HEALTH BASICS

Melanin

Melanin is a group of natural pigments that colour your skin, hair, and eyes.

WHAT IT IS
Pigment made by specialized cells in skin, hair, and eyes

WHERE IT COMES UP
Skin colour, tanning, moles, pigment changes, and eye colour

WHY IT MATTERS
Helps limit ultraviolet damage and colours several body tissues

WHAT IT IS NOT
Not a disease or diagnosis

WHO TO ASK
Primary care clinician, dermatologist, or eye clinician

HOW IT IS CHECKED
Usually visual examination; targeted skin, eye, or genetic tests

Overview

Melanin is a group of natural pigments. It gives much of the colour to your skin, hair, and eyes. Melanin is not a disease, diagnosis, or sign that something is wrong.

Specialized cells called melanocytes make melanin. In the skin, these cells sit mainly in the deepest part of the outer layer, called the epidermis. They package melanin into tiny structures and pass it to nearby skin cells.

Melanin helps protect those cells from some ultraviolet, or UV, radiation from sunlight. It does not provide complete protection. People of every skin tone can develop sunburn, sun damage, and skin cancer.

Melanin is only one influence on visible colour. Blood flow, skin thickness, inflammation, medicines, hormones, age, and inherited traits can also affect how your skin looks.

How it works

The two main forms of human melanin are eumelanin and pheomelanin . Eumelanin is usually brown or black. Pheomelanin is usually yellow or reddish. Your inherited mix of these pigments

helps shape your natural skin, hair, and eye colour.

People with different skin tones generally have similar numbers of melanocytes in the epidermis. Much of the difference comes from the type and amount of melanin produced, the size of its packages, and how those packages are distributed and broken down.

When UV radiation reaches the skin, melanin can absorb and scatter some of that energy. It can also limit some of the unstable molecules produced by UV exposure. Eumelanin generally offers more UV protection than pheomelanin, but neither prevents all damage.

UV exposure can signal melanocytes to produce and distribute more pigment. This creates a tan. A tan is a response to UV exposure, not proof that the exposure was safe. UV damage can occur before a visible tan develops.

Hair gets its colour from melanocytes in hair follicles. Hair becomes grey or white when follicles produce less pigment or lose pigment-producing cells.

In the eye, melanin is present in the iris and tissues around the retina, the light-sensitive layer at the back of the eye. It helps manage stray light and supports normal visual development. Neuromelanin , a related pigment found in parts of the brain, is different from skin melanin, and its role is not fully understood.

Why it matters for your health

Your natural amount and type of melanin influence how your skin responds to sunlight. More epidermal melanin can provide some protection against UV injury, but it is not the same as sunscreen and does not remove skin cancer risk.

Skin findings may also look different across skin tones. Redness from inflammation may appear red, purple, brown, grey, or darker than the surrounding skin. Some colour changes can be harder to notice without good lighting or examination of several areas.

Melanin can affect certain medical devices and treatments. For example, skin pigmentation is one factor that can affect pulse oximeter accuracy. A pulse oximeter estimates blood oxygen through the skin; it does not measure melanin. Clinicians should interpret the reading alongside symptoms and other findings.

Lasers and light-based treatments can also interact with melanin. The risk of burns or unwanted colour changes depends partly on skin tone, the device, and its settings. If you are considering such treatment, ask whether the practitioner has experience with your skin tone.

There is no standard blood test for your overall "melanin level." Pigment is usually assessed by looking at the skin, hair, or eyes and considering any changes over time.

What can go wrong

Melanin itself does not develop symptoms or need a cure. However, several conditions affect melanocytes or pigment production.

Albinism is a group of inherited conditions in which the body makes little or no melanin. It can affect the skin, hair, and eyes. Reduced pigment in the eyes may affect visual development, while reduced skin pigment increases sensitivity to UV damage.

Vitiligo occurs when the immune system attacks melanocytes, causing sharply defined areas of pigment loss. It is not contagious. Other light patches can have different causes, including inflammation, infection, injury, or scarring.

Melasma causes patches of increased pigmentation, often on the face. Sun exposure and hormonal influences can contribute. Post-inflammatory hyperpigmentation is darkening left after inflammation or injury, such as acne, eczema, a burn, or a procedure.

Some medicines and medical conditions can cause broader pigment changes. For example, adrenal insufficiency can sometimes cause increased pigmentation, especially in skin creases, scars, or inside the mouth. A clinician may consider blood tests when pigment changes occur with other relevant findings.

Melanoma is a cancer that begins in melanocytes. It is not "too much melanin," and melanoma is not always dark. Most moles are not melanoma, but a new or changing spot should be assessed promptly. Warning features include asymmetry, an irregular border, several colours, a changing size, or continuing evolution. A sore that does not heal or a spot that repeatedly bleeds also needs medical review.

Pigment change alone is rarely an emergency. Arrange routine follow-up for a persistent unexplained change in skin, hair, or eye colour. Seek a prompt appointment for a changing mole or non-healing lesion.

Seek urgent medical help if colour changes occur with severe weakness, repeated vomiting, confusion, or fainting. Sudden loss of vision or severe eye pain also needs urgent assessment. These symptoms may point to an underlying problem rather than to melanin itself.

What you can do

There is usually no reason to measure or change your melanin. If you notice a pigment change, practical steps can help a clinician assess it:

A biopsy removes a small sample for examination under a microscope. It is used only when the appearance and medical history do not provide enough information or when a concerning

lesion needs to be checked.

Protecting yourself from UV radiation remains useful at every skin tone. Seek shade, use clothing and hats, and follow sunscreen directions. The American Academy of Dermatology recommends broad-spectrum, water-resistant sunscreen with an SPF of 30 or higher. Sunscreen should not be used to extend time in strong sunlight.

Avoid tanning beds. A tan from UV exposure does not create reliable protection against later damage. A sunless tanning product may colour the outer skin but usually does not provide sun protection unless it is separately labelled with an SPF.

Be cautious with unregulated skin-lightening products. Some have contained mercury or undeclared potent ingredients. Ask a pharmacist or dermatologist about a product if its ingredients or source are unclear.

- Record when the change began and whether it is spreading
- Take clear photographs in similar lighting, with a ruler for scale
- List new medicines, supplements, skin products, illnesses, or procedures
- Ask whether a skin examination, eye examination, blood test, biopsy, or genetic test is relevant

Common questions

Can food or supplements significantly increase melanin?

No food or supplement has been established as a safe way to create meaningful UV protection by increasing melanin. A balanced diet supports general health, but it does not replace sun protection.

Does darker skin need sunscreen?

Yes. Natural melanin provides partial protection, not complete protection. UV radiation can still cause skin damage and skin cancer.

Are freckles and moles made of melanin?

Freckles are areas where skin cells contain more melanin. Moles are collections of melanocytes and may be light, dark, raised, or flat. Neither finding automatically means cancer.

Can melanin be measured with a blood test?

There is no routine blood test for total body melanin. Specialized instruments can estimate skin pigmentation in research or some clinical settings, but most people do not need this.

Why does skin sometimes become darker after irritation?

Inflammation can stimulate pigment production or alter how pigment is distributed. This post-inflammatory hyperpigmentation may follow acne, eczema, injury, or skin treatment. Its duration differs between people.

Does melanin determine race or ethnicity?

No. Skin pigmentation is a continuously varying human trait influenced by many genes and environmental exposure. It does not define a clear biological category of race or determine a person's ancestry by itself.

Sources

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