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Author(s)	OZAWA, Toshihiko
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In vivo study on the influence of the environmental stress :
The development of non-invasive evaluation system using in vivo ESR

Toshihiko Ozawa

*Department of Bioregulation Research,
National Institute of Radiological Sciences, Chiba 263, Japan*

Radiation is one of the environmental stress. When the organisms are exposed to radiation, the reactive oxygen species (ROS) are formed primarily in the various tissues. These ROS are known to cause the various types of tissue damage, succeeding the reaction with the various biological substances. However, organisms have a great variety of the defense systems against the environmental (oxidative) stress, such as the endogenous antioxidants and the antioxidative enzymes. They protect the homeostasis of the biological system against the oxidative stress in cooperation with each other. Therefore, the study in the whole body is essential for the total evaluation of the formation and reaction of ROS and the protective function against ROS in the organism.

Conventionally the invasive methods such as lethal doses and tissue damage have been used as an indication of the radiation damage in whole body. However, these methods should not show the formation and the reaction of free radicals directly, but the final damages due to free radical reactions. The system, which can measure the behavior of free radical in whole body, is necessary to study the influence of oxidative stress including the formation and the reaction of free radicals in vivo.

Recently the in vivo ESR was developed and able to detect the free radical reaction in whole

body, probing the signal decay of nitroxyl radical. The decay rate of nitroxyl obtained from in vivo ESR measurement was reported to be susceptible to the physiological and pathological changes in the organisms such as ischemia-reperfusion, aging, hypoxia and hyperoxia, and inflammation. It is suggested that this system may be applicable to study the influence of the environmental stress in whole body.

In the present study, I will discuss about the possibility of the in vivo ESR system to the evaluation of the formation and the reaction of ROS due to X-irradiation in whole body, and consider the effect of the environmental stress due to X-irradiation on lipid peroxidation and the level of α -tocopherol in various tissues.

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