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Sunscreens: The Dark Side of Avoiding the Sun

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In 2012, I published my extensively researched book, *Sunscreens—Biohazard: Treat as Hazardous Waste*.¹ I am saddened that the book has made little impact on the worldwide production, proliferation and use of sunscreens. The widespread use of sunscreens has resulted not only in increased skin cancers but in contamination of the world's water sources.

I am also staggered by current research showing that there is even greater harm that people need to be aware of. I am writing a new book to bring the public up to date on these hazards and the damage inflicted on the earth's entire ecosystem. This article covers only the highlights—I will cover the complete details in *Sunscreens—Biohazard II: Proof of Toxicity Keeps Piling Up*.

ARTICLE SUMMARY

- Research has not validated the claim that the sun is not safe because it causes melanoma.

- Sunscreen use actually promotes skin cancers.
- Sunscreen chemicals are toxic to all systems in the body and to all life on the planet.
- Sunscreen chemicals mimicking the shape of our hormones bind to the body's hormone receptors, disrupting estrogen, testosterone, progesterone and thyroid hormones.
- Sunshine provides many benefits for the whole body.
- Blocking UVB radiation leads to low vitamin D₃ levels due to the inability to produce this essential vitamin in the skin, which results in a multitude of health problems.
- Consumers should avoid products that have a SPF rating or foods or clothing that contain titanium dioxide.
- Eating, taking or using antioxidants on the skin are natural, safe ways to protect the skin from solar radiation.
Feeding the skin antioxidants provides nature's best solar radiation protection.

GOING IN THE WRONG DIRECTION

Sunscreens were introduced in the 1970s, yet here we are almost fifty years later with a shocking increase in the incidence of melanoma. In the United States in 1970, the incidence rate for melanoma was 5.7 per

100,000.² Between 1973 and 2011, the overall rate increased 200 percent,³ and the rate for children and white female young adults increased 253 percent.⁴ Figure 1 shows the increase in incidence since sunscreens came into widespread use.

If sunscreens actually worked, the lines in Figure 1 would be going in the opposite direction. To understand why they are not, we have to look at the basic premise of sunscreens and recognize that the entire concept of ultraviolet (UV) protection is wrong. Only 4 percent of the total solar radiation spectrum is UV radiation, which includes UVA and UVB. The first generation of sunscreens approved in 1978 by the Food and Drug Administration (FDA) blocked only the UVB portion of the UV wavelength. Figure 2 shows the level of penetration of the UVB rays in the skin. Although UVB rays are what cause the typical sunburn, and blocking UVB does stop the skin from turning red, the sunburn is the body's warning sign that it is time to get out of the sun because you have run out of your natural protective nutrients that prevent damage from the sun. Blocking the sunburn is just as dangerous as cutting the wire to the red warning light on the dash of your car.

When the incidence of melanoma continued to rise following the approval of UVB-blocking sunscreens, the FDA created new regulations in 1988 requiring that sunscreens also block UVA, which penetrates slightly more deeply into the skin. Figure 3 shows how deeply the UVA rays enter the skin, compared to UVB. This second generation of sunscreens is referred to as "broad spectrum"—that is, sunscreens that block both UVB and UVA radiation.

Other than UV radiation, the rest of the solar radiation spectrum includes visible wavelengths (49 percent) and near infrared (NIR) wavelengths (47 percent). Near infrared are divided into infrared A (IRA), infrared B (IRB) and infrared C (IRC) radiation. Look at Figure 4 to see how much deeper these rays go. Nothing applied to the skin can stop these deeply penetrating NIR wavelengths. As they go deeper into our skin, they cause damage to structures inside the skin, including cancer.

Studies published in the 1990s admitted that sunshine had not been proven to cause melanoma or skin cancers. In 1994, researchers reported that sunscreens “failed to protect against UV radiation-induced increase in melanoma incidence.”⁵ Several investigators also found a higher incidence of basal cell carcinomas with sunscreen use and stated in 1990 that their findings did not support a role for sunscreens in preventing basal cell carcinoma.⁶

By 2012—almost forty years after the beginning of sunscreen promotion as essential skin cancer protection—researchers stated: “Evidently, use of sunscreens is effective in prevention of sunburns in various models. However, evidence for their protective effects against melanoma skin cancer is less conclusive.”⁷ For non-melanoma skin cancers, a 2015 Australian study reported that their incidence had climbed to 2,448 per 100,000 person-years by 2011, up from 555 per 100,000 person-years in 1985.⁸ By 2017, researchers were reporting that “the effects of repeated, long-term and low-dose exposures to single compounds and mixtures of various UV filters” in sunscreens were “poorly studied” and that more research was needed “to evaluate the realistic hazard of contemporary

sunscreens.”⁹

UV FILTERS

The FDA has approved sixteen UV-filtering chemicals for use as sunscreen ingredients. Eight predominate in today’s formulations—six that block UVB (oxybenzone, octinoxate, octisalate, homosalate, octocrylene and titanium dioxide) and two also believed to filter UVA (avobenzone and zinc oxide).^{3,10} We have been mindlessly using these chemicals without realizing that they were not subject to full research before the FDA approved them for use in sunscreens. In fact, every chemical or mineral approved by FDA for a SPF (solar protective factor) rating is toxic to the body and aquatic life.¹¹

There are two types of UV filters: *chemical filters*, which absorb UV rays, and *physical filters*, which scatter and reflect UV rays. Animal and human studies indicate that both types of agents impair hormonal and developmental pathways. Chemical filters include benzophenones such as benzophenone-3 (BP-3), cinnamates such as octyl methoxycinnamate (OMC) and camphors such as 3-benzylidene-camphor (3-BC) and 4-methylbenzylidene-camphor (4-MBC).

