30TH IFSCC CONGRESS
18 – 21 SEPTEMBER 2018

Poster-No. P-S2-283

Establishment and application of a novel experimental model of stratum corneum carbonylation induced by UV and sebum

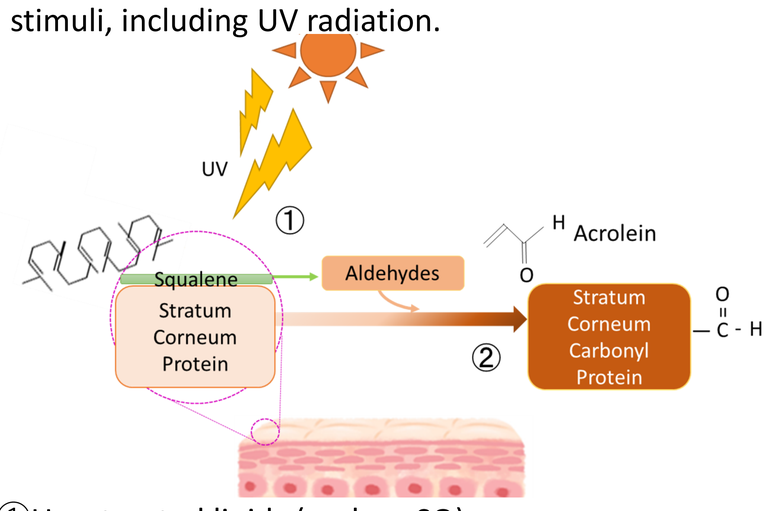
Omoi M[1, 2], Arai Y[1], Inamura K[1], Suzuki N[1], Hirao T[2]
1 IKEDA CORPORATION, MM Park Building 12F, 3-6-3 Minatomirai, Nishi-ku, Yokohama, 220-0012 Japan.
2 Faculty of Pharmacy, Chiba Institute of Science, 15-8 Shiomi-cho, Choshi, Chiba, 288-0025 Japan.

Conclusion

We established an experimental stratum corneum carbonyl protein (SCCP) induction model mimicking oxidative modification at the skin surface using a tape-stripped stratum corneum (SC) irradiated with ultraviolet (UV) + squalene (SQ). This experimental system made it possible to evaluate the efficacy of cosmetic ingredients in suppressing SCCP to **shield healthy skin**.

Introduction

Carbonyl protein (CP) is formed by various oxidative stimuli, including UV radiation.



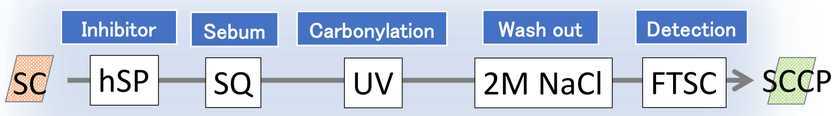
①Unsaturated lipids (such as SQ)
UV irradiation → Lipid peroxides
~~Degradation~~
Various aldehydes (such as acrolein (Acr))

②Aldehydes
Attack SC proteins
→ SCCP

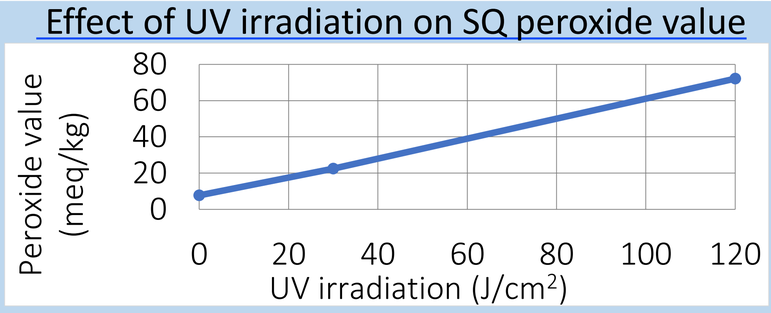
We need an experimental system ① + ②

Materials and Methods

- Materials
  - -Hydrolyzed soy protein (hSP)
    - ：Mixture of peptides
      (Average molecular weight 700 Da,
      Many basic amino acid residues such as Lys,
      Concentration 20%)
      TOFUPRO® U, IKEDA CORPORATION
- SC collection
  - - The inside of the upper arms by tape-stripping
- Carbonylation (induce SCCP)
  - - UV (LAX-C100 solar simulator (Asahi Spectra Co., Ltd.), SQ + UV, Acr
- Evaluation of SCCP
  - - Fluorescein-5-thiosemicarbazide (FTSC),
    EVOS-FL fluorescence microscope (Thermo Fisher Scientific)
- Wash out
  - - Soaking the SC in 2 mol/L NaCl

