aging. Flies with knockdown of *Prx5037* via RNA interference (RNAi) showed a reduction in lifespan compared to flies with wild type in the presence of H₂O₂ as a source of oxidative stress. Furthermore, we observed that the *Prx5037* expression levels in flies with wild type were reduced with aging. These results indicate that *PRDX3* plays important roles against oxidative stress and susceptibility of common diseases.