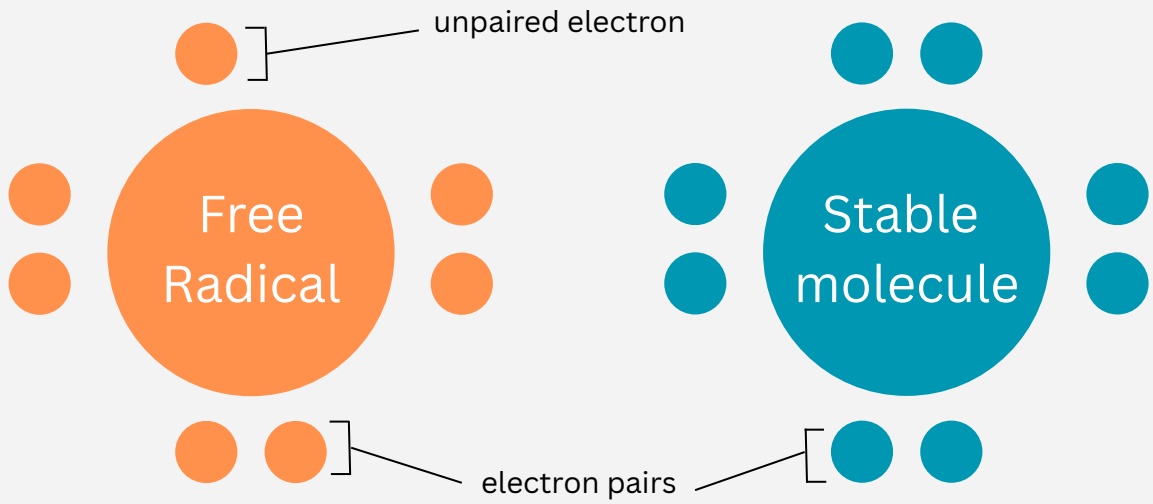
OXIDATIVE STRESS & FREE RADICALS

Oxidative stress is a major process involved in premature skin aging and overall skin damage. While the term can sound complicated, the concept is actually very simple. Throughout daily life, the body is exposed to unstable molecules called free radicals. These molecules are naturally created through normal body processes, but they are also heavily influenced by environmental and lifestyle factors like UV exposure, pollution, smoking, stress, poor sleep, and inflammation.

Free radicals are unstable because they are missing an electron. In order to stabilize themselves, they "steal" electrons from healthy cells in the body, including skin cells. This creates a chain reaction of cellular damage known as oxidative stress. Over time, this stress weakens important structures in the skin like collagen, elastin, and the skin barrier, contributing to visible aging and reduced skin health.



When a free radical steals an electron, it doesn't do it cleanly or harmlessly. The molecule it steals from often becomes structurally damaged or altered in the process.

A free radical is like someone ripping a brick out of a wall to fix their own wall. Yes, their wall becomes stable again, but now the other wall has been weakened or damaged. Then, the weakened wall steals from another wall, spreading the damage further.

In the skin, the molecules being "stolen from" are things like:

- collagen proteins
- elastin fibers
- cell membranes
- DNA
- lipids in the skin barrier

So even though the number of unstable molecules may not dramatically increase at that exact moment, the quality and integrity of this vital tissue progressively worsens.

Oxidative stress isn’t just about “unstable vs stable.” It’s about how much tissue damage occurs while instability is being passed around and whether the body can keep up with repairing it.

In the skin, oxidative stress can show up in many ways. It contributes to fine lines, loss of firmness, uneven tone, dullness, dehydration, and inflammation. It also accelerates the breakdown of collagen and elastin, which are responsible for keeping the skin firm and resilient. When oxidative stress becomes chronic, the skin’s ability to repair itself slows down, making it more vulnerable to both aging and irritation.

One of the biggest contributors to oxidative stress in the skin is UV exposure. Sunlight generates a large amount of free radical activity in the skin, which is why daily sunscreen use is one of the most important anti-aging habits overall. Pollution, smoking, chronic stress, poor diet, and lack of sleep can also increase oxidative stress internally and externally, creating ongoing strain on the skin’s repair systems.

The body does naturally have defense systems against free radicals through substances called antioxidants. Antioxidants help neutralize free radicals before they can cause damage. However, when free radical exposure becomes too high or chronic, the body’s antioxidant defenses can become overwhelmed, leading to oxidative stress.

Some common contributors to oxidative stress include:

- UV exposure and sun damage
- Pollution and environmental toxins
- Smoking and vaping
- Chronic stress and lack of sleep
- High inflammation levels in the body
- Poor diet and excessive processed foods

Supporting the skin against oxidative stress involves both lifestyle habits and skincare. Daily sunscreen is essential because it helps reduce one of the largest sources of free radical damage. Antioxidants in skincare, such as vitamin C, help neutralize free radicals on the skin before they can damage collagen and other structures. A healthy skin barrier also plays an important role, since compromised skin is more vulnerable to inflammation and environmental stress.

Lifestyle habits matter just as much because oxidative stress is not only a surface-level issue. Supporting the body internally can help reduce the overall burden of free radical damage.

Helpful lifestyle habits include:

- Eating antioxidant-rich foods like berries, leafy greens, and colorful vegetables
- Prioritizing sleep and stress management
- Staying hydrated
- Avoiding smoking
- Supporting blood sugar balance and reducing excessive processed foods

Oxygen in Skincare vs. Oxidative Stress

I don’t know if this is a thought you put together and said “wait a minute… that sounds contradictory” but this is a thought I came accross early in my career. Let’s chat about it real quick.

Oxygen facials are cosmetic treatments designed to hydrate and temporarily refresh the skin. These treatments either use pressurized oxygen to deliver hydrating serums or skincare ingredients onto the skin’s surface, or they use ingredients that oxygenate the skin at a cellular level. The goal is usually to create a more plump, radiant, and refreshed appearance immediately after treatment.

The important thing to understand is that oxidative stress is not caused by the oxygen we breathe or oxygen used in facials. In fact, the “oxygen” involved in oxidative stress refers to unstable oxygen-related molecules called reactive oxygen species (ROS), which are produced internally through cellular processes and environmental stress, not from applying pr increasing oxygen topically.