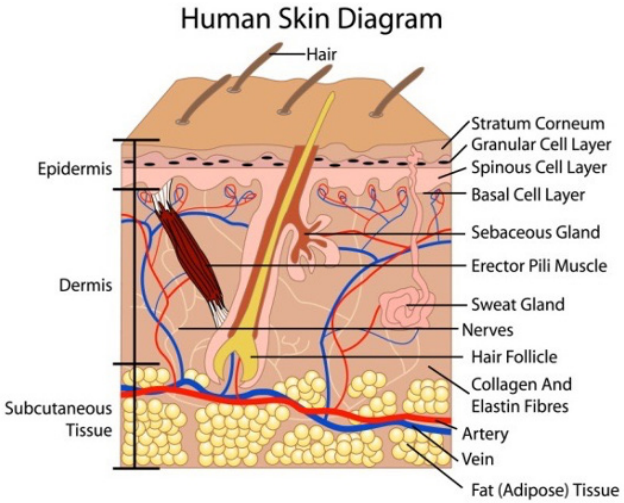
Unique Differences of Infant Skin, its Microbiome, and How to Support Normal Skin Maturation

The Skin Is Our Natural Protective Barrier



- **Protects** from injury, external environment, pathogens.
- **Regulates** temperature.
- **Helps manage** water loss.
- **Provides sensory perception.**

Maintaining Skin Barrier Integrity is Essential

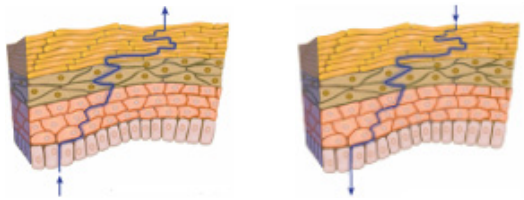
Measured by:

- Skin's ability to hold onto water -TEWL (transepidermal water loss)
- Skin Hydration
- Skin pH (acid mantle) – protective, mildly acidic, supports resident flora & inhibits pathogens

1. Irving V. J Wound Care 2001, 10:253-6. 2. Nikolovski J et al. J Invest Dermatol 2008, 128:1728-36.

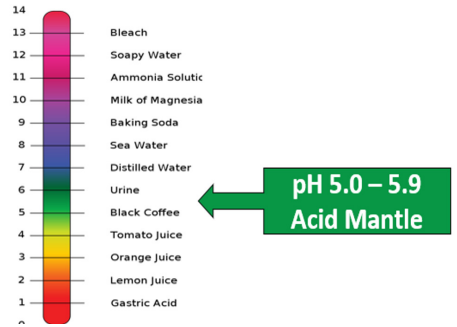
Infant's Skin is Uniquely Different and Develops Over First Years

Structure and **composition** differences lead to **functional** differences



- Infant skin can lose water 2x as fast.
- Smaller cells and thinner skin - shorter pathway outside to inside.

Infant skin pH 6.0 at birth, quickly becomes mildly acidic.

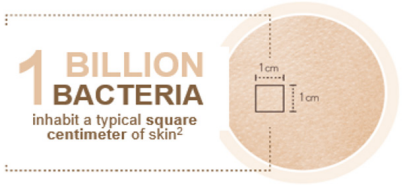


1. Stamatas G, et al. Pediatr Dermatol. Mar-Apr 2010;27(2):125-31.
2. Nikolovski J, et al. J Invest Dermatol. 2008;128:1728-1735 3. Mack M, et al. J Invest Dermatol. 2009;129(S1):S143
4. L.S Telofski et al. Dermatology Research and Practice, vol 2012. 2. G.N. Stamatas et al. International Journal of Cosmetic Science, 2011, 33, 17-24
5. Behrendt, H. and M. Green. "Patterns of skin pH from birth through adolescence : with a synopsis on skin growth." (1971).

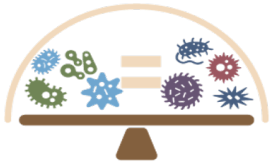
The Skin Microbiome Provides Essential First Line of Defense

The Skin Microbiome

Skin is an **ecosystem; microbiome** works with skin barrier.



Healthy skin inhabited by **harmless microbes**; helps **protect against harmful** microbes.

