

Hamilton Laboratories

Position Paper



Hamilton Sunscreens and Nanoparticles

Nanotechnology deals with structures the size 100 nanometers (10^{-7} m) or smaller.

There has recently been some debate raised regarding the use of nanoparticles in sunscreens. The concern which has been raised is that as the size of a particle becomes smaller the behaviour changes and that new health risks may arise.

The two ingredients which have been the main focus of these concerns are the inorganic sunscreen filters Titanium dioxide and Zinc oxide.

In response to the concerns raised Hamilton Laboratories has compiled a range of commonly asked questions and our current position.

It is vital that people take every possible step to protect themselves from excessive UV exposure. This includes seeking shade during the middle of the day, wearing protective clothing and properly applying a premium quality sunscreen.



HAMILTON®
Sunscreen

**Protection never
felt so good**



Q: Why use Titanium dioxide or Zinc oxide in sun protection products?

The use of Titanium dioxide and Zinc oxide in combination with other UV filters has proven to provide the highest level of protection possible. The combination of the two types of filters work synergistically together to provide greater protection from UV radiation than either alone.

Hamilton Laboratories only produces premium sunscreens with the highest level of protection we can formulate. This is absolutely essential considering the strength of the Australian sun and the risk of skin cancer. Therefore we use both Titanium dioxide and Zinc oxide in many of our formulas.

Q: How long have Hamilton Laboratories been using Titanium dioxide and Zinc oxide?

Hamilton Laboratories has a long and safe history of using both Titanium dioxide and Zinc oxide in our sunscreens. Titanium dioxide was first introduced to our sunscreen range over 15 years ago and has proven to be so successful at protecting the skin that it is now used in many of our sunscreen products.

Our Sensitive Sunscreen uses only Titanium dioxide and Zinc oxide due to their long history of safe use and low irritation.

Our quality control systems ensure all complaints related to sunscreen usage are recorded as per government requirements. At no point have any health concerns been recorded during this long history of usage.

Q: What is the current regulatory view on the use of Titanium dioxide and Zinc oxide in sunscreens?

Both Titanium dioxide and Zinc oxide have been used around the world in sunscreens for over 20 years, including Europe, USA, Australia and Japan. They have been extensively evaluated by the health authorities in each country and are considered safe.

Q: What of the concerns about the formation of free radicals with Titanium dioxide?

The two forms of Titanium dioxide, **anatase** and **rutile**, have the same chemical formula, but different crystal structures. The rutile form is used in Hamilton sunscreens as it is significantly less photocatalytic than the anatase form which is known to produce free radicalsⁱ.

A recent study on the effect of sunscreen on pre-painted steel sheets installed in roofing applications by BlueScope Steel Researchⁱⁱ emphasised that rutile Titanium dioxide is much less photocatalytic than the anatase form.

To further improve Titanium dioxide's safety the versions used in our sunscreens have a coating on the surface, commonly alumina, silica or dimethicone, providing an effective barrier around the Titanium dioxide.

Q: What do recent scientific studies say regarding the risk of Titanium dioxide and Zinc oxide penetrating across the skin?

The Therapeutic Goods Administration (TGA) has produced a very comprehensive summary on the use of nanoparticles in sunscreens <http://www.tga.gov.au/npmads/sunscreen-zotd.htm>.

Overall the literature review found eight relevant studies conducted on the dermal penetration of Titanium dioxide and Zinc oxide nanoparticles across human skin. Seven^{iii,iv,v,vi,vii,viii,ix} of the eight studies found that Titanium dioxide and Zinc oxide nanoparticles were unable to penetrate the skin and reach viable cells.

The remaining study^x had significant scientific flaws in its design, namely:

1. There was no statistically significant difference in Titanium dioxide concentration between the treated and untreated skin samples.
2. The skin used was that surrounding lesions undergoing surgical removal, and thus was likely to have compromised vascular permeability.