Chemical filters are well-documented endocrine (hormone) disruptors. Structurally mimicking the shape of our hormones, they bind to the body’s hormone receptors, blocking the ability of our hormones to sit in their receptors and thereby preventing them from performing their life-preserving functions. Many studies corroborate the hormone disruptions, showing that benzophenones disrupt estrogen, testosterone and nucleus

receptors; cinnamates disrupt estrogen, thyroid and nucleus receptors; and camphors disrupt estrogen, testosterone and progesterone receptors.¹² Mammals, fish, birds, reptiles, amphibians and aquatic invertebrates all show endocrine disruptions from sunscreen chemicals.¹³

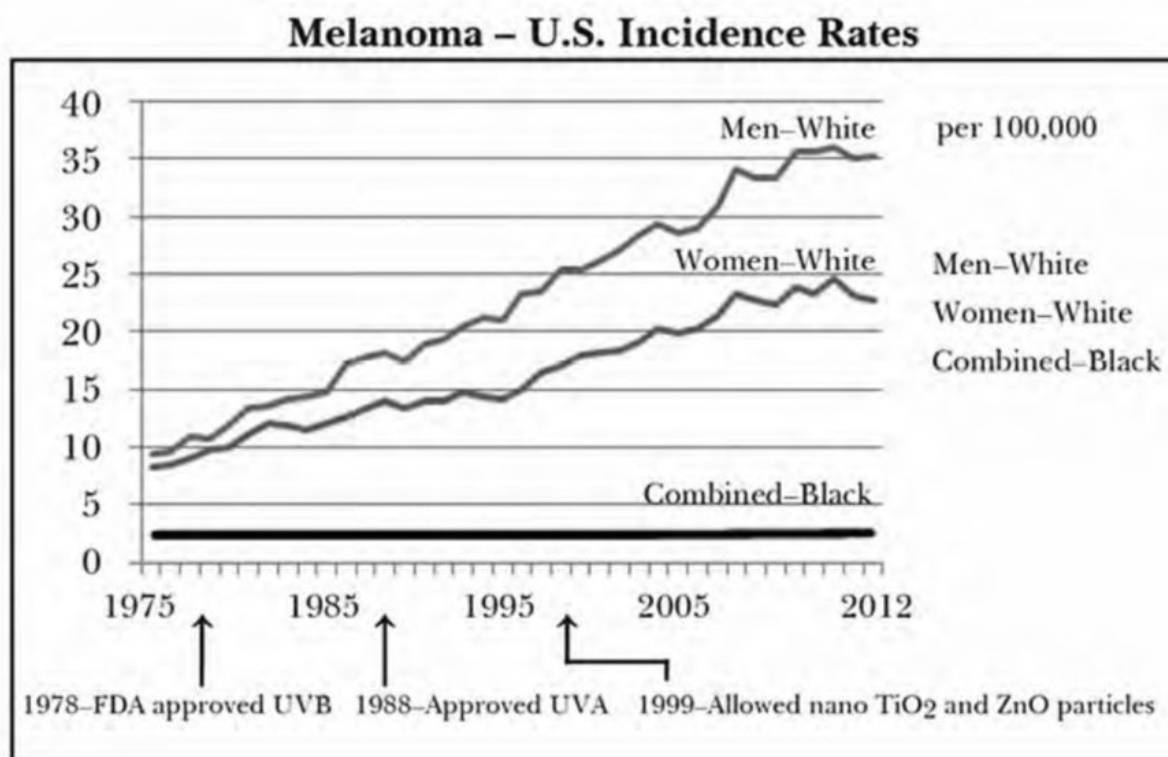


Figure 1: Source: Plourde E, Plourde M. EMF Freedom: Solutions for the 21st Century Pollution (2nd ed.). Irvine, CA: New Voice Publications; 2015.

BODY PENETRATION

BP-3—a substance that “may be absorbed through the skin”—was brought to market as a chemical filter even though its Material Safety Data Sheet (MSDS) states that its toxicological properties have not been fully

investigated and that no data are available regarding carcinogenicity, mutagenicity or teratogenicity [fetal developmental harm]. In “special remarks on chronic effects on humans,” the MSDS states that BP-3 “may

cause adverse reproductive effects.”¹⁴

Multiple studies confirm substantial absorption and distribution of chemical filters such as BP-3, OMC and 4-MBC throughout the whole body.¹⁵ After administration to the skin, BP-3 is detected in the blood of rats within five minutes, with metabolites of BP-3 found in all tissues examined. The liver absorbs the highest amount, followed by the kidney, spleen and testicles.¹⁶ After repeated topical applications, BP-3 accumulates in the blood, liver and brain, creating toxicity to nerve cells (neurons) and astrocytes (cells in the brain that surround neurons to support and insulate them).¹⁷

A study with human volunteers who applied BP-3, OMC and 4-MBC for two weeks detected all three sunscreen chemicals in blood and urine, along with alterations in reproductive hormone levels.¹⁵ Observing the amount of these “estrogenic” sunscreen compounds in the blood, the researchers expressed concern for children who have not reached puberty, because they are more sensitive to low levels of reproductive hormones. Young children are also less able to eliminate drugs and have a larger surface area per body weight than adults, which can result in greater absorption and build-up within their bodies. The researchers concluded that sunscreens “might have adverse effects in children.”¹⁵

