In vivo Raman Spectroscopy-based Identification of Filaggrin-gene Mutation Carriers; Key to Development of Strategies for Prevention of Atopic Dermatitis in this High-risk Group

Gerwin J Puppels[3,4], Claudio Nico[3], Peter J. Caspers[3,4], Tom C. Bakker Schut[3,4],

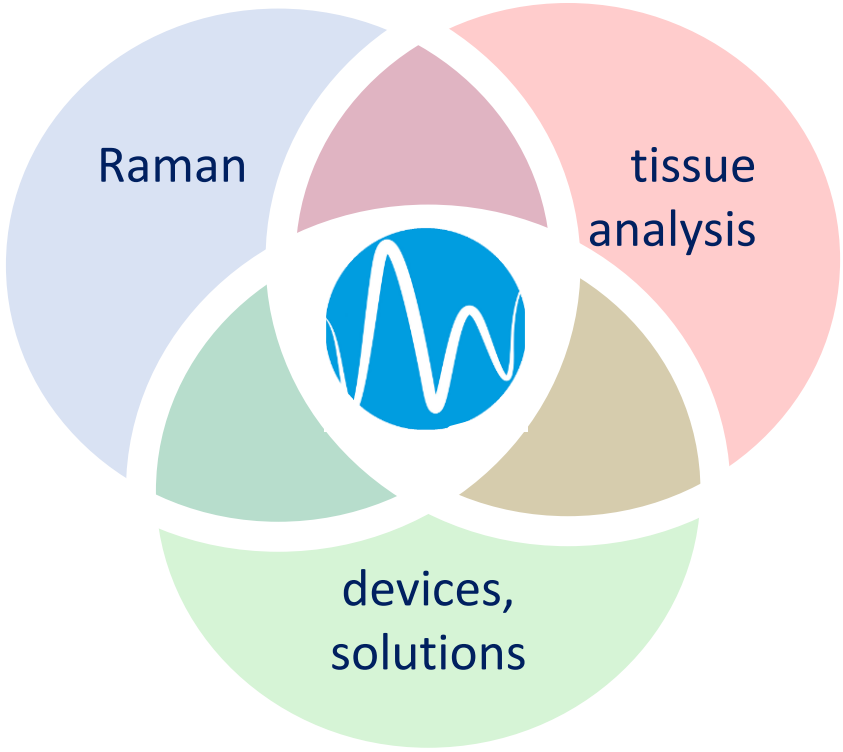
Carol Ní Chaoimh[1,2], Dhanis Lad[1,2], Deirdre M Murray[1,2], X F Colin C Wong[5], John E Common[5],

Alan D Irvine[1,6], Jonathan O'Brien Hourihane[1,2,7]

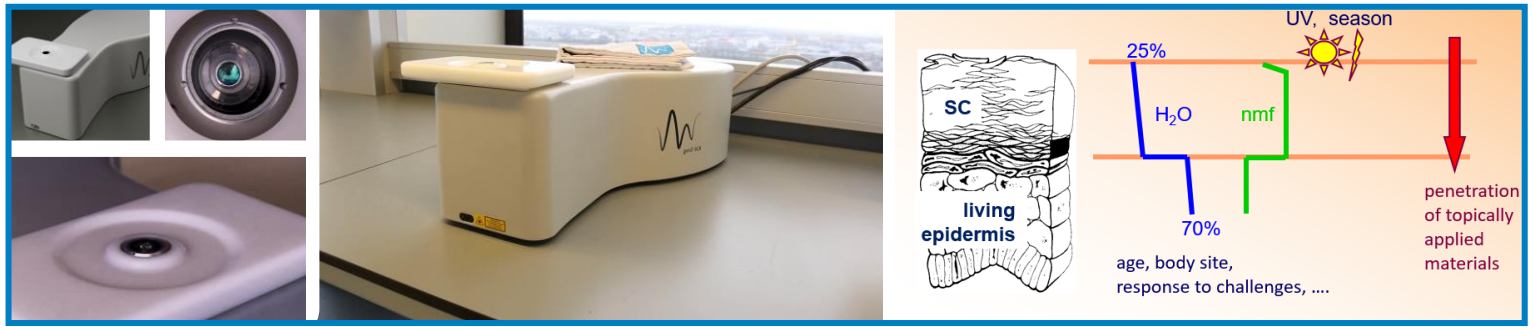
[1] Univ Coll Cork, INFANT Res Ctr, Cork, Ireland
[2] Univ Coll Cork, Paediat & Child Hlth, Cork, Ireland
[3] RiverD International BV, Rotterdam, Netherlands
[4] Univ Med Center Rotterdam, Erasmus MC, Dept Dermatology, Rotterdam, Netherlands
[5] A STAR Skin Res Labs, Singapore, Singapore
[6] Trinity Coll Dublin, Clin Med, Dublin, Ireland
[7] Royal Coll Surgeons Ireland, Paediat & Child Hlth, Dublin, Ireland

