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ABSTRACT BOOK

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DETECTING THE SIGNS OF SKIN DAMAGE USING BIOPHYSICAL AND BIOMARKER APPROACHES

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Introduction: Pressure ulcers (PUs) and incontinence-associated dermatitis (IAD) are types of skin damage that result from prolonged exposure to external insults including pressure, shear, friction, and moisture. The clinical symptoms, which can often become chronic, include erythema, skin swelling, oedema and skin breakdown. It is imperative to detect early signs of these conditions prior to irreversible damage. However, subjective skin assessment typically used by clinicians lack predictive capability. Objective biophysical and biomarker approaches have been suggested to provide the means of monitoring the early signs of damage, although further evidence is required to establish their sensitivity and specificity.

This project aims to develop an array of biophysical sensors, in addition to skin biomarkers, to understand the pathophysiological changes associated with variations in skin integrity, specifically associated with PUs and IAD.

Methods: A series of parallel studies have been conducted including a retrospective analysis of established data from the host lab, a survey of skin damage from the application of personal protective equipment (PPE), and prospective studies of skin changes following prolonged exposure to pressure and moisture, and PPE. Parameters assessed included transepidermal water loss (TEWL), stratum corneum hydration (SCH), erythema and inflammatory skin biomarkers.

Results: Results revealed that prolonged exposure of the skin to mechanical loads and moisture disrupted the barrier function, as evidenced by increased TEWL, SCH and manifestation of adverse reactions (i.e. itchiness, rashes, and spots). For example, the assessment of healthcare workers (n=17) using PPE revealed the nasal bridge was the skin site most affected by FFP3 mask application as evidence by increased TEWL, with the second consecutive day of mask usage (week 2) exhibiting the highest values (Figure 1A). Statistically significant correlations ($p<0.05$) were also observed at the nasal bridge prior and post mask application for TEWL (Figure 1A) and between TEWL and participants' BMI (Figure 1B).

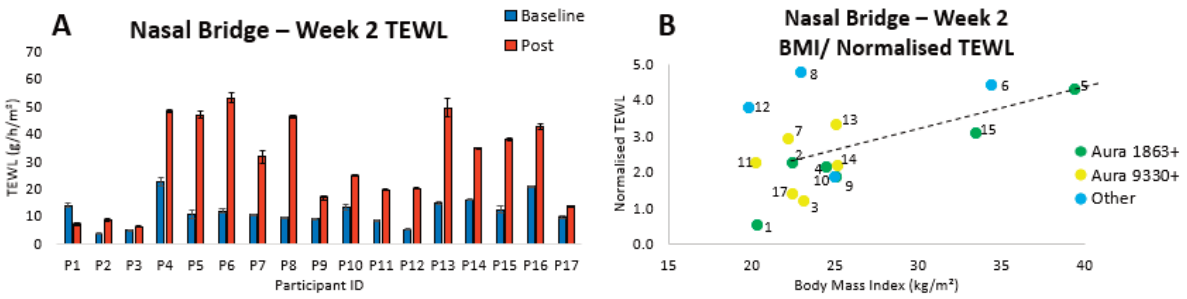

Figure 1. Variations in TEWL values following RPE application (A) and correlations of TEWL with participant BMI (B) on the bridge of the nose.

Conclusions: Prolonged use of RPE over 3 weeks period caused changes in skin barrier properties of HCWs causing an increase in TEWL and variations in skin hydration. Future works will include the analysis of skin sebum for the quantification of biomarkers, which are reflective of skin status. In addition, a cohort study of patients who have early signs of skin damage will be conducted.

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