In 2012, another group of researchers made similar observations about the risks that sunscreen ingredients pose to children: “Few human studies have investigated potential side effects of UV-filters, although human

exposure is high as UV-filters in sunscreens are rapidly absorbed from the skin. One of the UV-filters, BP-3, has been found in 96 percent of urine samples in the U.S. and several UV-filters in 85 percent of Swiss breast milk samples. It seems pertinent to evaluate whether exposure to UV-filters contribute to possible adverse effects on the developing organs of [fetuses] and children.”⁷ This situation is all the more tragic because chemical filters are fat-soluble (meaning that they can combine with or dissolve into fat); this allows them to cross the blood-brain barrier readily, impairing nerve transmission and producing toxic effects to the nerves.¹⁸

Skin Penetration by UVB Solar Rays

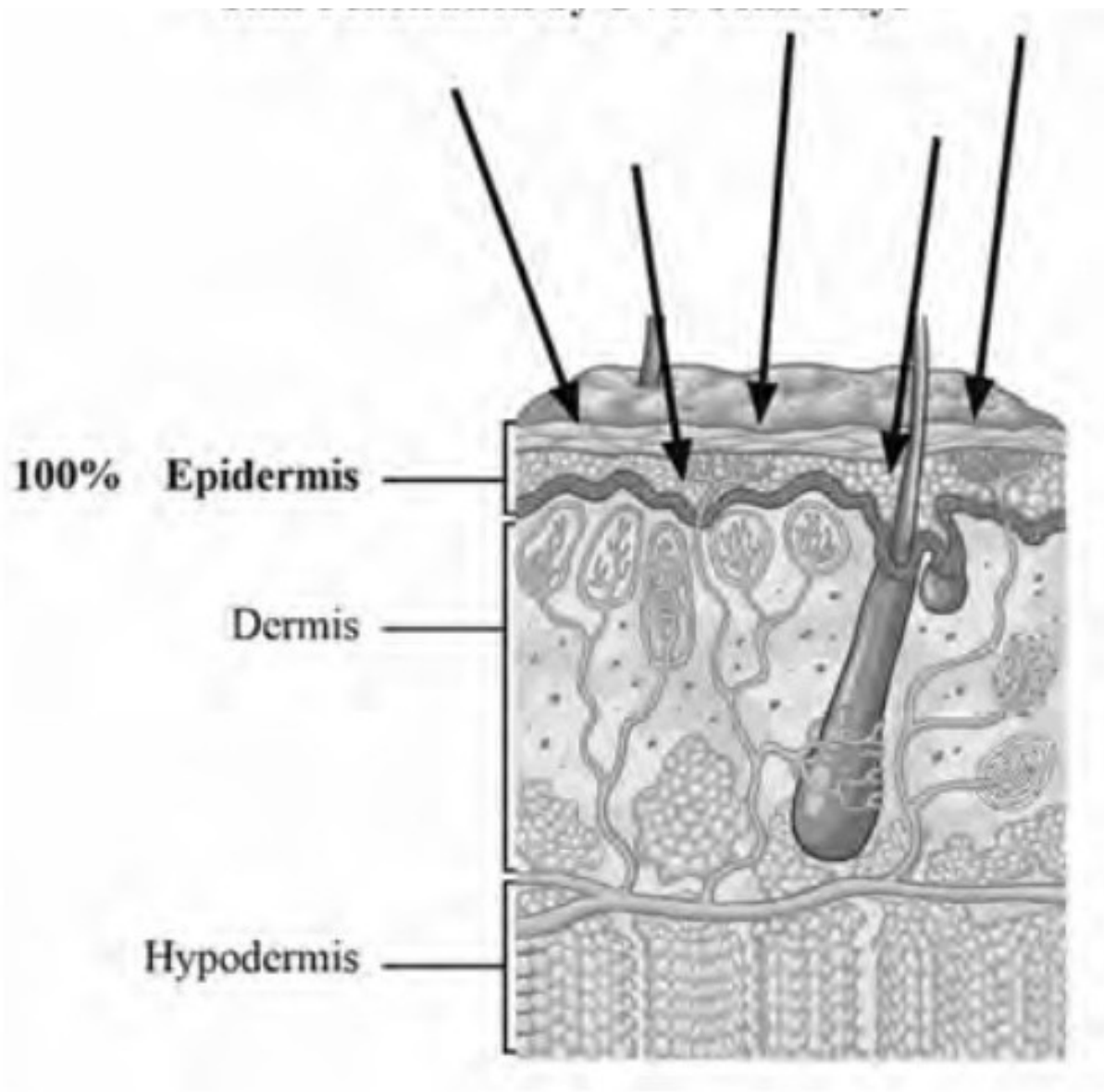


FIGURE 2: Skin Penetration by Ultraviolet B (UVB) Solar Rays

Skin Penetration by UVA Solar Rays

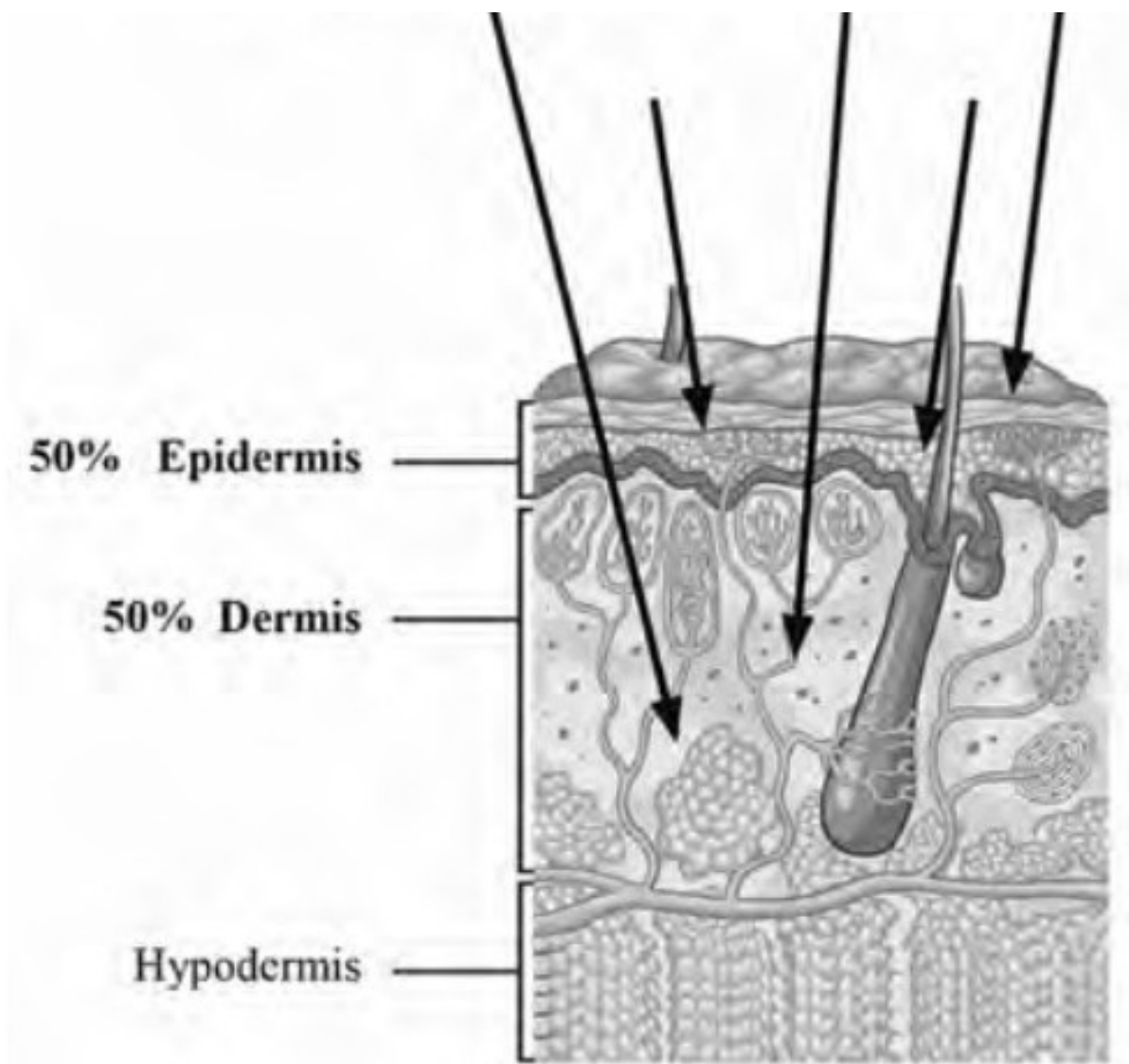


FIGURE 3: Skin Penetration by Ultraviolet A (UVA) Solar Rays

Source: Plourde E. Sunscreens—Biohazard: Treat as Hazardous Waste. Irvine, CA: New Voice Publications; 2011.

NEW RISKS

As if the endocrine-disrupting chemicals (EDCs) were not bad enough, sunscreen manufacturers are now advertising sunscreen formulations as “Kid Safe” if they contain physical filters rather than EDCs. This is a total

misrepresentation of the truth. The two physical filters found in sunscreens—zinc oxide (ZnO) and titanium dioxide (TiO₂)—are both extremely toxic in their own way.

Many individuals are probably familiar with the whitening qualities of zinc oxide and titanium dioxide in their bulk white paste form. In the past, regulators believed that these larger size parent materials were safe. Based on this assumption, in 1999, the FDA approved—without evidence of safety—the use of nanosize and micronized zinc oxide and titanium dioxide particles in sunscreens and other consumer products.