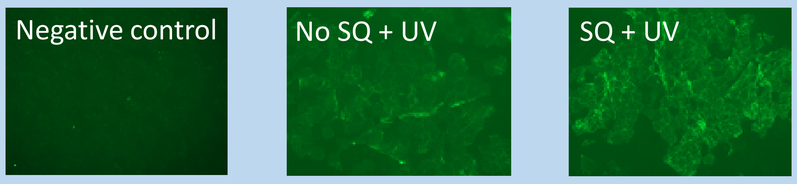


Effect of UV irradiation on SQ peroxide value

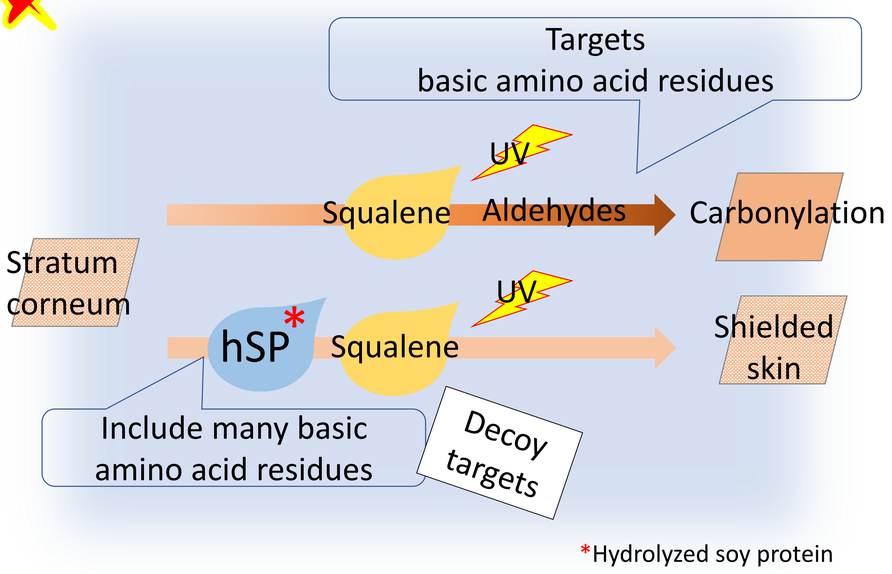


SQ was irradiated with different amounts of UV. Peroxides were consistently produced in SQ irradiated with UV.

Detection of carbonyl protein by Acr antibody



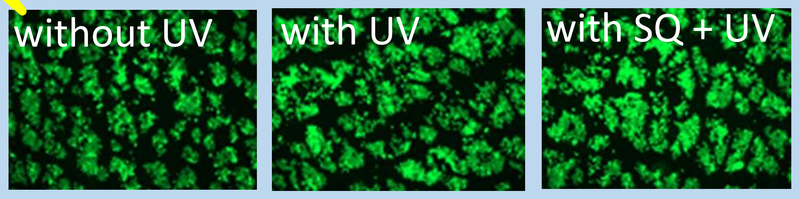
SC was treated without or with SQ, then irradiated with UV. Acr adduct was generated in the SC treated with SQ + UV.



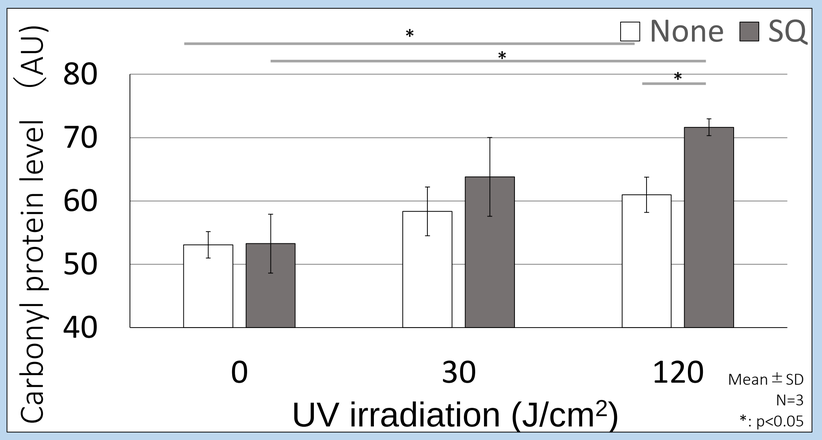
*Hydrolyzed soy protein

Results

Promotion of UV-induced SCCP by SQ

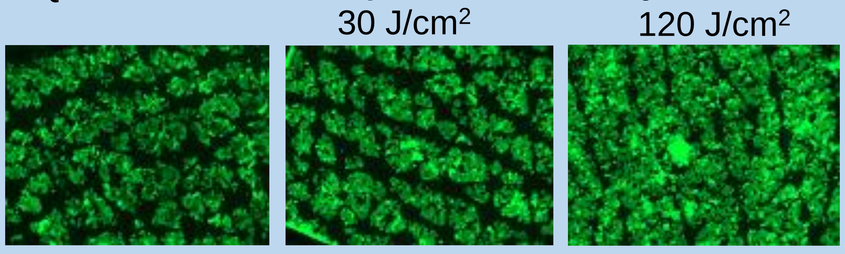


Typical images of SCCP following treatment without UV, with 120 J/cm² UV , or 120 J/cm² UV + SQ.
UV promoted greater SCCP induction in the presence of SQ.



