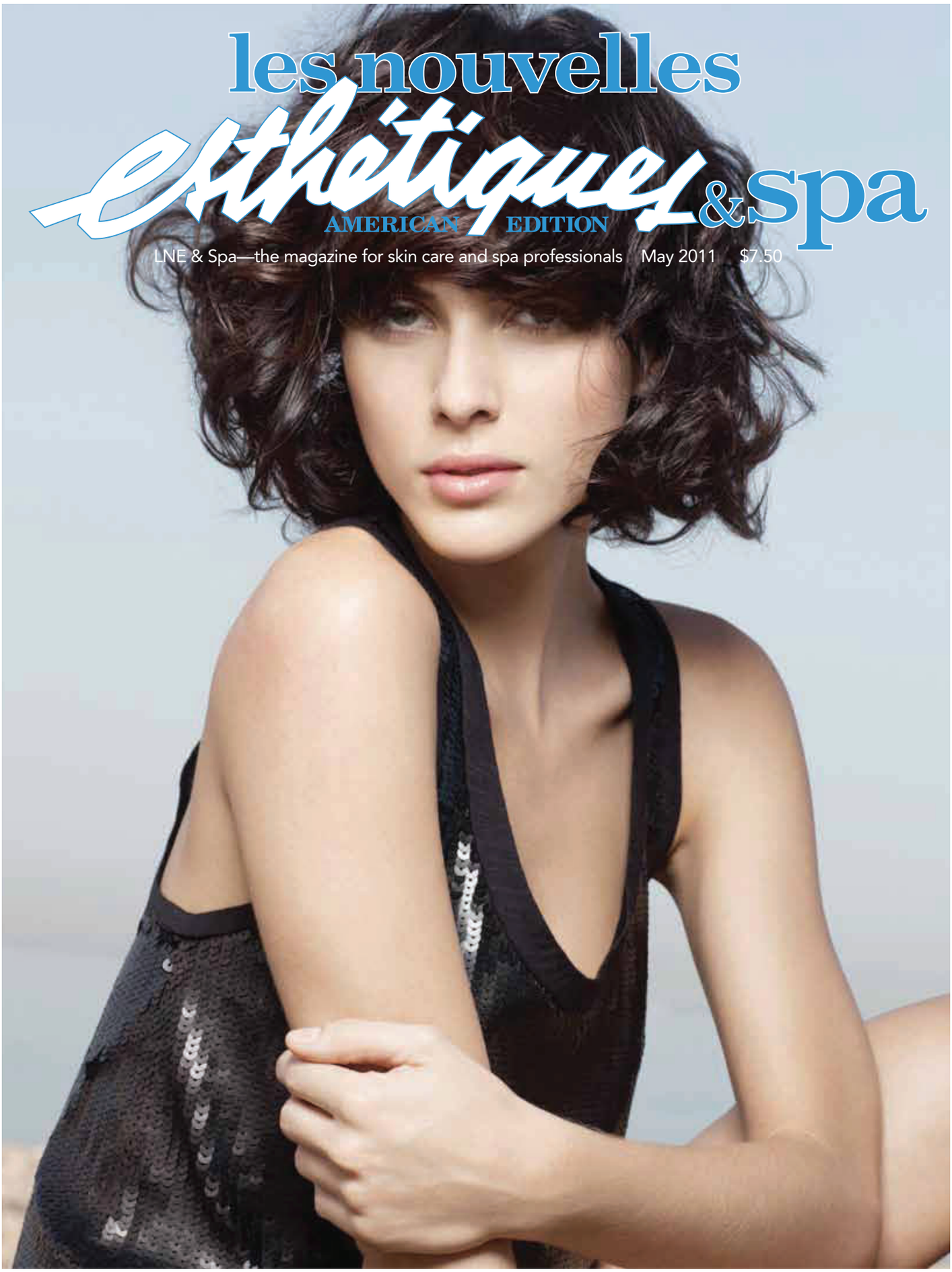

les nouvelles esthétiques & spa

AMERICAN EDITION

LNE & Spa—the magazine for skin care and spa professionals May 2011 $7.50

SUPER SUNSCREENS

CHEMICAL VERSUS PHYSICAL: CHOOSING THE PROPER FORMULATION

MOST WOULD AGREE THAT ADEQUATE sunscreen application is imperative to skin health. Proper sun protection keeps the skin from aging prematurely, prevents skin cancer formation and prolongs the results of professional treatments. Regrettably, certain sunscreen ingredients are portrayed incorrectly, leading some consumers to mistakenly believe that sun protection products may not be completely safe. By unveiling the myths behind physical and chemical sunscreens, the clinician can further educate the patient about the benefits behind the different types of sun protection.

