

Researchers at Lund University in Sweden and other institutions have worked out how the pigment of the skin manages to protect the body from the sun's dangerous UV rays. The skin pigment converts the UV radiation into heat through a rapid chemical reaction that shoots protons from the molecules of the pigment.

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In a new study, the team from Lund University, working with colleagues in France and Italy, have studied pigment in the skin and its building blocks. Pigment in both skin and hair comprises two different types of melanin: eumelanin and pheomelanin. Eumelanin makes us develop a suntan and gives colour to brown and black hair, whereas those with red hair and pale skin instead have high levels of pheomelanin.

"We found that eumelanin converts harmful UV radiation into heat with almost 100 per cent efficiency. The chemical reaction is incredibly quick, taking less than a thousandth of a billionth of a second," said Villy Sundström, Professor of Chemistry at Lund University.

What happens in detail in the chemical reaction is that a hydrogen ion -- a proton -- is ejected from the pigment at the same moment the UV light reaches the pigment molecule. The chain of events could be likened to the melanin getting rid of the energy of the UV light by very quickly shooting a proton projectile. This projectile in turn gives off energy to the surrounding membrane tissue in the form of heat. It has therefore converted dangerous UV energy into harmless heat.

"In this way, the pigment disarms the energy in the UV light and prevents it causing harmful chemical reactions," said Villy Sundström.

Eumelanin is considered to be the pigment that protects against UV radiation while pheomelanin is believed to cause skin cancer in some way, which explains why people with red hair are more likely to develop malignant melanoma. However, researchers have not previously been aware of what chemical reactions UV light causes in the pigment. There has therefore also been a lack of knowledge of the pigment processes that lead to protection against or development of cancer.

"By understanding how the body naturally protects itself against UV light, we can develop better sun protection products based on the same principles. This would provide better protection against skin cancer," said Villy Sundström.

The idea is also in the long run to find treatment methods and substances that replace natural pigment for those with defective production of eumelanin. Eumelanin is composed of two similar building blocks, but only one of them produces the protective effect. This shows that the effect is very specific -- it is a matter of small differences in the chemical structure of the building blocks. This insight could prove important in the development of substances for treatment and sun protection products.