E.V.E.I.L.S PROGRAM: Inside infants' skin: New spectroscopic, microscopic, genomic data leading to cutting edge and patented generation of baby skin research and care

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Introduction

In order to investigate non-invasively physiologic skin parameters, biochemical skin composition and skin surface maturation from birth, we performed age-groups comparative clinical studies. Biophysical measurements (capacitance, pH), *in vivo* Raman spectroscopy (RS) and Scanning Electron Microscopy (SEM) were performed on 138 healthy volunteers of 6 age groups. The lack of water in neonatal epidermis was immediately compensated by a high NMF level which was rapidly consumed till 6 months old. Based on SEM pictures, a quantitative maturation score (E.M.I: Electron Microscopy Isotropy) was developed with quantified analysis of cell density, clusters, adhesion cell shape and differentiability of single cells. Its values demonstrated a correlation with increasing age, with a maturation point between 1 and 2 years old.

Raman Spectroscopy and Scanning Electron Microscopy: first quantitative maturation score (E.M.I)

Initial study (A)
BIOMETROLOGY+RAMAN+SEM

108 male or female volunteers (including 36 for SEM)

6 age groups

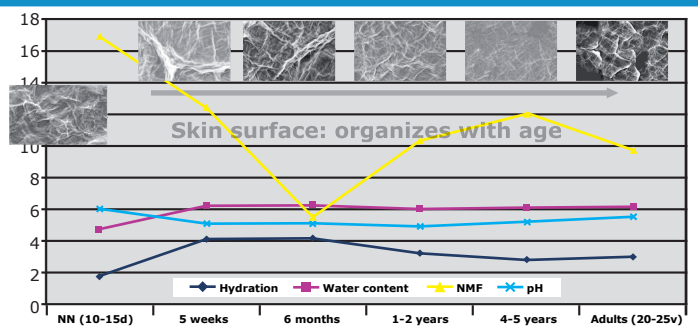
- 1 to 15 days (newborns)
- 5/6 weeks (infants)
- 6 months +/- 1 month (infants)
- 1 to 2 years (infants)
- 4 to 5 years (children)
- 20 to 35 years (adults)

Confirmatory study (B)
SEM

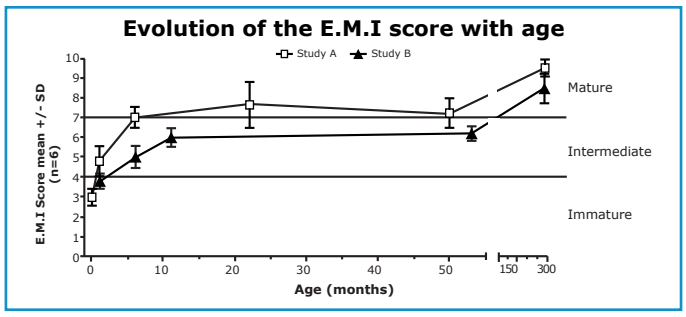
30 male or female volunteers

5 age groups

- 5/6 weeks (infants)
- 6 months +/- 1 month (infants)
- 1 to 2 years (infants)
- 4 to 5 years (children)
- 20 to 35 years (adults)



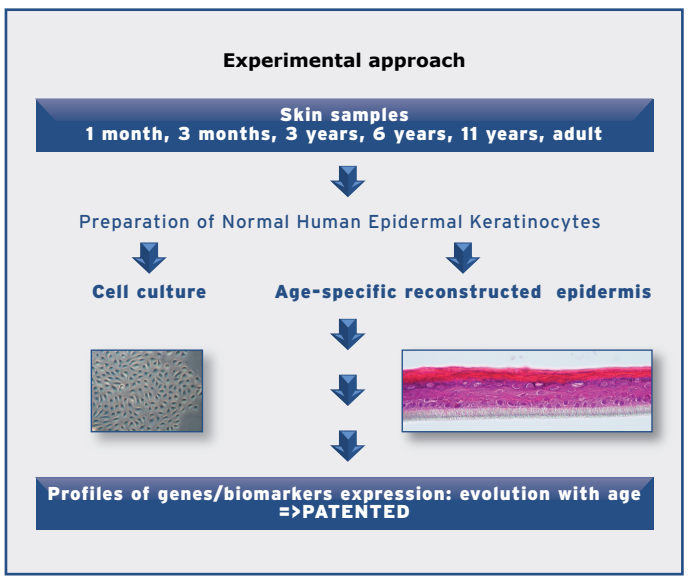
NMF quickly increase at birth and then regulate skin hydration until 1-2 years

