Pandemic stress and the role of sustained cortisol exposure in scalp samples promoting inflammatory cytokine dysregulation

McGuckin, Colin1; Desroches, Anne-Laure1; Payen, Pauline1; Milet, Clement1; Kappler, Katharina2; Vialle, Alize1; Lacroix, Mathieu1; Luangvannasy, Tiffany1; Boisseau, Romain1; Forraz, Nico1; Wandrey, Franziska2.*
1 CTISkin department, CTIBIOTECH, Lyon-Meyzieu, France; 2 Mibelle Group Biochemistry, MIBELLE AG, Buchs, Switzerland.

Poster-ID : 183

INTRODUCTION

The relationship between stressful periods and cutaneous manifestations are well known. The Covid-19 crisis that occurred in recent years significantly increased skin stress reports worldwide. Cortisol is a steroid hormone synthesized from cholesterol and widely known as the body's stress hormone. It has many functions in the human body and is not restricted to the primary nervous system, but also peripherally around the body including scalp and skin. The role of hair follicle is considered important in the process of long term chronic scalp issues. Barrier function and keratinocyte turnover is already known to be perturbed during immunological events with production of cytokines stimulating the recruitment of immune cells. Stress and emotions are processed by the brain amygdala which activates the HPA axis causing the release of cortisol.

Therefore, in the present study, we developed a hair follicle – epidermis – dermis model to mimic any negative effects of psychological stress and help to create a screening system which would be suitable for actives, products or treatments.

METHODS

EXPLANT - SEEDING

TREATMENT

- Untreated
- 3%SDS (only Group1)
- Cortisol 10µm, 100µm, 500µm

Group1 - 24 hours

Group2 - 48 hours

D0 **D1** **D2** **D3** **CBA**

Fresh Scalp explants
Fermales : 61 to 71 yo

Metabolic activity assay

Ex vivo scalp models : 6 replicates were perfomed per group per conditions.

Metabolic activity : AlamarblueTM Cell Viability reagent – 4 hours incubation.

Cytokines levels : Cytometric Bead Array (CBA) - Human Inflammatory Cytokines on culture supernatants : IL-6, IL-8, IL-12 p70, IL-10, TNF and IL1-β.

RESULTS

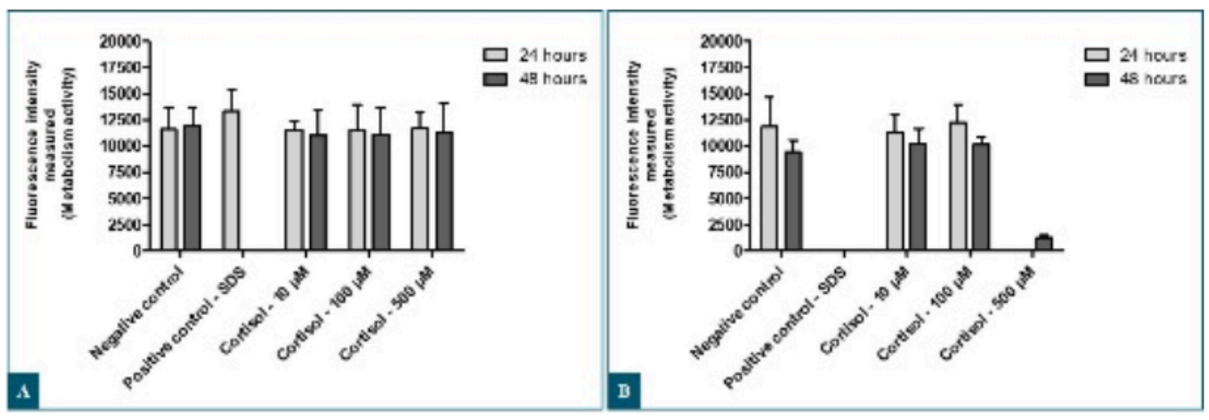

***Figure** ., Alamar Blue quantification before (A) and after (B) treatment application (Day 1 or Day 3 – n=6)*

- **SDS : reduced tissue viability.**
- **Cortisol 10 and 100 µM : not induce a significative reduction**
- **Cortisol 500 µM : reduced significantly viability of the samples.**

