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Field Notes from the American Academy of Dermatology 69th Annual Meeting

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A focus on photoprotection and Vitamin D

ABSTRACT: Approximately 17,000 dermatologists and other individuals with an interest in skin care attended the annual meeting of the American Academy of Dermatology. This meeting provides the opportunity to present latest dermatology clinical findings, introduce new innovative medical devices and cosmetic products.

PHOTOPROTECTION

Darrell S. Rigel, MD, Clinical Professor of Dermatology, New York University Medical Centre, New York, USA presented a symposium entitled "Melanoma and Photoprotection Update - 2011"

Dr. Rigel discussed UVB and UVA Coverage in High SPF Sunscreens. He noted that SPF 15 and higher rated sunscreens need several sunscreen chemicals to reach sufficient UVA protection offered by high SPF products. SPF ratings have limitations in that it is a measurement of UVB protection. Under the existing system in the United States UVB/UVA sunscreens are sold with no indication of the amount of UVA protection that they provide. A separate UVA labelling needs to be adopted. Rigel went on to emphasize that there is increasing evidence that UVA is more important in human skin carcinogenesis that has been previously thought. Further, various studies show that UVA is required for sunscreens to prevent immunosuppression. From a biological perspective UVB radiation is responsible for sunburn and skin cancer. UVA radiation is connected with photodamage, wrinkles of skin, and general photoaging.

HIGH SPF SUNSCREEN PRODUCTS

Dr. Rigel summarized a high SPF sunscreen study currently in press in the Journal of the American Academy of Dermatology, by Russak et al. (1), evaluating an SPF 50 sunscreen compared to an SPF 85 formulation. Fifty-six volunteers applied a photostabilized SPF 85 sunscreen which was compared to an SPF 50 sunscreen to the face while skiing at Vail Colorado, USA. A single application was applied only at the start of the day. The average period of exposure was 5.0 hours. The noon sun exposure was calculated to be equivalent of 1 MED after 22 minutes of exposure. Eight of the fifty-six volunteers sunburned using the SPF 50 compared to

one of the fifty-six volunteers using the SPF 85 formulation ($p=0.03$). The study concluded that high SPF formulations (SPF=85) are more effective in protecting from sunburn with a single application in a high UV test environment. According to Dr. Rigel, other studies have shown the amount of sunscreen applied greatly influences the resulting SPF. In an example study, 40 volunteers that included two groups using an SPF 15 and 30 applied sunscreen in four different densities ; 2, 1.5, 1.0 and 0.5 mg/cm². The volunteers were then irradiated with a solar simulator. MED and SPF were determined after 24 hours. It was observed that the SPF significantly decreased when the amount of sunscreen applied was decreased ($p<0.001$). The correlation between specified SPF and applied amount of sunscreen grew exponentially. The investigators concluded that the protection provided by sunscreen is related to the amount of product applied (1). It is essential to educate consumers to apply larger amounts of sunscreen for adequate photoprotection (2). The latter comment was supported by another study (3) that assessed the sunscreen knowledge of 423 subjects in New Jersey, USA regarding proper use of sunscreen. The study showed that 86 percent knew sunscreens reduced sunburn, 70 percent knew sunscreens reduced skin cancer occurrence, but only 30 percent knew pre-application and reapplication rules of sunscreen use. Only 18 percent knew that at least 1 ounce (30 grams) is needed to cover the entire body.

NATURAL APPROACHED TO UV PHOTOPROTECTION

Compounds that absorb UV are found throughout nature. Examples given included quinine from the chinchona tree, cinnamates from the cinnamon tree, green tea epigallocatecin-3-gallate. Studies have shown the potential for natural ingredients to help suppress the carcinogenic activity of UV radiation, UV-induced sunburn response, protect against UV-induced immunosuppression and photoaging of skin (4). Other examples are caffeine and sodium benzoate as UVB absorbers (5).

CAN A SUNSCREEN WITH ANTIOXIDANTS ADDED REDUCE ADDITIONAL DAMAGE?

A 2006 study by Damiani et al. (6), 2006 reported that the sunscreen methoxycinnamate with an antioxidant nitroxide

TEMPOL was shown to prevent sunburn and absorb free radicals. The investigators concluded that combination sunscreens and antioxidants may be used to reduce photo-induced skin damage. Dr. Rigel presented data indicating that free radicals can be generated in skin by visible light and IR and UV exposure. Various techniques may be used to measure these effects. Examples provided were in vivo detection of reactive oxygen species by chemiluminescence photon emission and electron spin resonance. These studies show that the addition of antioxidants to sunscreen formulations can reduce free radicals generated by solar and IR light exposure. Other benefits include reduction of detrimental matrix metalloproteinases (MMP) induced by visible light (7).

IN SUMMARY

In addition to UV, IR and visible light can have damaging effects on skin. These effects include dermal matrix degradation, effects

on skin's pigmentation, DNA damage that can potentially lead to photocarcinogenesis, and free radical generation. UV protection is an important issue and photoprotection can make a big difference in preserving the health of the human population

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Dermatologists address controversies in Vitamin D

INTRODUCTION

The health effects of vitamin D are gaining prominence within the medical community and the public. It is hypothesized that the main source of vitamin D for the body is unprotected exposure to sunlight (1). There is interest regarding the levels of vitamin D in the population and the effect that sun protection has on this, as well as those people who feel that the benefits of sun protection outweigh any potential risks.

