- Proteins

SCIENCE

# WHAT IS KERATIN?

## Learn about the vital protein that helps hold your body together

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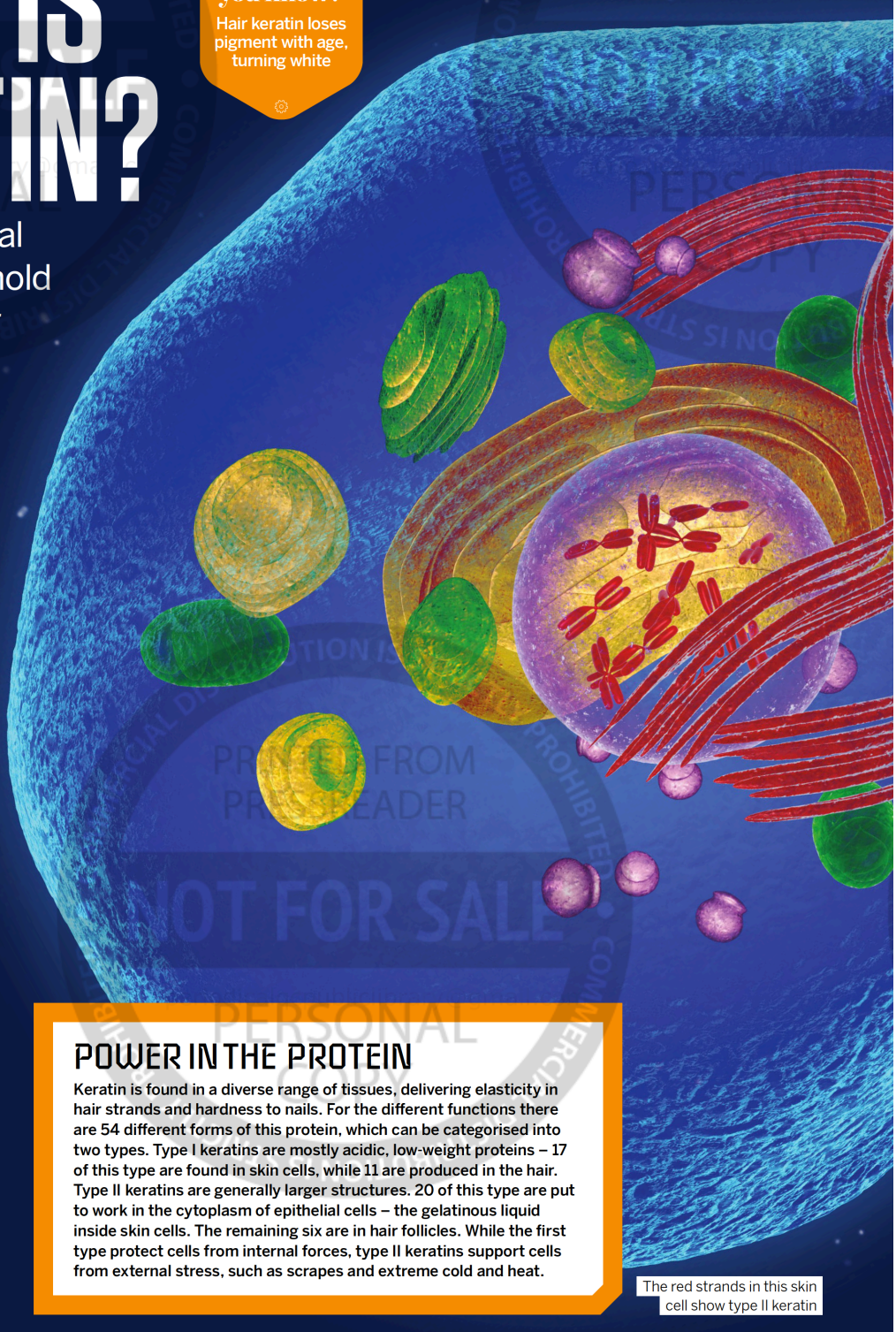
**Did you know?**

Hair keratin loses pigment with age, turning white

Keratin is a protein that adds strength to many of your body's hard and soft external tissues. It is predominantly found in the hair, nails and outer layer of skin, but is also in many other glands and organs. The molecule is much tougher than others in the body, being more resistant to tearing and scratching. Keratin is also waterproof and isn't dissolved by acids, alkalis or most of the body's natural chemicals.

Your body produces keratin itself, but relies on you consuming enough protein as part of your diet. If you aren't eating enough, your body struggles to make an adequate supply of keratin and you might experience brittle nails, thinning hair and dry or flaking skin. Keratin keeps your many millions of skin cells connected and working together as the largest organ in the body. To achieve this, the proteins form long strands inside the cells, which anchor to each other to form a strong skin shield.

The two broad forms of keratin are alpha-keratin and beta-keratin. Mammals usually produce alpha-keratin structures, and birds and reptiles the latter form of keratin. The structure of mammalian keratin molecules is twisted into a coil, while beta-keratin is in the form of stacked sheets. Unlike the hair, nail and skin structures of keratin in the human body, beta-keratin produces scales, feathers, beaks and claws. Reptiles, for example, benefit from the more rigid skins this keratin provides.



The red strands in this skin cell show type II keratin

### POWER IN THE PROTEIN

Keratin is found in a diverse range of tissues, delivering elasticity in hair strands and hardness to nails. For the different functions there are 54 different forms of this protein, which can be categorised into two types. Type I keratins are mostly acidic, low-weight proteins – 17 of this type are found in skin cells, while 11 are produced in the hair. Type II keratins are generally larger structures. 20 of this type are put to work in the cytoplasm of epithelial cells – the gelatinous liquid inside skin cells. The remaining six are in hair follicles. While the first type protect cells from internal forces, type II keratins support cells from external stress, such as scrapes and extreme cold and heat.

**DID YOU KNOW?** 95 per cent of hair is made of keratin, giving it its waterproof properties




Under a microscope, a fingernail (brown) emerges from the nail bed

A human hair is around 0.01 millimetres wide

## INSIDE A HAIR STRAND

How this protein is packed into bundles to achieve hierarchical strength

## 5 FACTS KERATIN DISORDERS

**1 EPIDERMOLYSIS BULLOSA (EB)**
Due to protein mutations, including those of keratin, this genetic disorder gives a person fragile and easily blistered skin.

**2 ICHTHYOSIS**
This condition is caused by an overproduction of keratin. Skin cells accumulate and create a scaly appearance over the body.

**3 PACHYONYCHIA CONGENITA**
Keratin loses its strong structure and network of filaments. Nails grow to become very thick and sore calluses form on the soles of the feet.

**4 CURLY HAIR SYNDROME**
The keratin in a person's hair is unable to maintain its elasticity and strong shape. As a result, hair forms unusually tight curls.

**5 STEATOCYSTOMA MULTIPLEX**
The symptoms of this genetic disorder include multiple cysts in the skin. The keratin 17 gene is impacted, preventing a strong skin cell network and altering the growth of skin gland cells.

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