Manufacturers developed these vastly smaller particles to trick the eye and get around the cosmetically unappealing residue left by the bulk white paste. However, subsequent research has showed that both the bulk paste and smaller particles are harmful. A 2015 study that compared titanium dioxide in nanoparticle form to its bulk form found that both created cell membrane damage after just twenty-four hours of application.¹⁹

The definition of “nano” refers to particles less than one hundred nanometers in size (with one nanometer being approximately half the size of a strand of DNA). The term “micro” applies to particles greater than one hundred nanometers. The diameter of a human hair—approximately seventy-five thousand nanometers—is about five thousand times larger than a fifteen-nanometer-in-diameter nanoparticle. Numerous modern products—including paints, papers, foods, toothpaste, makeup and

chewing gum in addition to sunscreens—now contain titanium dioxide and zinc oxide nanoparticles, with skyrocketing exposure over the two decades since the FDA’s approval.

The FDA does not require manufacturers to list the size of the particles present in a given product. Thus, most consumers remain unaware of the presence and potential dangers of the nanoparticles and micronized particles in the sunscreen formulations and other products they are buying, nor are they aware that the tremendous reduction in size makes these particles behave quite differently from larger particles.

In the pictures of a rat's skin cell in Figure 5, the arrows point to dark spots (titanium dioxide nanoparticles) that have penetrated into the cell and into its nucleus, where they are capable of disrupting DNA cell division.

