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STAY-C® 50 and skin

STAY-C® 50 – for visibly younger looking skin

Photo-damage of skin including premature skin aging is to a large extent caused by reactive oxygen species (ROS). Their generation and also the quenching of ROS in living skin can be quantified and visualized. UV filters already protect against UV-induced ROS generation. However this first line of defense is not complete. In vivo antioxidants STAY-C® 50 and Vitamin E acetate were shown to provide an additional quenching effect of ROS of almost 50% to a standard sunscreen formulation of SPF 8 (figure 2)[3].

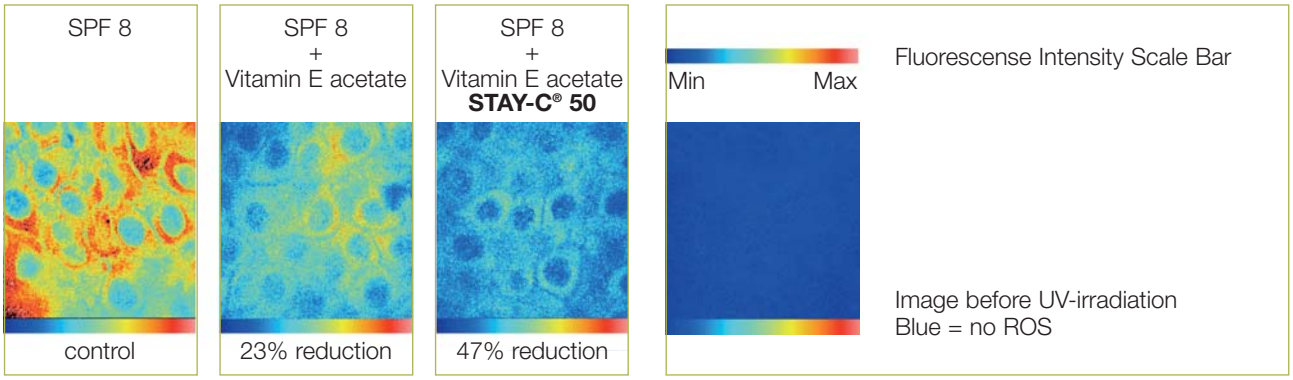

Figure 2: Quenching of UV-induced ROS in human ex vivo skin after the test emulsions have been applied for 3 hours. Dihydrorhodamine was used to monitor the ROS by fluorescence signals. The images, based on two-photon fluorescence microscopy, are taken from the spinous layer of the epidermis. Compared to the SPF 8-control formulation the addition of 2.5% Vitamin E acetate leads to a 23% reduction of the ROS level. The combination of 2.5% STAY-C® 50 and 2.5% Vitamin E acetate quenched the ROS to almost 50%.

STAY-C® 50 does not only reduce the level of damaging free radicals but also helps to increase the skin firmness. Volunteers who had regularly used an emulsion with STAY-C® 50 experienced a firmer skin. This in vivo effect was supported by the additional finding that STAY-C® 50 promotes the synthesis of collagen I and III in human fibroblasts[4].

STAY-C® 50 – for better looking skin tone

Vitamin C and some derivatives have been traditionally used as active ingredients to brighten the complexion because they are known to inhibit the formation of melanin. Studies have shown that STAY-C® 50 reduces the melanogenesis in primary human melanocytes by 57%[5] (figure 3).

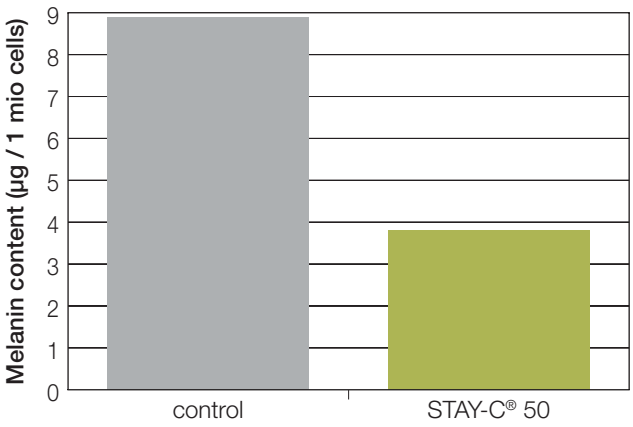

Figure 3: A 4-day treatment of primary human melanocytes of skin type II/III with 0.14% STAY-C 50® resulted in a 57% reduction of the melanin content. Melanin was quantified by absorption at 475 nm.

Age spots are another visual indication of aged skin resulting from UV light stimulated overproduction of melanin. A 3-month in vivo study on Asian skin has shown that regular use of a cream with STAY-C® 50 resulted in a reduced color intensity of facial age spots[6]. The overall skin lightening effect of STAY-C® 50 was assessed as 25% by dermatological reading (figure 4).

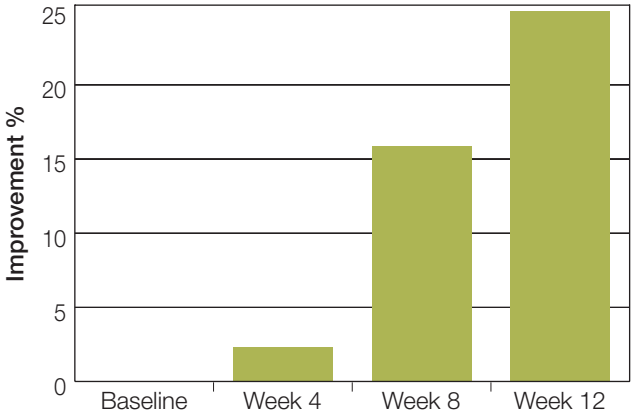

Figure 4: Dermatological assessment of the age spot fading effect of STAY-C® 50 from a 3-months double blind placebo-controlled in vivo study with 39 female volunteers in Asia. The test cream contained 3% STAY-C® 50 and 1% Vitamin E acetate.