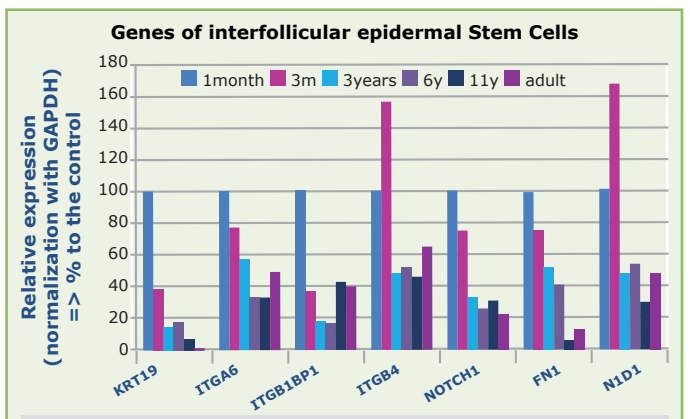


The skin maturation is reached around 1-2 years.

Age-specific reocontsructed epidermis

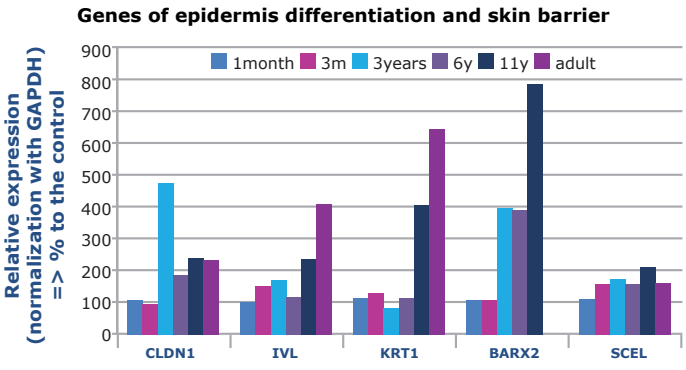
We modeled the world first patented epidermis of infants and children *in vitro*. Gene expression from age-specific reconstructed epidermis and keratinocytes monolayers cultures was analyzed by "full transcriptome microarray" and confirmed by quantitative RT-PCR, with a focus on stem cells markers. Genes involved in the barrier function have a low expression in the younger infants and increase with age. Stem cells markers expression (proliferation, adhesion and niche) was the highest in the samples from younger infants and it quickly decreased with age.





KRT 19: keratin 19/ ITGA6, ITGB4, ITGB1BP1: integrin alpha6, beta 4, integrin beta1 binding protein/ NOTCH1: Notch homolog 1/ NID1: translocation associated nidogen 1/ FN1: fibronectin 1

The cellular resource is "mobilized" for the barrier construction during early childhood



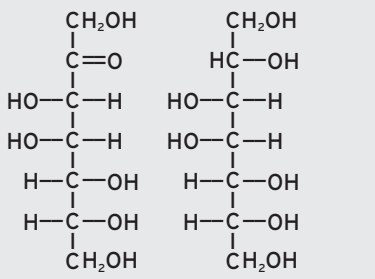
CLDN 1:claudin 1/ IVL:involucrin/ KRT1:keratin1/ BARX2:BARX homeobox/ SCEL:sciellin proteins

Skin barrier develops and organizes with age

Avocado perseose, a biomimetic patented active ingredient targeted to the needs of infants' skin

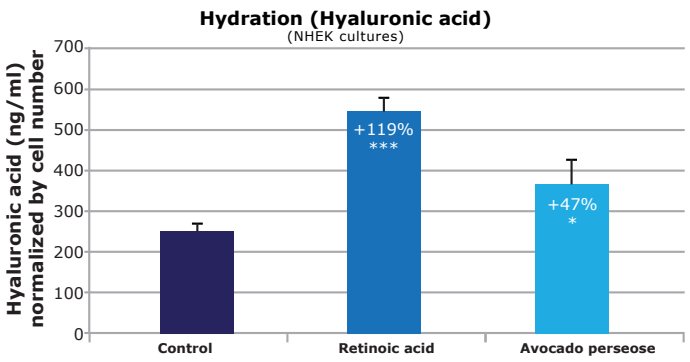
Avocado perseose is a patented natural oligosaccharide which was screened on skin explants, on human keratinocytes (NHK) and on age-specific skin models under basal conditions and after UV irradiation. It demonstrated specific and significant actions on skin barrier function and hydration. It did not modulate gene expression profile of stem cells markers under basal conditions and avoided their UV-induced down-regulation on age-specific skin models.

