TEWL and stratum corneum hydration changes caused by prolonged contact with a new TEWL measurement head

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Introduction

The aim of this research was to investigate the effect on TEWL and stratum corneum (SC) hydration of prolonged contact with the measurement head of a patented new instrument for measuring water vapour flux (*Cool-TEWL*, see [1]). It uses a closed measurement chamber to eliminate fluctuations due to ambient air movements, whilst removing trapped water vapour with an electronically cooled condensing surface opposite the measurement orifice. In consequence, the skin surface is exposed to a precisely controlled and highly reproducible microclimate of ~10% relative humidity and it was thought worthwhile to investigate and quantify any consequential changes in skin properties [2].

Experimental details

Volar forearm skin was exposed to repeated cycles of prolonged contact with the *Cool-TEWL* measurement head in two measurement series, as summarised in Table 43.1.

Table 43.1: Main experimental parameters		
Parameter	**Series (1)**	**Series (2)**
No of volunteers	4	3
No of contact cycles	6	5
Duration of contact (minutes)	5	30

At baseline and immediately after each period of contact (within 30 seconds), the mean hydration of the top ~10μm of the SC under study was measured using the *OTTER* technique [3]. The measurements were normalised to the first measurement from each

volunteer and fitted to a linear relationship of form $y = A + B*t$, where B is the gradient characterising the mean change with time of exposure.

Results

Measurement Series (1) did not reveal any underlying trend above the noise. Measurement Series (2) revealed a trend of decreasing TEWL (–0.10±0.03% per minute, see Figure 43.1a) and increasing SC hydration (+0.05±0.05% per minute, see Figure 43.1b).
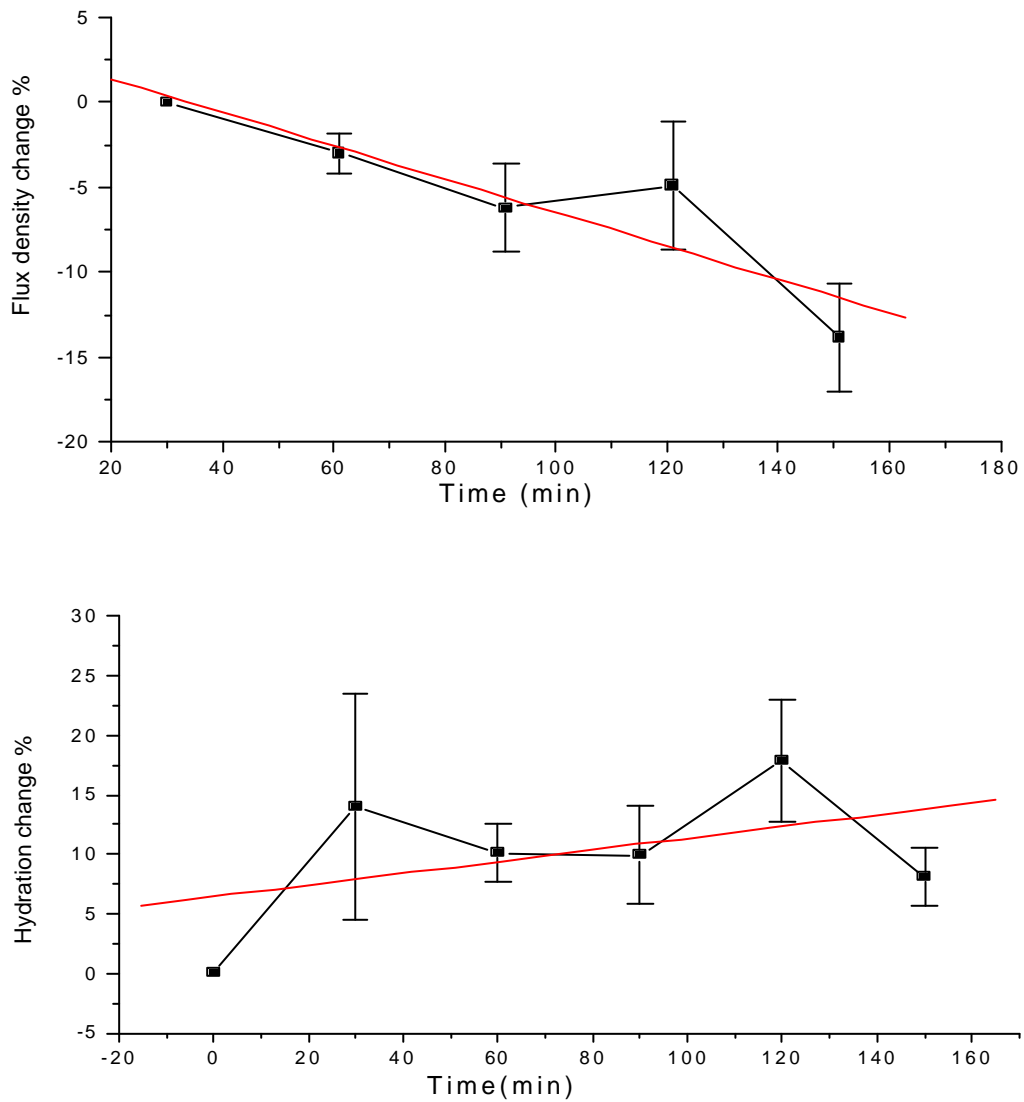
Figure 43.1 Time Series (2) results for (a) TEWL (upper) and (b) SC hydration (lower) with fitted trend lines.

Discussion and conclusions

The most surprising aspect of these experiments is how small the observed changes of SC properties were, given the long exposure times to which the test sites were subjected. The weak increase SC hydration with contact time is clearly not the result of exposure to the microclimate, where the opposite effect would be expected. Metabolic changes occur in the volunteers during these experiments. For example, a decrease of skin surface temperature in Measurement Series (2) was observed. Finally, we attribute the relatively large error bars in the TEWL data to (a) instrument imperfection in the crude prototype used and (b) bio-noise.

In conclusion, the results show that prolonged exposure of skin to the low relative humidity microclimate within the *Cool-TEWL* measurement head has little discernible effect on TEWL and SC hydration.

References

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