Efficacy and Substantivity Evaluation of a Sunscreen Formulation for People Conducting Sporting Activities in a High-UV Intensity Locale

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BACKGROUND

It has been reported that moderate physical activities outdoors, sweat or heat can facilitate skin erythema reaction[1]. Sunscreens designed for people conducting sport activities should provide sufficient protection level to compensate for these changes in skin physiology. In addition, sweating or water immersion and rub-off can also compromise the performance of a sunscreen and a sport sunscreen needs to withstand these factors. A consumer use sunscreen test was conducted on subjects during sport activities at high altitude and extreme UV conditions to evaluate these properties.

MATERIALS & METHODS

Materials

SPF 70+ sunscreen designed for sport activities containing 15% homosalate, 5% octisalate, 4%, octocrylene, 5% oxybenzone and 3% avobenzone

Study Location and Design

The SPF 70+ sport sunscreen was tested under the real-world conditions in a single-blinded clinical study in the summer of 2008 at Vail, CO (elevation 2,500 meters above sea level) for subjects playing golf (average exposure was about 4.5 hours). The sunburning UVB of sunlight at this elevation is approximately 65% higher than the intensity at sea level (every 305 meters above sea level, increases the UVB fluence rate increases by 8%[2]). The study location and design represent the extreme UV condition that people may experience during outdoor sporting activities. Subjects applied sunscreen to their whole faces at the beginning of the study. Upon completion of the sport activity, dermatological evaluation was conducted on the next day. Subjects also self-assessed the SPF 70+ sunscreen.

Study Population

Out of 43 subjects who participated in both cells, 22 had Fitzpatrick skin type I-II, 17 had skin type III and 4 had skin type IV. The average age was 45.7 for the study population including 34 males and 9 females.

UV Conditions During the Study

UV conditions during the entire study period of the day were monitored and estimated to be roughly 5 Joule/cm^2 of UVB and 83 Joule/cm^2 of UVA for total exposure dose. Therefore virtually all subjects were expected to get sunburn in unprotected skin areas. The total UV dose is estimated to be more than 20 MED for skin type I subject.

Re-Application Subgroup

To test the substantivity of the sunscreen, one subset of the subjects (21) applied the SPF 70+ sport sunscreen on the whole face at the baseline and reapplied the sunscreen in the middle of the activities (about 2 hours into the UV exposure) to only one half of the face.

RESULTS

Location

Fig. 1 Shows The Study Location

Dermatologist Grading

For the 21-subject reapplication group, none of the subjects could be differentiated in terms of increased erythema on one side by clinical examination at the end of the exposure. No post-exposure sunburn was noted clinically although one subject had a slight increase in erythema.

Fig. 2

Fig. 3

Figure 2 pie chart shows 95% (20/21) of subjects had no lateral difference, indicating excellent substantivity to skin for the sport SPF 70+ sunscreen and that re-application was not necessary for the prevention of sunburn.

Of the all 43 subjects that had SPF 70+ applied to their faces, only one subject experienced slight erythema.

Figure 3 pie chart shows SPF 70+ has 98% (42/43) of the subjects protected.

Subject Self-Assessment

Table 1 shows the percentage of the subjects (N=43) that agree with the statement describing the SPF 70+ sport sunscreen.

Protect my skin during intensive sport activities	91%
Does not sting my face	93%
Does not run into my eyes and sting	93%
Gentle formula	98%
Non-irritating	93%
Resists rub-off	77%
The skin is still breathable when wearing the sunscreen.	91%
Non-greasy	86%
Rate the overall sunscreen experiences as excellent or good	95%

CONCLUSIONS

- The tested formulation is substantive and reapplication was not needed to prevent sunburn to the skin.
- The high performance of the SPF 70+ sport sunscreen was very effective in protecting skin from sunburns under extreme UV and real sporting conditions.

REFERENCES

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