

Measuring Skin Condition for a Healthier Workplace

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Measuring Skin Condition for a Healthier Workplace

- What can we measure
- What is it measuring?
- What does it tell us?
- Factors influencing skin condition measurement
- Demonstrations
- A chance to use the equipment
- How can we use it?

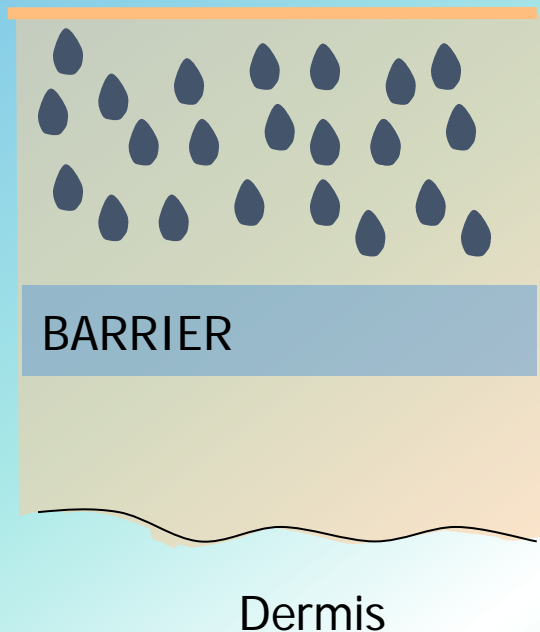


Instrumentation for measurement of dermal toxicity

- Hydration measurement
- Transepidermal water loss measurement
- Colour measurement
- pH
- Elasticity
- Desquamation
- Skin topography
- Microcirculation mapping
- General considerations



Hydration



- Stratum Corneum (SC) Hydration
- Water gradient in SC
- Influences:
 - Barrier function
 - Mechanical properties
 - Chemical/Drug penetration

Why Measure Hydration?

- Characterisation of normal skin
- Characterisation of pathologic skin
 - Actinic aged skin
 - Dry Scaly Lesions
 - Irritated skin conditions
- Assessment of
 - product efficacy/personal hygiene
 - Effectiveness of control measures



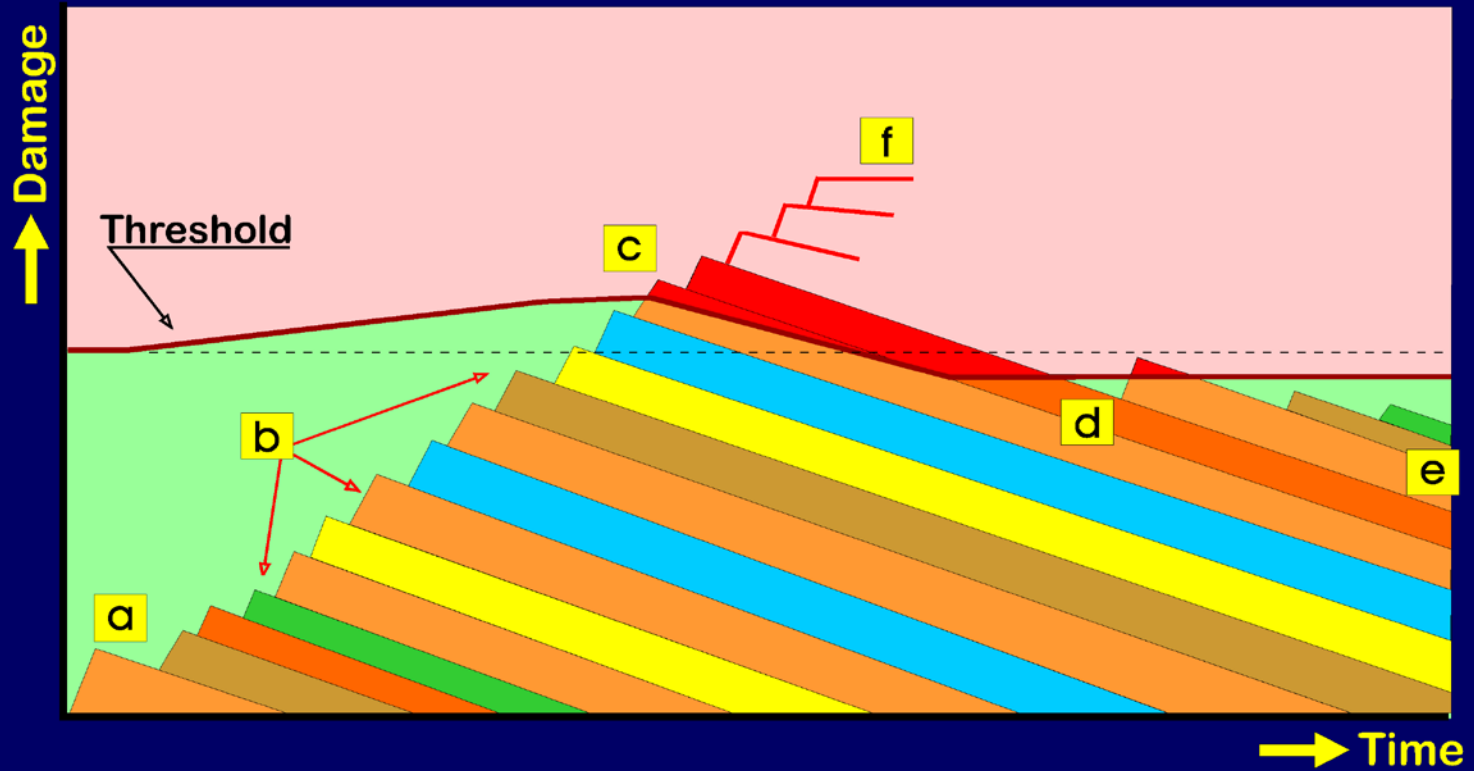
What does it tell us?