RiverD International

Solutions for unmet diagnostic needs



in vivo molecular skin composition analysis



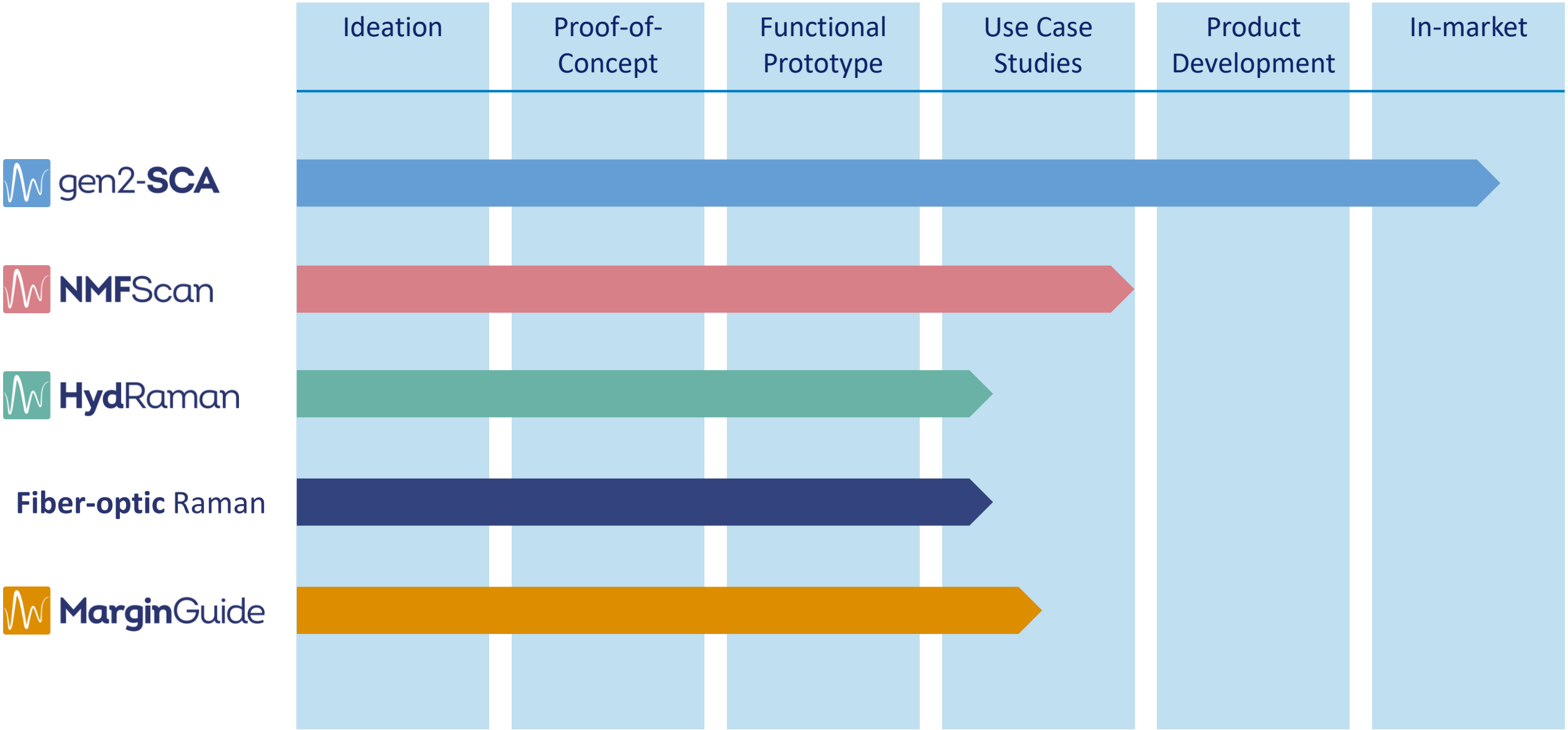
gen2-SCA

Unique technology for non-invasive skin analysis in use by

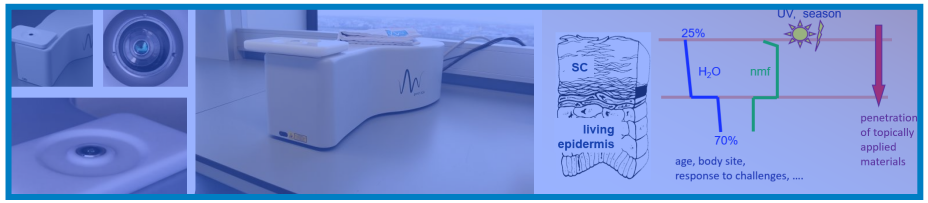
- personal care/cosmetics industry
- commercial research organizations
- academic research
- pharmaceutical industry

Unilever P&G Johnson&Johnson COLGATE-PALMOLIVE COMPANY SHISEIDO

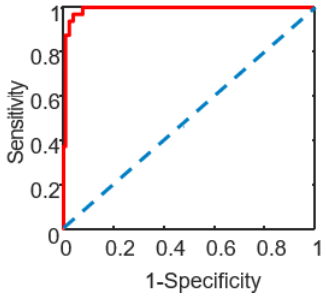
Products & R&D Pipeline

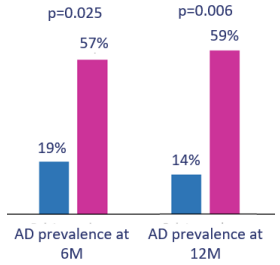


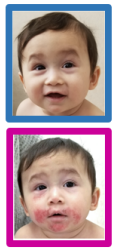
Atopic dermatitis & FLG-mutation status



gen2-SCA





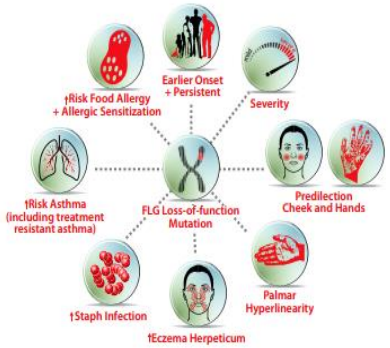


NMFScan

Rapid, non-invasive identification of filaggrin-gene mutation carriers (10-15% of general population), who are at strongly increased risk of developing atopic dermatitis

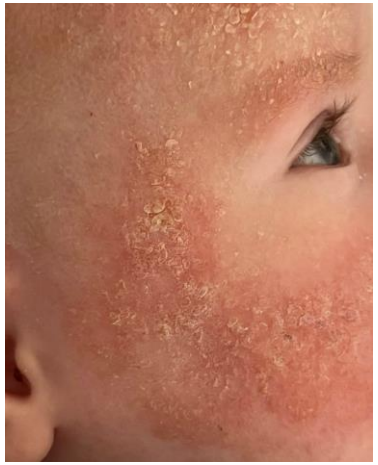
Use cases under investigation:

- Identification of “at risk” newborns to create a window-of-opportunity for disease prevention
- Stratification of AD-patients for better personalized patient care

