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Novel applications of Phototherapy

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OUR HUMAN RELATIONSHIP WITH LIGHT

Phototherapy is perhaps the most ancient form of treatment in dermatology, being responsible for the management of a wide variety of skin diseases and it remains an extremely effective, safe and broadly used form of treatment.

Our relationship with the sun’s light and its popularity may seem to change almost as quickly as seasons or as fashion trends do. During winter we fear the “winter blues”, seasonal affective disorder (SAD), with advertisements making us believe in the need to expose ourselves to “happy light lamps” and take vitamin D supplements. In the summer we are encouraged to cover up, avoid the midday sun and use broad-spectrum sunscreen with high sun protection factor (SPF) to prevent skin cancer. Throughout the year it is still recommended to use broad-spectrum sunscreen daily to protect from the sun’s aging effects such as rhytides (i.e. wrinkles) and uneven pigmentation. Such conflicting information may contribute to the general apprehension towards phototherapy.

Tanning has also gone in and out of fashion. Until the end of the Victorian era, pallid skin was seen as a sign of "refinement" since people from lower social status had tanner skin as result of working outdoors more. In the beginning of the 20th century, scientific evidence of the positive effects of ultraviolet radiation (UV) in health and its use as a medical therapy started to emerge. In 1903, Niels Finsen was awarded the Nobel Prize in Medicine for describing the “Finsen Light Therapy” that could cure diseases such as lupus vulgaris and rickets. However, it was in the 1920’s when two women seem to have changed the perception of tanned skin as fashionable and luxurious. Parisians started to admire the “caramel” skin of the popular singer Josephine Baker and the tanned skin of fashion-designer Coco Chanel, who developed her tan as result of an accidental sunburn in 1923 while visiting the French Riviera.

These contradictory attitudes towards UV radiation have also been and are still present among the medical community. The fear of phototherapy-induced skin cancer and reports of fatal overexposure results in a significant geographic variation of the use of phototherapy. Additionally, there is also a wide discrepancy on protocols prescribed for the same medical indication despite the many studies published on these therapies.
GLOBAL AWARENESS

As the importance of the therapeutic effects of the sun’s UV rays have grown, so has the development of artificial light sources, and the concept of phototherapy has greatly expanded. Since one of the first books on phototherapy, Die Heilkraft des Lichtes by Willibald Gebhardt (published in 1898), hundreds of new books have since been written. A sign of growing interest in studying the effects of light was marked by the creation of sub-specialty areas like photobiology and photochemistry. The demand for specific clinical-related information fueled the establishment of national and international photomedicine and photodermatology societies such as the British Photodermatology Group (1988), Photomedicine Society (1992) and European Society for Photodermatology (1995). In the same way, the recognition of the impact of UV radiation on human health by the World Health Organization in collaboration with the United Nations Environment Programme, the World Meteorological Organization, the International Agency on Cancer Research and the International Commission on Non-Ionizing Radiation Protection led to the creation of INTERSUN, a global UV-focused program. Currently there are regular meetings, journals and publications aimed to promote, support, stimulate and report information about all aspects of photosciences.

PROGRESS OF PHOTOTHERAPY IN DERMATOLOGY

Light has long played a significant role in the treatment of human diseases. The earliest registered information on heliotherapy in the treatment of skin diseases dates back to the fifteenth century B.C. This issue starts with a brief repost on the history of phototherapy by Grzybowski et al.; from the ancient use of heliotherapy to the modern discoveries and inventions that contributed to current artificial light therapies. Matos et al, follow by elucidating the mechanisms of action of phothotherapy and its immunologic effects. Ultraviolet radiation is also responsible for the photosynthesis of vitamin D and its active metabolites in the skin. Increasing controversy indicates that vitamin D produced during phototherapy may be responsible for some the positive effects. Juzeniene et al. review what is known about the use of phototherapy to enhance vitamin D levels, the use of vitamin D analogs with phototherapy, the efficacy of combination therapies and controversies regarding some of the outcomes.