- Information about skin pathology
- Psoriasis ~ Eczematous dermatitis ~ Atopic dermatitis
 - Show lower values than normal skin
- Skin Irritation/irritant damage
 - Both acute and chronic irritation
 - Decrease in hydration
 - Removal of surface lipids
 - Removal of water-holding substances/Natural Moisturising Factors (NMFs)



Importance of Skin Hydration

Cumulative effect on the skin of contact with irritants



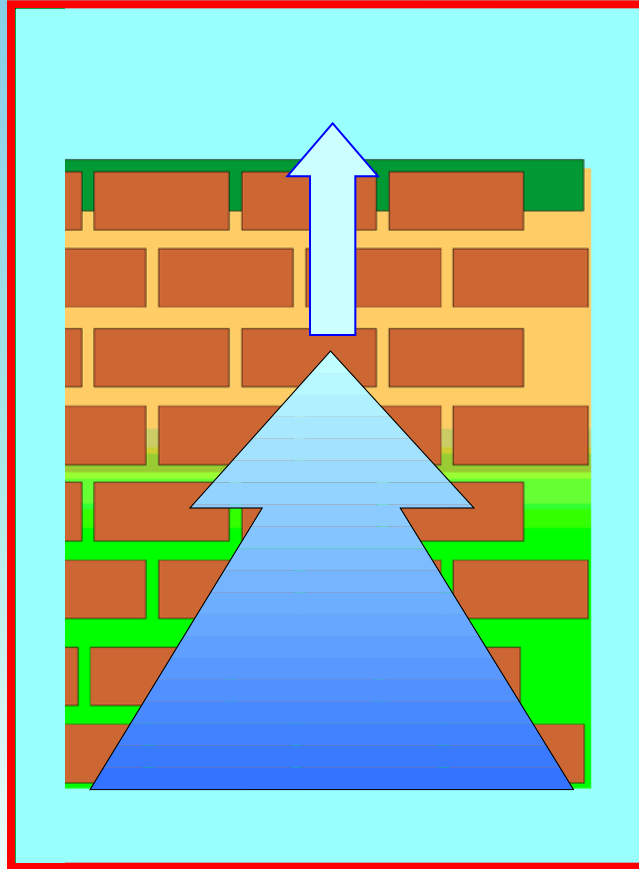
{After Malten/van der Walle}

Methods for Hydration Measurement

- Electrical Methods
 - Capacitance
 - Conductance
 - Impedence
- Optothermal Transient Emission Radiometry (OTTER)
- Confocal Raman Spectroscopy



Transepidermal Water Loss (TEWL)