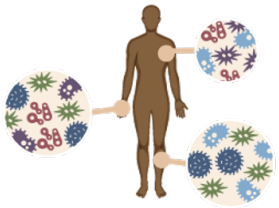


A Balanced Microbiome

The skin microbiome is a habitat of billions of beneficial and harmful bacteria. An imbalance of these bacteria can lead to a variety of skin conditions including acne, eczema, rosacea and aging.[1]

pH Balance

The skin microbiome prefers a relatively acidic environment (pH around 5.0) which also inhibits growth of pathogens.[1]



Bacterial Diversity Differs by Body Zone

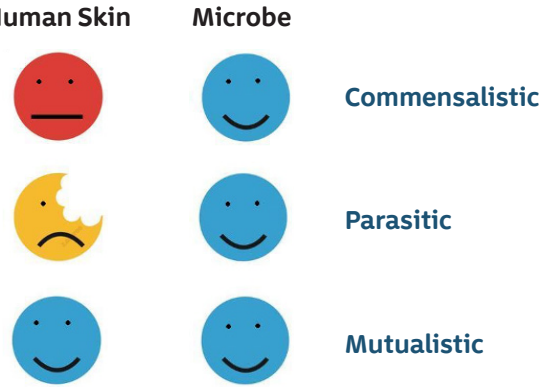
Differences in skin temperature, texture, thickness, humidity and chemistry help determine which kinds of microbes live where on the skin.[1]

1. EA Grice, JA Segre, Nat Rev Microbiol 2011: 9(4), 244-53.
2. EA Grice, HH Kong, G Renaud, AC Young, et al. Genome Res 2008: 18(7), 1043-50.

Skin-Microbe Relationships Are Important

Balanced microbiome supports healthy skin and imbalance between harmful & beneficial microbes may be associated with skin conditions

- Goal: **Enhance beneficial** microbes and **protect from harmful microbes.**
- **Balance** is key. Both **richness** and **diversity** are important.
  - Richness - Total # of bacterial species
  - Diversity - # & abundance of individual types of organisms
- Healthy microbiome **prefers acidic environment** (about pH 5.0) which also inhibits pathogens.



EA Grice, JA Segre, Nat Rev Microbiol 2011: 9(4), 244-53.
EA Grice, HH Kong, G Renaud, AC Young, et al. Genome Res 2008: 18(7), 1043-50.

Infant Skin Microbiome Establishes at Birth, Different vs. Adult, Develops Over Time

***In utero* skin is in a sterile environment**

The skin of vaginally-born babies is colonized by microbes from the mother's vagina[1]

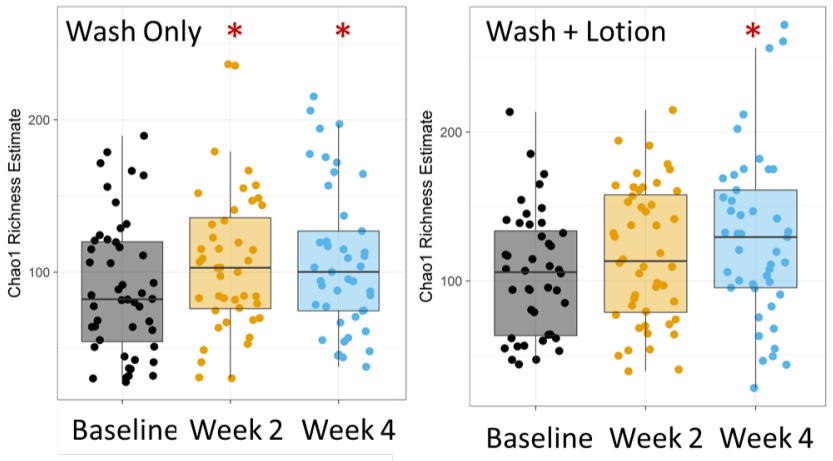
The skin of C-section babies is colonized by microbes from the mother's skin[1]

Baby skin microbiome community is dynamic and becomes more diverse as the baby grows[2]

Skin contacts between mother and child (breast-feeding, kangaroo care, wash, massage, etc.) is an opportunity for exchange of microbiome[2]

1. MG Dominguez-Bello, EK Costello, M Contreras, M Nargris, G Hidalgo, N Fierer, R Knight, PNAS 107(26), 11971-5, 2010
2. KA Capone, SE Dowd, GN Stamatas, J Nikolovski, J Invest Dermatol 2011: 131, 2026-2032
3. G Gaitanis, G Tsiouri, P Spyridonos, T Stefos, GN Stamatas, A Velegraki, ID Bassukas, Pediatr Dermatol 36, 460-465, 2019

Applying Lotion After Bath Accelerates Increase in Skin Microbial Richness*



* P<0.05 from Baseline
** P<0.05 Between treatments

Clinical Study Results - adding application of lotion after bath, using mild products specifically formulated for baby's skin

*Shown in a clinical study
KA Capone, D Friscia, L Telofski, J Nikolovski, Presented at AAD 2019

Key Takeaways

1. The skin and its microbiome continue to mature and develop long after birth, playing an important role as a first line of defense

2. Skin care routines should strive to maintain the integrity of the skin barrier and support the skin microbiome

3. In a clinical study, adding an application of lotion after bath, using mild products specifically formulated for baby's skin, was shown to accelerate increase in skin microbial richness