Ironically, given the purpose of sunscreens, the nanoparticles penetrate even more when exposed to UV light.²⁰ The interaction of nanoparticles with UV radiation leads to the generation of free radicals, which are highly damaging molecules on the nanoparticles' surface, with unpaired electrons that damage cells and DNA.²¹ A study that examined "normal conditions of sunscreen use"—which exposed humans with healthy skin to sunscreen products containing zinc oxide nanoparticles for five days "under outdoor conditions"—found that this short period of use resulted in measurable levels of zinc ions in participants' blood and urine, with blood levels that continued to increase even after discontinuing sunscreen use, and higher levels in the blood and urine of women compared to men.²² In addition, when the skin is already damaged (whether from prior sunburn or other physical damage), skin absorption of nanoparticles increases, and nanoparticles also remain in wounded skin.²³

FALSE ADVERTISING

Manufacturers and even some medical experts trusted by the public claim

that some sunscreen formulations use micronized rather than nanosize particles and are, therefore, safe “natural mineral” preparations. Likewise, advertising targeted at health-conscious parents heralds “non-nano” as being safe for kids. Nothing could be further from the truth. It is completely misleading to promote any sunscreen as “non-nano” because the powders used to formulate sunscreens contain both nanosize and micronized particles. Approximately 70 percent of titanium dioxide powder is nanosized, as is about 33 percent of zinc oxide powder. This means that all sunscreen formulations contain nanosize particles. There is no technology that can sort these tiny particles to ensure that only a certain size ends up in any product.²⁴

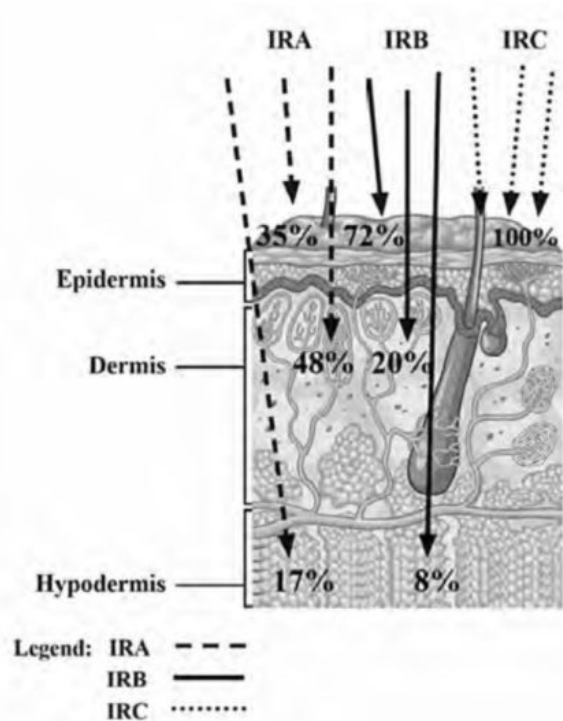


FIGURE 4: Skin Penetration by Infrared (IR) Solar Rays Source: Plourde E. Sunscreens—Biohazard: Treat as Hazardous Waste. Irvine, CA: New Voice Publications; 2011.

Moreover, when you get down to one five-thousandth the diameter of a human hair, the difference between “nano” (at sixty nanometers) and “micro” (at one hundred and sixty nanometers) is meaningless. Studies show that they both cause cellular damage.²⁵ In one study, researchers gave mice either micronized titanium dioxide (one hundred and sixty nanometers) or nanosize titanium dioxide (thirty-three nanometers) and found identical damage, which included increased cell division in the esophagus and colon, increased sperm with two nuclei and increased testicular cell death.²⁶ Both sizes of particles caused DNA damage in bone marrow cells; the micronized particles also caused abnormal cell division in bone marrow cells, and the nanosize particles caused liver cell DNA damage. Determining that the DNA toxicity was due to nanoparticle-induced inflammation and/or oxidative stress, the researchers concluded: “Given the increasing use of TiO(2) nanoparticles, these findings indicate a potential health hazard associated with exposure to TiO(2) particles.”²⁶

GROWING EVIDENCE OF HARM

Another study in mice examined three types of metallic nanoparticles (titanium dioxide, zinc oxide and aluminum oxide), administering oral doses of each for twenty-one consecutive days.²⁷ The researchers observed that this resulted in toxicity to brain nerve cells, with nanoparticles found inside the cells and nucleus, oxidative stress in red blood cells and the liver and disrupted antioxidant enzymes. The zinc oxide nanoparticles were the most toxic, followed by aluminum oxide and titanium dioxide.²⁷ In another study involving hairless mice, application of titanium dioxide nanoparticles over sixty days caused pathological lesions (injury) in the skin, liver and brain and also reduced collagen in the skin,

creating skin aging. The researchers concluded: "Altogether, the present study indicates that nanosize TiO₂ may pose a health risk to human [sic] after dermal exposure over a relative [sic] long time period."²⁸ This proof of long-term damage goes against the claims made by manufacturers that long-term sunscreen use will decrease skin aging.

