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Vitamin A Status and Metabolism of Cutaneous Polyamines in the Hairless Mouse After UV Irradiation: Action of ß-Carotene and Astaxanthin

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Summary: Solar radiations (UV A and B) can cause epidermis photoaging and skin cancers. These frequently irreversible effects result from the in situ generation of free radicals. However, it has been noted that nutritional factors can modulate photochemical damage, in particular the common carotenoids present in food, which can be considered as potential prophylactic agents against carcinogenesis. We investigated the effect of UV A and B radiations on the skin of the SKH1 hairless mouse fed a diet either lacking in vitamin A or supplemented with retinol, ß-carotene or astaxanthin. The latter is an oxygenated carotenoid (like canthaxanthin) without provitamin A activity and with strong singlet oxygen quenching ability.

After analysing of vitamin status of each group (plasma retinol concentrations and hepatic reserves), we searched for UV-induced modifications of polyamine metabolism by measuring epidermal ornithine decarboxylase (ODC) activity and free polyamines concentration (putrescine, spermidine and spermine).

In the basal state without irradiation, differences in ODC activity between groups were non significant; but after UV stimulation, ODC increased markedly in the skin of vitamin A-deficient animals, much more than in other groups. Curiously, the addition of astaxanthin or ß-carotene to the regimen containing retinol reduced the protective effect of retinol alone.

Regarding polyamines after irradiation, putrescine was significantly increased in the skin of deficient animals, in parallel with ODC activity.

However, astaxanthin had a stronger inhibitory effect on putrescine accumulation than retinol, and decreased spermidine and spermine concentrations: this suggests a specific action on transglutaminases.

Introduction

The skin is the tissue most directly exposed to mechanical, chemical or physical damage. In particular, solar radiation (UV A and B) can cause premature aging of the epidermis and skin cancers. The harmful effect of these radiations is partly due to the in situ generation of free radicals from excited molecules [1]: light converts sensitizer molecules into electronically excited forms, usually singlet oxygen, which may be

Abbreviations used: ODC, ornithine decarboxylase.