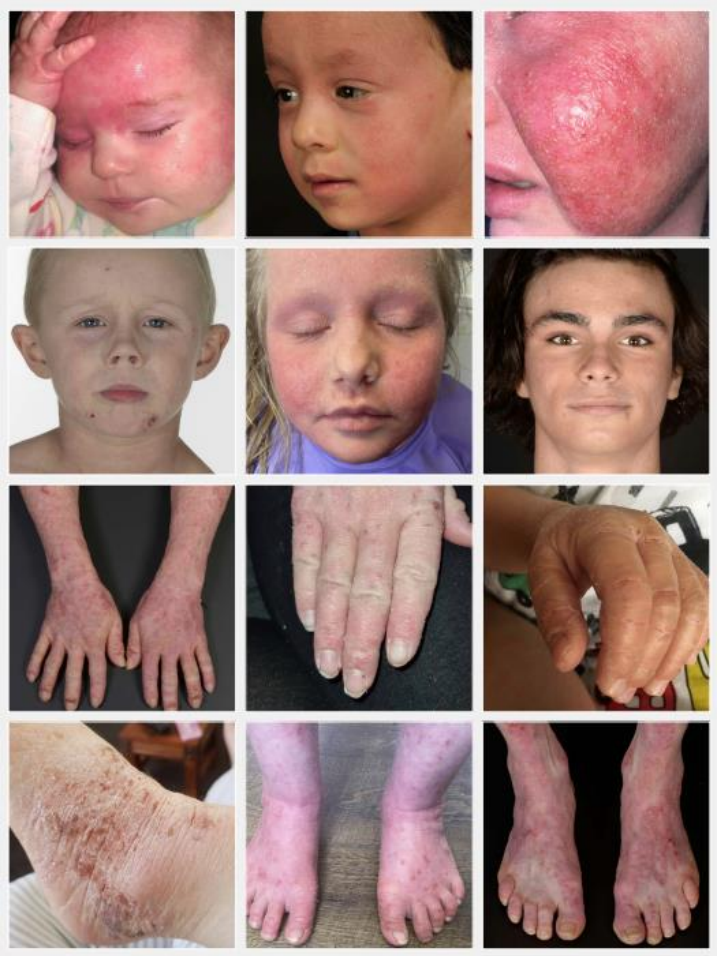


Atopic Dermatitis

- chronic inflammatory disease, causing:
  - skin lesions and itching
  - sleep deprivation, social withdrawal, poor school performance



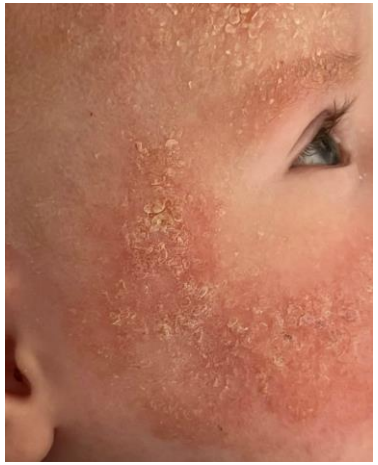
Source: Global Atopic Dermatitis Atlas 2022 Report



Source: Global Atopic Dermatitis Atlas 2022 Report

Atopic Dermatitis

- chronic inflammatory disease, causing:
  - skin lesions and itching
  - sleep deprivation, social withdrawal, poor school performance



Source: Global Atopic Dermatitis Atlas 2022 Report

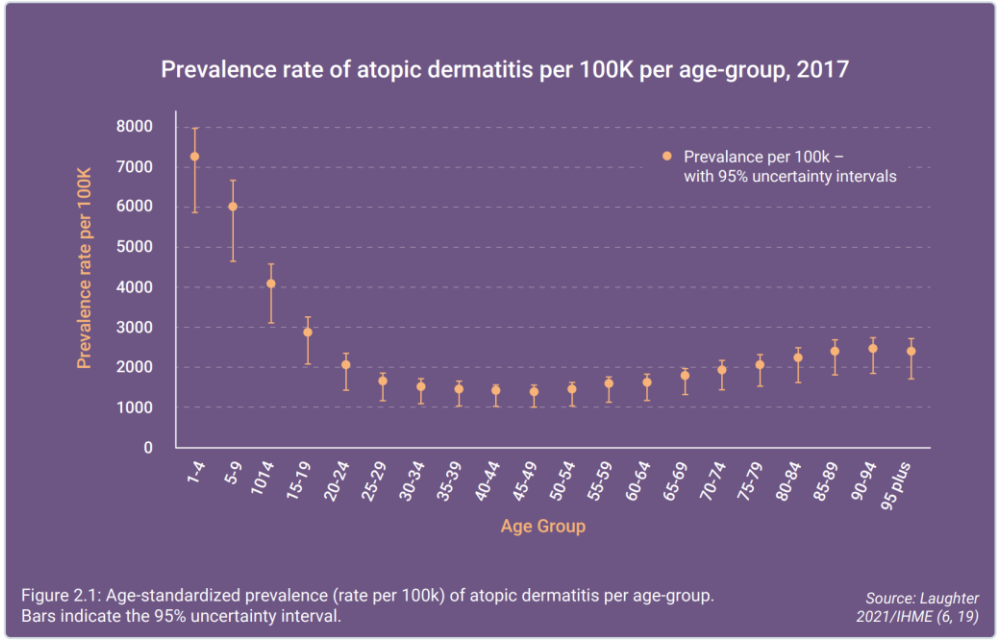
- usually begins in childhood
- starting point of the “atopic march”