An oligosaccharide in total affinity with the skin



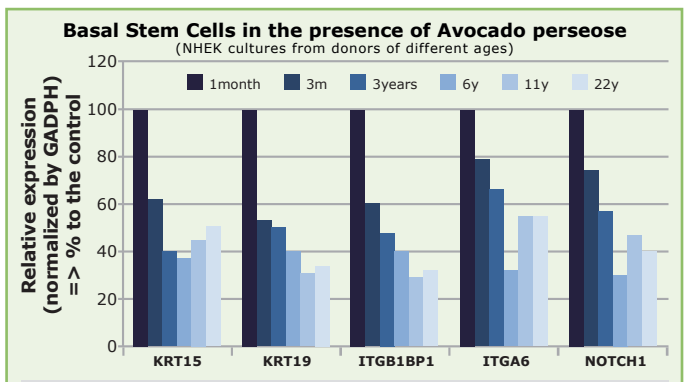
50% Mannoheptulose C7 — Perseitol C7 50%

Avocado Perseose®



*p<0.05; ***p<0.001 – One-Way ANOVA followed by Dunnett test

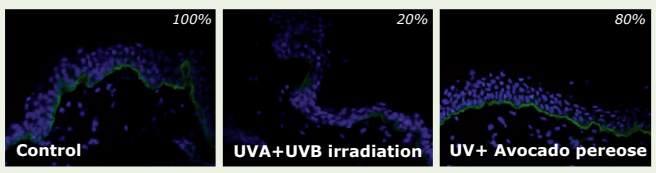
Avocado perseose maintains epidermal water content



KRT15,19: keratin 15,19/ ITG1BP1: integrin beta1 binding protein/ ITGA6: integrin alpha6/ NOTCH1: Notch homolog 1

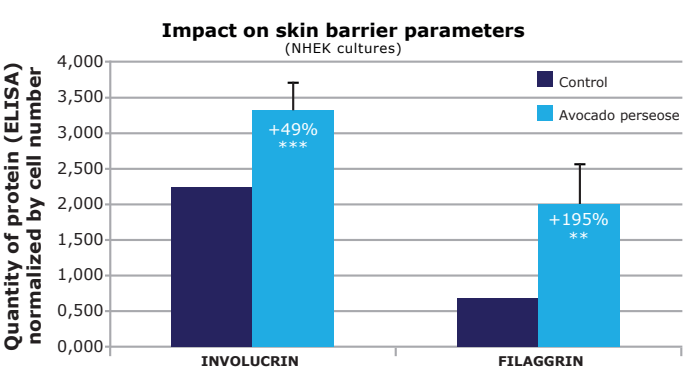
Avocado perseose maintains the balance of epidermal Stem cells

UV-irradiated Stem Cells in the presence of Avocado perseose

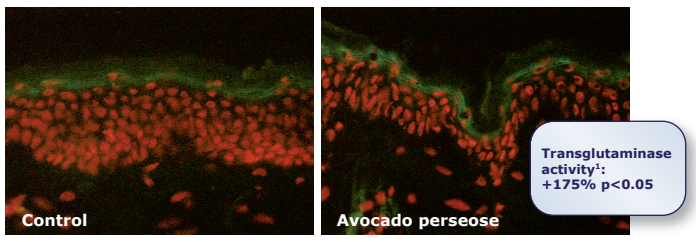


Normal human skin explants were treated with avocado perseose before and after being irradiated by UVA (10J/cm²) and UVB (200 mJ/cm²). Integrin alpha 6 was immunostained.

Avocado perseose preserves the potential of epidermal Stem Cells



**p<0.01; ***p<0.001 – One-Way ANOVA followed by Dunnett test



Normal human skin explants were delipidated by a mix of organic solvents and then topically treated by Avocado perseose. Membrane transglutaminase was immunostained.

Avocado perseose reinforces skin barrier cohesion and organization

Conclusion

This large research program introduced new fundamental knowledge on infant and children skin and enabled the development of patented specific skin models or score to assess tolerance and efficacy of baby products.

Avocado perseose is adapted to the regulation and maturation processes taking place from birth until the second year of life. Its incorporation in baby products provides a cutting edge vision on skin protection in children.

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