Carotenoids Suppress Proliferating Cell Nuclear Antigen and Cyclin D1 Expression in Oral Carcinogenic Models

Hsin-Chung Cheng, Hsin Chien, Chia-Hui Liao, Yi-Yuan Yang and Shih-Yi Huang
Chen HC;Chien H;Liao CH;Yang YY;Huang SY

Abstract

The purpose of this study was to investigate the chemopreventive effect of carotenoids on proliferating cell nuclear antigen (PCNA) and cyclin D1 expression in betel (Areca catechu) quid extract (BQE)-induced hamster oral cancer and human KB cell models, respectively. In the in vivo animal study, 41 hamsters were divided into six groups and treated with 0.3 ml of 0.5% 9,10-dimethyl-1,2-benz[a]-anthracene, BQE, α-tocopherol, β-carotene, lycopene, lutein and mixed carotenoids for 12 weeks. After treatment, the pouches were excised and graded using an immunohistochemical assay of PCNA. In the in vitro cell experiment, KB cells were cultured, and the inhibitory effect of carotenoids (β-carotene, lycopene and lutein) on cell proliferation was evaluated. Cyclin D1 and PCNA were evaluated in terms of cell differentiation. In the results, most of the animal lesions showed no overexpression of PCNA. However, in dysplastic lesions, PCNA expressions by the β-carotene, lutein, lycopene, mixed and vitamin E groups were less than that of the control group. In papilloma lesions, PCNA expressions by the β-carotene, mixed and vitamin E groups were less severe than that of the control group. PCNA expression by the vitamin E-treated group was less severe than that of the control group. No carcinoma was found in the lycopene or mixed groups. In the cell study, all carotenoids exerted a significant inhibitory effect on KB cell proliferation. Although lycopene suppressed KB cell proliferation at the G0/G1 phase with a significant decrease in PCNA expression, β-carotene and lutein possessed less of an inhibitory effect and even exhibited elevated cell proliferation at the G2/M phase. These results indicate that different carotenoids present various suppressive abilities against PCNA and cyclin D1 expressions in cell proliferation. In conclusion, carotenoids suppressed the carcinogenesis of induced hamster oral cancer and a cancer cell line by acting as a suppressor which inhibited the expressions of PCNA and cyclin D1.