

Pollution and Premature Ageing

Environmental Pollutants that can affect the skin

Pollutants can be Organic or Inorganic Substances

- **Ozone**

Although ozone in the upper atmosphere helps protect the skin by preventing UVC rays from reaching the earth's surface, in the lower atmosphere it is a free radical environmental pollutant that damages the skin.

- **Polycyclic Aromatic Hydrocarbons (Carbon Monoxide)**

This element of factory and car emissions, robs the skin of oxygen, which may give it a dull-grey appearance and additionally, it interferes with nutrient delivery to the skin.

- **Heavy Metals or tobacco smoke**

Accumulates on the skin surface which results in a dull complexion and skin inflammation.

- **Dust and dirt**

May remain on the surface of the skin and blocks the pores.

Symptoms of a pollutant exposed skin

- Premature ageing
- Inflammation
- Oxidative stress
- Protein and DNA damage
- Skin irritation or allergies
- Lipid peroxidation (Lipid peroxidation is the oxidative degradation of lipids within the skin)
- Dry, wrinkled and dull skin



Effects of pollution on the skin

Deterioration of the bacterial flora of the skin

- Exposure to high concentrations of ozone reduces the resident flora by 50%, suggesting that the gas has a bactericidal effect.
- Studies have shown that bacteria present on the surface of the skin can partly metabolize pollutants.
- This incomplete degradation gives rise to metabolites that are toxic for the skin.

Induction of the inflammatory cascade

- A number of pollutants have been described as being linked to the production of inflammatory mediators.
- This uncontrolled production results in the deterioration of epidermal differentiation and may result in a compromised skin barrier.
- If inflammation within the skin is chronic, it causes premature ageing.

Activation of the aryl-hydrocarbon receptor pathway

- The aryl-hydrocarbon receptor is a transcription factor in the cytoplasm that can detect the presence of pollutants and translates their toxic effects into signals.
- This receptor regulates several physiological functions including cell proliferation, inflammation and melanogenesis.

- Exposure of human keratinocytes to polluting stress leads to the activation of the aryl-hydrocarbon receptor pathway. This may influence rapid cell turnover, increased inflammation within the skin and development of hyperpigmentation.
- It also causes the production of pro-inflammatory mediators including reactive oxygen species, which is known for DNA damage and deterioration of cells.

Disruption of the mitokines (prohibitins) pathway

- Acting as a receiver/emitter, the mitochondrion receives the danger signal from a pollution incident and sends it to its partner organelles via protein mediators: mitokines.
- This intracellular communication mechanism enables mitokines to trigger the tissue's optimal anti-stress response.
- Exposure of human keratinocytes to environmental pollution leads to a reduction in mitokines.
- If the mitokines pathway is disrupted, the skin is unable to effectively respond and adapt to stress.