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Efficacy evaluation biomarkers of dietary antioxidants

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It is widely accepted that free-radical induced oxidative damages are involved in pathogenic processes of major diseases including cancer, atherosclerosis, rheumatoid arthritis and diabetes. A number of epidemiological studies have indicated that frequent consumptions of plant foods rich in antioxidants reduce the risk of developing cancer and cardiovascular diseases, while many intervention trials have failed to prove the protective role of major dietary antioxidants. For example, -carotene supplementation failed to reduce lung cancer incidence in smokers as well as the occurrence of myocardial infarction. The complexity of diets is a possible explanation for this discrepancy. Plant foods contain a large number of non-nutritive antioxidant compounds other than antioxidant vitamins. Carotenoids, flavonoids, and other plant phenolic compounds are both quantitatively and qualitatively important dietary antioxidants although their bioavailability is yet to be determined. While most of free radicals generated in the body are intercepted by antioxidant defenses, reactive species escape to damage biomolucules such as DNA, lipid, and protein. Oxidative DNA damage over a long time period is believed to contribute to the development of cancer, and therefore, anticarcinogenic properties of dietary antioxidants may be derived from their ability to reduce oxidative cellular DNA damages. Several biomarkers have been used to evaluate the role of dietary antioxidants. Previous studies in our laboratory showed that the diet low in vegetables and fruits increases lymphocyte DNA damage. In the same study, urinary excretion of phenolic antioxidants showed significantly positive relationships with plasma activity of superoxide dismutase, a known radical scavenging enzyme. In an animal experiment, dietary quercetin reduced a chemical

carcinogen induced liver 8-hydroxy guanosine level, an indicator of oxidative DNA damage. Also, dietary quercetin reduced iNOS expression and the level of the precancerous markers in the colon of rats treated with a carinogen, which indicate that dietary antioxidant reduce inflammatory responses inhbiting tumor formation. The most widely used biomarkers to assess oxidative stresses involved in atherosclerosis include lipid peroxides and oxidized LDL. A previous study indicated that non-nutritive dietary antioxidants reduced lipid peroxide formation only in rats fed high-fat diet implying that the composition of the diet is an important determinant in assessing the efficacy of dietary antioxidants.