Understanding ultraviolet radiation

Ultraviolet radiation is a group of wavelengths of electromagnetic radiation shorter than what the human eye can see. While there are many wavelengths in the electromagnetic spectrum, UVA and UVB are directly related to the health of the skin. UVB radiation has a wavelength of 290 to 320 nanometers (nm), long enough to reach the deepest layers of the epidermis. This particular wavelength of ultraviolet light is referred to as the "burning ray" and is responsible for causing sunburns. The longest of the ultraviolet rays are UVA, ranging from 320 to 400 nm. Thought to be the principal cause of extrinsic aging, UVA rays are known as the "aging rays."

Both UVA and UVB rays have been shown to cause DNA damage in the skin, which leads to skin cancer. Because both are responsible for various levels of damage, sunscreen products, no matter the type of sun protection ingredients used, should provide broad-spectrum coverage that shields from both UVA and UVB radiation.

Physical sunscreen

Physical sunscreens include zinc oxide and titanium dioxide, which sit on the surface of the skin and reflect or scatter ultraviolet radiation before it can reach the epidermis. In the past, these inorganic materials were thick and occlusive, deterring patient compliance due to their appearance when applied to the skin. Although they were not a cosmetically elegant means of sun protection, physical sunscreens have always been quite effective. Science has since greatly improved physical sunscreens, creating smaller particle sizes that are more cosmetically elegant.

The decreased particle size are referred to as micronized particles or—if they are made smaller than 100 microns—nanoparticles. Micronization is a process by which the particle size of a substance is reduced. Inherently, the pigment of the substance will lessen as the particle size decreases. Since zinc oxide and titanium dioxide are opaque, micronizing the particles allows for a wider range of patient use.

Micronized particles have been safely used in skin care and cosmetics for years with no known side effects. Nanoparticles are even smaller in size and, in some instances unrelated to sunscreens, are thought to penetrate the cellular wall. For some, this is concerning because the technology is still relatively new and the ramifications of cellular penetration are unknown. Numerous studies have been conducted on the use of nanoparticles in skin care and, while more data is necessary to make a solid conclusion, the use of nanotechnology is widely considered a safe and effective means for improving the

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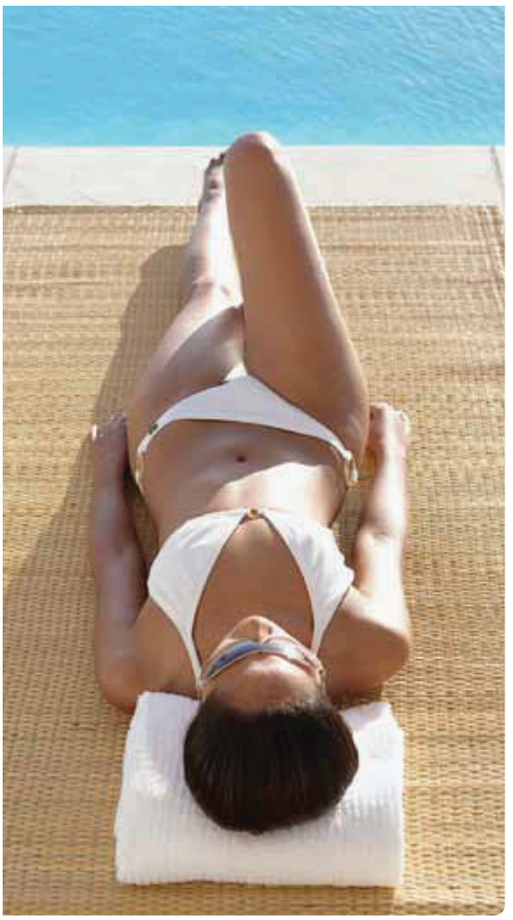

Unfortunately, titanium dioxide does not disappear once applied to the skin. This is often a deterrent for patients, especially those with higher Fitzpatrick skin types, reducing the likelihood of consistent daily use.

texture of sunscreens. Studies specifically related to nanoparticles of zinc oxide and titanium dioxide have been able to confirm that they do not penetrate the skin and, therefore, are not absorbed.

Zinc oxide offers the widest range of protection, covering both UVB and UVA rays. Thick, occlusive zinc oxide sunscreen products have since been replaced with virtually weightless formulations that still adequately protect the skin. Micronized zinc oxide paired with technology such as Z-Cote® HP1 has revolutionized the physical sunscreen market. Z-Cote HP1 is a hydrophobic water repellant that coats the zinc oxide molecule, allowing it to appear transparent on the skin as well as reducing the level of oxidative damage caused by ultraviolet radiation. Additionally, zinc oxide is known to be a superior anti-inflammatory agent, making an already exceptional protective ingredient that much more appealing.

