**INTRODUCTION**

- Androgenetic alopecia (AGA) causes balding in approximately 50% of men and women. One of the main causes of AGA is the conversion of testosterone to dihydrotestosterone (DHT) by 5α-reductase.
- Local administration of red or near-infrared light via low level light therapy (LLLT) has emerged as a safe and effective alternative to systemic medications for AGA.
- Despite multiple FDA-cleared LLLT devices, the mechanisms of action, including DHT inhibition, for LLLT remain unknown.
- Orange-red wavelengths of light have been shown to exert biological effects that may lead to the inhibition of 5α-reductase conversion of testosterone to DHT.
- REVIAN RED® uses light-emitting diodes (LEDs) emitting dual wavelengths from the orange (620 nm) and red (660 nm) portion of the visible light spectrum.
- In this study, we evaluated how red/orange wavelengths of light:
  1. Stimulate nitric oxide (NO) release
  2. Inhibit testosterone conversion to DHT

**RESULTS**

Red and orange wavelengths of light induce release of NO from nitrosothiols and nitrosylated proteins

**Dual wavelength LEDs reduce the conversion of testosterone to DHT by epithelial cells in vitro**

**CONCLUSIONS**

The results of our study provide evidence of the ability of LED-based LLLT therapies to stop hair loss by decreasing production of DHT.

This conclusion is supported by the following data:

1. Orange-red wavelengths of light can induce the release of NO from nitrosothiols and nitrosylated proteins.
2. Nitric oxide inhibits 5α-reductase enzymatic conversion of testosterone to DHT in vitro.
3. Using a translational optics platform, we demonstrated the production of NO and ROS by dual wavelength LEDs in epithelial cells in vitro.
4. Using the same translational optics platform, we demonstrated that dual wavelength LEDs inhibit DHT formation in epithelial cells in vitro.
5. Dual wavelength-based LED illumination induced stronger biological effects in vitro than individual wavelength LED-based illumination, suggesting a synergistic effect between the two wavelengths.
6. However, 660 nm laser-based illumination did not have any impact on the production of DHT in epithelial cell cultures.

**Translational Optics Platform**

We designed a translational optics platform that:

- Simulates the distance from emitter to scalp (~10 mm).
- Mimics end product design for LLLT devices, including power input, irradiance, and fluence.

Using this platform, we:

1. Detected the stimulation of NO in epithelial cells at the time of illumination using DAF-FM diacetate.
2. Detected the stimulation of ROS in epithelial cells at the time of illumination using CellROX Deep Red Reagent.
3. Determined the conversion of testosterone to DHT by epithelial cells following illumination using competitive ELISA.