THE SCIENCE SUPPORTING SKINCEUTICALS SUNSCREEN PRODUCTS

ABSTRACT

Until the advent of recently-patented technologies, not one sunscreen existed that provided both substantial UVA and UVB protection without turning skin white. Recent scientific findings reveal that it is the long UVAI (340-400 nm) rays that cause photoaging. Only two sunscreen ingredients (zinc oxide and Parsol 1789) protect in this range, with zinc oxide being the preferred ingredient. By incorporating two innovative technologies (Z-Cote® transparent zinc oxide and incapsulated OTCINOXATE) in one sunscreen product line, SkinCeuticals provides superior sun care products for daily use.

UV RADIATION AND THE UV SPECTRUM

Exposure to ultraviolet radiation (UVR) is a well-documented health hazard. The ultraviolet spectrum is divided into the following key regions: UVC (270-290 nm), UVB (290-320 nm), UVAII (320-340 nm), and UVAI (340-400 nm). The ozone layer protects humans from damage against UVC rays, but not UVB and UVA rays. UVB rays are known to cause burning. UVA rays are now known to cause photoaging.

THE EFFECTS OF SUN ON SKIN

When sun shines on skin, the short (290-320 nm) UVB (burning) rays are absorbed by the epidermis. These generate oxygen-free radicals which can destroy and mutate cells and even cause skin cancer. The longer (320-400 nm) UVA (aging) go deep into the skin's dermis, and even through skin. These rays go thirty to forty times deeper than UVB rays, and also generate oxygen-free radicals. Oxygen-free radicals are like indiscriminate bombs, destroying and/or mutating anything in their way, including collagen, elastin, proteoglycan, and cells.

REPEATED UVA (320-400 NM) EXPOSURE CAUSES PHOTOAGING IN HUMAN SKIN

Photoaging is damage to the skin caused by the sun. Photoaging damage includes, but is not limited to: wrinkles, dark blotches, freckles, leathery texture, and loss of elasticity. UVA rays penetrate the skin's surface, invading the layers below and eventually destroying the collagen and elastin that give skin its firm, plump texture and elasticity. Recent studies show that it takes relatively small amounts of repeated UVA exposure to cause photoaging in human skin. Only eight moderate dosages of UVA are necessary before changes are evident (Lavker et al, *J Am Acad Dermatol,* 1995; Lowe et al, *J Invest Dermatol,* 1995).

THE UVAI (340-400 NM) LONG RAYS CAN CAUSE PHOTOAGING DAMAGE

Just recently, scientists proved that specifically it is the long UVA rays (UVAI, 340-400 nm) that are responsible for photoaging damage in skin (Lavker, R.M. et al, *Photochemistry and Photobiology,* 1995). Given the structure of skin, dermatologists and photobiologists have long hypothesized that the UVA rays which penetrate the skin deepest, might be responsible for photoaging changes in skin; finally, it has been proven. Unfortunately, most currently available sunscreens typically don't protect from UVAI insults.

UVA RADIATION MAY PLAY A ROLE IN MELANOMA FORMULATION

A recent study has detected a correlation between the use of sunlamps or sunbeds and the development of melanoma, especially in younger individuals (Autier et al, *Int J Cancer,* 1994). In addition, PUVA (ultraviolet A radiation plus oral methoxsalen) therapy is known to increase the incidence of melanoma (Stern et al, *N Engl J Med,* 1997). UVA also is known to cause DNA mutations in cell culture (Nishigori et al, *J Invest Dermatol,* 1996).

UVA RADIATION MAY PLAY A ROLE IN MELANOMA FORMULATION

Three international, well-controlled studies also have shown a higher incidence of melanoma skin cancers in individuals using UVB sunscreens (Wolf et al, *J Invest Dermatol,* 1996; Autier et al, *Int J Cancer,* 1995; Westerdahl et al, Melanoma Research, 1995). These findings lend impetus to the notion that excessive exposure to UVA through sunscreens and changing sunbathing habits may be contributing to the spiraling incidence of melanoma.

The most important preventable cause of melanoma is excessive exposure to UV radiation from the sun. Malignant melanoma also has been linked to past sunburns and sun exposure at younger ages. (Other possible causes of melanoma include genetic factors and immune system deficiencies). With the introduction of true broad spectrum sunscreens containing transparent zinc oxide, excessive sun exposure to UVA radiation can be controlled.

COMMON SUNSCREEN INGREDIENTS PROTECT SKIN MAINLY AGAINST UVB RAYS

Recent studies show that the most common sunscreen ingredients protect mainly against UVB rays (290-320 nm), the rays

responsible for most sun burning, but not UVA rays (320-400nm), the rays that cause photoaging. Only zinc oxide blocks UVB, UVAII and UVAI rays.

Common UVB (290-320 nm) sunscreen ingredients are octinoxate, octisalate (OCS), para-aminobenzoic acid (PABA), and octocrylene. Zinc oxide also protects in this range, uniformly covering from 290-380 nm.

Common UVAII (320-340 nm) sunscreen ingredients are oxybenzone (benzophenone-3) and titanium dioxide. Of these two UVAII blocks, only titanium dioxide also protects against UVB rays, which is why most commercially-available sunscreens combine two or more sunscreen ingredients. In contrast, zinc oxide protects not only in this range, but also in the UVB and UVAI range, uniformly covering from 290-380 nm.