Figure 1.2: Atopic dermatitis and associated diseases

Source: Global Atopic Dermatitis Atlas 2022 Report

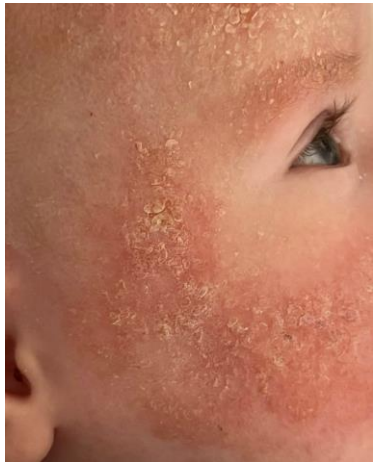
Atopic Dermatitis

- chronic inflammatory disease, causing:
  - skin lesions and itching
  - sleep deprivation, social withdrawal, poor school performance



Source: Global Atopic Dermatitis Atlas 2022 Report

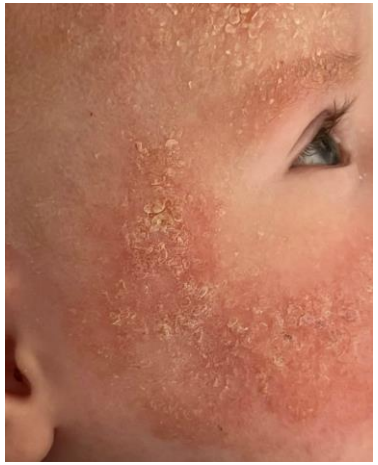
- usually begins in childhood
- starting point of the “atopic march”
- up to 20% of children develop AD (~60% in the first year of life)
- up to 10% of adults have AD



Source: Global Atopic Dermatitis Atlas 2022 Report

Atopic Dermatitis

- chronic inflammatory disease, causing:
  - skin lesions and itching
  - sleep deprivation, social withdrawal, poor school performance

