EVALUATION OF THE BIOLOGICAL EFFECT IN DNA DAMAGE REPAIR OF A HIGH BROAD SPECTRUM SUNSCREEN CONTAINING NICOTINAMIDE AND PANTHENOL USING 3D LINE-FIELD OPTICAL COHERENCE TOMOGRAPHY

J. Pérez-Anker[1], B. Alejo[1], P. Iglesias[1], P. Roses-Gibert[1], V. Berot[2], C. Cano[3], E. Cinotti[4], V. Del Marmol[3], M. Fontaine[3], M. Miyamoto[3], J. Monnier[5], J.L. Perrot[2], P. Rubegni[4], L. Tognetti[4], M. Suppa[3,6], D. Kerob[7], A. L. Demessant[7], L. Prieto[8], J. Malvehy[1], S. Puig[1]

[1]Dermatology Department, Melanoma Unit, Hospital Clínic de Barcelona, Barcelona, Spain, [2]Dermatology Department, University Hospital of Saint-Etienne, Saint-Etienne, France, [3]Dermatology Department, Hôpital Erasme, Brussels, Belgium, [4]Dermatology Unit, University of Siena, Siena, Italy, [5]Dermatology Department, AP-HM, Aix-Marseille University, Marseille, France, [6]Dermatology Department, Institut Jules Bordet, Brussels, Belgium, [7]La Roche-Posay Laboratoire Dermatologique, Levallois , France, [8]La Roche-Posay Laboratoire Dermatologique, Madrid, Spain

INTRODUCTION

Nicotinamide is the precursor of NAD (nicotinamide adenine dinucleotide), an essential coenzyme in the production of ATP (adenosine triphosphate), the main source of cellular energy. Previous studies in mice showed that oral consumption or topical application of Nicotinamide prevents immunosuppression and reduces the number of tumors induced by UV radiation.[1] In humans, topical application of 5% Nicotinamide prevents immunosuppression caused by solar UV radiation, but not from burns. Furthermore, oral Nicotinamide reduces the diagnosis rate of new non-melanoma skin cancers and actinic keratosis (AK) in high-risk patients. It has been suggested that one of the mechanisms by which Nicotinamide may protect against photodamage is by increasing ATP production which enhances DNA repair. Additionally, Nicotinamide acts as a PARP1 inhibitor. Extensive DNA damage leads to over-activation of PARP1 which can lead to NAD depletion. Thus, cells are unable to enter apoptosis, since the process requires a large amount of energy.

Using a sunscreen with a high broad spectrum UVB-UVA and containing Nicotinamide and Panthenol, may allow to reverse chronic sun damage, improve skin morphology (LC-OCT + histology) as well as biological and molecular (DNA damage) markers, in patients with AK.

Our objective was to determine the morphological effect of a high broad spectrum UVB-UVA sunscreen containing Nicotinamide and Panthenol *in vivo.*

MATERIAL & METHODS

In a prospective single-center study, 19 subjects with AK aged between 50 and 70 years were included. Four lesions on the scalp of each subject were selected: 2 AK (area 1 & 2) and 2 field cancerization (FC), (area 3 & 4); (Figure 1). During the screening visit, LC-OCT imaging of the 4 lesions and a biopsy of one AK and one FC were performed. After 8 weeks of applying the nicotinamide–containing high broad spectrum UVB-UVA sunscreen twice a day, LC-OCT imaging technique was repeated for the two remaining lesions and a biopsy was performed (Figure 2). Images of AK vs FC, AK before treatment vs after treatment and FC before and after treatment were compared and a keratinocyte analysis (atypia score and keratinocyte metrics) was done.

Figure 1

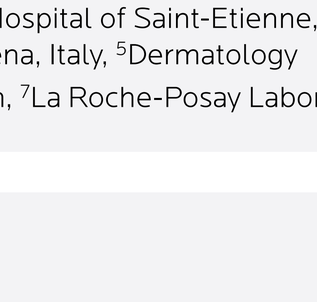


Figure 2

RESULTS

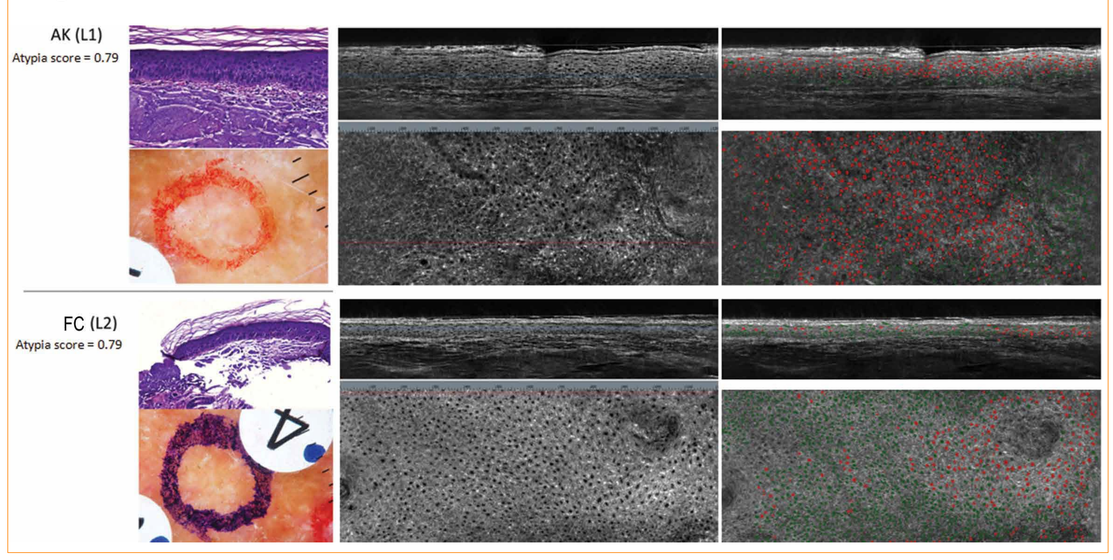
The epidermis and the stratum corneum were significantly thicker for the AK than for the FC (+51% and +139% respectively) (Figure 3) and the dermo-epidermal junction (DEJ) was more undulated for the AK than for the FC. Regarding keratinocytes analysis, the average number of layers was higher for the AK than for the FC (+24%) and the atypia score was significantly higher for the AK than for the FC (+36%) (Figure 4). Moreover, the AK keratinocyte nuclei had a larger volume (+9%) with more variability (+19%) and their cytoplasm was larger (+23%).

The epidermis was significantly thinner in the AK after than before the treatment (-13%).

Regarding the keratinocyte analysis, a small decrease of the mean volume of the FC nuclei and the average number of layers of the FC (-8.8% and -7,2% respectively) was observed.

Figure 3

Figure 4



CONCLUSION

The tested high broad spectrum UVB-UVA sunscreen containing Nicotinamide and Panthenol may have a positive effect on the structure of the epidermis of AK and the keratinocyte nuclei of FC.

Acknowlegements:

We thank patients and investigators who took part in this study

Funding:

25th World Congress of Dermatology SINGAPORE 2023
LA ROCHE-POSAY LABORATOIRE DERMATOLOGIQUE
PLATINUM SPONSOR

References:

1. Snaidr VA, Damian DL, Halliday GM. Nicotinamide for photoprotection and skin cancer chemoprevention: A review of efficacy and safety. Exp Dermatol. 2019 Feb;28 Suppl 1:15-22.