

## Skin Rejuvenation using selective amplification of the sunlight's spectrum with Fluorescent Therapeutic Material (FTM): A Novel approach to photo-rejuvenation

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### Abstract

Light, in the spectral range of 500nm to 700nm, has strong absorption by fibroblasts, melanin and hemoglobin and maximal therapeutic benefit for the pigmented lesion, collagen remodeling and rosacea<sup>1,2,3</sup>. This clinical study evaluates the efficacy of fluorescent therapeutic material (FTM) that delivers a significant level of yellow light to the skin of photodamaged and rosacea patients. Ten female patients were exposed to light produced by a sun simulator and passed to the skin through FTM that amplifies optical energy in the yellow spectrum. Patients were exposed for one hour per week for 8 weeks. All patients completed a questionnaire and had pre and post photos. Overall, the patients reported a 21.5% improvement in their skin appearance, with small but noticeable enhancements in their brown and red discoloration, pore size, texture and fine wrinkles. A blinded observer, who scored the randomized pre and post treatment photos, was unable to measure a significant objective difference between the pre and post treatment appearances.

### Introduction

Photodamage and rosacea are common aesthetic skin conditions. With the advent and development of Intense Pulsed Light and IPL photorejuvenation, broad band light has become one of the accepted treatments of choice for sun damaged skin and rosacea<sup>4</sup>.

IPL or broad band light harnesses the power of filtered light produced by flash lamp striking the skin and being selectively absorbed at various levels of the superficial dermis by hemoglobin and melanin. The resulting heat generated by the interaction of the photon and target chromophore, a process called selective photothermolysis, results in an improvement in the reduction of skin discoloration.

Over the past decade, IPL photorejuvenation or FotoFacial®<sup>5,6,7</sup> has grown to become one of the most common, light based skin enhancement procedures in the world. The most therapeutic wavelengths of light for photorejuvenation are in

the spectrum range between 500-600nm, where the optimum absorption for hemoglobin and melanin reside. The objectives of the current study were to determine potential benefits of FTM for skin rejuvenation for use as outdoor clothing while converting the broad spectrum of sunlight to the narrow spectrum of intense therapeutic light irradiating the user's skin.

### Materials and Methods

In this study, we evaluated the efficacy and safety of a fabric, the matrix of which was impregnated with a novel and proprietary fluorescent yellow pigment which absorbs UV Light and amplifies transmission of beneficial yellow light on the skin. The FTM (SunSoul, Toronto, Canada) also provides sun protective factor in UVA and UVB ranges with a UPF/SPF of 50+.

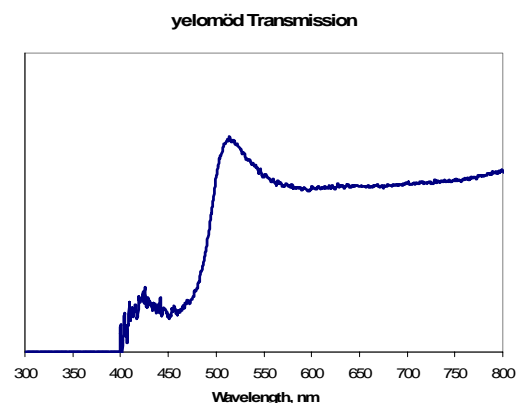


Figure 1. Transmission of yelomod

All patients were evaluated and consented for the study. Patients were treated in a clinical setting with a sun simulator and controlled environment. Pre and post treatment photos and questionnaire were completed. There were 10 patients, all were female and 7 presented with predominantly photodamaged skin, while 3 patients exhibited predominantly clinical findings of telangiectasia and rosacea. The average age for the patient was 44 years old. All patients were placed in front of a light source (sun simulator), once per week for one hour and a total of 8 weeks. The light source was a gas discharging continuous wave (CW)



*Figure 2. Pre- and Post- treatment pictures of female patient*

lamp, which provided a broad spectrum of light output with a power density of 40mW/cm<sup>2</sup>. The distance between the sun simulator and the subject was adjusted to ensure uniform delivery of light energy.

