A POSSIBLE SOLUTION FOR PROGRESSIVE MACULAR HYPOMELANOSIS FROM A SOUTH AFRICAN PLANT

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Abstract - Progressive macular hypomelanosis (PMH) is a hypopigmentary disease characterised by the presence of hypopigmented spots found on the chest and back. PMH is different from other hypopigmented diseases, such as pityriasisversi color, leukoderma and vitiligo, as the diseaseis mainly caused (although all other causes still need to be identified) by bacteria identified as Propionibacterium acnes. The current treatment for PMH is the administration of anti bioticscombined with ultra violet (UV) radiation. Unfortunately, UV radiation could lead to undesired consequences in the long run, such as DNA damage, skin cancer and increased skin aging. An alternative treatment, which does not require UV radiation for treating PMH is vital.

The objectives of the present study were to determine ifa South African indigenous plant, belonging to the Fabaceae family, could firstly aid in the regulation of melanin production and melanin transfer, and secondly inhibit P. acnes' growth (strain ATCC 11827 (acne vulgar is reference strain)and strain ATCC 6919 (reference strain found in 47% of PMH patients' lesions)), thereby providing a possible alternative treatment for PMH. Currentlythere are no known plants specifically used for the treatment of PMH.

The ethanol extract of this plant showed no cytotoxicity towards B16F10 mouse melanocytes when compared to the positive control, actinomycin D. Actinomycin D resulted in 50% viable cells when the cells were treated with a concentration of 0.27 ± 0.022 µg/ml. The B16F10 cells treated with 500 µg/ml of the extract resulted in an additional 105 µg/ml (0µg/ml intracellularand 105µg/ml extracellular) of melanin formation, when compared to that of the untreated cells, whereas theophylline, the positive control, only resulted in 40 µg/ml (21µg/ml intracellularand 19µg/ml extracellular) of additional melanin formation. Consequently, this plantwas found to be significantly more active than theophylline. Melanin transfer between normal human melanocytes and normal human keratinocytes was analysed by immunofluorescence. The cells treated with the extract showed an increase in both melanocyte dendricity and the concentration of melanosomes in the dendrite tips. The cells treated with the positive control, alpha melanocyte stimulating hormone (α-MSH), and the extract(60 µg/ml and 80 µg/ml)led to a significant ($P < 0.001$) increase in the amount of positive keratinocytes with several melanosomes present around the keratinocyte nuclei as compared to that of the untreated cells. During this study, it was found that the extract superseded the effect of α-MSH.

The ethanol extract of this plant did not show significant antibacterial activity against P. acnes when compared to the positive control, tetracycline, however, a significant increase ($P < 0.001$) in the antibacterial activity was observed for the gold nanoparticles synthesized with the ethanol extract. The gold nanoparticles synthesised using the extract, therefore, has potential to be used for PMH and the extract on its own might be used in treatments targeting hypopigmentation.

Keywords: Melanin Production, Melanin Transfer, Progressive Macular Hypomelanosis, Gold Nanoparticles.