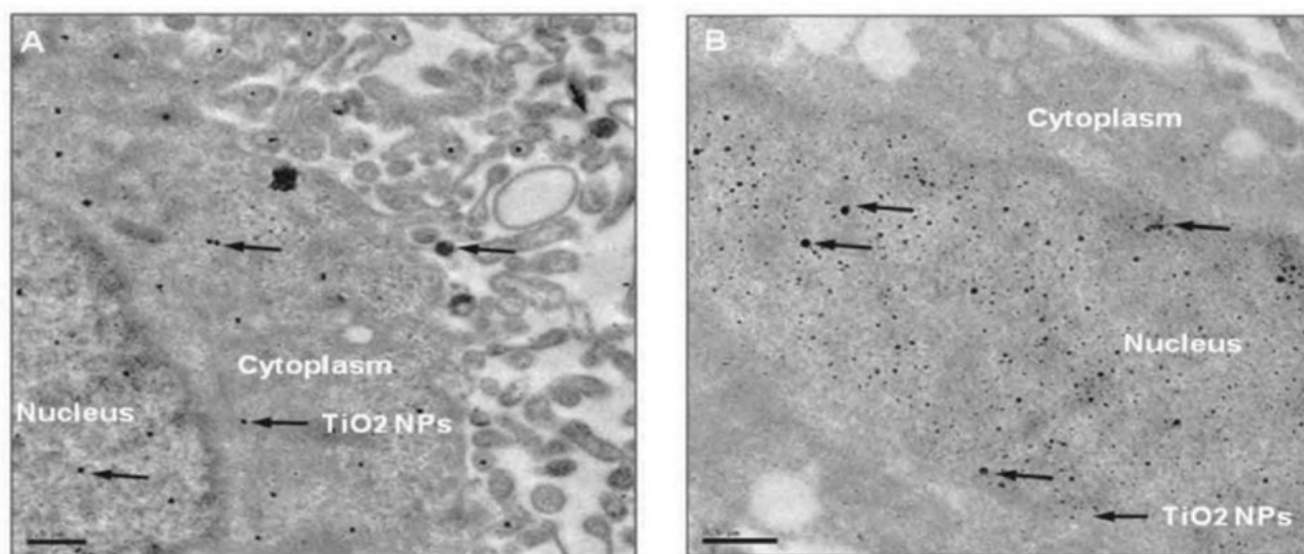


FIGURE 5: Penetration of Titanium Dioxide Nanoparticles into Rat Skin Cell and Nucleus Source: Shukla RK, Sharma V, Pandey AK, Singh S, Sultana S, Dhawan A. ROS-mediated genotoxicity induced by titanium dioxide nanoparticles in human epidermal cells. Toxicol in Vitro 2011;25(1):231-41. [Reprinted with permission.]

SPRAY SUNSCREENS

Sunscreens in spray bottles, promoted as convenient, can be even more harmful, particularly because the products affect innocent bystanders. Inhalation is associated with increased exposure of the brain to zinc

nanoparticles because the olfactory nerves (nose) can directly transport the nanoparticles into the brain.²⁹ Inhaled nanoparticles also cause lung damage, which allows the nanoparticles to travel through the blood to all tissues and organs,³⁰ creating oxidation damage in the brain, lungs, blood, lymph nodes, liver, kidney and spleen.³¹ Those who wish to protect themselves should avoid using any spray sunscreens and should stay away from anyone spraying themselves, as it is carried by the wind and can contaminate everyone in the area.

REPRODUCTIVE EFFECTS

Many published studies have shown that sunscreen chemicals alter and interfere with reproduction. As long ago as 1992, the U.S. government published research that identified body-wide toxicity from the sunscreen chemical HMB (2-hydroxy-4-methoxybenzophenone). Exposing rats and mice to HMB created similar effects whether it was administered topically or orally. The alterations included cellular death, weight gain and damage to both liver and kidney.³² This report on HMB also found that the chemical caused reproductive toxicity, with a lengthened menstrual cycle and decreased sperm count.³²

At least nine studies of titanium dioxide nanoparticles in mice and rats show reproductive harm, including problems that could result in impaired fertility.³³⁻⁴¹ The wide-ranging reproductive effects identified in these studies include increased cell death, premature and inhibited egg development, death of ovary cells, deformed follicle growth, cellular and DNA toxicity, cellular changes in testicular tissue, decreased testicular weight, decreased testosterone, reduced sperm quality, placenta toxicity

and neurotoxicity to neonatal as well as to adult brains.

The fact that titanium dioxide nanoparticles do not leave the body makes their reproductive effects particularly troubling. Females should guard against using products that contain titanium dioxide or other products that potentially contain other nanosize materials such as zinc oxide.

Unfortunately, almost all makeup today contains titanium dioxide nanoparticles. If a makeup or other product has an SPF ranking, it automatically contains one or more of the harmful materials described in this article. In fact, the FDA will not even allow products to be tested for a SPF value ranking unless they contain one of their approved sunscreen chemicals. Women should take care to use only cosmetics that do not have any SPF rating.

FETAL DEVELOPMENT

There is no doubt that sunscreen chemicals are absorbed. It is imperative to study the extent to which they transfer to the fetus and whether and how they interfere with the child's development. Although the placenta has specialized cells to prevent toxins from entering the fetus while it is developing, this protective barrier does not block passage of nanoparticles. A mouse study found that gestational exposure to titanium dioxide nanoparticles significantly impaired placental growth and development.⁴² Another study showed that when pregnant rats were treated with titanium dioxide nanoparticles, the nanoparticles concentrated in the hippocampus of the brains of the rats' one-day-old pups. Moreover, as the pups aged, they demonstrated significant impairment in learning and memory (critical functions that the hippocampus performs).³⁶ Researchers also have

reported that the pups of pregnant mice treated with titanium dioxide developed alterations in their cerebral cortex and olfactory bulb.³⁸ The alterations to the cerebral cortex suggest that titanium dioxide exposure should be considered as a risk factor for autism, as autistic brains show abnormal cellular arrangements in the cerebral cortex.⁴³

Ordinarily, the body is able to counter the oxidation reactions that occur continually throughout the whole body, preventing inflammation in the tissues so that it does not disrupt normal functioning. However, research indicates that titanium dioxide exposure during pregnancy may impair the development of the brain and central nervous system of the offspring, disrupting antioxidation reactions within the brain and altering neurotransmitter functions; this in turn may result in altered neurobehavioral performance and conditions diagnosed as psychiatric.^{44,45} Studies also show that titanium dioxide disrupts the body's ability to perform its continual DNA repair, which is essential to maintain good health. All these alterations of chemicals within the brain cannot help but lead to alterations in behavior.⁴⁶

