

# Barrier function and immunology of the skin: skin health and skin disease

Julia Schofield

# Barrier function

Why does it matter?

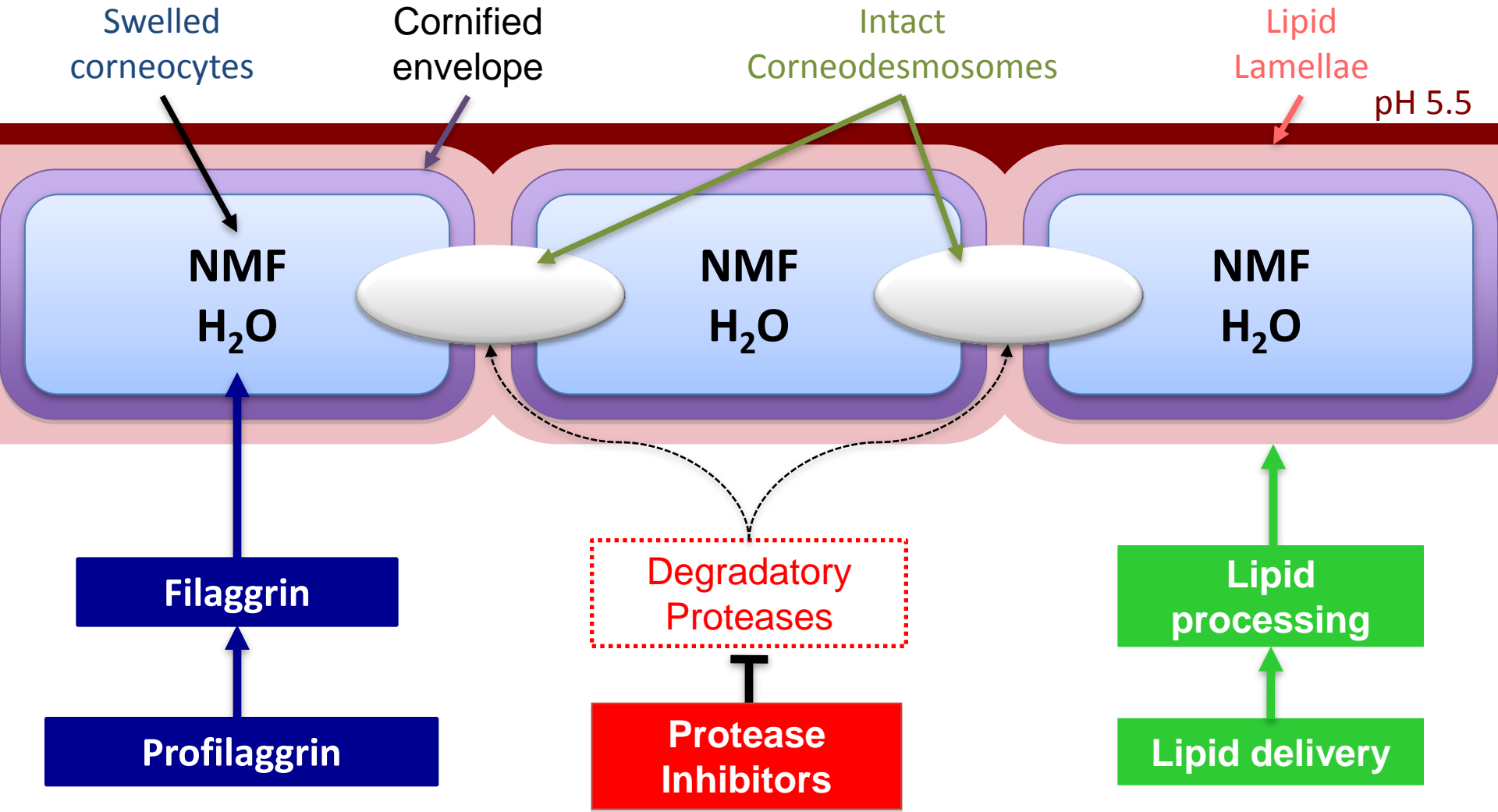
# Childhood eczema

- Eczema is common
- Mild, moderate or severe
- 20% under one year olds
- Big impact on families
- Recent research shows importance of barrier function
- Relevant to eczema of all types in all ages

