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Grape seed proanthocyanidins and skin cancer prevention: Inhibition of oxidative stress and protection of immune system

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Abstract

Overexposure of the skin to ultraviolet (UV) radiation has a variety of adverse effects on human health, including the development of skin cancers. There is a need to develop nutrition-based efficient chemopreventive strategies. The proanthocyanidins present in grape seeds (*Vitis vinifera*) have been shown to have some biological effects, including prevention of photocarcinogenesis. The present communication discusses the *in vitro* and *in vivo* studies of the possible protective effect of grape seed proanthocyanidins (GSPs) and the molecular mechanism for these effects. In SKH-1 hairless mice, dietary supplementation with GSPs is associated with a decrease of UVB-induced skin tumor development in terms of tumor incidence, tumor multiplicity, and a decrease in the malignant transformation of papillomas to carcinomas. It is suggested that the chemopreventive effects of dietary GSPs are mediated through the attenuation of UV-induced: (a) oxidative stress; (b) activation of mitogen-activated protein kinases and nuclear factor- κ B signaling pathways; and (c) immunosuppression through alterations in immunoregulatory cytokines. Collectively, these studies indicate protective potential of GSPs against experimental photocarcinogenesis in SKH-1 hairless mice, and the possible mechanisms of action of GSPs, and suggest that dietary GSPs could be useful in the attenuation of the adverse UV-induced health effects in human skin.

Keywords

Grape seed proanthocyanidins; Immunosuppression; Oxidative stress; Photocarcinogenesis;
Ultraviolet radiation

1 Introduction

Proanthocyanidins are naturally occurring compounds that are widely available in fruits, vegetables, nuts, seeds, flowers and bark. They are a class of phenolic compounds that take the form of oligomers or polymers of polyhydroxy flavan-3-ol units, such as (+)-catechin and (-)-epicatechin [1]. The seeds of the grape (*Vitis vinifera*) are particularly rich source of proanthocyanidins, and the proanthocyanidins represent the major type of polyphenols in red wine. These grape seed proanthocyanidins (GSPs) are mainly dimers, trimers and highly polymerized oligomers of monomeric catechins [2,3]. GSPs have been shown to be potent antioxidants and free radical scavengers, being more effective than either ascorbic acid or vitamin E [4,5]. Furthermore, GSPs have been shown to have anti-carcinogenic activity in different cancer models [6,7]. Feeding proanthocyanidins-rich extracts to rabbit significantly reduced severe atherosclerosis in the aorta [8], retarded the development of aortic