

## Measurements of trans-onychia water loss (TOWL) using Aquaflux

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**Purpose:** Transepidermal water loss (TEWL) – passage of water from the body through the skin into the outside environment - is widely employed to characterize skin. In contrast, there are very few reports on the measurement of Transonychia Water Loss (TOWL) – passage of water from the body through the *nail plate* into the outside environment. The TOWL values reported by different researchers have been quite different, some of which can be assigned to the different techniques of measurement and adaptation of instruments designed to measure TEWL. The aim of the study was to develop protocol for TOWL measurements using a specially designed cap with the condenser-chamber Aquaflux and, determine inter-day, inter-finger and inter-hand variabilities in TOWL, as well as the influences of nail varnish application and removal, filing and hydration of the nail plate, on TOWL.

**Methods:** A measurement cap was designed and produced by the manufacturer of Aquaflux to fit nail plates. TOWL (finger) measurements were conducted in 1 subject with healthy nails, following subject acclimatisation for 30 min in the laboratory.

**Results:** Time allowed before instrument baseline calibration, interval between measurements, and probe contact pressure on fingernail influenced TOWL readings. Significant inter-day, inter-finger and inter-hand differences in TOWL were found. Filing the nail plate with a nail file increased TOWL, increase being related to number of filing strokes, and was significantly increased after 5 strokes. Application of a nail polish reduced TOWL, as a function of the number of varnish coats applied. Removal of the nail varnish with ethanol resulted in increase in TOWL back to control values. Hydrating the nail plate (by fingernail immersion in water) increased TOWL, the extent of increase corresponding with duration of immersion, with a maximum being reached after 5 minutes immersion. Subsequently, TOWL decreased with time to control values, the time taken being directly related to duration of hydration.

**Conclusion:** A protocol for accurate and reproducible measurement of TOWL using the Aquaflux was developed. Inter-day, inter-finger and inter-hand differences in TOWL in one subject show the difficulties of using TOWL as a parameter, in disease, for example, and the need for careful controls.