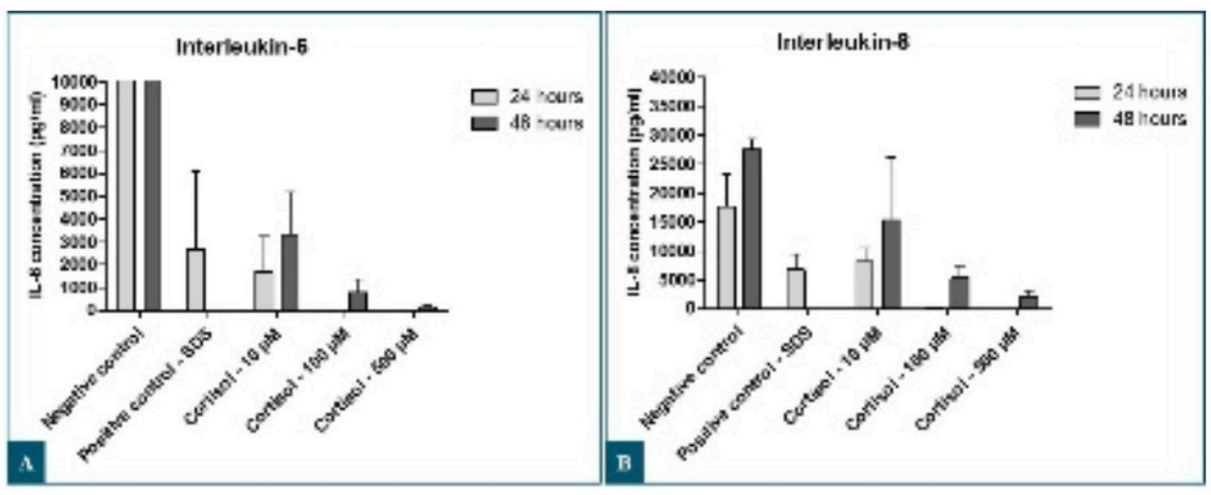

***Figure** . IL-6 (A) and IL-8 (B) Secreted cytokines from skin scalp explants after treatment applications.*

IL-6 (A) and IL-8 (B):

- **Constitutively secreted in control samples.**
- **Highly reduced by SDS application.**
- **Dose-response cortisol reduction regardless of time application**

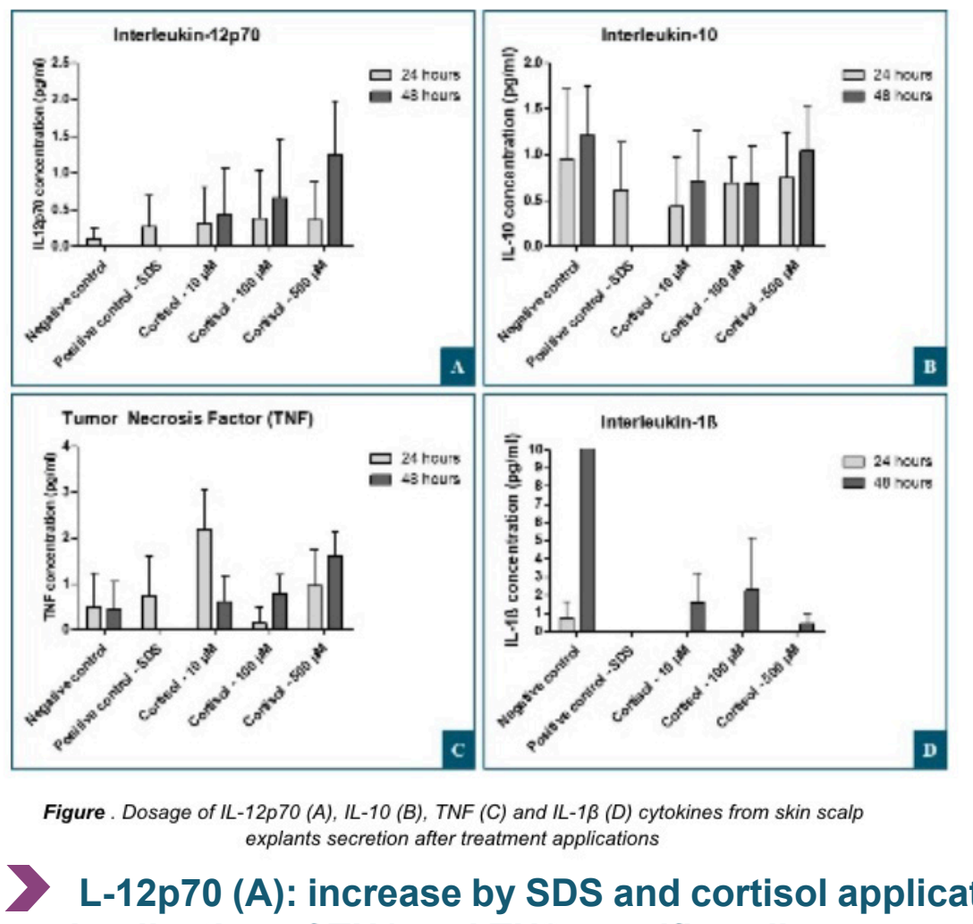

***Figure** . Dosage of IL-12p70 (A), IL-10 (B), TNF (C) and IL-1β (D) cytokines from skin scalp explants secretion after treatment applications*

- **L-12p70 (A): increase by SDS and cortisol application. Implication of TH1 and TH2 specific cells**
- **IL-10 (B): inhibition by cortisol only after 48 hours.**
- **IL-1β (D) and TNF (C): low amounts in all conditions.**

CONCLUSION

- **Scalp was severely perturbed by higher concentrations of cortisol and the speed (only 1 to 2 days) of action was an important factor indicating that even short periods of stress can affect the scalp quality.**
- **We have developed a new testing model for the scalp-hair-stress cycle, where cortisol is a major implicated factor and is defined and has immunological interactional involvement.**
- **With the current group of cytokines, there may have been a move to promotion of TH1 cytokine response and reduction of TH2 response.**