Despite the beneficial biological impact of phototherapy, it can also lead to acute and long-term adverse effects. Coelho et al. thoroughly explore the “dark side of light” in two manuscripts: 1) putting in context the adverse effects of each treatment modality, while specifying preventive and monitoring measures, and 2) focusing on the mechanisms of
the most feared side effect: photocarcinogenesis.\(^7\) It was noted that despite concerns over the carcinogenic potential of ultraviolet radiation, most studies do not show an increased risk of non-melanoma or melanoma skin cancer in patients treated under controlled UVB (broadband and narrowband) and UVA1 phototherapy protocols. On the other hand, photosensitivity can be an adverse effect of several drugs that induce photoallergic and phototoxic reactions. It remains a common clinical problem, frequently underdiagnosed. Monteiro et al. review the drugs, which have been implicated as photosensitizers, the involved mechanism, as well as their clinical presentations.\(^8\)

Brownell et al. discuss patient compliance rates. In order to optimize health outcomes, it is extremely important to account for patient compliance when tailoring therapy regimens and selecting patients. It can also influence the appearance of side effects and discomfort, grade of improvement and even affinity with staff.\(^9\) Nevertheless, phototherapy remains one of the most commonly utilized treatments for several diseases. Matos et al. provide an updated comprehensive overview of UVB phototherapy for psoriasis, on the pursuit of the optimal regime. It aims to help physicians optimize their choice of modality and dosing regimen to ensure optimal outcomes for psoriasis patients.\(^10\) Even though there are a variety of wavelengths and modalities available to treat vitiligo, narrow-band UVB (NBUVB) remains the safest and most feasible line of treatment. Esmat et al. attempt to describe the most efficient protocols while accounting for the heterogeneous population of vitiligo patients.\(^11\) Eleftheriadou et al. follow by describing home portable devices available for vitiligo, which may overcome the need to treat vitiligo in hospital-based phototherapy cabinets, allowing early treatment at home that may enhance the likelihood of successful repigmentation.\(^12\) Rodenbeck et al. describe phototherapy dosing regimens and treatment concerns as a second-line treatment for moderate to severe atopic dermatitis.\(^13\) Teske et al. revised current literature on phototherapy as an effective treatment strategy for a variety of sclerosing skin conditions.\(^14\) Light therapy is also currently used for various modalities of cosmetic conditions, such as acne vulgaris, solar lentigo and melasma. Brownell et al. describe these as well as the indications and mechanism of action for each cosmetic modality.\(^15\) Welsh discusses the potential therapeutic effect of UV in alopecia areata.\(^16\)

Crall et al. focused on special considerations governing the use of phototherapy in pediatric populations.\(^17\) These include the pediatric patient but also family and facility-based factors that are oriented around heightened concerns with regards to safety and tolerability of treatment. Lastly, Madigan et al. discuss the controversial use of indoor tanning beds.\(^18\) Evidence-based research has shown an association between indoor tanning and negative health risks, such as melanoma and non-melanoma skin cancers, psychologic dependence and propensity towards other high-risk health behaviors.
Although UVR is also used in photochemotherapy (i.e. PUVA, using psoralen as a photosensitizer together with UVA radiation) and photodynamic therapy (PDT, UVA-1), the articles in this issue will mostly focus on phototherapy alone.

**OUR GOAL**

This issue aims to provide an updated comprehensive overview of the use of Phototherapy in most common skin conditions to the reader looking for a greater understanding of photodermatology literature. We are most grateful for having superb collaborators who gave their valuable time, experience and knowledge in revising the newest literature in order to present emerging evidence-based recommendations on remarkable core topics.

**Figure 1.** Dr. Tiago R. Matos and Dr. Vaneeta Sheth at the Department of Dermatology, Phototherapy Centre. Brigham and Women’s Hospital. A Harvard Medical School teaching hospital.
REFERENCES