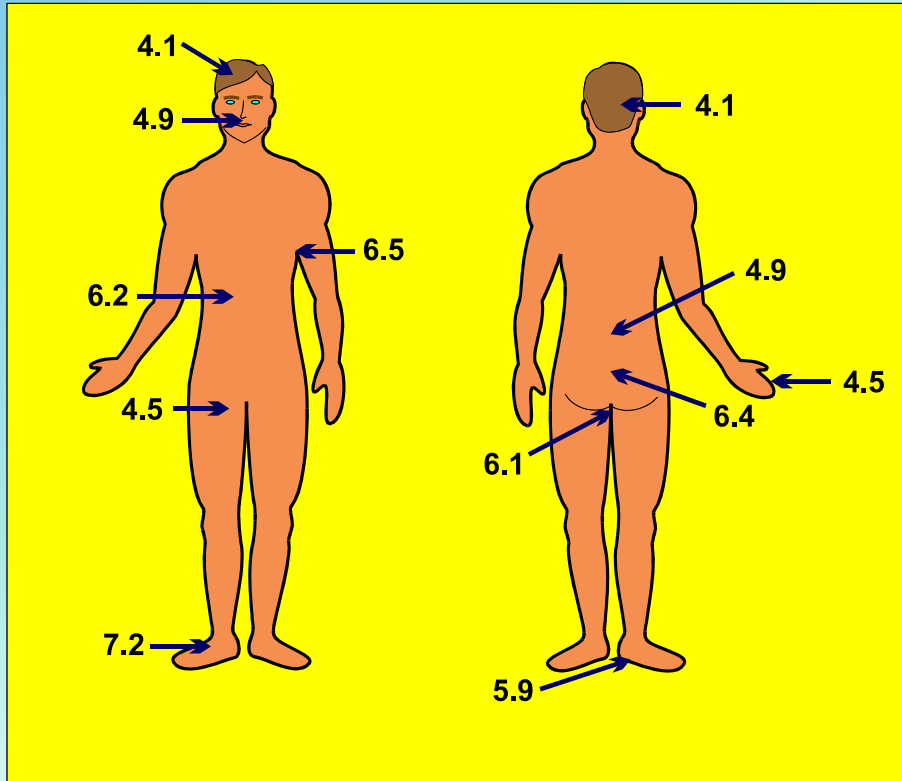
- Water passes through the skin
- Not sweat
- Evaporates off surface
- Passes through barrier

Why Measure TEWL?

- Characterise barrier function
 - Normal
 - Pathological
- Predictive irritancy testing
- Effectiveness of exposure control measures



pH



- Skin surface is acidic
- Acid Mantle
- Protective function
- Microflora

Why measure pH?

- Understand effectiveness of barrier to microorganisms
- Understand some effects of exposure



Colour



- Skin pigmentation
 - Melanin
 - Erythema
- Full spectrum colour
- Blood perfusion

Why Measure Colour?

- Quantitative
- Objective
- Continuous
- Clinical disease
- Irritant dermatitis studies
- Vasoconstriction test
- Phototype ~ Photosensitivity
- Pigmentation changes due to exposure or treatments



Biomechanical Properties

- Elasticity
- Viscoelasticity
- Ageing
- Pathological Conditions
 - Scleroderma
 - Connective-tissue disorders
 - Psoriasis
 - Acute Edema



Why Measure Biomechanical Properties?

- Understand long term changes as a result of exposure
- Raise awareness
- Engage workforce and stakeholders



Skin Surface Topography

- Skin Surface texture
- Wrinkles
- Wounds
- Aging
- Skin Disease



Why Measure Skin Topography?

- Understand skin surface changes
- Long term effects of workplace exposure
- Raise awareness



Desquamation

- Loss of stratum corneum at skin surface
- Normal skin physiology
- Disease processes
- Interpreting actions of chemicals/drugs

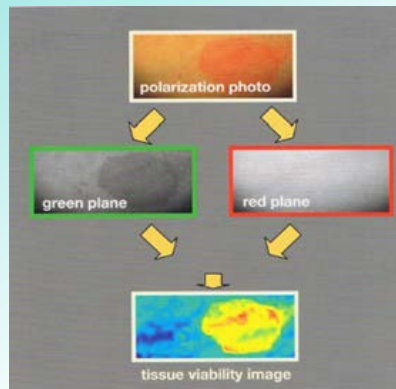
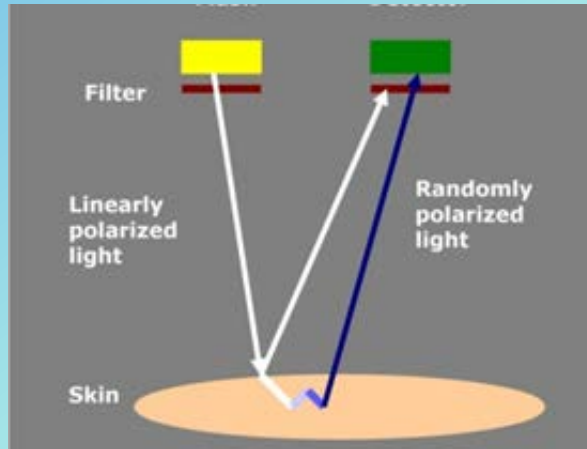


Why measure Desquamation?

