Project Summary for EPUAP website

Project Title: The relationship between subepidermal moisture measurement and inflammatory markers in the early identification of pressure ulcers.

Project Team: Ms Natalie L. McEvoy, Professor Zena Moore, Professor Declan Patton, Dr Cathal Kearney, Professor Peter Worsley, Professor Ger Curley.

Project Focus: To establish the correlation between IL-1α and total protein (TP) and SEM measurement in the early detection of pressure ulcers in adult intensive care patients.

Introduction: Cytokines are synthesized and released after mechanical injury of the skin cells, making them a biomarker. The cytokine of interest in this study is IL-1α, a pro inflammatory cytokine that is released after injury to the keratinocytes and that has been shown to be significantly increased after pressure loading of the skin (Soetens et al., 2019). A simple method has been developed to collect samples for IL-1α and total protein (TP) noninvasively in humans with the use of Sebutape. These tapes which are commercially available (Cu-Derm, Dallas, TX, USA), can acquire sebum non-invasively by being applied to the skin surface in the region of interest for a period of two minutes. Recently, a new technology to measure levels of Sub Epidermal Moisture (SEM) has been developed. The SEM Scanner™ detects subdermal skin changes based on the principles of inflammation between 3-10 days before pressure ulcers become visible. For the very first time this study will involve the sampling of sebum and measurement of SEM from at risk skin sites in critically ill intensive care unit patients (sacrum, both heels and a control site). The control site will represent an area of the body where there is no pressure applied, for example the arm. Patients will be monitored over five days, taking multiple samples of sebum and SEM readings to better understand the onset of skin damage in this vulnerable population. SEM and Sebutape samples will be taken at the same time points, to assess any potential associations between the inflammatory measurement approaches. Sebutape samples will be stored frozen at -80°C for analysis. For biochemical analysis, tape samples will be thawed, suspended in PBS, and agitated in a sonic water bath (10min) and vortexed (2min) to release collected protein. Total protein level will be measured by standard Bradford assay and used to normalise the readings of il-1 α, which will be measured using standard ELISA techniques.

Project Aim: To undertake an observational study of IL-1α, total protein (TP) and SEM as indicators of the presence of early pressure ulcer damage in adult intensive care patients.

Key Milestones:

The following will be achieved during this scholarship,

1. Develop the skills needed to apply and remove the Sebutape from the skin surface.
2. Develop a better understanding of the processes involved in handling Sebutape and extracting the sebum from the tape.
3. Learning the steps involved in the ELISA assay, to competently extract the desired protein from the sebum.
4. Develop a detailed understanding of the processes underpinning inflammation in the early stages of pressure ulceration.

References:

SOETENS, J. F. J., WORSLEY, P. R., BADER, D. L. & OOMENS, C. W. J. 2019. Investigating the influence of intermittent and continuous mechanical loading on skin through non-invasive sampling of IL-1alpha. *J Tissue Viability,* 28**,** 1-6.