EFFECTIVENESS OF A BROAD-SPECTRUM DAILY MOISTURIZING CREAM IN THE PREVENTION OF UVA INDUCED GENE EXPRESSION RELATED TO OXIDATIVE STRESS AND SKIN AGING IN HUMAN SKIN

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INTRODUCTION

Daily exposure to ultraviolet radiation (UVR) is able to induce a number of detrimental effects in human skin including premature aging (photoaging). Photoaging of human skin is not only due to shortwave UV radiation (UVB) but is also the consequence of exposure to longwave UV radiation (UVA radiation). Studies on the mechanisms by which UVA causes skin aging have revealed that an increased expression of matrix metalloproteinase 1 (MMP-1 or collagenase 1) is of importance and that this induction is mediated through the generation of reactive oxygen species (ROS). As a consequence, prevention of photoaging should be directed at prevention of UVA radiation-induced upregulation of gene related to oxidative stress and MMP-1. In this regard, a broad-spectrum daily moisturizing cream which contains a combination of UVB and UVA filters may offer a powerful protection against these UV-induced effects on gene expression.

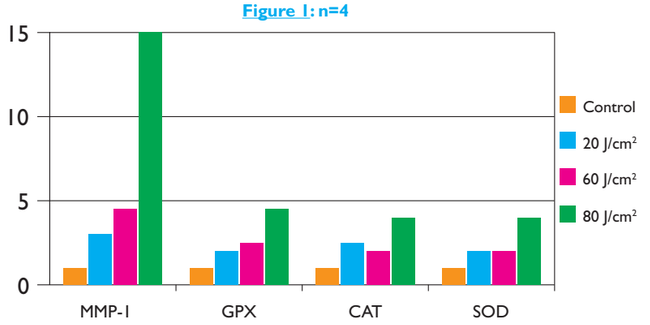
METHODS

Prior to start of this study positive vote of local ethical committee at the Heinrich-Heine-University was obtained. After informed consent, a total of 44 human volunteers with healthy skin, no history of skin cancer, photodermatosis or recent (within the last 6 month) visits to a tanning salon were enrolled. In 14 individuals, buttock skin (test area of 4 x 4 cm on the buttock side) has been exposed to 20, 60 or 80 J/cm^2 UVA and biopsy samples were collected 24h or 72h after exposure from a UVASUN 5000 Lamp (Mutzhas) equipped with Schott WG335/3mm filter and two UG5/3mm filters in order to obtain a spectrum between 320 and 400 nm. In 30 individuals, prior to irradiation at 80 J/cm^2 (20 min according to COLIPA) one test area had been treated with 2mg/cm^2 of broad-spectrum daily moisturizing cream (SPF15, UVA-PF 15 determined by the persistent pigment darkening (PPD) method), whereas other test sides had been left untreated (UVA site). 24 hours later, 4 mm punch biopsies were taken under local anesthesia from each side. Moreover an unirradiated control has been taken (control site). Total RNA was isolated from these biopsies and SOD (superoxide dismutase), CAT (catalase), GPX (glutathione peroxidase), MMP-1 and 18S rRNA expression was assessed by Real time RT-PCR. The PCR reactions were carried out on an Option 1 (MJ Research, Waltham, MA, USA) using SYBR Green® PCR Master Mix (Applied Biosystems, Darmstadt, Germany). For comparison of relative expression in real time PCR control cells and treated cells the $2^{(-\text{delta delta C(T)})}$ method was used according to Livak and Schmittgen (2001). Expression was normalized to expression of 18 S rRNA as «housekeeping gene». Unstimulated controls were set equal to one. Results are given for each individual of fold increase versus an untreated control.

RESULTS

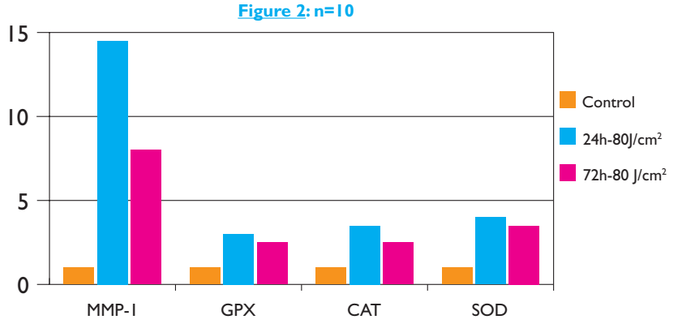
24 hours after exposure to 20, 60 and 80 J/cm2 of UVA a dose-dependent increased expression of MMP-1 and antioxidant defence mRNA expression was noticed.

Figure 1: n=4



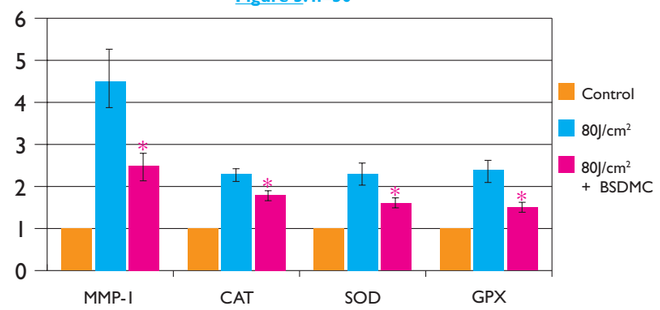
After single exposure to 80J/cm^2 UVA, the most significant induction of the analyzed genes was observed 24h post-exposure.

Figure 2: n=10



The application of broad-spectrum daily moisturizing cream (BSDMC) (SPF15, UVA-PF 15) prior to 80J/cm^2 UVA exposure significantly prevented ($p<0.05$, Wilcoxon signed-rank test) the UVA induced increase in MMP-1 and antioxidant defence mRNA expression.

Figure 3: n=30



*P<0,05 versus UVA exposed site

CONCLUSION

This study clearly demonstrates the effective protection offered by a broad-spectrum daily moisturizing cream (SPF15, UVA-PF 15) in the prevention from UVA radiation-induced photoaging, directed at prevention of UVA-induced upregulation of gene related to oxidative stress and MMP-1.

REFERENCE

Livak KJ, Schmittgen TD. Analysis of relative gene expression data using real-time quantitative PCR and the 2 (-Delta Delta C(T)) Method. *Methods. 2001, Dec ;* **25**(4):402-408.

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