Fruits of bog blueberry (Vaccinium uliginosum L.) are rich in anthocyanins that contribute pigmentation. Anthocyanins have received much attention as agents with potentials preventing chronic diseases. This study investigated the capacity of anthocyanin-rich extract from bog blueberry (ATH-BBe) to inhibit photoaging in UV-B-irradiated human dermal fibroblasts. BBe anthocyanins were detected as cyanidin-3-glucoside, petunidin-3-glucoside, malvidin-3-glucoside, and delphinidin3-glucoside. ATH-BBe attenuated UV-B-induced toxicity accompanying reactive oxygen species (ROS) production and the resultant DNA damage responsible for activation of p53 and Bad. Preincubation of ATH-BBe markedly suppressed collagen degradation via blunting production of collagenolytic matrix metalloproteinases (MMP). Additionally, ATH-BBe enhanced UV-B-downregulated procollagen expression at transcriptional levels. We next attempted to explore whether ATH-BBe mitigated the MMP-promoted collagen degradation through blocking nuclear factor kappaB (NF-kappaB) activation and MAPK-signaling cascades. UV-B radiation enhanced nuclear translocation of NF-kappaB, which was reversed by treatment with ATH-BBe. The UV-B radiation rapidly activated apoptosis signal-regulating kinase-1 (ASK-1)-signaling cascades of JNK and p38 mitogen-activated protein kinase (p38 MAPK), whereas ATH-BBe hampered phosphorylation of c-Jun, p53, and signal transducers and activators of transcription-1 (STAT-1) linked to these MAPK signaling pathways. ATH-BBe diminished UV-B augmented-release of inflammatory interleukin (IL)-6 and IL-8. These results demonstrate that ATH-BBe dampens UV-B-triggered collagen destruction and inflammatory responses through modulating NF-kappaB-responsive and MAPK-dependent pathways. Therefore, anthocyanins from edible bog blueberry may be protective against UV-induced skin photoaging.


BACKGROUND: Diabetes is a multisystem disease caused by the presence of chronic hyperglycemia, which leads to increased oxidative stress. Many of the changes observed in type II diabetic patients can be traced to the increased production of advanced glycation end products, also known as AGEs. AGEs are produced as a result of a nonenzymatic reaction with glucose interacting with proteins, lipids, and nucleic acids. AGEs are also present in normal skin with advancing age and contribute to the senescence of many body organs, including the skin. AIMS: This research evaluated the effect of a topical product formulation containing blueberry extract, an AGE inhibitor, and C-xyloside, a GAG synthesis stimulator, applied twice daily on the hand, arm, and facial skin of 20 type II diabetic females. Diabetic skin was chosen for evaluation because AGEs are found in increased concentration in diabetic skin, representing a model for accelerated aging. MATERIALS AND METHODS: This single-center study enrolled 20 female type II diabetics aged 55+ years with mild to moderate fine lines, wrinkles, and hyperpigmentation on the face and hands. Subjects used the study product on their face, hand, and inner forearm twice daily for 12 weeks. Ordinal grading on a 4-point scale (0 = none, 1 = mild, 2 =moderate, 3 = severe) of facial fine lines, wrinkles, firmness, radiance, skin tone, skin smoothness, hyperpigmentation, creping, density, sagging, and overall appearance was performed by the investigator at baseline, week 4, week 8, and week 12. Tolerability, subject assessments, digital photography, AGE measurements, skin caliper measurements, and corneometry were also performed at each time point.
RESULTS: 19/20 subjects successfully completed the study. The presence of AGEs was documented by skin autofluorescence. The 12-week duration of the study was insufficient to measure a change in skin AGEs, but longer application of the study product might produce different results. No tolerability issues were noted. There was a statistically significant increase in skin caliper measurements on the face ($P = 0.004$) and arm ($P = 0.014$) as well as corneometry measurements ($P < 0.001$) consistent with enhanced moisturization at week 12. The dermatologist investigator also found statistically significant improvement in fine lines ($P = 0.01$), firmness ($P = 0.011$), radiance ($P < 0.001$), skin tone ($P = 0.014$), skin smoothness ($P < 0.001$), creping ($P < 0.004$), and overall appearance ($P < 0.001$). CONCLUSION: This study examined a topical product containing an AGE inhibitor and a GAG synthesis stimulator designed for the unique needs of diabetic skin.


Anthocyanin-rich extracts were obtained from bog blueberries (Vaccinium uliginosum) and their potential protective mechanisms against UV-induced skin photoaging were studied in a UV-B-exposed human dermal fibroblast model. Anthocyanins present in extracts were identified as cyanidin-3, malvidin-3, delphinidin-3 and petunidin-3 glucosides. Cell culture studies revealed photoprotective actions of anthocyanin-rich blueberry extracts on fibroblast collagen collapse and inflammatory responses associated with photoaging. At nutraceutically relevant doses blueberry extracts mitigated UV-B-induced oxidative injury leading to DNA damage and subsequent activation of the ATR-p53-Bad apoptosis pathway which appeared responsible for fibroblast survival. Results also demonstrated modulation of nuclear factor-$\kappa$B and mitogen activated protein kinase signalling which may entail photodamage caused by UV-induced destructive cascade of collagen. It is suggested that dietary interventions with blueberry extracts may provide a promising rationale for development of strategies aimed at limiting sun light-induced photoaging.