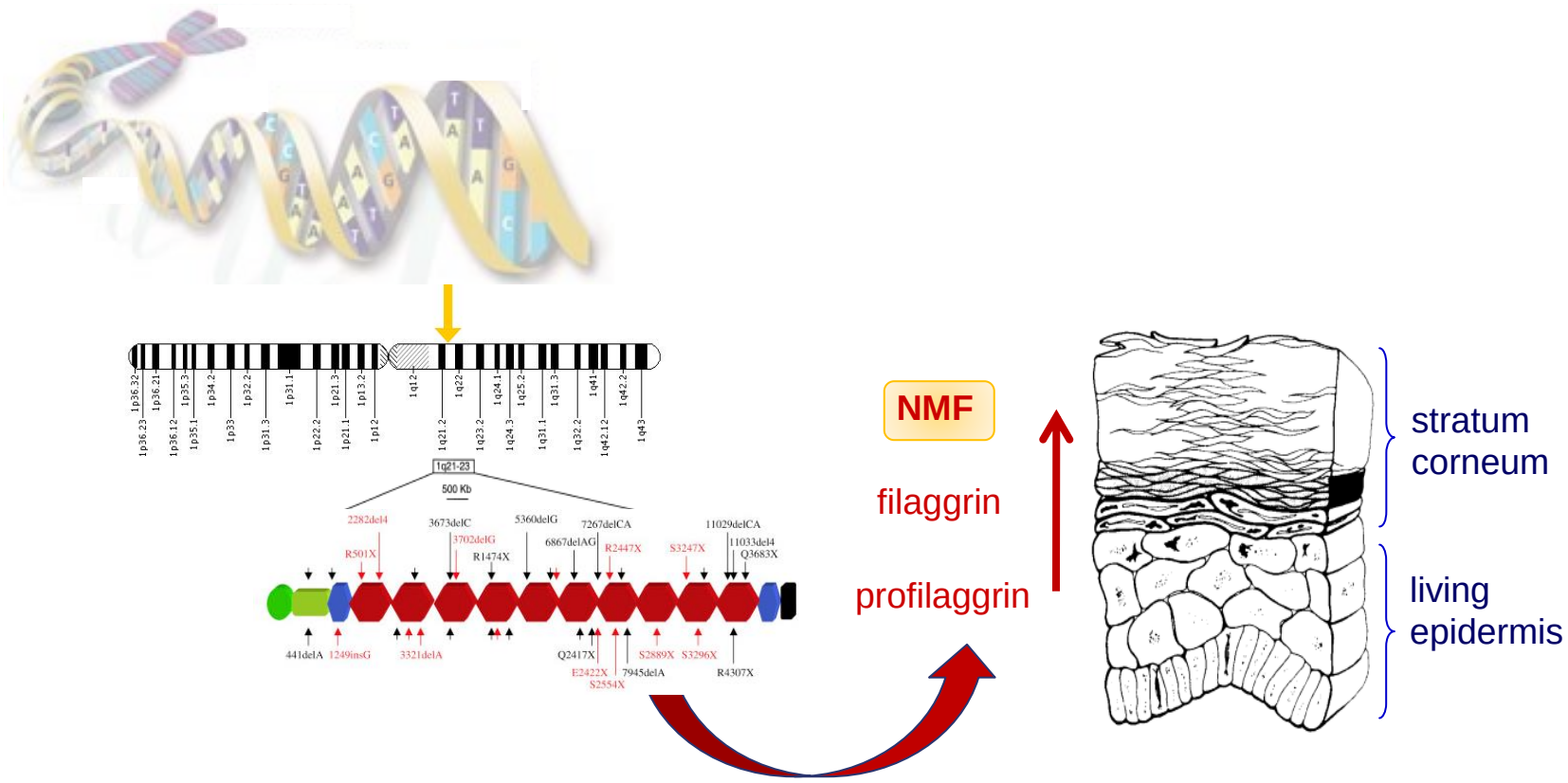


Source: Global Atopic Dermatitis Atlas 2022 Report

- usually begins in childhood
- starting point of the “atopic march”
- up to 20% of children develop AD (~60% in the first year of life)
- up to 10% of adults have AD
- genetic predisposition is a strong risk factor

