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Perfumes and Lotions Interfere with Your Body's Pollution Defense

Analysis by Dr. Joseph Mercola | July 22, 2025

STORY AT-A-GLANCE

- Your body is surrounded by an "oxidation field" made of reactive hydroxyl molecules (OH). This protective layer helps break down harmful pollutants in the air before they reach your lungs or enter your body through the skin
- Nearly 90% of U.S. adults use personal care products daily, but these items release airborne compounds that disrupt your body's natural chemical shield
- Even "fragrance-free" lotions contain chemicals that make the skin's natural ozone shield become less than half as effective
- Personal care product chemicals concentrate around your face and chest, creating highly reactive zones that rapidly deplete protective radicals in your breathing space
- To reduce your exposure to these compounds, switch to safer alternatives like essential oil-based scents, natural deodorizers like baking soda, and single-ingredient moisturizers such as coconut oil

Nearly 90% of adults in the United States use personal care products daily,[1] routinely applying lotions, perfumes, deodorants, and aftershaves without a second thought. Most people assume these products simply enhance their scent, moisturize their skin, or improve how they feel throughout the day.

However, what few realize is that these everyday items may have unseen effects on your health and immediate surroundings. Once you use these products, their chemical ingredients don't just stay confined to your skin. They evaporate into the air and interact with the environment around you.

A new study from Penn State reveals that these airborne compounds disrupt a natural chemical shield your body depends on to neutralize harmful pollutants, while also altering the composition of the air you breathe indoors. These findings reveal a largely overlooked aspect of how modern hygiene products influence your personal exposure to pollution.[2]

How Personal Care Products Disrupt Your Chemical Pollution Shield

The featured study, published in the journal Science Advances,[3] explored the impact of common personal care products, particularly perfumes and fragrance-free lotions, on the chemistry of the human oxidation field, a protective layer formed by reactive hydroxyl radicals (OH) around the human body.

This oxidation field results from ozone interacting with skin-emitted compounds, generating OH radicals essential for neutralizing airborne pollutants. While "radicals" often sound harmful, OH radicals in this context are beneficial as they help break down toxic chemicals before they enter your body.

- **"Fragrance-free" doesn't mean chemically harmless —** One key finding from the experiment involved volunteers applying a common fragrance-free body lotion containing **linoleic acid (LA)**. Researchers reported that the lotion dramatically reduced the generation of 6-MHO, a molecule your skin normally produces when ozone reacts with skin oil called squalene.

  The lotion thinned out the skin's natural oils and thus substantially decreased the ozone-skin reaction, causing a 34% drop in 6-MHO levels compared to baseline conditions without lotion use. As a result, it reduced the available OH radicals,

which weakened the protective oxidation field.

- **The lotion significantly changed the skin's chemical balance —** After applying lotion, airborne chemicals used up the skin's protective OH radicals by as much as 170%, while the amount remaining on the skin dropped by up to 140%. This means the skin's natural ozone defense became less than half as effective, since the protective OH molecules escaped into the air instead of staying on the skin to neutralize pollution. The researchers explained:

  > *"The main cause of the higher OH reactivity is the emission of phenoxyethanol from the lotion, which, in the first few hours, contributes to ~54% of the total reactivity in the presence of O_3 [ozone] and to more than 60% in the absence of O_3.*
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  > *As the emission of phenoxyethanol and its gas-phase concentration decrease over the next 2 hours, the contribution of the lotion to the total OH reactivity decreases to ~25% in the presence of O_3 and ~40% in the absence of O_3."*[4]

- **Perfumes overwhelmed the body's ability to maintain a chemical shield —** The researchers tested a common perfume made with ethanol and plant-based compounds called monoterpenes. Although monoterpenes help form protective OH radicals when they react with ozone, the overwhelming amount of ethanol in the fragrance canceled out that effect.

  As soon as participants applied the perfume indoors, ethanol levels in the air around them shot up to thousands of parts per billion. This surge caused a steep spike in OH reactivity, rapidly depleting available OH radicals and drastically reducing their concentration by as much as 86% compared to normal, fragrance-free conditions.

- **Fragrance use releases more ethanol than crowds —** Fragrance use caused indoor ethanol levels to spike to nearly 4 parts per million (ppm), while monoterpenes barely reached 11 parts per billion (ppb). Ethanol made up over 99% of all detected

volatile compounds. To put that in perspective, the air in a packed soccer stadium full of beer drinkers only reached 400 ppb — about one-tenth the ethanol released by a single fragrance spray.

- **Ethanol-free fragrances had minimal effect —** The researchers tested a simplified fragrance containing only linalool (a natural scent compound). They found that without ethanol, this fragrance had a much smaller impact, reducing protective OH radical levels by less than 10%. This shows that ethanol, not the scent ingredients themselves, is mainly responsible for weakening the skin's chemical defense.

