Studies on the Oxidation and Peroxide Scavenging Potentials of Tissues in Spontaneously Hypertensive Rats (SHR) and Stroke-Prone SHR

Isao TOMITA, Mitsuaki SANO, Shigeo SERIZAWA,
Tomoko TAKATA, and Masako FURUKAWA

Lipid peroxides are highly toxic and are assumed to be closely correlated to the age-related biochemical changes in tissues, especially to the susceptibility of cell membranes.

In the present study, the formation of lipid peroxides and peroxide scavenging systems in SHR and stroke-prone SHR (SHRSP) fed on CMF diet (protein 30.4%, lipid 8.3%, carbohydrate 44.0%, cellulose 3.7%, ash 6.6%, water 7.0%, dl- α -tocopherol 20 mg 372.3 Cal/100 Gm) was investigated. The studies on SHR and SHRSP fed on the synthetic diet (protein 22.9%, lipid 6.0%, carbohydrate 46.5%, cellulose 9.5%, ash 6.3%, water 8.5% 332 Cal/100 Gm) with or without 20 mg of dl- α -tocopheryl acetate were also carried out.

Lipid peroxides in tissue homogenates were determined by thiobarbituric acid method (TBA) according to Masugi et al (Seikagaku 48: 420, 1976). Total and protein bound sulfhydryl contents were analyzed with DTNB. DPPH was used for the determination of free radical producing substances. The activity of superoxide dismutase (SOD) was determined with 101,000 $\times$ g supernatant of tissues after dialysis for 10 hours according to Elstner et al (Anal Biochem 70: 616, 1976). Glutathione peroxidase (GSH_{px}) activity was determined by DTNB method in the presence of H₂O₂ (Hafeman et al: J Nutr 104: 580, 1974).

Lipid peroxides determined as TBA reactant (malon dialdehyde) were 1.12 ± 0.05 (mean $\pm$ SE, 2 months) and 1.41 ± 0.09 (7 months) n moles/mg protein in the brains of SHRSP while they were 1.12 ± 0.12 (2 months) and 1.27 ± 0.11 (7 months) in those of SHR. The lipid peroxide level in 7-month-old SHRSP was significantly elevated ($p < 0.02$). The changes of the values in livers of SHRSP and SHR were not significant. The activities of GSH_{px} in the brains of SHRSP were 1.31 ± 0.41 (2 months), 3.29 ± 0.51 (5.5 months), and 3.10 ± 0.32 (7 months) unit/mg protein. The latter 2 values of 5.5 and 7 months were significantly higher than that of 2 months ($p < 0.02$, 0.01 respectively), while no significant change was observed in the brains of 2 and 7-month-old SHR. It must also be noted that liver GSH_{px} activity increased largely with age in SHRSP but not in SHR. Significant increases of DPPH reactive substances and protein bound SH were observed in the brains of 7-month-old SHRSP while no remarkable change was obtained in both liver and brain of SHRSP and SHR.

SHRSP which received synthetic diet with dl- α -tocopherol for 6 months showed the marked decrease of peroxide formation in both liver and brain as compared with SHRSP fed on the diet without tocopherol.

Blood pressure, GSH_{PX} , SOD, and T-SH in livers and brains of SHRSP were all very slightly lowered by the tocopherol supplementation.

Large effect of CMF diet on GSH_{PX} in liver of SHRSP is under careful investigation.

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