Nanomaterials

Insoluble nanoparticles in cosmetic products are essentially used as UV-filters or preservatives.Nanoparticles alter properties of cosmetic products including color, transparency, solubility and chemical reactivity.[4] It is unclear to what extent insoluble nanoparticles are used in cosmetic products.

WHAT ARE NANOMATERIALS?

There is not a legal definition for nanomaterials. Typically, they are defined as purposely engineered materials with at least one dimension between 1 and 100 nanometers, which is about 1/8000 the width of a human hair.[1] At this size, materials begin to exhibit unique properties that affect physical, chemical, and biological behavior.[2] There is no single type of nanomaterial. They can differ with respect to composition, primary particle size, shape, surface coatings and strength of particle bonds.[3]

Nano-sized particles exist in nature and can be created from a variety of elements and compounds, such as carbon or silver. Most nanoscale materials are too small to be seen with the naked eye or conventional lab microscopes.[5]

Some nanomaterials are referred to as engineered nanomaterials (ENMs) which are used to design pharmaceuticals, electronics, and can be added to cloth or other materials to make them stronger yet lighter.[6]

Found In

- Deodorants
- Toothpastes
- Shampoos
- Lotions
- Foundation
- Anti-aging creams
- Nail polish.

What to look for on the label

- Fullerenes
- Micronized zinc oxide
- Nano zinc oxide
- Micronized titanium dioxide
- Micronized quartz silica

Health Concerns

Studies have indicated that low solubility nanoparticles tend to be more toxic than larger particles of the same material.[7] However, we know very little about the potential effects on human health and the environment due to research gaps related to nanoscale materials.

Exposure to nanomaterials may happen through the skin[8] or inhalation. The skin may be permeable to nanomaterials of different shapes and properties. Short-term inhalation may lead to exposures that are retained in the lung and other organs after six months.[9][10]

There is evidence that following nasal inhalation some nanoparticles may reach the brain.[11][12] Iridium nanoparticles circulating in blood can cross the blood-brain barrier.[13][14] Several in vivo studies have shown that inhaled ultrafine particles can pass into the circulation.[15][16][17][18]

Inhalation of nanomaterials may lead to inflammation and oxidative stress.[19][20][21] The molecular charge of nanoparticles may play a role in body's response to inhalation exposure.[22]

Some minerals become invisible but still absorb UV radiation at the nanoscale. These UV-filtering substances are increasingly used for broad-band sun protection including UVA radiation.

Titanium Dioxide (TiO2): TiO2 nanoparticles may be more toxic than larger particles of TiO2, which pose few health hazards.[25][26] Many studies have found that non-nanoized TiO2 used as a mineral UV-filter in sunscreen cosmetic products does not penetrate healthy skin and poses no human health risks from skin exposure.[27][28][29][30] However, rats and mice exposed to nanoized TiO2 (normally <100 nm) experience significant lung inflammation[31][32][33] and DNA damage.[34] This raises concerns that human inhalation of TiO2 could also lead to adverse health effects.

Zinc Oxide (ZnO): Studies have found that even low concentrations of ZnO may lead to damage in human epidermal cells.[35] Yet, a review of the risks of nano-structured TiO2 and ZnO found nanoized TiO2 and ZnO are not likely to penetrate the skin due to how they are bound. The researchers concluded both materials are safe to use as UV filters.[36]

Silver: Nanoized silver may lead to oxidative stress and resulting cell damage.[37] Silver nanoparticles have shown toxic effects on the male reproductive system. Research suggests that nanoparticles cross the blood-testes barrier where they can be

deposited into the testes with the potential for adverse effects on sperm cells.[38] Studies have shown silver nanoparticles can bind to different tissues and can cause a number of toxic effects that gradually lead to cell death.[39]

Fullerenes: Fullerenes are carbon tubes sometimes used in anti-aging and eye creams.[40] Fullerenes may penetrate into the top two layers of the skin (the epidermis and dermis).[41] They also make the skin unusually sensitive to light, leaving cells vulnerable to the effects of UV light exposure.[42][43]

Silica: Nanoized silica may lead to pregnancy complications when injected intravenously into pregnant mice. It also appears nanoized silica can cross the placenta, leading to deposits in the fetal liver and fetal brain.[44] Ultrafine crystalline silica (SiO_2) nanoparticles induce cell damage leading cell mutations and cancer cells with two nuclei in human in vitro cells.[45]

Carbon Black: Ultrafine carbon black particles may alter genes in lung cells, lead to inflammation and inhibit the growth of cells that line the circulatory system. [46][47] Research suggests nanosized carbon black may lead to mutations in the lung cell of rats exposed 15 months earlier.[48]

Vulnerable Populations

Workers (https://www.safecosmetics.org/population/workers/)

Regulations

FDA monitors the use of nanotechnology and the use of nanoscale materials in cosmetics, but does not ban nanomaterials.[49] The European Commission prohibits the use of zinc oxide as a UV filter.[50]

How to Avoid?

Research has shown nanoized particles can be potentially harmful when inhaled. Avoid loose cosmetic powders and aerosol sunscreen products that contain nanoized TiO_2 or ZnO. Don't forget to check the ingredient labels of your personal care products.

Explore other Chemicals

Butylated Compounds (https://www.safecosmetics.org/chemicals/butylated-compounds/)

Lead And Other Heavy Metals (https://www.safecosmetics.org/chemicals/lead-and-other-heavy-metals/)

Triclosan (https://www.safecosmetics.org/chemicals/triclosan/)

Benzophenone & Related Compounds (https://www.safecosmetics.org/chemicals/benzophenone/)

Resorcinol (https://www.safecosmetics.org/chemicals/resorcinol/)

PABA (https://www.safecosmetics.org/chemicals/paba/)

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