Hormonally active vitamin D3, 1, 25-(OH)2D3 is believed to have a role in bone health, the prevention of cancer formation and other diseases. Opinions are divided regarding how one should obtain vitamin D, either through solar exposure and/or oral supplementation and what is the appropriate optimal target level of vitamin D for the population.

Dr. Kenneth Linden, a dermatologist from California, USA directed a session focused on the above issues. Dr. Linden noted that there is considerable interest in vitamin D as indicated by the volume of papers published in 2010. Over 1,400 papers on vitamin D were published compared to approximately 400 on vitamin C. One concern expressed by Dr. Linden is that children who are spending too much time indoors at computers are not outdoors long enough for their bodies to produce a sufficient quantity of vitamin D. The current debate is what adequate levels of vitamin D are for adults and children and with respect to safety, and what is the optimal way to achieve a healthy vitamin D level.

BIOCHEMISTRY OF VITAMIN D

Roughly 90 percent or more vitamin D is obtained through biosynthesis following exposure to ultraviolet-B exposure. Synthesis begins in the skin where 7-dehydrocholesterol converts to a previtamin D3. This is then converted to 25-(OH)D3 by the enzyme 25-hydroxylase, followed by conversion to 1, 25-(OH)2D3 by 1 α -hydroxylase. The latter reactions occur in the liver although both enzymes are found in skin (2, 3). The product of hydroxylation (25(OH)D) found in the liver is considered as the most appropriate

form to measure vitamin D status in the body (1). Dr. Linden explained that vitamin D is fat soluble and functions as a steroid hormone. It influences multiple gene expression in the body and low levels may be related to cancer, poor bone health, type 1 and 2 diabetes, and heart disease. He noted that many of the published studies are conflicting. Some authorities recommend brief exposure to sunlight other authorities advocate alternative approaches to acquire vitamin D that pose reduced risk for skin cancer.

WHAT IS AN ADEQUATE VITAMIN D LEVEL AND THE BEST WAY TO ACQUIRE IT?

The American Academy of Dermatology has updated its position statement on vitamin D based on a review of scientific literature and a report issued by the National Academy of Sciences Institute of Medicine (IOM). The IOM has found insufficient evidence to support major revisions in the dietary reference intakes for calcium and vitamin D (4). The Academy recommends that the public obtain vitamin D from a healthy diet that includes vitamin D, and/or dietary supplements. Vitamin D obtained from unprotected exposure to UV radiation from the sun or indoor tanning devices is a known risk factor for development of skin cancer. A vitamin D blood level of 20 ng/ml as a Recommended Dietary Allowance (RDA) is considered safe to support skeletal health. The Academy continues to recommend that individuals protect themselves from sun exposure by wearing sunscreen and covering up with wide-brimmed hats, long sleeves, pants and sunglasses when outdoors (5). Table 1 indicates advised Dietary Reference Intakes for vitamin D.

Age/Gender/Life Stage	Recommended Dietary Allowance (RDA) (ug/d)	Maximum No Risk Daily Intake (ug/d)
Infants (0-12 months)	5	25
Children (1-8 years)	5	50
Men and Women (9-50 years)	5	50
Men and Women (50-70 years)	10	50
Men and Women (over 70 years)	15	50
Pregnant Women (18-50 years)	5	50
Lactating Women (18-50 years)	5	50

Table 1. Dietary reference intake for Vitamin D. source DRI report, www.nap.edu.

EVENTS

Vitamin D also known as calciferol

Vitamin D2 also known as ergocalciferol

Vitamin D3 also known as cholecalciferol

25OHD is 25-hydroxyvitamin D

Calcitriol is 1,25-dihydroxyvitamin D

24,25(OH)₂D is 24,25-dihydroxyvitamin D

IU is an International Unit which is measured based on biological activity; 1 IU of vitamin D is defined as the activity of 0.025 ug of cholecalciferol in bioassays with rats and chicks

Conversions for vitamin D3;

40 IU = 1 ug

2.5 nmol/L = 1 ng/mL

Table 2. Vitamin D terms and conversions (4).

EXAMPLES OF THE VITAMIN D CONTROVERSY

In another session entitled Hot Topics Symposium, dermatologist Richard Gallo, M.D., Ph.D. chief of the division of dermatology, University of California, USA discussed a 1991 Danish study published in the British Journal of Medicine that concluded that the majority of patients in the study with sun-seeking behaviour were still below optimal serum vitamin D. Over 53 percent of the sun-seekers had serum levels below 50 nmol/l of hydroxyvitamin D. He mentioned a 2009 study of serum 25-hydroxy D levels in twins during summer and winter months with presumably similar

sun exposure levels. There was tremendous variability within the population. The study concluded that 50 percent of the variation, particularly in the summer was related to genetic influences rather than sun exposure. Dr. Gallo concluded from his review of the numerous vitamin D papers that the ability to protect against cancer remains inconclusive. Regarding the ability to improve resistance to infection, various human studies reported seasonal associations with viral infections that can be associated with serum levels of 25-D, but there are conflicting reports in the literature.

SUMMARY

Dermatologists are in general agreement that advocating exposure to sunlight to increase vitamin D levels in skin is misguided advice. Overall solar exposure damages skin, this should be the key message for the consumer.

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