

Evolutionary medicine of skin cancer risk among Europeans

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The proclivity of Spaniards to bask in regions like the Costa del Sol while their northern European counterparts must stay under cover to protect their paler skin or risk skin cancer is due in large part to the pigment producing qualities of the MC1R gene locus. The MC1R gene, expressed in skin and hair follicle cells, is more diverse in Eurasian populations compared to African populations.

Now, a team of researchers led by Santos Alonso, et. al., have examined the evolutionary selective pressure for MC1R among a large population of Spaniards in comparison to their Northern Europeans counterparts as well as individuals with melanoma. Using data from the 1,000 Genomes Project as well as samples from different regions of Spain, they authors show that selection for the MC1R locus is strong in South Europeans, but not the case for Northern Europeans.

Two evolutionary selective processes seem to be acting on MC1R in Southern Europeans. On the one hand, there is [selective pressure](#) to maintain at [high frequencies](#) the ancestral form of the gene, also the one most common in Africans. But simultaneously, one gene variant seems to be favored in South Europeans. This [gene variant](#), called the V60L allele, has been associated before with red/blond hair and fair skin.

World frequency distribution of V60L is confined mostly to Europe and the Near East but mostly absent in East Asia and Africa, indicating that the first appearance of V60L mutation occurred some time after modern humans left Africa but before dispersal throughout Europe. Fair skin

depigmentation could be a useful change for the adaptation of humans to this new environment. Traditionally, depigmentation had been hypothetically explained as a function of the need of humans to synthesize vitamin D in areas of reduced sun light (compared to Africa). "We have not proved that this is the underlying reason for the signature of positive selection on V60L, but our data adds support to this view, although this point needs to be further explored" says Santos Alonso, senior author of the paper.

Interestingly, the same allele V60L has been associated to increased risk of melanoma, the most dangerous of skin cancers. This indicates", says Saioa López, one of the two main authors of the paper, "that the increase in fitness for the population as a consequence of depigmentation has had a collateral damage consequence for the individual's health. This can be reconciled if we assume that melanoma is typically a post-reproductive disease, and consequently should have little effect on the individual's genetic contribution to the next generation. It constitutes a kind of evolutionary 'buy now pay later' trade-off."

Provided by Oxford University Press

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