

Anthocyanins induce the activation of phase II enzymes through the antioxidant response element pathway against oxidative stress-induced apoptosis.

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Abstract

Reactive oxygen species (ROS)-induced cell damage is inevitable and severe and is involved in numerous diseases, including cancer. Reducing oxidative stress is one of the strategies of chemoprevention. Anthocyanins are naturally occurring flavonoids that show multiple benefits. We first pointed out the effects of anthocyanins in the contributions to activation of phase II antioxidant and detoxifying enzymes, chemopreventive potency, and involved transcriptional regulation. Our results obtained in rat liver Clone 9 cells showed that treatment of anthocyanins leads to positive effects on elevating the antioxidant capacity, including activated expression of glutathione-related enzymes (glutathione reductase, glutathione peroxidase, and glutathione S-transferase) and recruited GSH content. In addition, the activity of NAD(P)H: quinone oxidoreductase (NQO1) was also promoted under the treatment of anthocyanin. This influential functions as the defense system against programmed cell death induced by H₂O₂. The capacity for induction of luciferase expression by anthocyanins in cells transfected with rat nqo1-promoter constructed plasmid was further investigated; we found that the molecular mechanism is related to the activation of antioxidant response element (ARE) upstream of genes that are involved in antioxidation and detoxification. Our data suggest that natural anthocyanins are recommended as chemopreventive phytochemicals and could stimulate the antioxidant system to resist oxidant-induced injury. And, more important, the promoting effect of anthocyanins on ARE-regulated phase II enzyme expression seems to be a critical point in modulating the defense system against oxidative stress.