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# The growth of human scalp hair in females using visible red light laser and LED sources

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## Abstract

**Background and objectives:** Low level laser (light) therapy (LLLT) has been demonstrated to promote hair growth in males. A double-blind randomized controlled trial was undertaken to define the safety and physiologic effects of LLLT on females with androgenic alopecia.

**Methods:** Forty-seven females (18-60 years old, Fitzpatrick I-IV, and Ludwig-Savin Baldness Scale I-2, I-3, I-4, II-1, II-2 baldness patterns) were recruited. A transition zone scalp site was selected; hairs were

trimmed to 3 mm height; the area was tattooed and photographed. The active group received a "TOPHAT655" unit containing 21, 5 mW diode lasers (655 ± 5 nm) and 30 LEDS (655 ± 20 nm), in a bicycle-helmet like apparatus. The placebo group unit appeared identical, containing incandescent red lights. Patients treated at home every other day × 16 weeks (60 treatments, 67 J/cm(2) irradiance/25 minute treatment, 2.9 J dose), with follow up and photography at 16 weeks. A masked 2.85 cm(2) photographic area was evaluated by another blinded investigator. The primary endpoint was the percent increase in hair counts from baseline.

**Results:** Forty-two patients completed the study (24 active, 18 sham). No adverse events or side effects were reported. Baseline hair counts were 228.2 ± 133.4 (N = 18) in the sham and 209.6 ± 118.5 (N = 24) in the active group (P = 0.642). Post Treatment hair counts were 252.1 ± 143.3 (N = 18) in the sham group and 309.9 ± 166.6 (N = 24) in the active group (P = 0.235). The change in hair counts over baseline was 23.9 ± 30.1 (N = 18) in the sham group and 100.3 ± 53.4 (N = 24) in the active group (P < 0.0001). The percent hair increase over the duration of the study was 11.05 ± 48.30 (N = 18) for the sham group and 48.07 ± 17.61 (N = 24) for the active group (P < 0.001). This demonstrates a 37% increase in hair growth in the active treatment group as compared to the placebo group.

**Conclusions:** LLLT of the scalp at 655 nm significantly improved hair counts in women with androgenetic alopecia at a rate similar to that observed in males using the same parameters.

**Trial registration:** ClinicalTrials.gov NCT01437163.

**Keywords:** LED; RCT; alopecia; clinical research; hair; human; laser; low level laser therapy (LLLT); photobiomodulation.



## Figures

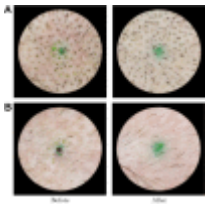

**Fig 1** Sham treatment group subject pre...

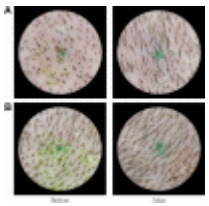

**Fig 2** Active treatment group subject pre...

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