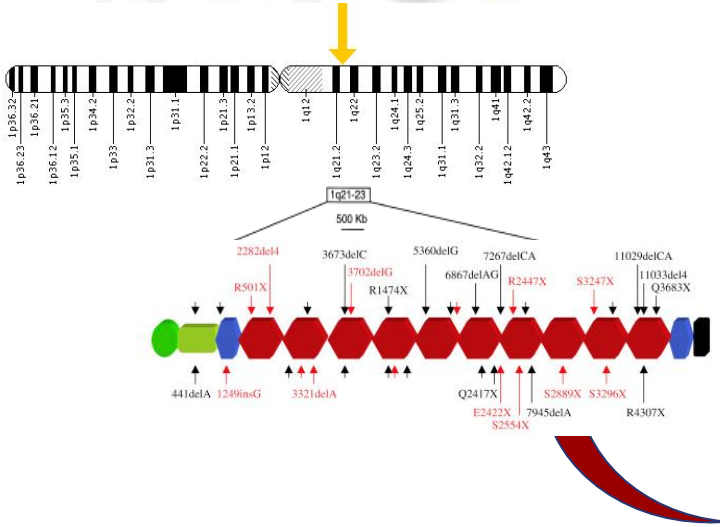
Loss-of-function FLG mutations

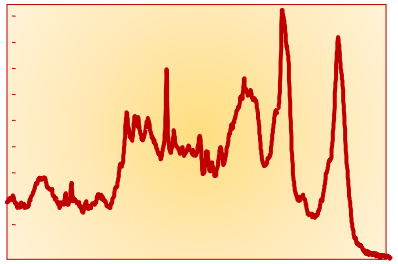
(pro)filaggrin



Palmer CNA, et al.. Nat Genet 2006; 38:441–6

Raman spectroscopic ID of FLG-mutation carriers



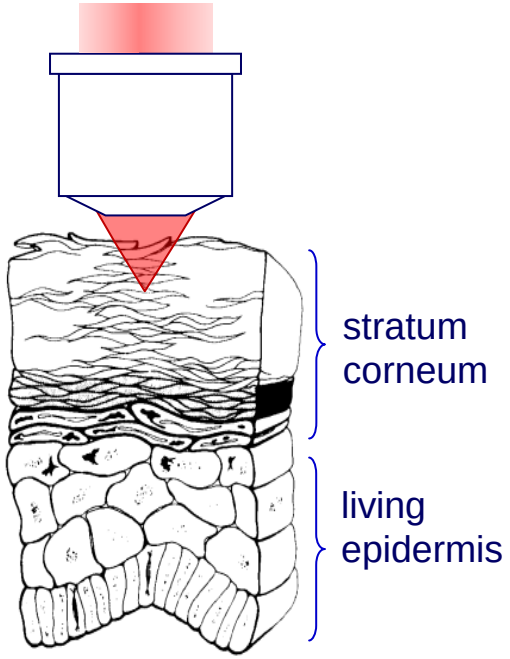


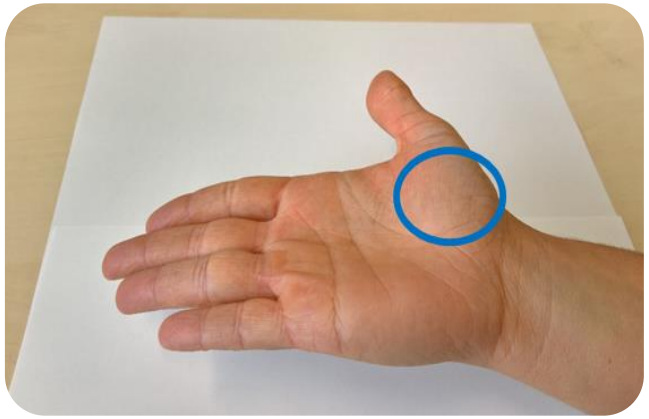
[NMF]

