50% reduction of chronic inflammatory skin disease severity with 12 weeks of high dose blue light therapy

Patients with psoriasis and atopic dermatitis are treated with blue light irradiation to decrease the symptoms of their disease. PhD candidate Zandra Félix Garza found out that treatment regimes with a duration equal to or higher than twelve weeks and a high dose, yield a disease severity reduction higher than fifty percent. Furthermore, Félix Garza suggests that the treatment efficacy can be increased for all patients, including those with low treatment response, by using a therapeutic protocol where the patient's skin is irradiated on a daily basis with a high dose of blue light.

The skin, the largest organ of the human body, protects it from harmful microorganisms and substances, and limits its water loss. In case of an internal or external threat, an inflammatory response is triggered in the skin for protective and regenerative purposes. However, the interplay between genetic, immunological, and environmental factors can result in chronic inflammatory skin conditions like psoriasis and atopic dermatitis. These diseases are characterized by high levels of inflammation and abnormal proliferation and differentiation of the structural skin cells known as keratinocytes.

Clinical investigations show that blue light irradiation decreases the symptoms of these dermatological diseases. However, the exact mechanism of blue light therapy leading to the management of these conditions is yet to be fully understood. Despite the good efficacy of blue light in treating psoriasis and atopic dermatitis, there is currently no systematic definition of the settings comprised in an effective treatment protocol to achieve a strong therapeutic effect in the lesional skin.

Computational methodologies are powerful tools that enable the systematic study of diseases and their therapeutic approaches. In her PhD research, Félix Garza developed computational tools that couple experimental and clinical data on blue light irradiation of human skin cells and enable the study of the intrinsic and extrinsic factors that may determine the outcome of blue light therapy in patients with psoriasis and atopic dermatitis.

Félix Garza's computational framework shows that the heterogeneity of the patient's skin and the settings used for its irradiation with blue light are the main factors that determine the efficacy of the treatment. The two irradiation settings predicted to have the most significant impact on the management of the disease are the dose of light applied on the skin and the duration of the treatment itself.

Title of PhD-thesis: Modeling the effect of blue light irradiation on inflammatory skin diseases. Supervisors: Natal A.W. van Riel (TU/e), Peter A. J. Hilbers (TU/e). Other main parties involved: Philips Electronics Netherlands B.V.