Author's response to reviews

Title: Photostability of commercial sunscreens upon sun exposure and irradiation by ultraviolet lamps

Authors:

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Version: 5 Date: 17 October 2006

Author's response to reviews: see over
Dear Peter Newmark,

We hereby resubmit the enclosed article "Photostability of commercial sunscreens upon sun exposure and irradiation by ultraviolet lamps" for considering of publication in BMC Dermatology. This article was previously submitted and rejected in December 2005.

The peer reviewers had many excellent suggestions and we have rewritten the article extensively, according to their suggestions. E.g., the figures are now of better quality, the tables have been adjusted to give a better overlook. However, there are not so many studies about photostability after natural sun exposure to our knowledge. Our material is quite small so we have not done any statistical analysis of the material but our data supports the findings from other studies. The aim of this study was not to suggest a SPF test method but to investigate the photostability. We have suggested a method to measure the photostability which we call the Area Under the Curve Index (AUCI) which compares the spectrum after UV exposure with the spectrum before.

In this study the photostability of sunscreens after exposure to natural sunlight and UV lamps has been investigated. It is shown that not all sunscreens keep their protection after UV exposure and that the degradation is more pronounced when exposed to the sun than when the same amount of energy is irradiated from the UV-lamps. The main interest in this article is what happens after exposure to natural sunlight. The sunscreens have been exposed to artificial UV lamps as well and the results are similar to what happens after natural sunlight in spite of the fact that the UV irradiation was much higher than during natural exposure.

There have been several articles about photostability which two reviewers write in their comments. However, the issue of photostability is still current since there are many products on the market that are not photostable. One of the co-authors, Nils Tarras-Wahlberg, received several letters from sunscreen producers after a photostability article published 1999. They claimed that commercial sunscreens are more stable than photoactive compounds in petrolatum, this is not always the case which we show in this article. Hopefully you will find our rewritten article of interest and consider it for publication in BMC Dermatology.

Suggested section: Research article

On the next pages the reviewers’ comments are provided (blue) with our comments (black).

Yours sincerely,

Helena Gonzalez, MD
Reviewer's report
Title: Photostability of commercial sunscreens upon sun exposure and irradiation by ultraviolet lamps
Version: 1 Date: 22 November 2005
Reviewer: Brian Diffey
Reviewer's report:
General
The authors have measured the absorption spectrum of 7 commercially-available sunscreen products following exposure to natural sunlight and UV radiation from 2 different lamps. There is a considerable literature on measurement of sunscreen photostability, including using natural sunlight as the source. There are not so many articles about photostability and natural sunlight. We conducted a search in PubMed using the search words: sunscreens AND (solar irradiation OR solar radiation OR natural sunlight OR sunlight) AND photostability). 25 articles were displayed and only one studied photostability using natural sunlight as the source. [Moyal D, Refregier JL, Cahrdon A. In vivo measurement of the photostability of sunscreen products using diffuse reflectance spectroscopy. Photodermatol Photoimmunol Photomed. 2002 Feb; 18(1):14-22.] and this study is unremarkable in that it adds no new insights into what is already known. Furthermore, the study has not been well designed in respect of exposure to UVB radiation. The authors used a fluorescent sunlamp (Philips TL12), which is known to be a very poor surrogate for solar UVB as it emits an appreciable range of wavelengths not found in terrestrial sunlight. We agree that the UVB source is not the best, however, in the UVB range most of the sunscreens were photostable. It was in the UVA range several sunscreens were photounstable both after natural sunlight and after artificial UVA irradiation. We have also added the Area Under the Curve Index as a tool to measure photoinstability.

Major Compulsory Revisions (that the author must respond to before a decision on publication can be reached)

Minor Essential Revisions (such as missing labels on figures, or the wrong use of a term, which the author can be trusted to correct)

Discretionary Revisions (which the author can choose to ignore)

What next?: Reject because too small an advance to publish

Level of interest: An article of insufficient interest to warrant publication in a scientific/medical journal
Quality of written English: Acceptable
Statistical review: No
Declaration of competing interests: I declare that I have no competing interests
Reviewer’s report
Title: Photostability of commercial sunscreens upon sun exposure and irradiation by ultraviolet lamps
Version: 1  Date: 19 December 2005
Reviewer: Dominique D Moyal
Reviewer’s report: General
This topic is not new, many references are missing. We are aware of that it is not a new topic, however as we stated in our discussion we would have thought that there would be a great improvement of the photostability but this is clearly not the case. Three of the seven sunscreens were photounstable in the UVA area and the contained the combination of ethylhexyl methoxycinnamate and butyl methoxydibenzoylmethane which is known to be photounstable. Furthermore the US Food and Drug Administration do not recommend this combination. We think it is important to show that there are still many photounstable products on the market. The authors should add references and should discuss their results compared to those obtained by other authors, as example publication from H.Maier et al, Photodermatology, Photoimmunology, Photomedecine 2005, 21, 84-92. We have added this reference and included some other references as well. The method is not sufficiently described and there are not sufficient details provided to replicate the work.
We have now described the method in more detail.

