

Sawaliram

Question: लोगों को रंग उजला (गोरा) और काला क्यों होता है?

Answer by Rudrashis Chakravorty

Well, in short, our skin colour is determined by what kind of genes responsible for producing skin colour pigments we have inherited from our parents which have been influenced by the amount of ultraviolet radiation (UVR) that falls at any particular location. Let us understand this by looking at the history of skin colour in humans.

The story has its roots in hair!

While the number and density of hair follicles in humans is quite similar to that of other apes, the hair on our bodies is neither as thick nor as long as that of our closest relatives, such as the chimpanzees. However, our ancestors had body hair like them till about 5 million years. At that time they had begun walking using their feet and spending more time in open environments in search of food and water. As a consequence, they faced the big challenge of not letting their core body temperature climb too high. The prevalent theory is that the resulting adaptations to prevent the heating up of the bodies of ancient humans were the: 1. Reduction of body hair, and 2. an increase in the number of sweat glands. We think that these worked together and allowed our ancestors' bodies to cool down thanks to the better sweating and its evaporation.

What has all this to do with skin colour?

Thing is, around 1.5 million years ago, our planet faced a spell of unnaturally dry climate for an extended period and over large areas. Trees died in huge numbers under such arid conditions, shade was scanty, exposing the hairless skins of the early members of the genus *Homo* (of which modern humans, *Homo sapiens*, is a member species and the only remaining one, all the rest now being extinct) to direct sunlight, specifically higher levels of UV radiation (UVR) for more prolonged periods than seen earlier.

One can obviously ask at this point as to what is so bad about our skins seeing too much of UVR from the Sun? You see, although UV rays make up only a small portion of the Sun's light, it causes most of the damage that sunshine normally inflicts on our bodies. Skin cancers can occur because UV rays can damage the DNA present in our body cells, resulting in them behaving abnormallyⁱ And this is the reason we think that our ancestor's skin gradually started acquiring a darker tone.

How does dark skin protect us?

Those with darker skin had more melanin (a broad term for a group of natural pigments found in the skin cells of most organisms) that protects skin cells from UVR radiation damage, reducing the risk of cancer. The amount and kinds of melanin produced in humans is mainly controlled by several genes and their variants sitting in melanocytes, the skin cells producing melanin. Our skin tones are created depending on which of the melanin-producing genes we have inherited from our each of our parents, plus what their combined effect can lead to in our cells. At this time in our history, genes that were responsible for greater production of melanin likely spread in populations. This was probably how dark skin came to be in humans.

But how does that explain why some people are fair?

About 1,00,000-70,000 years ago, some anatomically modern humans (*Homo sapiens*) began to migrate away from the tropics to the north where they were exposed to less intense sunlight. Perhaps the need for using more clothing to cover their bodies against the colder climate at these higher latitudes had added to greater protection from UVR in daylight for them. Under these conditions, possessing lighter-skinned gene variants was not too big a problem for an individual from the point of view of natural selection. Thus genes for light-skin spread in those populations.

As different groups of humans began spreading to different regions of our planet later in our evolutionary history, they not only got exposed to different intensities of sunlight, but also gradually came into contact with other human groups who were either already living there or arrived after them. With the passage of time, members of these groups started forming sexual relationships and the different kinds of pigment-producing genes they had originally carried got all mixed up in the bodies of their children. Combined with the history of changing climatic conditions experienced by Earth, this ultimately resulted in the huge variety of skin tones nowadays seen all around us all over the planet. For example, scientists these days say that human populations over the past 50,000 years have changed from dark-skinned to light-skinned and vice versa as they migrated to different UV zones, and that such major changes in skin colour may have happened in as little as 100 generations (spanning roughly 2,500 years).

Guess this biology and geography combination is a far better and proven mixture to apply to our bodies to get the best results, than what today's multimillion-dollar beauty industry would have us believe.

ⁱ The strength of the UV rays reaching the ground anywhere on Earth is not really uniform and depends upon a number of aspects, for example, on the time of the day and the season of the year. This strength is inversely related to the distance of the concerned location from the Equator. Which means that the further away you travel from the Equator towards any of the two Poles, the lesser is your body exposed to UVR.