A Topical Antioxidant Serum Containing Silymarin Prevents Sebum Peroxidation in Oily, Blemish-Prone Skin

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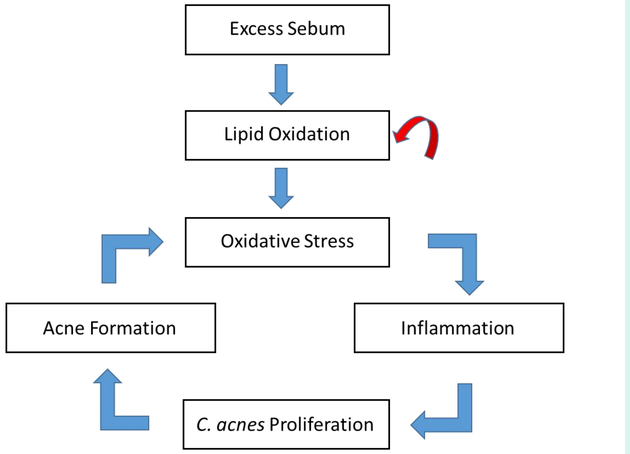
INTRODUCTION

Acneic skin is known to have higher levels of oxidative stress and lower levels of antioxidants than healthy skin.[1] Daily environmental factors like UV and pollution generate free radicals that can exacerbate this condition. Research suggests that lipid peroxidation contributes to inflammation and creates a favorable environment for acne-causing bacteria which may ultimately lead to blemishes (Figure 1).[2] Therefore, an opportunity exists for a topical antioxidant treatment to help disrupt this pathogenesis.

Figure 1. The role of lipid oxidation in the acne cycle.



Silymarin is a standardized extract from *Silybum marianum* (milk thistle) seeds that typically contains 70-80% of an isomeric mixture of flavonoid complexes called flavonolignans.[3] The main component, representing about 50-60% of the flavonolignan mixture, is called silybin. Silymarin has very strong, well known antioxidant properties including its proven ability to reduce lipid peroxidation. We evaluated the propensity for a serum containing 0.5% silymarin, 15% vitamin C, 0.5% ferulic acid, and 0.5% salicylic acid to prevent sebum peroxidation both ex vivo and in blemish-prone skin.

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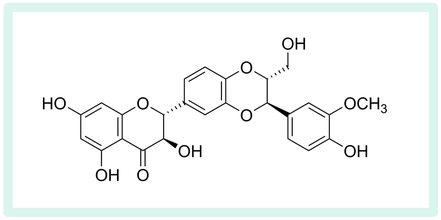


Figure 2. Silybin A, a major flavonolignan component of silymarin.

METHODS

Method 1. Samples of sebum were collected from the forehead of 2 volunteers with oily skin on a HVHP filter disc and exposed to UVA (5 J/cm^2) radiation in the presence (5 mg/cm^2) and absence of test product. The discs were extracted with methanol and the levels of squalene and peroxidized squalene were measured in triplicate by HPLC.[4]

Method 2. Two samples of sebum were collected from the forehead of 24 volunteers via tape stripping. One tape strip was treated with test product (2 mg/cm^2) while the other served as untreated control. The strips were exposed to UV radiation to induce free radical oxidative stress then extracted with methanol. Thiobarbituric acid assay reagents (Cayman Chemical TBARS Assay) were added and the samples incubated before analyzing using a fluorescent plate reader.

Method 3. A blinded 12 week clinical study was conducted on 53 Asian male and female subjects aged 18-50 with mild-to-moderate acne who applied the serum once daily for the duration of the study. A randomized portion of the panel (35 subjects) had sebum sampled from the forehead using a HVHP filter disc at baseline and week 4. The filter discs were extracted and analyzed by HPLC.

RESULTS

- According to Method 1, ex vivo evaluation of human sebum showed that the test formula provided an 82% average reduction of UVA-induced squalene peroxidation compared to untreated control (Figure 3).
- According to Method 2, ex vivo evaluation showed that the test formula was effective at reducing malondialdehyde (MDA)[5], a well-known marker of lipid peroxidation, in human sebum induced by UV exposure by an average of 76% (Figure 4).
- According to Method 3, evaluation of sebum samples collected after 4 weeks of once daily product treatment on acne-prone skin, showed a 76% average reduction in the lipid peroxidation index (ratio of squalene peroxide to squalene) compared to baseline (Figure 5).

Figure 3. Sebum peroxidation after UVA radiation.

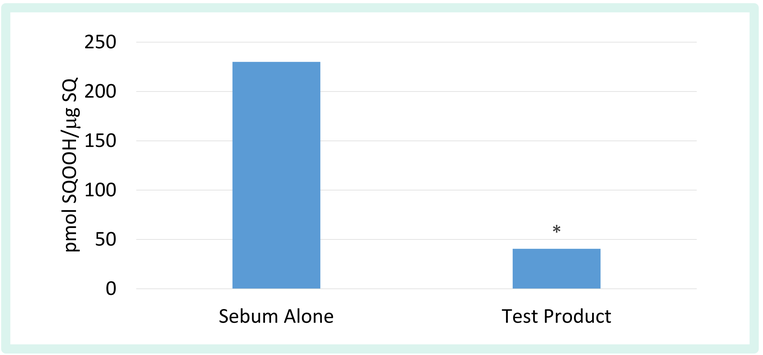


Figure 4. Evolution of MDA in sebum after UV radiation

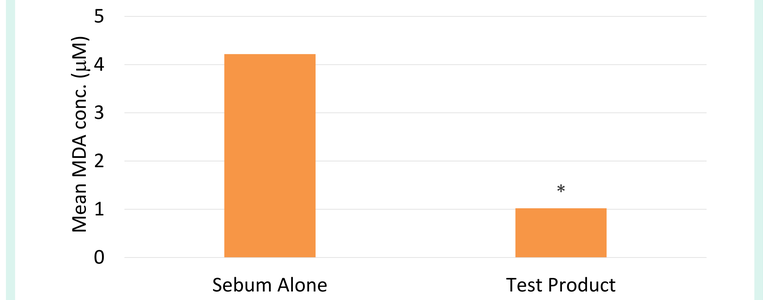
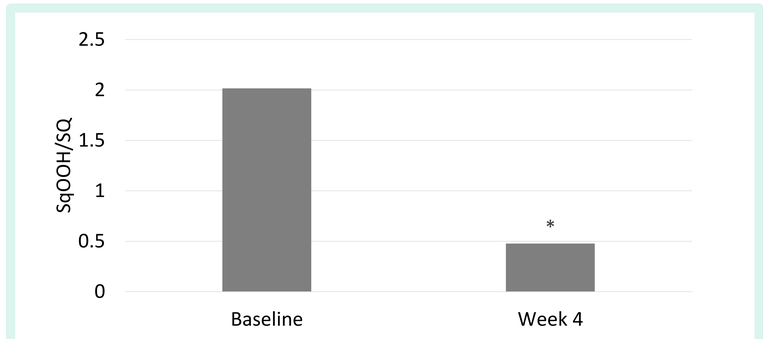


Figure 5. Lipid peroxidation index – in vivo product usage



CONCLUSIONS

The results from three independent ex vivo and in vivo studies consistently demonstrate the effectiveness of a serum containing 0.5% silymarin, 15% vitamin C, 0.5% ferulic acid, and 0.5% salicylic acid to prevent sebum peroxidation under acute UV stress or reduce sebum peroxidation under real life use conditions. This suggests that the formula may be an effective topical antioxidant treatment for oily, blemish prone skin.

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