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# Prooxidant and Antioxidant Activity of Dietary β-Carotene in Primary Rat Hepatocytes

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**ABSTRACT**

The ability of β-carotene to protect against oxidative stress and lipid peroxidation is assessed. Primary rat hepatocytes cultures were oxidatively stressed by exposure to ferric chloride ($FeCl_3$). Activities of the antioxidant enzymes superoxide dismutase (SOD; *EC* 1.11.19), catalase (CAT; *EC* 1.11.1.6) and glutathione peroxidase (GSH-Px; *EC* 1.11.1.9) were measured as indices of oxidative stress. Rats were fed 0.1g β-carotene per 1 kg diet for 6 weeks, then primary rat hepatocytes were incubated with 0.05~0.2 mM $FeCl_3$ for 30 or 60 min and exhibited decreased SOD activity ($p = 0.0023$), increased CAT activity ($p = 0.0001$), and increased malondialdehyde concentration ($p = 0.0001$) compared with those from rats on a β-carotene-free diet. Rat primary hepatocytes incubated with 0.05~0.2 mM $FeCl_3$ for 60 min exhibited increased GSH-Px activity compared with those from rats on a β-carotene-free diet. These results indicate that β-carotene without $FeCl_3$-induced oxidative stress acts to shift the prooxidant-antioxidant balance towards antioxidant activity. (N. Taipei J. Med. 2000; 2:261-270)

Numerous epidemiological studies support a strong inverse relationship between consumption of β-carotene-rich fruits and vegetables and the incidence of some degenerative diseases. β-Carotene is widely used as a precursor of vitamin A, as a food colorant, and as a food additive. Most work has focused on β-carotene as a potential anticarcinogen. Because free radical-induced damage to mammalian tissues is believed to contribute to the aging process and to the development of some degenerative diseases,[1] it has been proposed that dietary carotenoids serve as antioxidants in tissues.[2]

β-Carotene has been used as an antioxidant in many in vitro systems.[3] A plausible mechanism for the potential anticarcinogenic effects of β-carotene is its ability to scavenge reactive oxygen species that cause oxidative DNA damage. However, 2 recent major intervention trials, 1 in Finland[4] and 1 in the USA,[5] unexpectedly demonstrated an increased risk of lung cancer in smokers who were given high doses of β-carotene

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