BACKGROUND: Sunlight is a very potent environmental factor in skin pathogenesis and can induce skin cancer. UVB irradiation is known to cause oxidative stress, inflammation and especially DNA damage. Topical application of agents with UV absorbing, antioxidant and anti-inflammatory activities is a successful strategy in the protection of the skin against UV-caused damage. OBJECTIVE: To examine the ability of the phenolic fraction of Lonicera caerulaea and Vaccinum myrtillus fruits to moderate UVB-induced damage. METHODS: HaCaT keratinocytes, a well-established in vitro system for investigations on UV radiation induced cell damage, were used to assess the effects of pre- and post-treatment with L. caerulea (LCE) and V. myrtillus (VME) phenolic fractions (5-50 mg/l) on keratinocyte damage induced by a solar simulator (295-315 nm). RESULTS: In this study, a model of UVB-induced damage to HaCaT was established. LCE and VME efficiently reduced the extent of DNA breakage (especially at concentrations of 25 and 10 mg/l) together with caspase-3 and -9 activity and DNA laddering induced by UVB (100 or 200 mJ/cm(2)). LCE and VME significantly decreased RONS generation and partially diminished IL-6 expression. LCE pre-treatment also prevented keratinocytes proliferation. CONCLUSION: The results suggest that the phenolic fraction of L. caerulaea and V. myrtillus fruits suppress UVB-caused injury to keratinocytes. These results now need to be demonstrated in vivo.

Glycation is a slow chemical reaction which takes place between amino residues in protein and a reducing sugar. In skin this reaction creates new residues or induces the formation of cross-links (advanced glycation end products or AGEs) in the extracellular matrix of the dermis. Formation of such cross-links between macromolecules may be responsible for loss of elasticity or modification of other properties of the dermis observed during aging. We had previously developed a reconstructed skin model which enabled us to study the consequences of matrix alteration by preglycation of the collagen and have reported several modifications of interest induced by glycation in the dermal and epidermal compartments of reconstructed skin as well as at the level of the dermal-epidermal junction. For example we showed that collagen IV and laminin were increased in the basement membrane zone and that alpha6 and beta1 integrins in epidermis were expanded to suprabasal layers. The aim of this new study was to look at the biological effects of glycation inhibitors like aminoguanidine in the skin model. Aminoguanidine was mixed with collagen in the presence of ribose as reducing sugar, and immunostaining was used to visualize its effects on AGE Products and biological markers. After aminoguanidine treatment, we found a low amount of AGE products and a possible return to the normal pattern of distribution of markers in skin constructs as compared to those treated with ribose only. Interestingly similar results were also obtained, although to a lesser extent, with a blueberry extract. In conclusion the glycation inhibitory effect has been functionally demonstrated in the reconstructed skin model and it is shown that this model can be used to assess anti-glycation agents.


Exposure to UVA radiation is known to cause many adverse biological effects by inducing the stricken cells to produce reactive oxygen species (ROS). In recent years the use of botanicals has received considerable interest in the skin protection. Bilberry (Vaccinium myrtillus L.) fruit contains several polyphenols with strong antioxidant and anti-inflammatory properties. In this study we evaluated potential UVA preventive effect of V. myrtillus fruit extract (VME; anthocyanins, 25% w/w) in HaCaT keratinocytes. Pretreatment (1 h) or post-treatment (4 h) of HaCaT with VME resulted in attenuation of UVA-caused damage. Application of the extract significantly reduced UVA-stimulated ROS formation in keratinocytes. VME also prevented/reduced UVA-caused peroxidation of membrane lipids and depletion of intracellular GSH. The observed cytoprotective effect may be linked to the antioxidant activity of the plant constituents, namely anthocyanins.

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OBJECTIVE: To investigate whether nutritional intervention with a proprietary formulation and other micronutrients may favourably alter skin roughness and elasticity. METHODS: Sixty-two women aged 45-73 years participated in a double-blind, placebo-controlled trial testing the efficacy of a proprietary oral supplement for skin nutrition (Evelle), for improvement of skin elasticity and roughness. The active ingredients were vitamins C and E, carotenoids, selenium, zinc, amino acids and glycosaminoglycans, blueberry extract and Pycnogenol. RESULTS: Skin elasticity, measured using an optical cutometer, was found to be statistically significantly increased by 9% after 6 weeks of treatment.
compared with placebo (p=0.0351). Skin roughness, as evaluated by three-dimensional microtopography imaging, was found to be statistically significantly lowered by 6% compared with the control group after 12 weeks treatment (p=0.0157). CONCLUSION: Evelle can potentially improve visible signs of cutaneous ageing.