Major Compulsory Revisions (that the author must respond to before a decision on publication can be reached)

Methods

Sunscreens

=> What is the size of the quartz plates? Are they with a frozen face or fully polished?
The sunscreen was weighed and placed between two plates of polished silica (quartz) with diameter 25 mm and thickness 5 mm.

=> How many plates per product are they measured? what is the reproducibility of the results?
1-2 measurements per sunscreen were done. We have quite a small amount of material so we have not done any statistic analysis for this study.

=> How much sunscreen is weighed?
0.5 mg/cm²

=> What is the need (or the benefit of) for squeezing the product between two plates, instead off applying it over one plate? This procedure avoids solvent evaporation and contact with air during UV exposure, so looks not similar to that used for skin application in the controlled SPF test methods which specify to let sunscreens drying (and self-levelling) at least for 15 min before starting UV exposure or in real life in natural sun exposure
In another study [N Tarras-Wahlberg et al. Changes in ultraviolet absorption of sunscreens after ultraviolet irradiation. J Invest Dermatol 1999, 113(4):547-553], the measurements were done in this way. They used photoactive compounds in petrolatum. The authors received comments about that commercial sunscreens often contain photostabilizers so commercial sunscreens are probably more photostable than compounds in petrolatum. We wanted to investigate if this was true for commercial sunscreens and we used the same method as in the previous study by N Tarras-Wahlberg.
There are different methods to measure the UVA protection. According to the Australian/New Zealand standard the product can be placed in a quartz cell constructed to provide an 8 µm
Reviewer's report
Title: Photostability of commercial sunscreens upon sun exposure and irradiation by ultraviolet lamps
Version: 1 Date: 16 December 2005
Reviewer: H C Wulf

Reviewer's report: This is an interesting paper of good clinical relevans for sunscreen protection against skin cancer and erythema. This paper could be considerably improved, if the authors would stick to the subject mentioned in the title of the paper and avoid going into other subjects like skin cancer, a longer discussion about weather conditions during sun irradiation, penetration of titanium dioxide, relative increase of UVA exposure and free radical effect on DNA. I thus suggest that most of the following could be omitted:
- Background section, the first 5 lines.
- Part of Page 4, line 5, 9 and 14.
- Page 6, line 2 and 3 and most of line 2 To 14.
- Page 9, line 5 to 11.
- Page 11, line 20 to 23.
- Page 12, line 1 - 14.

These changes are of course only a suggestion that may simplify the manuscript and make it more precise on the target.

All of the above has been done.

Another principle thing that I need is the standard deviation of the measured curves. This is especially important since the differences are small like in Figure IV, V, VII, VIII B. Are they really different from before radiation. This question is especially relevant, when evaluating Figure I B, where increasing doses of UV actually shows less degradation than for small doses.

In this study we have not done that, we wanted to see if there was a difference at all when using commercial sunscreens. In another study [N Tarras-Wahlberg et al. Changes in ultraviolet absorption of sunscreens after ultraviolet irradiation. J Invest Dermatol 1999, 113(4):547-553], the measurements were done in this way. They used photoactive compounds in petrolatum. The authors received comments about that commercial sunscreens often contain photostabilizers so commercial sunscreens are probably more photostable than compounds in petrolatum. We wanted to investigate if this was true for commercial sunscreens and we used the same method as in the previous study by N Tarras-Wahlberg. For future studies we are going to calculate the standard deviation as well.

Minor suggestions:
- Page 2, abstract first line: prevent skin cancer, I think it is mainly used to prevent erythema. We have rewritten that sentence.
- Page 5: outdoor UV doses may be found in E. Thieden et al. We have included that reference.
- Page 8, line 12: “idealsituation” should be “ideal situation”.
- Page 8, line 16: “exposure to UV lamps” may be changed into “exposure to UV from lamps”.
- Page 9, last two sections: you may mention that the claim of companies does not seem to be correct.
- Page 11, line 2: “explained”, you may use “suggested”.
- Page 11, line 15: you may add “and this was the case here”.
- Page 12, line 18: “factorslike” should be “factors like”.

Done.