- **Personal care products disrupt protective chemistry near breathing zones —** The researchers further visualized how personal care products altered the human oxidation field spatially and found that when lotion was applied, its volatile ingredients concentrated around the face and chest area.

  Similarly, fragrance use created highly reactive zones immediately above participants' heads. This matters because these are the areas closest to your breathing zone. With fewer OH radicals present, more pollutants can enter your lungs and bloodstream unfiltered.

- **Together, the effects of lotion and fragrance spray are even worse —** Nora Zannoni, lead author of the study and a researcher at the Institute of Atmospheric Sciences and Climate in Bologna, noted:

  > *"The application of a fragrance and a lotion together showed that fragrances impact the OH reactivity and concentration over shorter time periods, whereas lotions show more persistent effects, consistent with the rate of emissions of organic compounds from these personal care products."*[5]

With nearly 90% of your time spent indoors, making safer choices is more important than ever for your long-term health. Learn more about the importance of maintaining safe indoor air in "**Just How Bad Is the Air Inside Your Home, and What Can You Do About It?**"

Broader Health Risks from Personal Care Product Compounds

Beyond disrupting the natural protective air shield around your body, ingredients in perfumes, lotions, as well as other personal care products are linked to a wide range of health effects. A review published in the Journal of Dermatology and Cosmetology detailed the many ways these chemical exposures harm human health, especially when used regularly:[6]

- **Contact dermatitis —** This skin condition occurs in two primary forms — allergic and irritant. Allergic contact dermatitis is a delayed reaction appearing hours or days after exposure, characterized by red, inflamed, and itchy skin. Irritant contact dermatitis results from repeated contact with substances that cause immediate skin irritation, leading to rapid inflammation and rashes.

- **Contact urticaria (hives) —** Urticaria is marked by itchy, raised welts on the skin, often triggered by fragrance allergens. Sometimes, contact urticaria progresses into angioedema, a deeper swelling of the skin that causes pain and warmth. In severe situations, exposure escalates rapidly into anaphylaxis, a life-threatening allergic response.

- **Phototoxicity —** Phototoxic reactions occur when specific chemicals become reactive upon exposure to sunlight, resulting in severe, sunburn-like skin damage. Phototoxic substances like furocoumarins absorb ultraviolet (UV) radiation, leading to immediate cell damage and long-term skin discoloration or burn-like injuries.

- **Photoallergy —** Photoallergic reactions are less common and involve an immune response following repeated exposure to both a chemical and sunlight. Unlike phototoxicity, these immune-driven reactions result in persistent skin irritation and discoloration. Personal care products containing photosensitizing ingredients, as well as certain medications, often trigger photoallergic reactions.

- **Cancer —** Chemicals like phthalates, benzene derivatives, and formaldehyde-releasing preservatives enter your body through the skin or inhalation. They disrupt hormone pathways, increasing the risk for hormone-related cancers. Moreover,

certain fragrance chemicals bioaccumulate in your body, raising long-term exposure risks and leading to cellular changes associated with cancer development.

- **Reproductive problems —** Chemicals in fragrances have been associated with fertility issues, menstrual irregularities, and various reproductive and thyroid health concerns. Products like bubble baths or scented shower gels, especially when used near sensitive areas, also heighten the risk of infections, hormonal disruptions, and even cancers affecting reproductive organs.

- **Lung diseases —** Airborne chemicals from powdered cosmetics and scented products can harm lung tissue with repeated exposure. Fine particles like those in talcum powder have been shown to trigger allergies, worsen asthma, and promote ongoing respiratory inflammation, especially in people with preexisting sensitivities.

- **Headaches and neurological effects —** VOCs trigger headaches, dizziness, and nausea. For individuals susceptible to migraines, exposure to these compounds often significantly exacerbates symptoms, leading to chronic headaches and long-term neurological disturbances.

Freshen Yourself and Your Space with Safer Alternatives

If perfumes and lotions disrupt your body's natural pollution defenses, the solution isn't to give up on hygiene — it's to make smarter choices. Keep in mind that what you put on your skin ends up in your body. So, the fewer synthetic chemicals your skin has to process, the better off your entire system will be. If you're aiming to reduce your exposure, the good news is you have better options.

- **Choose essential oil-based scents instead of synthetic fragrance —** Natural products scented with essential oils like lavender, citrus, eucalyptus, rosemary, or sandalwood offer a safer way to stay fresh. Their scent may be lighter, but they don't come with synthetic chemicals, which means they're easier on your skin and lungs.

- **Use natural deodorizing ingredients that work with your body —** Baking soda, activated charcoal, witch hazel, tea tree oil, coconut oil, and aloe vera all help control odor without flooding your skin with reactive chemicals. For more on using these options, check out my article, "How to Make a Natural Odor Eliminator."