A Japanese mouse study of maternal exposure to titanium dioxide nanoparticles found significant alterations in one thousand eight hundred and eighty-seven genes in the brains of offspring within the first twenty-one days of development.³⁵ The altered genes were associated with brain development, cell death, response to oxidative stress, brain mitochondria, inflammation and neurotransmitters. The study's results suggest that exposure to nanoparticles in pregnancy "can alter gene expression in the neonatal period and might cause the onset of psychiatric disorders even in adulthood," particularly since the genes in question are involved in

disorders including autism, anxiety disorders, Alzheimer's disease, attention deficit hyperactivity disorder (ADHD), blood-brain barrier alterations, epilepsy, mitochondrial disease, Parkinson's disease and schizophrenia.³⁵

Sunscreens with endocrine-disrupting chemical filters also have developmental and long-term implications. A study that analyzed maternal blood, amniotic fluid, cord blood and fetal blood detected several benzophenones (BP-1, BP-3, and 4-MBP) in the amniotic fluid, cord blood and fetal blood,⁴⁷ showing that EDCs "get through" to the developing fetus. Moreover, the benzophenones being incorporated into our bodies are creating multigenerational health effects. Researchers who looked at levels of BP-3 in maternal urinary samples found that more BP-3 in the pregnant mother's urine correlated with increased overall weight and head circumference of male babies.⁴⁸

The endocrine-disrupting chemicals found in sunscreens alter both hormonal and non-hormonal pathways and their metabolism. Being fat-soluble, they are easily deposited in tissues, where they create a situation of prolonged accumulation and release, even when there is no more exposure. Disturbingly, when benzophenones get through to the developing fetus, they disrupt key stages of maturation and formation of the reproductive system's regulatory mechanisms.⁴⁹ Cinnamates such as OMC and camphors such as 4-MBC, as well as the sunscreen preservative

propyl paraben, all show estrogenic activity in fish. Male fish show estrogenic markers and are no longer completely male or completely female, which has led researchers to call them "intersex" fish.⁵⁰

Many young people today are stating that they are confused as to their sexual orientation. It is no wonder! The use of estrogenic and anti-testosterone sunscreen chemicals for the last forty years could be one reason that males and females are experiencing gender identity confusion in ever greater numbers. It is known that testosterone secreted by fetal testicles plays a key role in the permanent organization of the developing central nervous system toward masculine patterns.⁵¹ This means that males exposed to these chemicals in utero are subject to disruption of the development of normal masculine character traits. And not only are fetuses exposed to strong chemicals capable of altering natural sexual patterning, but the exposure to these estrogenic and anti-testosterone chemicals then continues throughout their lives.

AVOIDANCE IS THE BEST SOLUTION

Sunscreen chemicals create many life-altering changes. The bottom line is that, following decades of using sunscreens with substances that were never safe to begin with, we now have sunscreens that have been made even more unsafe with the inclusion of tiny particles that more easily penetrate the skin and tissues, making them even more biologically reactive. Brought to market without proper testing for safety, the minute size of nanoparticles also makes it difficult to measure them and document the damage. A study published in 2013 stated that notwithstanding their “wide scale” of use “in the world consumer market,” the “potential hazards on humans [of zinc oxide nanoparticles] remain largely unknown.”⁵² This has left many unanswered questions regarding nanoparticle safety. Manufacturers have taken advantage of this perceived

uncertainty to continue promoting their products as “safe.” The reality is that there is plenty of proof of harm—including experimental evidence of damage to cells and animal model evidence of damage to lab animals—indicating that reduced-size titanium dioxide and zinc oxide should be banned.

Although articles have described hormone disruptions from endocrine-disrupting chemicals for decades—and new studies keep revealing the same harm—they have not attracted adequate attention. By ignoring this evidence, we have created whole generations that feel uncertain regarding their maleness or femaleness. Fortunately, information about the risks of endocrine-disrupting sunscreen chemicals is finally starting to encourage the public to stay away from sunscreens with chemical filters. To date, the public is less aware of the vast amount of research showing that sunscreens containing titanium dioxide and zinc oxide nanoparticles can be just as detrimental as those containing endocrine-disrupting chemicals.⁵³ Some investigators are starting to recommend that women avoid products containing titanium dioxide nanoparticles during pregnancy,⁴² but because the nanoparticles are difficult to remove from the body, it would be far better to avoid any exposure at all.

Many studies prove that antioxidant foods and supplements prevent and reverse the oxidation damage that solar radiation can create. A 2018 article is even titled, “Natural antioxidants: multiple mechanisms to protect skin from solar radiation.”⁵⁴ The solar radiation protection that antioxidants provide is also proven by the testimonies of people who go into the sun after taking in high amounts of antioxidants and report their skin does not even turn color—even those who have extremely white skin. Chapter 17

("Antioxidants: Mother Nature's Protective Sunscreens") in my first book¹ goes into more detail about antioxidant foods, how they interact and their degree of potency.

My new book, *Sunscreens—Biohazard II: Proof of Toxicity Keeps Piling Up*, will describe numerous ways in which sunscreens are affecting all life on the planet. Topics include ecological harm; swimming pools as toxic chemical dumps; synergistic toxicity of sunscreen chemicals and other chemicals; sunscreen chemicals' generational toxicity (comparable to that of DDT); sunscreen chemicals in the fish we eat; sunscreens' ability to breach the body's protective barriers; and the role of sunscreen chemicals in the obesity epidemic.