Titanium dioxide is a naturally occurring mineral widely used in cosmetics and sunscreen products because of its ability to reflect ultraviolet rays from the skin. Like zinc oxide, titanium dioxide is often micronized because it is occlusive by nature. Unfortunately, titanium dioxide does not disappear once applied to the skin. This is often a deterrent for patients, especially those with higher Fitzpatrick skin types, reducing the likelihood of consistent daily use. Recent controversy surrounding titanium dioxide being a potential carcinogen has once again falsely instilled fear among consumers. It is unfortunate when scientific studies are taken out of context and information is misconstrued. Titanium dioxide has been used for decades and proven to be an effective sun protection agent.

Chemical sunscreens

Chemical sunscreens have been used for their strong ability to effectively absorb UVB radiation. Chemical sunscreens are organic substances that pass through the corneocytes and absorb harmful ultraviolet rays before they can damage the skin. Consumer information can sometimes be misleading, causing patients to believe chemical sunscreens are harmful or sensitizing, which is a misrepresentation. More often than not, the product's base ingredients, rather than the active ingredients, cause sensitive skin to react unfavorably. However, there is some controversy behind how chemical sunscreens dissolve ultraviolet rays. Since chemical sunscreens are absorbed into the skin, the question remains if the ultraviolet rays are also being absorbed within the skin before being disseminated. While the concern is understandable, chemical sunscreens are proven to absorb ultraviolet rays before they cause cutaneous damage, therefore, the issue of whether the radiation penetrates is unimportant. There are many chemical sunscreens used in today's market that are deemed safe and highly effective. The following are the most often used:

- Cinnamates are the most commonly used UVB sunscreen agents. Although cinnamates are often paired with other UVB absorbers, they tend to be less sensitizing than other options. Octinoxate and cinoxate are the more widely recognized trade names in the cinnamate family.
- Salicylates, like cinnamates, are known to be non-sensitizing with topical application. They also require additional sunscreen additives in order to protect the skin from ultraviolet damage because they provide weak ultraviolet absorption when used alone. The most commonly used salicylates are octisalate and homosalate.
- Benzophenones, most often oxybenzone or dioxybenzone, are unparalleled in the family of chemical sunscreens because they offer both UVB and slight UVA protection. While reactions are rare, there is a potential for sensitization in some skin types. Although this family of chemical sunscreens narrowly extends into the UVA wavelengths, used alone, benzophenones do not provide adequate broad-spectrum protection.
- Dibenzoylmethanes, also known as avobenzone, is an efficacious UVA absorber, but requires additional UVB ingredients to reach its full potential. Because it is relatively unstable on its own, it is also recommended to use avobenzone in conjunction with stabilizers and antioxidants to counteract the photo-instability.

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When physical and chemical sunscreen agents are used together, product consistency is manageable and the patient is more inclined to apply the sunscreen daily.

- The U.S. Food and Drug Administration recently approved the camphor derivative ecamsule, a photostable UVA absorber. While effective, it must be formulated with another sunscreen agent, such as avobenzone or titanium dioxide in order to provide optimal ultraviolet coverage.

Antioxidants

The addition of antioxidants to a sunscreen formula can improve its ability to protect against harmful ultraviolet rays as well as damaging free radicals. Although there are many antioxidants on the market, the following may be particularly beneficial for sunscreen formulations because of their chemo-preventive properties.

- Caffeine is a unique antioxidant that can force ultraviolet-damaged cells into apoptosis, or organized cell death, before they are able to duplicate into potentially cancer-causing cells.
- Silymarin, from the milk thistle plant, contains silybin and has been found to protect against ultraviolet-induced cellular damage and carcinogenesis, or cancer cell formation.
- Genistein is a soy isoflavone that has the ability to increase the skin's natural antioxidants while also interfering with ultraviolet-induced DNA damage and mutation.
- Epigallocatechin gallate (EGCG) is a potent polyphenol antioxidant found in green tea that protects against oxidative damage, is a superior anti-inflammatory and has chemoprotective benefits.
- Resveratrol is a well-known ingredient derived from colored berries and grapes. When applied topically prior to ultraviolet exposure, resveratrol has been shown to suppress free radical damage and inflammation.

Best of both worlds

The most comprehensive sunscreen coverage comes from blending physical and chemical sunscreens. When physical and chemical sunscreen agents are used together, product consistency is manageable and the patient is more inclined to apply the sunscreen daily. Octisalate and octinoxate are non-sensitizing, photo-stable chemical sunscreen options that work well to make physical sunscreens even more cosmetically elegant.

Sunscreen is a daily necessity in the maintenance of skin health. Although the debate continues between physical and chemical sunscreens, it seems that a blend of both, along with antioxidants, creates the most comprehensive sunscreen product available on today's market. While physical sunscreens are capable of protecting the skin from both UVB and UVA damage, their thicker consistency and white appearance are less than appealing to some patients. Chemical sunscreens offer adequate protection from UVB rays, which can cause cancer formation, but frequently do not offer favorable protection against aging UVA rays. Therefore, blending a physical sunscreen with a chemical sunscreen proves to be an efficacious sunscreen option. ■

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