- Understand surface skin condition
- Monitor changes as a result of control measures
- Raise awareness



Microcirculation Mapping

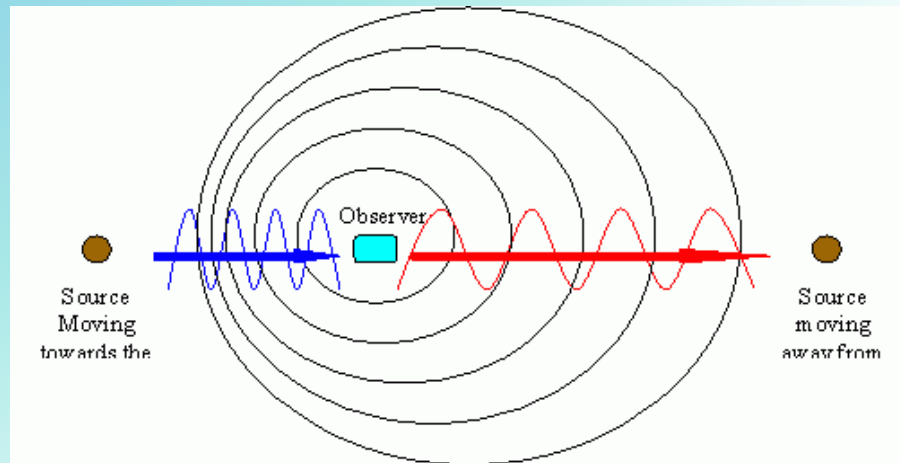


- Polarised Light Spectroscopy
- Photograph made of skin area
- Image produced with blood perfusion
- Quick
- Video capture also possible
- Can also be used for other parameters

