

Role of sphingosine 1-phosphate in ultraviolet-induced melanogenesis

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Melanin content in pigment cells is regulated by multiple mechanisms. We have previously shown that melanogenesis in mouse B16 melanoma cells is inhibited by activation of phospholipase D through ubiquitin proteasome-mediated degradation of tyrosinase. Further, we have recently found that sphingosine 1-phosphate, a lipid messenger that is implicated in the regulation of a wide variety of important cellular events acting through intracellular as well as extracellular mechanisms, suppresses melanin content in B16 cells. In this study, the involvement of phospholipase D and sphingosine kinase, a key regulator of intracellular sphingosine 1-phosphate level, in ultraviolet B-induced skin pigmentation and sphingosine 1-phosphate-induced suppression of melanin content in B16 cells was examined. Neither phospholipase D activity nor sphingosine kinase activity in B16 cells was affected by ultraviolet B, suggesting that these enzymes are not involved in ultraviolet B-induced pigmentation. We next investigated the involvement of phospholipase D and sphingosine kinase in the sphingosine 1-phosphate-induced suppression of melanin content. sphingosine 1-phosphate did not activate phospholipase D in B16 cells, indicating that phospholipase D activation is not involved in the sphingosine 1-phosphate-induced suppression of melanin content. However, treatment of B16 cells with the sphingosine kinase inhibitor dimethylsphingosine resulted in an increase in melanin content without affecting tyrosinase activity. Melanosomes were highly aggregated in the cells treated with dimethylsphingosine. Furthermore, sphingosine kinase co-localized with the aggregated melanosomes. These results suggest that sphingosine 1-phosphate, that is derived from sphingosine in the melanosome membrane through the catalytic activation of sphingosine kinase, regulates melanin content through melanosome distribution.