UVAI (340-400 nm) sunscreen ingredients are limited to only two: avobenzone (Parsol 1789) and zinc oxide. Parsol 1789 is not an adequate UVAII block, which is why it often is combined with a common UVAII block, oxybenzone. The effective range of Parsol 1789 is approximately only 340-375 nm. Zinc oxide, in contrast, protects uniformly from 290-380 nm.

ONLY ZINC OXIDE BLOCKS UVB, UVAII AND UVAI RAYS

To protect against photodamage, including sun burning and photoaging, one needs a sun protection product that blocks UVB, UVAII and UVAI rays. Only one sunscreen ingredient protects against all three types of ultraviolet radiation: zinc oxide.

GENERAL INFORMATION ABOUT SUNSCREENS

Any sun protection product with an SPF of 2 or higher is considered a sunscreen. Any sun product that contains a physical sunscreen ingredient and an SPF of 12 or higher is considered a sunscreen.

TWO TYPES OF SUNSCREEN INGREDIENTS

In reality, all sunscreen ingredients are chemicals. However, the sunscreen industry labels sunscreen ingredients as either chemical (organic chemical) or physical (inorganic chemical). The differentiation is based on how the ingredients behave on skin. Chemical sunscreen ingredients typically are absorbed into the epidermis, are thought to be metabolized by the body, and sometimes cause allergic reactions. Physical sunscreen ingredients lie on top of the skin's surface and are not absorbed into the epidermis or metabolized by the body. Many companies combine both chemical and physical sunscreens to enhance a product's SPF abilities.

CHEMICAL SUNSCREEN INGREDIENTS

Chemical sunscreen ingredients, when used on their own, provide only partial UV protection. Octinoxate, Octocrylene, Octisalate, PABA (Para-aminobenzoic acid), Octyl Dimethyl Paba (Padimate-O), Oxybenzone (Benzo-phenone-3), and Avobenzone (Parsol 1789), all are chemical sunscreens. Many of these chemicals are not preferred sunscreen ingredients because of their tendency to cause allergic reactions.

PHYSICAL SUNSCREEN INGREDIENTS

Titanium dioxide and zinc oxide are physical sunscreen ingredients, which form a protective barrier over the skin, stopping UV rays from penetrating the skin's surface. Both titanium dioxide and zinc oxide offer total UVB protection; however, zinc oxide offers far more UVA protection than titanium dioxide. Typically, physical sunscreen ingredients are white, pasty, and turn blue on contact with water.

Titanium dioxide is a common physical sunscreen; it protects in the UV range from 290-340 nm. It protects against UVB radiation fully, but only protects against short UVA radiation (320-340 nm). Titanium dioxide offers no protection from the long UVA rays (340-400 nm) recently proven to cause photoaging changes in human skin. Using titanium dioxide alone, skin turns white or bluish at SPF7.

Zinc oxide uniformly covers from 290-380 nm, thus protecting against UVB (290-320 nm) and most of the UVA (320-400 nm). No other sunscreen ingredient provides broader protection.

Zinc oxide is so safe and gentle that it is one of only two sunscreen particulate ingredients that also is recognized by the FDA as a Category 1 skin protectant, meaning that the FDA acknowledges it as safe for use on compromised or environmentally-challenged skin. Zinc oxide is so safe that it often is the leading ingredient in baby care products.

Unfortunately, traditional zinc oxide is white and pasty. Often used by lifeguards for sun protection, traditional zinc oxide is not cosmetically elegant, and hence, not widely used for total body sun protection. However, the newly available transparent zinc oxide, Z-Cote®, overcomes these disadvantages.

TRANSPARENT MICRO-FINE ZINC OXIDE (Z-COTE HP1®)

Z-Cote HP1® is a particle of micro-fine zinc oxide, coated with a patented form of dimethicone. This coating process turns the traditionally granular and pasty particles of zinc oxide into a smooth, elegant formulation which is completely transparent, and hence, perfect to wear alone or under make-up or cosmetics. This transparent zinc oxide provides true broad-spectrum UVA/UVB protection, uniformly protecting from 290-380 nanometers (nm).

ENCAPSULATED OCTINOXATE

Octinoxate is the leading UVB sunscreen ingredient, known for being non-irritating. By encapsulating octinoxate, it is possible to use less chemical sunscreen ingredients and improve SPF. The result is increased protection, using less potentially irritating ingredients.

SKINCEUTICALS SUNSCREEN PRODUCTS

SkinCeuticals manufactures sunscreen products which incorporate both Z-Cote HP1® and encapsulated octinoxate for true broad spectrum protection. SkinCeuticals sunscreens are cosmetically elegant, unlike the pasty white zinc oxide sunscreens in the past, providing protection from UVA/UVB damage, using less potentially irritatating sunscreen ingredients.

For more information, or for a complete bibliography of scientific research supporting SkinCeuticals sunscreens, please visit the SkinCeuticals, Inc. website at www.skinceuticals.com, or call toll free 800-811-1660.

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