Acknowledgement to Wheelsbridge

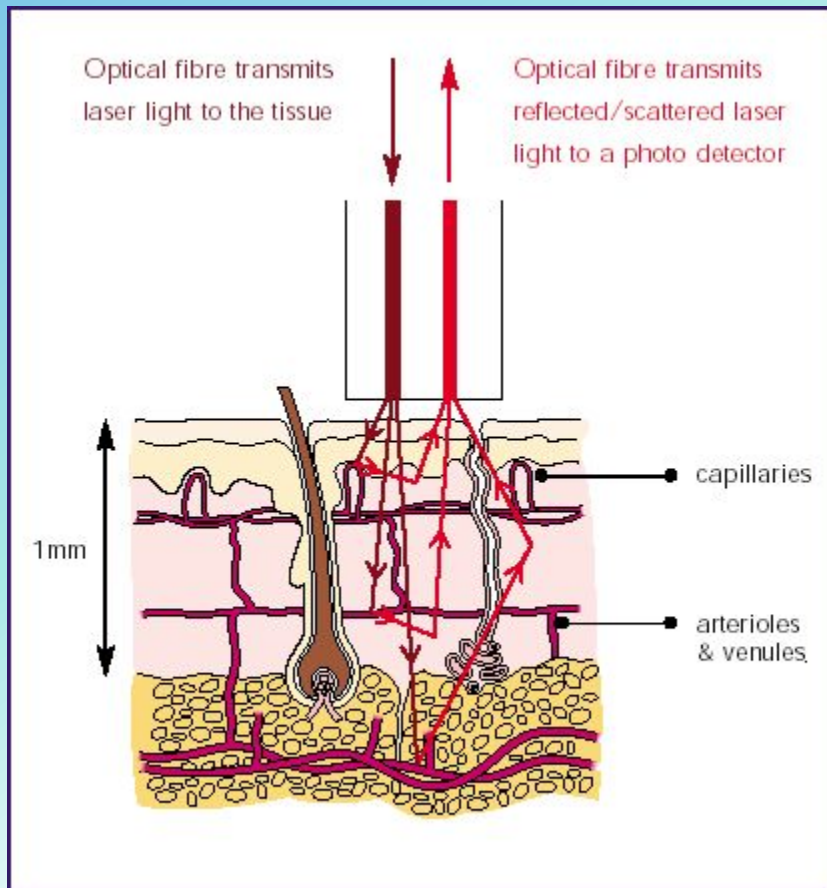


Laser Doppler Blood Flow Measurement



- Laser light
- Doppler shift
- Blood flux
 - Blood cell perfusion

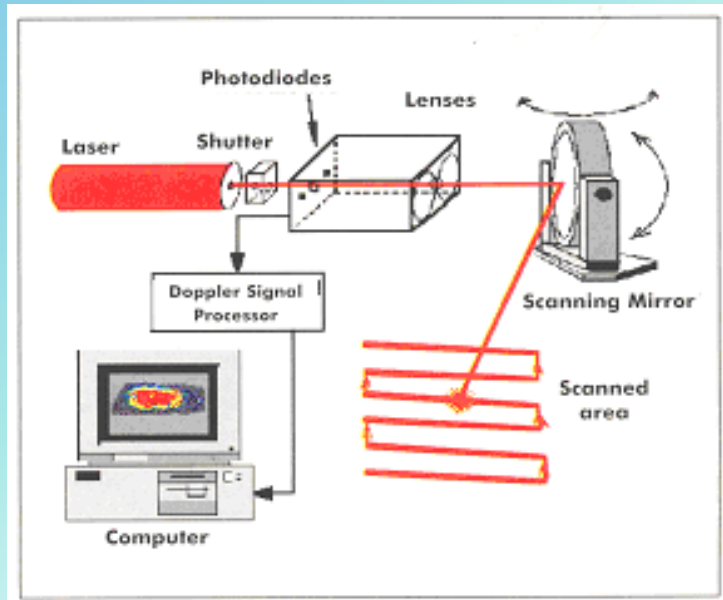
Laser Doppler Flowmetry



- Single point measurement
- One or more optical fibres
- Dermis
- Temperature
- Continuous

Acknowledgement to Moor Instruments

Laser Doppler Imagery



- Laser Scan of surface
- Doppler shift measured
- Signal processed to produce image

Acknowledgement to
Moor Instruments

Why Measure Blood flow?

- Microcirculation important for
 - Skin metabolism
 - Temperature regulation
 - Defence system
- Some skin disorders characterised by changes in blood flow
 - Psoriasis
 - Rosacea
 - Irritant damage
 - Reynaulds
 - HAVs



Using skin measurements in scientific research

- It has been used – Published research
- General considerations
 - Knowledge of the instruments
 - Factors influencing measurements
 - Study design
 - Taking measurements
 - Interpretation of data and data reporting



Knowledge of the instruments

- What do they measure?
- What is the measurement principle?
- Are there any instrumental limitations?

Factors influencing measurements

- Endogenous factors (related to the subject measured)
 - Age
 - Gender
 - Ethnicity
 - Anatomical position
 - Medication, smoking, exercise, etc
- Exogenous factors
 - Skin washing/wet work
 - Solvents/surfactants/soaps
 - Occlusion



Factors influencing measurements

- **Environmental factors**
 - Air convection/movement
 - Ambient temperature
 - Relative humidity
 - Ambient light
 - Season
- **Measurement factors**
 - Calibration
 - Different models



Study Design

- Clearly defined study objective
 - Measurement variable directly linked to study objectives
- Subject inclusion and exclusion criteria
 - Control groups
- Accessibility of subjects and compliance
- Ethically justified



Taking measurements

- Measurement settings
 - Clinical
 - Non-clinical
- Calibrate and verification of instruments
- Also "characterise" the measurement environment
- Acclimatisation of instruments and subjects
- Observations of environment and subjects
 - Note deviations
- It takes time to make measurements



Interpretation of data and data reporting

- Take note of factors influencing data
- Absolute values
 - Comparison with reference values
- Relative as a %change over time



Demonstrations



Exercise

- Try the measurement equipment
- Would you use it? And Why?
- What would you use?
- How would you use it?



Would you use it? And Why?



What would you use?



How would you use it?



How would you use it?

- Skin Health Surveillance
 - Responsible people
 - Occupational Health professionals
 - Regular monitoring
- Education and Training/Raising awareness
- Indicator of Compliance
- Risk assessment



Any Questions?