SIDEBARS

INGESTABLE NANOPARTICLES

Consumers should be on the lookout for food-grade titanium dioxide nanoparticles in foods—something else the FDA has seen fit to approve. The food industry uses food-grade nanosize titanium dioxide as a food additive because it enhances the color of white foods like puddings. Discussing the presence of titanium dioxide particles in white-colored seafood and fish products, researchers have warned of toxicity to the gastrointestinal tract:

Together, these results show relatively high concentrations of TiO₂ particles in some seafood and surimi (fish paste) products available in the market, and our findings therefore call for attention on TiO₂ particle

exposure and uptake through daily foods.⁵⁵

WIDE-RANGING HEALTH EFFECTS

There is substantial evidence that sunscreen chemicals have an impact on the entire body.⁵⁶ The changes these chemicals create are now rampant in society, linked to illnesses affecting numerous body systems.

ADULT NEUROLOGICAL DISORDERS: Adult (and especially older adult) mice exposed to zinc oxide nanoparticles have inflammatory responses in the blood and brain, increased oxidative stress levels, impaired learning, impaired memory and pathological changes in the hippocampus. Studies also show that titanium dioxide nanoparticles accumulate in critical parts in the brain, including the hippocampus, which could induce neurodegenerative diseases such as Alzheimer's.^{57,58} The hippocampus is especially important as it regulates emotions and is the primary area of memory and learning, consolidating our short-term to long-term memory.⁵⁹ It is time to look at sunscreen use as one reason for the difficulty with memory that is afflicting a growing proportion of the population.

HEART-RELATED EFFECTS: Titanium dioxide-containing sunscreens also cause harm to the heart, including heartbeat irregularities.⁶⁰ Titanium dioxide is also in many other consumer products. Those experiencing

heart palpitations (including young girls who are starting to use makeup) should check all products to see whether they contain titanium dioxide.

DIABETES: Sunscreen use is linked to diabetes in several ways. Type 1 diabetes is connected to lower exposure to sunshine leading to less vitamin D₃.⁶¹ Zinc oxide nanoparticles can alter blood sugar regulation,⁶² and titanium dioxide nanoparticles have been found by the billions in the pancreas of those with type 2 diabetes, compared with nondiabetic individuals.⁶³

BREAST CANCER: The estrogenic effects of the endocrine-disrupting chemicals in sunscreen can contribute to breast cancer cells multiplying and metastasizing.⁶⁴ Stopping use of chemicals that promote the growth and spread of breast cancer cells would be a great place to focus breast cancer prevention campaigns.

LIVER, THYROID AND IMMUNE FUNCTION: Titanium dioxide has been implicated in problems with the liver, thyroid (low T3 and T4) and immune function.^{62,65}

LEAKY GUT: Many people are suffering from leaky-gut-related conditions, including individuals on the autism spectrum. Inhaled zinc oxide nanoparticles have been shown to disrupt the normal bacterial flora in the gut and create permeability in the intestinal lining, which leads to leaky gut.⁶⁶ This is one of the key factors that makes these particles so harmful. It is false to state that zinc oxide sprays are safe for children.

MITOCHONDRIAL DYSFUNCTION: Over the last several decades, there has been a tremendous increase in diseases that exhibit mitochondrial dysfunction. Zinc oxide has been shown to alter the ability of the

mitochondrial membrane to create the energy the body requires to maintain health.⁶²

DEPRESSION: Titanium dioxide nanoparticles entering the brain can trigger mental health effects. One group of researchers concluded that “Exposure to [titanium dioxide nanoparticles] in fetal life induces changes that could lead to depressive-like behaviors in adulthood.”⁴⁴

DNA DAMAGE: Zinc oxide nanoparticles have been associated with DNA damage to hundreds of genes, including breaks, deletions, rearrangements, additions and disruption of the body’s natural ability to repair damaged DNA.^{67,68}

IMPAIRED DETOXIFICATION: Nanoparticles disrupt the MTHFR gene, leading to changes in DNA methylation that reduce the body’s ability to detoxify chemicals.⁶⁹ Many individuals diagnosed with MTHFR alterations are having difficulty maintaining their health.

THE MULTIPLE HEALTH BENEFITS OF VITAMIN D

The sun makes your skin produce your own very beneficial vitamin D₃, which performs many functions. When D₃ levels are low, it can result in bone loss, hair loss, bone and back pain, muscle pain, impaired wound healing, obesity, frequent infections, depression and fatigue. Researchers have also observed that the benefits of sun exposure go beyond

production of vitamin D and include “other physiological responses to sunlight, still inadequately explored, including release of nitric oxide, production of beta-endorphin, and regulation of circadian rhythms—all

important components of life-long vibrant health and well-being.”⁷⁰

Another critical function that sunshine on our skin performs is to catalyze the formation of cholesterol sulfate. Among the many important roles of cholesterol sulfate are the stabilization of red blood cells and the reduction of plaque formation in the arteries. Dr. Stephanie Seneff’s book *Cindy and Erica’s Obsession to Solve Today’s Health Care Crisis* provides detailed descriptions of the many ways cholesterol sulfate supports health.⁷¹

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About Elizabeth Plourde, CLS, NCMP, PhD

Elizabeth Plourde, CLS, NCMP, PhD, is a clinical laboratory scientist and NAMS certified menopause practitioner. Her education has been augmented by invaluable experience working with cutting-edge medical research laboratories. Applying this knowledge and background, her research is devoted to hormone interactions and toxins that interfere with

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