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Hair Growth Promoting Effects of 650 nm Red Light Stimulation on Human Hair Follicles and Study of Its Mechanisms via RNA Sequencing Transcriptome Analysis

Kai Yang [1], Yulong Tang [2], Yanyun Ma [2 3], Qingmei Liu [4], Yan Huang [2], Yuting Zhang [2], Xiangguang Shi [4], Li Zhang [1], Yue Zhang [4], Ji'an Wang [4], Yifei Zhu [4], Wei Liu [5], Yimei Tan [6], Jinran Lin [4], Wenyu Wu [1 4]

Affiliations

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Abstract

Background: Androgenetic alopecia (AGA) leads to thinning of scalp hair and affects 60%~70% of the adult population worldwide. Developing more effective treatments and studying its mechanism are of

great significance. Previous clinical studies have revealed that hair growth is stimulated by 650-nm red light.

Objective: This study aimed to explore the effect and mechanism of 650-nm red light on the treatment of AGA by using *ex vivo* hair follicle culture.

Methods: Human hair follicles were obtained from hair transplant patients with AGA. Hair follicles were cultured in Williams E medium and treated with or without 650-nm red light. Real-time RT-PCR and immunofluorescence staining were used to detect the expression level of genes and proteins in hair follicles, respectively. RNA-sequencing analysis was carried out to reveal the distinct gene signatures upon 650 nm treatment.

Results: Low-level 650 nm red light promoted the proliferation of human hair follicles in the experimental cultured-tissue model. Consistently, 650 nm red light significantly delayed the transition of hair cycle from anagen to catagen *in vitro*. RNA-seq analysis and gene clustering for the differentially expressed genes suggests that leukocyte transendothelial migration, metabolism, adherens junction and other biological process maybe involved in stimulation of hair follicles by 650-nm red light treatment.

Conclusion: The effect of 650-nm red light on *ex vivo* hair follicles and the transcriptome set which implicates the role of red light in promoting hair growth and reversing of miniaturization process of AGA were identified.

Keywords: 650-nm red light; Androgenetic alopecia; Hair follicle; Low-level laser therapy; RNA sequencing.

Figures

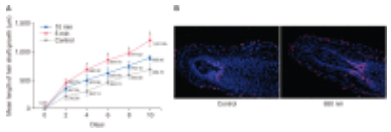

Fig. 1. Hair shaft elongation and cell...

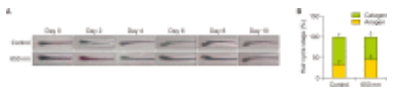

Fig. 2. Hair cycle stage detection in...

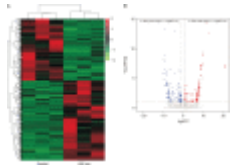

Fig. 3. Overview of gene expression and...

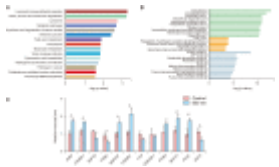

Fig. 4. Pathway enrichment analysis and gene...

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