INTRODUCTION

Elevated protease activity within the stratum corneum (SC) accelerates barrier breakdown in chronic skin diseases such as atopic dermatitis (AD).1 We have developed a simple, non-invasive assay to quantify a broad spectrum of proteases at the skin surface. Using this assay, we recently identified a subset of neonates at-risk of developing AD with elevated protease activity, highlighting the potential for protease-associated barrier breakdown in normal appearing skin.2 To extend these findings we have investigated protease activity at non-lesional sites in AD.

AIMS

1. To assess surface protease activity in conjunction with the biophysical and molecular properties of the skin barrier in AD patients at non-lesional sites.
2. To place our AD findings into context by comparing the results to a healthy adult cohort.

METHODS

Subjects

AD cohort: Patients with quiescent AD (n=20) and active disease (n=68) underwent skin assessments at a single visit. A diagnosis of AD was made in accordance with the UK working party diagnostic criteria.3

Healthy adult cohort: For comparison a cohort of adults with no history of skin disease or atopy was recruited and underwent identical assessments (n=20).

Biophysical measurements

• Permeability barrier function was determined by measuring transepidermal water loss (TEWL) using an Aquaflex evaporimeter (Biox, UK) in climate controlled conditions.4
• Skin surface pH and SC hydration was determined using a SkinoMetrix probe (Quantum, Germany) attached to a Nicolet iS5 FTIR spectrometer (Thermo Fisher Scientific, Waltham, USA) to measure mass of SC removed.7

Protease activity

A broad-spectrum casein substrate was used to assay surface protease activity on forearm-collected D-Square discs in line with previously published methodology.10

ATR-FTIR spectroscopy

• Lipid structure (full width half maximum [FWHM]) of healthy volunteers (n=53)6 was analysed in-vivo using a silver halide technique (FDG, FLG, SPINK5, KLK7, atopy and early onset AD

• Subjects with quiescent AD possess a significant permeability barrier function defect compared to healthy controls with no history of atopy.
• In patients with active AD, protease activity is significantly elevated at both lesional and non-lesional sites.

This elevation in protease activity was associated with a less orthonormal SC lipid structure and weakened permeability barrier function providing new insight to barrier breakdown in non-lesional skin.

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REFERENCES