

The Role of Phenolic Cytotoxicity in the Premature Cell Death of Vitiligo Melanocytes

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The cause of vitiligo is not well understood. It has been hypothesized for many years that certain environmental chemicals may be selectively toxic to "vitiligo" melanocytes and thus instigate the disease. People who work with the derivatives of phenol have a higher incidence of vitiligo. Therefore, we investigated the effects of phenolic cytotoxicity on the death of vitiligo melanocytes. Phenols are molecules structurally similar to tyrosine, the substrate for tyrosinase which is the key enzyme for melanin biochemical synthesis. It has been proposed that phenolic derivatives compete with tyrosine for hydroxylation by tyrosinase and generate an abundance of toxic free radical intermediates. We have examined the susceptibility of cutaneous derived cultured melanocytes and fibroblasts from both control subjects and vitiligo patients to 4-tertiary butyl phenol (4-TBP). 4-TBP induced cytotoxicity to both melanocytes and fibroblasts from control subjects and vitiligo patients in the 4-TBP induced cytotoxicity. After 4-TBP treatment, vitiligo melanocytes did not exhibit more susceptibility than normal melanocytes. However, melanocytes with high levels of tyrosinase activity and melanin content showed less susceptibility to 4-TBP. We also investigated the effect of catalase, an antioxidant, on the susceptibility of melanocytes to 4-TBP. The results showed catalase (< 500 U/ml) could increase the viability of normal melanocytes to 4-TBP (500 uM) as compared with control. These results suggest: (1) that vitiligo melanocytes are more susceptible to phenolic derivatives than normal melanocytes or fibroblasts, (2) tyrosinase and/or melanin may potentially work as antioxidants in melanocytes, and (3) catalase can protect normal melanocytes from cytotoxicity of 4-TBP.