NMF

filaggrin

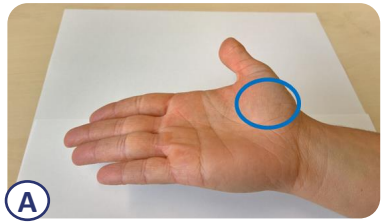
profilaggrin

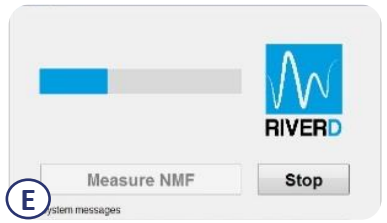


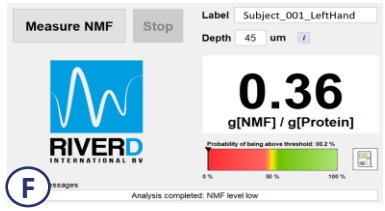


Palmer CNA, et al.. Nat Genet 2006; 38:441–6

NMFScan



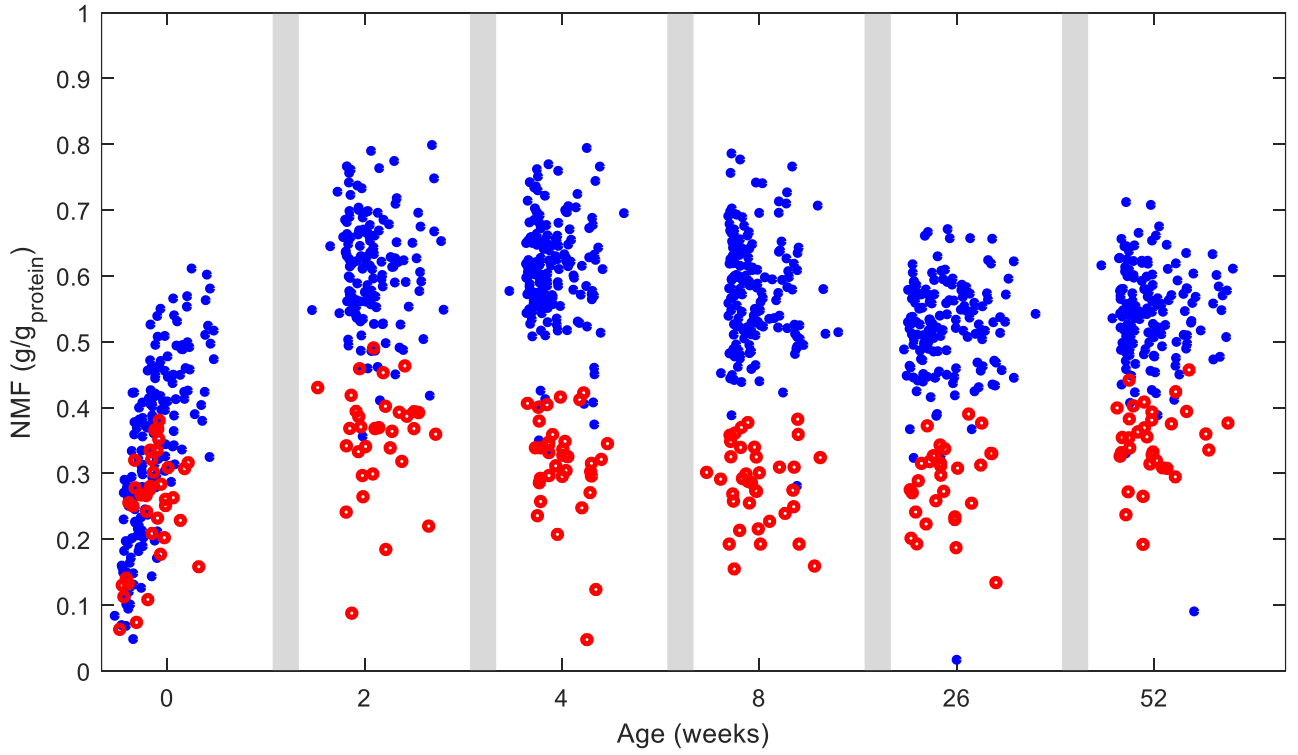




photograph with parental permission

[NMF] identifies newborns with a LoF-FLG mutation

- FLG genotyping
- [NMF] measured at
  - Day 1-4
  - Week 2
  - Week 4
  - Week 8
  - Week 26
  - Week 52

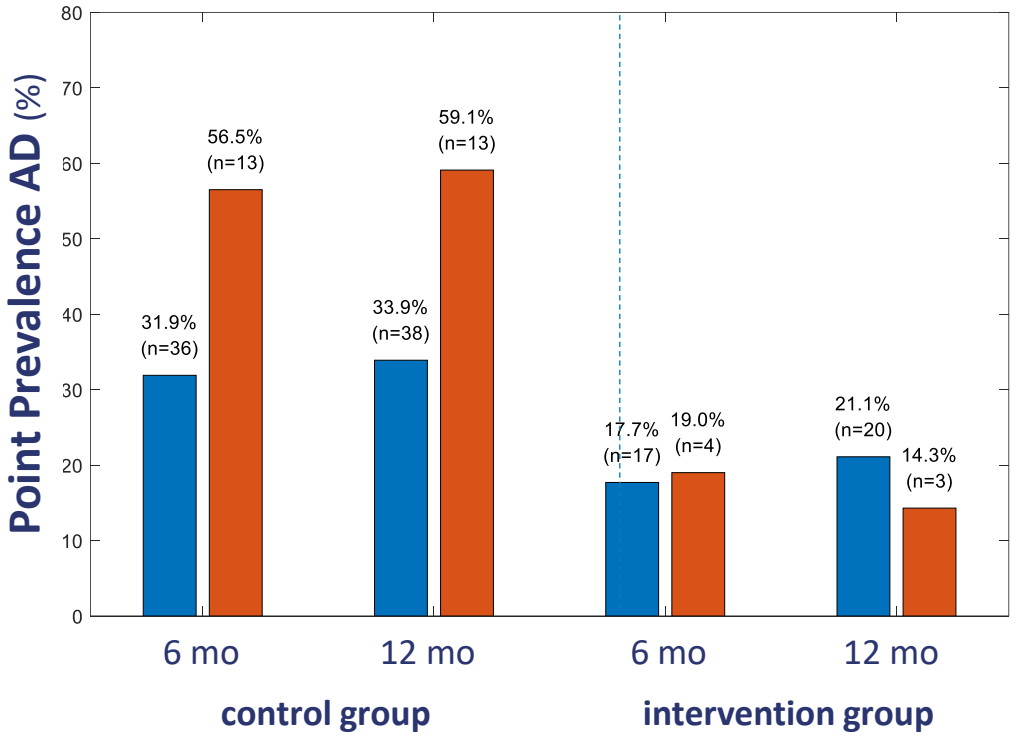


wild type-FLG

LoF-FLG mutation carriers

submitted for publication

STOP-AD study – FLG genotype stratification



wild type FLG

LoF-FLG mutation carrier

Short term emollient treatment appears to:

- reduce AD incidence in first year of life
- take away the “extra risk of AD-development” for FLG-mutation carriers

Ní Chaoimh *et al.* Allergy 2023;78:984

small (handheld) <u>low-cost</u> device

- (uncooled, low DC, low read-out noise) array detectors
- stable laser source (785 – 830nm region)
- highly reproducible, “low-resolution” spectrometer
- laser suppression filtering
- wireless
- ….

Products & R&D Pipeline

RiverD

	Ideation	Proof-of-Concept	Functional Prototype	Use Case Studies	Product Development	In-market
gen2-SCA						
NMFScan						
HydRaman						
Fiber-optic Raman						
MarginGuide