The Japanese Ministry of Health has approved STAY-C® 50 as a quasi drug (Q/D) for skin whitening products.

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STAY-C® 50 – reducing the appearance of acne

Skin blemishes and acne are skin disorders not only experienced by teenagers but also by adults. The emergence of skin impurities and inflammation is complex and involves among many factors the bacterial colonization by *Proprionibacterium acnes*. Also the free radical induced peroxidation of sebum is considered to play a role[7].

Our study using 20 volunteers has shown that an emulsion with 1% STAY-C® 50 significantly inhibits the UVA light induced sebum (squalene) oxidation by 30%. We also could demonstrate that 1% STAY-C® 50 very effectively reduced the bacterial count of *Proprionibacterium acnes* under physiological conditions[5].

Another study performed together with Professor Ikeno[8] further illustrates the potential of STAY-C® 50 to improve the appearance of skin conditions associated with pimples and inflammation. Volunteers with moderate to severe skin blemishes regularly applied a 5% STAY-C® 50 lotion twice daily on their face. After 12 weeks their skin condition was significantly ameliorated by 77% on average (figure 5). The visual improvement is illustrated in figure 6 by a representative subject. The efficacy of STAY-C® 50 was superior than 5% Benzoylperoxide, a widely prescribed drug for acne treatment.

Figure 5: Efficacy assessment in 5 grades after 12 weeks twice daily application of either 5% STAY-C® 50 or 5% Benzoylperoxide onto the facial skin of volunteers (2 groups of 30 persons) with inflammatory and non-inflammatory acne lesions.

Figure 6: Representative subject with inflammatory and non-inflammatory lesions of acne vulgaris before treatment (left) and after 12 weeks (right) of twice daily application of a 5% STAY-C® 50 lotion.

STAY-C® 50 – in body care, hair care and oral care

STAY-C® 50 – deodorant activity

Don't be surprised if consumers ask specifically for deodorant products with STAY-C® 50. They might have heard that STAY-C® 50 helps to control body odor. An underarm sniff test involving 10 volunteers revealed that a 0.2% STAY-C® 50 formulation reduced the axillary malodor by more than 40% 8 hours after the application[4]. 24 hours later, the STAY-C® 50 formulation performed an additional 10% better than the placebo.

STAY-C® 50 – hair color protection

Women and men enjoy today's selection of brilliant hair colors and the ease of application. But they also want their color to stay as long as possible. Shampoos and treatment products often contain UV filters to prevent fading or color change. The protective potential of anti-oxidant vitamins for hair has not been evaluated so far. A study performed on behalf of DSM Nutritional Products showed that the application of a hair tonic with 0.5% STAY-C® 50 onto bleached and permanently colored human hair tresses significantly stabilized the hair color during a 24 hours irradiation time[4].

STAY-C® 50 – support of healthy teeth and gum

In spite of more regular toothbrushing plaque formation and caries or gum bleeding and gingivitis have remained a problem for many consumers. In both cases, bacteria are strongly involved. Studies have shown that STAY-C® 50 is able to suppress the growth of several bacteria associated with caries or gingivitis. An example of its activity is demonstrated in figure 7. STAY-C® 50 inhibits the growth *of Streptococcus mutans*, the principle causative bacterium of caries. Similar efficacy was also shown against *Actinobacillus actinomycetemcomitans* and *Porphyromas gingivalis*, two bacteria associated with gingivitis[9].

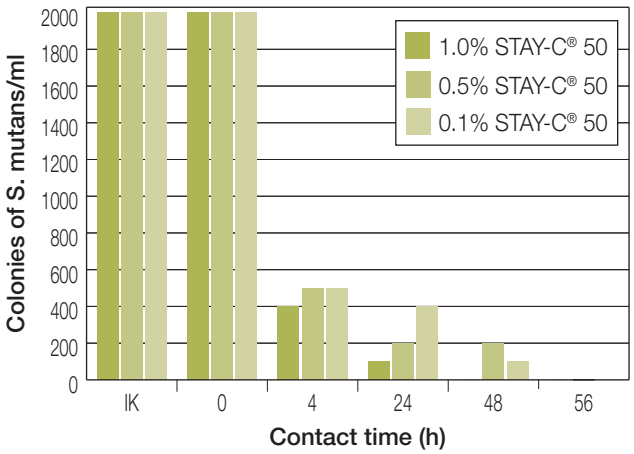

Figure 7: 0.1 to 1.0% STAY-C® 50 was added to suspensions of Streptococcus mutans and incubated for up to 56 hours. An aliquot was plated on colony forming plates, cultivated and statistically counted. STAY-C® 50 inhibited the growth of S. mutans at all tested concentrations.

Formulating with STAY-C® 50

STAY-C® 50 is a versatile Vitamin C derivative for many applications and product types. From skin care to hair and oral care products it can be included in emulsions, gels, sprays and stick products.
Recommended use level: 0.5 to 5.0%

Some formulation guidelines

- **Maintain the formulation at a pH of around 7 to avoid hydrolysis.**
- **Always use chelating agents (e.g. disodium EDTA) to avoid degradation of STAY-C® 50 by heavy metal ions.**
- **If the formulation is heated, add STAY-C® 50 in the down-cooling step below 40°C. In most cases, the powder can be directly added.**

Different reference formulations are available and can be sent on request.

References

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