SCCP was successfully induced by UV irradiation in a dose-dependent manner. We established a novel experimental model of SC carbonylation induced by UV + sebum component.

Induction of SCCP by UV-irradiated SQ

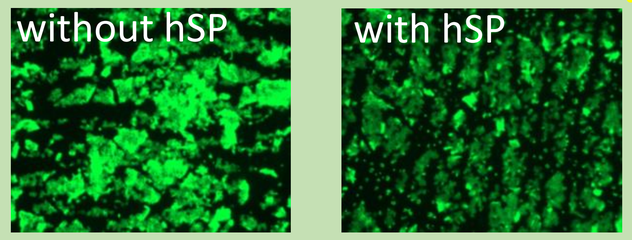


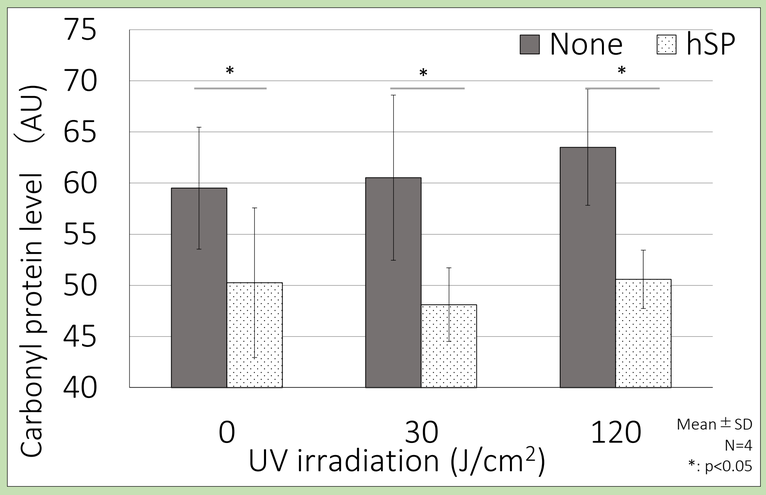
The SCCP level was increased in a dose-dependent manner by application of UV-irradiated SQ.

Inhibitory effect of hSP on Acr-induced SCCP induction

SC was treated with deionized water or hSP , then treated without or with 1 mmol/L Acr. hSP showed an excellent inhibitory effect against SCCP induction by Acr.

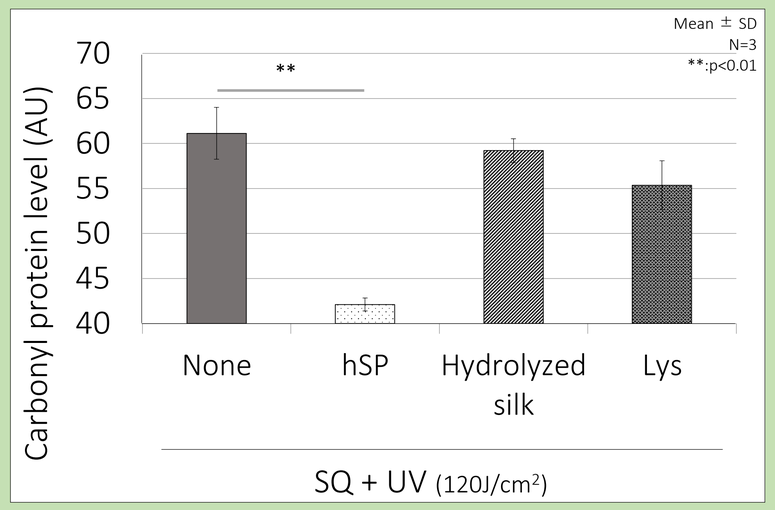
Inhibitory effect of hSP on UV-induced SCCP induction in the presence of SQ





SC was treated without or with hSP, then irradiated with UV + SQ. hSP application to the tape-stripped SC prior to UV + SQ resulted in significant inhibition of SCCP generation.

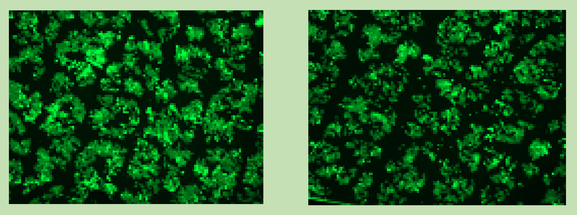
Inhibitory effect of cosmetic ingredients on UV-induced SCCP induction in the presence of SQ



hSP exhibited an excellent inhibitory effect against the SCCP induction as compared with hydrolyzed silk or L-Lys.

Loss of the inhibitory effect of hSP on SCCP induction by SQ + UV following removal of hSP prior to SCCP induction

	Pre-wash	Post-wash
hSP	+	+
Wash	+	–
SQ + UV (30J/cm²)	+	+
Wash	–	+



Removal of adsorbed hSP prior to SCCP induction (pre-wash) eliminated the inhibitory effect of hSP against UV-induced SCCP induction in the presence of SQ.