



## **Preventing skin damage in the sun**

By Morten Bryhn MD, Ph D., Director of Research and Development, Pronova Biocare

**Solar radiation is an important environmental hazard with many deleterious effects on the skin such as sunburn, photoaging and carcinogenesis. The underlying mechanisms of ultraviolet radiation induced skin damage are complex and incompletely understood. Omega-3 fatty acids show promising effects "from inside" demonstrated in 3 clinical studies.**

The wish to get a suntan has two aspects: the medical and the cosmetic. Synthesis of vitamin D important for calcium uptake in the bones is important. Osteoporosis is common in the Nordic countries where exposure to sun is mainly restricted to a few, short summer months. And then there is the mental part. Lack of sunlight makes us depressive. Light exposure is widely used therapeutically as prophylaxis against depressions. The suntan makes us look healthy, at least pale Caucasians living in the cold part of Mother Earth. The suntan also protects us from getting sunburned creating a barrier against the unwanted effects of ultraviolet radiation. So exposure to sunlight makes sense in many ways.

But solar radiation is an important environmental hazard with many deleterious effects on the skin such as sunburn, photo aging and carcinogenesis. The most hazardous wavelengths of solar radiation reaching the Earth are ultraviolet-B (UVB) and ultraviolet-A (UVA). The more energetic UVB causes most reactions in the superficial part of the skin layer, while UVA reaches the deeper layer. UVB is primarily responsible for sunburn and carcinogenesis, whereas UVA is believed to be responsible for photo aging; and it also promotes UVB carcinogenicity.

The underlying mechanisms of ultraviolet radiation induced skin damage are complex and incompletely understood. However, free radicals and activators of the immune system such as prostaglandins and cytokines are released in the process. Skin protection against solar radiation is based on barrier sunscreens. Originally, UVB-screening agents were used alone because UVA was felt to be largely harmless. Sunburn was reduced, resulting in higher UVA exposure, because individuals could stay in the sun longer. It is now recognized that UVA causes not only photo aging but also promotes the carcinogenicity of UVB. So there has been focus on new ways of preventing skin damage caused by solar radiation by combining different measures. Omega-3 fatty acids have shown promising effects "from inside" which have been demonstrated in three clinical studies.

### **First study**

A research group in Liverpool, UK, has tested the effect of Omega-3 fatty acids in people especially susceptible to solar radiation damage. In the first study 15 people were given about 1.75g of Omega-3 fatty acids daily for 6 months (1). Everyone was exposed to artificial UVB light till reddening of the skin occurred before starting taking Omega-3 capsules. The same procedure was repeated at 1, 2, 3, 6 months and then medication was discontinued. A last exposure was repeated at 8.5 months after the study started. Skin biopsies were taken from six subjects. All subjects completed the three months treatment and 10 continued for a total of 6 months. The UVB dose causing erythema increased almost linear from the start to 6 months of treatment, and was reduced to almost initial values after 8.5 months (Fig. 1)

This means that the tolerance towards UVB radiation improved significantly. After one month of treatment the effect compared to before the treatment started was statistically significant. The tolerance improved continuously during 6 months of treatment and disappeared rapidly after stopping Omega-3 medication. Analysis of fatty acids in skin biopsies showed an increase in EPA and DHA, the most abundant Omega-3 fatty acids in fish oil.



### **Second study**

In a second study in the type of light-sensitive patients 13 people were treated with the same dose, 1,75mg, of Omega-3 fatty acids as in the first study during three months (2). As in the first study the tolerance to UVB light increased significantly compared to pre-treatment values (Fig. 2).

### **Third study**

In a third study on three patients with a rare skin disease causing severe symptoms to sun exposure, the same dose of Omega-3 fatty acids was applied during three months. Clinically significant improvements were obtained in two of the patients (3).

These studies document the positive effects of Omega-3 fatty acids on preventing sunburn from UVB exposure. An UVB cause not only sunburn but also is responsible for dermal carcinogenicity. Polyunsaturated fatty acids act as substrate for production of immun-activators like prostaglandins. There are two different series of these activators: one type produced by Omega-6 fatty acids and another from Omega-3 fatty acids. The Omega-6 derived activators are causing inflammatory reactions while those from Omega-3 fatty acids do not have these effects. A balance between the intake of Omega-6 and Omega-3 fatty acids is essential for obtaining normal immunological reactions. However, the diet today contains large amounts of Omega-6 fatty acids from seed and vegetable oils and red meat while the intake of Omega-3 is low due to the fact that people do not eat fatty fish very often. A study in mice fed Omega-6 fatty acids showed promoted photocarcinogenesis and inflammation (4) while Omega-3 fatty acids in another animal study reduced sunburn and skin cancer (5). Increased intake of Omega-3 fatty acids will reduce the negative effects of Omega-6 fatty acids by competing for the same enzymes producing the immunoactivators causing sunburn and perhaps even photocarcinogenicity.

There is definitely a need for new therapies and educational programs to prevent negative effects from sun exposure (6). Safe sun-bath should comprise three separate elements: 1) Reducing sun exposure especially in the middle of the day when solar radiation is maximal and using hats and T-shirts and other garments 2) Sun-screens, preferably active against UVB and UVA and 3) Omega-3 fatty acids. Three grams of an Omega-3 concentrate containing about 60% omega-3 fatty acids daily will reduce the risk of getting sunburned. Optimally treatment should be started early, at least one month before the sunbathing season, and should be continued throughout the summer.

### **REFERENCES**

- 1) Rhodes LE et al. Dietary fish-oil supplementation in humans reduces UVB-erythematous sensitivity but increases epidermal lipid peroxidation  
J Invest Dermatol 1994;103:151-154
- 2) Rhodes LE et al. Dietary fish oil reduces basal and ultraviolet B-generated PGE2 levels in skin and increases the threshold to provocation of polymorphic light eruption  
J Invest Dermatol 1995;105:532-535
- 3) Rhodes LE and White SI. Dietary fish oil as a protective agent in hydroa vacciniforme  
Br J Dermatol 1998;138:173-178
- 4) Black HS et al. Influence of dietary Omega-6, -3 fatty acids sources on the initiation and promotion stages of photocarcinogenesis  
Photochem Photobiol 1992;56:195-199
- 5) Orengo I et al. Influence of dietary menhaden oil upon carcinogenesis and various cutaneous responses to ultraviolet radiation  
Photochem Photobiol 1989;49:71-77
- 6) Rhodes LE. Topical and systemic approaches for protection against solar radiation-induced skin damage.  
Clinics in Dermatol 1998;16:75-82