

## Enhanced VEGF Expression in Hair Follicle Dermal Papilla Cells by *Centella asiatica* Linn.

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### ABSTRACT

*Centella asiatica* Linn. (*C. asiatica*) extract has been shown to possess high antioxidant activity due to its phenols and flavonoids. This study tested the efficacy of 70%-ethanol (EtOH) crude extracts of *C. asiatica* and its fractions ( $H_2O$ , EtOAc,  $CH_2Cl_2$ , and hexane) to modulate human follicle dermal papilla cells. In addition, we analyzed the extracts for major phytochemicals as well as free radical scavenging activity. Our results from ABTS and DPPH assays showed that the amounts of phenolic and flavonoid compounds in the extracts were both related to its free radical scavenging activity. While the EtOAc fraction of *C. asiatica* demonstrated the highest free radical scavenging activity, it was toxic to human follicle dermal papilla cells. The cell viability test was positive when cells were treated with EtOH crude extract and  $H_2O$  fraction. VEGF gene expression, quantified by real-time PCR analysis of the EtOH crude extract, showed a significant level of induction, indicating that the growth promotion effect in human follicle dermal papilla cells was related to VEGF gene expression, which has a positive hair growth stimulating effect. The EtOH crude extract of *C. asiatica* may offer potential in hair growth promoting products.

**Keywords:** Antioxidant activities, *Centella asiatica*, Phytochemical screening, Real-time PCR, Gene expression

### INTRODUCTION

Hair protects the scalp from the environment, including heat, cold, and UV radiation, and serves as a measure of beauty. As its loss can result in distress and psychological problems, prevention or treatment strategies need to be investigated. So far, only two drugs, minoxidil and finasteride, have been approved for the treatment of hair loss in men by the US Food and Drug Administration (Park et al., 2012).

Hair follicles of any hair type have a unique life cycle comprised of three main stages – anagen, catagen, and telogen, each of which leads to the destruction and regeneration of hair follicles over a lifetime. The regulation of the hair cycle is complicated and involves several