Figure 1 shows the spectrum of the yellow FTM (yelomöd – SunSoul). The yellow FTM was placed between the sun-simulator and the face (Figure 3)



*Figure 3. Patient treatment set up with the yelomod FTM and sun simulator*

At the completion of the study, before and after pictures were analyzed. Before and after photos were analyzed and scored by an independent observer.

## **Results**

All study patients presented with mild, moderate or severe photoaging (dyschromia, brown discoloration, melasma, or lentigos), or erythema, telangiectasia or rosacea. All patients underwent one treatment per week for 8 treatments.

All patients completed a study questionnaire which consisted of a linear analogue scale from 0-100 (0 meaning is no improvement and 100 being complete clearance) and each study patient was required to rank the degree of improvement at the end of treatment cycle.

Brown discoloration showed an average improvement score of 16.3, Red discoloration 8.4, pore size 3.8, Fine Lines 2.5, texture and fine wrinkles 2.0 and overall skin health and appearance scored 21.5 (see table 1)



**Figure 4. Pre- and Post- treatment pictures of forehead treatment**

**Table 1. Patient Questionnaire Results**

<b><i>Skin Concern</i></b>	<b><i>Degree of Improvement</i></b>
Brown Discoloration	16.3%
Red Discoloration	8.4%
Pore Size	3.8%
Skin Texture and fine lines	2.0%
Overall Skin Improvement	21.5%

There was no statistical photographically evident significant difference when the before and after photographs were randomized, reviewed and scored by a blinded reviewer.

## ***Discussion***

Intense Pulsed Light (IPL) photorejuvenation has grown in 10 short years to be the most common application of aesthetic light-based energy in North America.

The popularity of IPL based skin rejuvenation is the broad spectral length, diverse aesthetic clinical effect, little downtime and enhanced appearance. The disadvantages of IPL based physician therapy are the need to travel to a doctor's office, the discomfort, cost and potential downtime. The emergence of LED devices and photomodulation has demonstrated that multiple exposures to low fluence therapeutic light can produce some skin rejuvenation effects,

however, the patient must still visit the clinic multiple times, often 20-30 visits over many weeks.

The concept of Fluorescent Therapeutic Materials, which can filter out harmful UV radiation, amplify the part of sunlight into the therapeutic yellow range and focus it on the skin for aesthetic benefits for those chromophores susceptible to the yellow wavelength, is a profound and revolutionary one. The FTM acts as a "FotoFacial®" garment providing rejuvenation benefits to the skin while being worn outside. In this study, we were able to confirm, with a small sample size and limited use, that patients noted a demonstrable difference in the quality of their skin after accumulating eight hours of exposure to sun simulator and FTM. Although the skin rejuvenation results were not as dramatic as with some professional devices, patients were happy with the improvement, reporting a 21% improvement in the appearance of their skin. As expected, the chromophore improvements (in melanin and hemoglobin based aging pathologies) reported more noticeable improvement than dermal textural enhancements, which would require a greater degree of photo-stimulation. At one hour per week, for 8 weeks, the FTM patients in this study were likely underdosed, when you compare the exposure times that patients receive in LED photomodulation studies. The blinded observer of the before and after photos was not able to observe a demonstrable difference in the pre and post-FTM photos, however, even in high fluence medical IPL systems, the photos do not often reveal a dramatic difference in the appearance of the skin to an observer, while the patients report a significant skin enhancement.

Certainly, there were no complications in this study, no discomfort, no UV damage, or burns.

## **Conclusion**

The future for this FTM is very promising for clinicians and patients. The FTM, when configured in garments will provide a sun block and rejuvenation effect. The garments would be ideal for the outdoor enthusiast, who wants to maintain youthful attractive skin. Golf, tennis, jogging and beach FTM wear may change how clinicians view modest exposure to the sun. Finally, the FTM will be ideal home support garments for patients who are receiving in office photorejuvenation treatments from their physician, as sort of “protect your investment garment” that will become a staple of physician dispensing and part of their home skin care retail patient program. Zero safety concern, high comfort for users and no special time commitment make the treatment attractive for patients looking to maintain and improve the look of their skin.

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