The TGA summarised the nanoparticle review by highlighting that, "*the weight of current evidence is that they remain on the surface of the skin and in the outer dead layer (stratum corneum) of the skin*".

I am still concerned about wearing a sunscreen. How important is it for me to wear a sunscreen?

It is extremely important to understand that the risks related to **not** using a sunscreen (such as skin cancer) far outweigh the concerns related to nanoparticles. The Cancer Council and TGA have both emphasised the importance of properly protecting your skin from the sun.

Being Sun Smart includes;

- Wear sun protective clothing
- Apply Hamilton Sunscreen
- Wear a hat
- Seek shade
- Wear sunglasses



Which Hamilton Sunscreen products do not contain Titanium dioxide or Zinc oxide?

If you wish to use a premium Hamilton sunscreen but are still concerned, there are several products within our range which do not contain Titanium dioxide or Zinc oxide.

The following products can be used;

- Hamilton Sunscreen Cream 15+
- Hamilton Sunscreen Lotion 15+
- Hamilton Sunscreen Spray 30+
- Hamilton Solastick Lipbalm 30+

About Hamilton Laboratories

Hamilton Laboratories has been designing and manufacturing premium sunscreens for over 75 years. Hamilton sunscreens are available at your nearest pharmacies.

For further information please contact our consumer information number 1800 882 592 or speak to your medical professional.

Dr Graham Aldous

Director of Scientific Affairs - Hamilton Laboratories

ⁱ Uchino T, Tokunaga H, Ando M, Utsumi H: Quantitative determination of OH radical generation and its cytotoxicity induced by TiO₂-UVA treatment. *Toxicol In Vitro* 2002, 16(5):629-635.

ⁱⁱ Barker P, Branch A: The interaction of modern sunscreen formulations with surface coatings. *Progress in Organic Coatings* 2008, 62 (3): 313-320.

ⁱⁱⁱ Lademann J, Weigmann H, Rickmeyer C, Barthelmes H, Schaefer H, Mueller G, Sterry W: Penetration of titanium dioxide microparticles in a sunscreen formulation into the horny layer and the follicular orifice. *Skin Pharmacol Appl Skin Physiol* 1999, 12:247-256.

^{iv} Lademann J, Otberg N, Richter H, Weigmann HJ, Lindemann U, Schaefer H, Sterry W: Investigation of follicular penetration of topically applied substances. *Skin Pharmacol Appl Skin Physiol* 2001, 14:17-22.

^v Schulz J, Hohenberg H, Pflucker F, Gartner E, Will T, Pfeiffer S, Wepf R, Wendel V, Gers-Barlag H, Wittern KP: Distribution of sunscreens on skin. *Adv Drug Deliv Rev* November 2002, 54(1):157-163.

^{vi} Pfluecker F, Hohenberg H, Hoelzle E, Will T, Pfeiffer S, Wepf R, Diembeck W, Gers-Barlag H: The outermost stratum corneum layer is an effective barrier against dermal uptake of topically applied micronized titanium dioxide. *International Journal of Cosmetic Science* 1999, 21(6):399-411.

^{vii} Tan MH, Commens CA, Burnett L, Snitch PJ: A pilot study on the percutaneous absorption of microfine titanium dioxide from sunscreens. *Aust J Dermatol* 1996, 37:185-187.

^{viii} Zs Kertesz, Z Szikszai, A Z Kiss: Quality of skin as a barrier to ultra-fine particles. Contribution of the IBA Group to the NANODERM EU-5 PROJECT IN 2003-2004

^{ix} A. S. Dussert & E. Gooris: Characterisation of the mineral content of a physical sunscreen emulsion and its distribution onto human stratum corneum. *International J. Cosmetic Science* 1997; 19:119-129

^x Tan MH, Commens CA, Burnett L, Snitch PJ: A pilot study on the percutaneous absorption of microfine titanium dioxide from sunscreens. *Aust J Dermatol* 1996, 37:185-187.