individual's ability to tolerate sunlight is inversely proportional to that individual's degree of melanin pigmentation. Melanin, a complex polymer of tyrosine derivatives, is synthesized in specialized epidermal dendritic cells known as *melanocytes* and is packaged into *melanosomes* that are transferred via dendritic processes into *keratinocytes*, thereby providing photoprotection (dissipating the vast majority of absorbed UVR in the skin) and simultaneously darkening the skin. Sun-induced melanogenesis is a consequence of increased tyrosinase activity in melanocytes. Central to the suntan response is the melanocortin-1 receptor (*MC1R*), and mutations in this gene contribute to the wide variation in human skin and hair color; individuals with red hair and fair skin typically have low MC1R activity. In the skin, there are two main types of melanin: eumelanin (providing brown and black pigmentation associated with high MC1R activity) and pheomelanin (providing red pigmentation associated with low MC1R activity). Pheomelanin is a cysteine-containing red polymer of benzothiazine units and has much weaker shielding capacity against UVR compared to eumelanin. This may explain why individuals with a higher proportion of pheomelanin (red hair/fair skin appearance) have an increased risk of melanoma formation. In addition, pheomelanin may also promote melanoma formation through induction of oxidative damage by amplifying UV-A–induced ROS but also through UVR-independent mechanisms.

The human *MC1R* gene encodes a G protein–coupled receptor that binds α-melanocyte-stimulating hormone (α-MSH), which is secreted in the skin mainly by keratinocytes in response to UVR. The UV-induced expression of this hormone is controlled by the tumor suppressor p53, and absence of functional p53 attenuates the tanning response. Activation of the melanocortin receptor leads to increased intracellular cyclic adenosine 5′-monophosphate (cAMP) and protein kinase A activation, resulting in an increased transcription of the microphthalmia-associated transcription factor (MITF), which stimulates melanogenesis. Since the precursor of α-MSH, proopiomelanocortin produced by keratinocytes, is also the precursor of β-endorphins, UVR may result in not only increased pigmentation but also increased β-endorphin production in the skin,