- **Swap commercial lotions for safer moisturizers —** Choose single-ingredient alternatives such as tallow balm or cold-pressed coconut oil. These provide deep hydration without altering your skin's natural chemistry. They're especially effective when applied to damp skin after bathing.

  If you prefer a lighter feel, look for aloe vera gel or unscented glycerin-based moisturizers that rely on natural humectants. These options draw moisture into the skin without blocking its natural ozone defense.

- **Don't trust the label — read the actual ingredients —** Buzzwords like "phthalate-free," "unscented," or "natural" may be useful starting points, but they're not guarantees. Some products still sneak in chemical preservatives or list "fragrance" as a catch-all term for undisclosed synthetic blends. If you're trying to lower your exposure, scan the full ingredient list and skip anything that doesn't spell it out clearly.

For more on how synthetic scents pollute your air and harm your health, see "The Dangers of Inhaling Petrochemical Fragrances and Scented Products."

How to Protect Your Health Against Air Pollution

Once your skin's protective chemistry has been compromised by lotions or fragrances, your body becomes more vulnerable to pollution from both inside and outside your home. To address this, you need to limit your exposures and create an environment that supports recovery. Here are strategies to help protect your health and reinforce your body's natural defenses against air pollution:

- **Purify your indoor air to reduce the burden on your skin —** Use a HEPA-equipped air purifier in your home to reduce the load of airborne pollutants your compromised defenses can no longer neutralize. Run it continuously and change filters as recommended, especially if you've recently used scented products.
- **Limit outdoor exposure during peak pollution hours —** Monitor air quality apps and avoid going outside during high traffic times or smog alerts. Plan walks, exercise, and errands for times when pollution levels are lower and your skin has had time to restore its natural barrier.
- **Ventilate only when outdoor air is clean —** Avoid opening windows when outdoor air quality is poor. Instead, open your windows for at least 15 minutes a day when the outside air is clean, such as during early morning or late evening, and use fans or filtered ventilation systems that limit particle entry.
- **Create a clean-air recovery zone in your bedroom —** While you sleep, your body works to repair and restore itself, making clean air essential to that process. Support overnight recovery by removing or frequently cleaning rugs that trap dust and chemicals, choosing bedding made from organic cotton, and running a high-quality air purifier next to your bed throughout the night.

For more tips on how to reduce indoor air pollutants, read "**The Importance of Reducing Indoor Pollution**."

Frequently Asked Questions (FAQs) About the Effects of Personal Care Products

Q: What is the "human oxidation field," and why is it important for health?

A: The oxidation field is a zone of reactive hydroxyl (OH) radicals that forms around your body when skin-emitted compounds like squalene interact with ozone in the air. This invisible chemical shield helps neutralize pollutants before they enter your body

through inhalation or skin contact. Disrupting this field, such as by using fragranced or chemical-laden products, leaves you more vulnerable to air pollution and its health effects.

Q: How do personal care products interfere with the oxidation field?

A: When you apply lotions or perfumes, they release volatile organic compounds (VOCs) into the air. Ingredients like ethanol and phenoxyethanol either outcompete or consume OH radicals, dramatically reducing their presence. This weakens your oxidation field and leaves your body less equipped to break down harmful air pollutants.

Q: What happens when lotion and perfume are used together?

A: Combining both leads to a compounded effect. Perfume causes a sharp, short-term spike in OH reactivity (meaning it rapidly uses up the protective OH radicals, leaving fewer available to neutralize pollutants), while lotion has a slower but more persistent suppressive effect. Together, they drastically weaken your oxidation field over both the short and long term, especially around your breathing zone.

Q: Do fragrance-free products still disrupt your body's pollution defenses?

A: Yes. "Fragrance-free" does not mean chemically neutral. In the Penn State study, a common fragrance-free lotion containing phenoxyethanol and linoleic acid lowered the number of protective molecules and sped up their breakdown, causing nearly as much harm as strong perfumes.

Q: How can I reduce my daily exposure to harmful chemicals in lotions and perfumes?

A: Start by switching to products with short, transparent ingredient lists. Look for moisturizers made from single-ingredient oils like cold-pressed coconut oil or tallow balm. For scent, choose essential oil-based sprays that don't contain ethanol, phenoxyethanol, or synthetic "fragrance" blends.

In the study, a simplified fragrance made with just linalool (a natural essential oil component) had a minimal impact on protective OH radicals, causing less than a 10% drop, compared to conventional perfumes that caused up to an 86% reduction.

Sources and References

- [1] Front Public Health. 2024 Aug 26;12:1439027
- [2, 3, 4] Sci. Adv.11,eads7908(2025)
- [5] News Medical Life Sciences, May 27, 2025
- [6] Journal of Dermatology and Cosmetology. 2020;4(2): 42-44