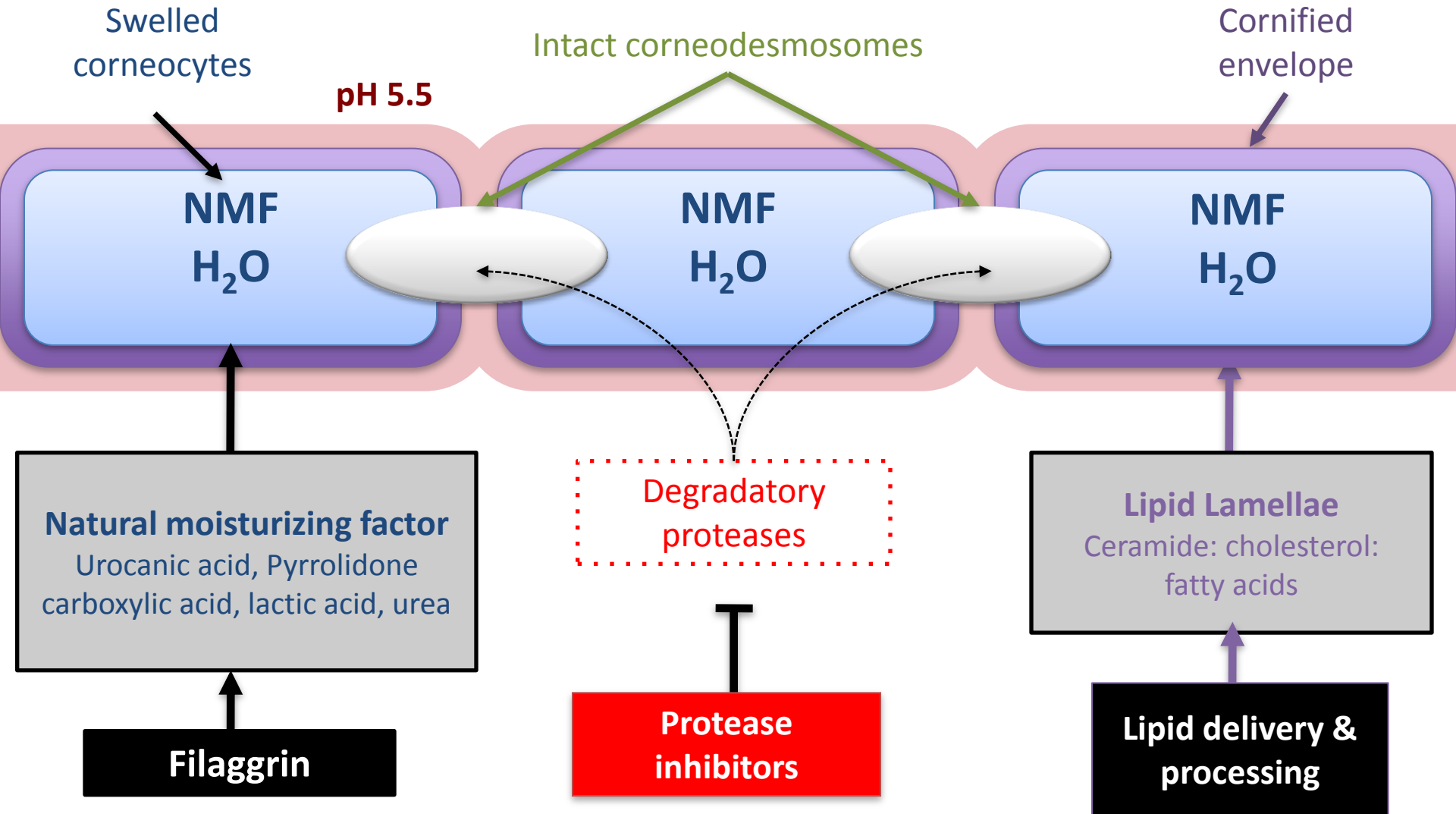
# Barrier function and atopic eczema

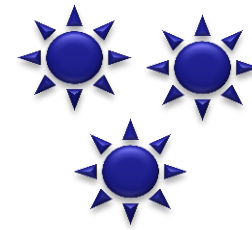


# A Healthy Skin Barrier



# A Healthy Skin Barrier

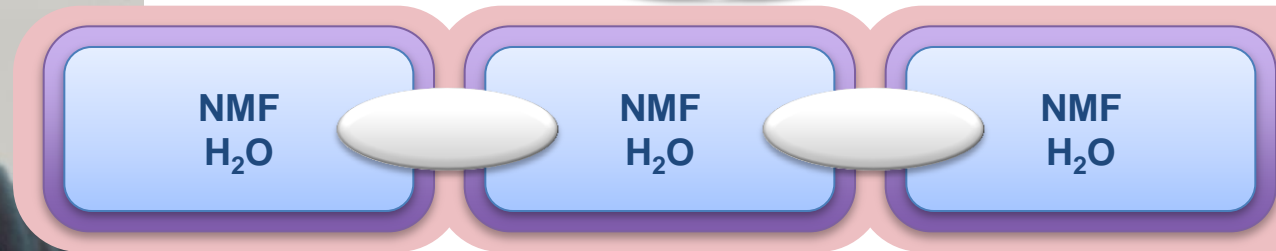




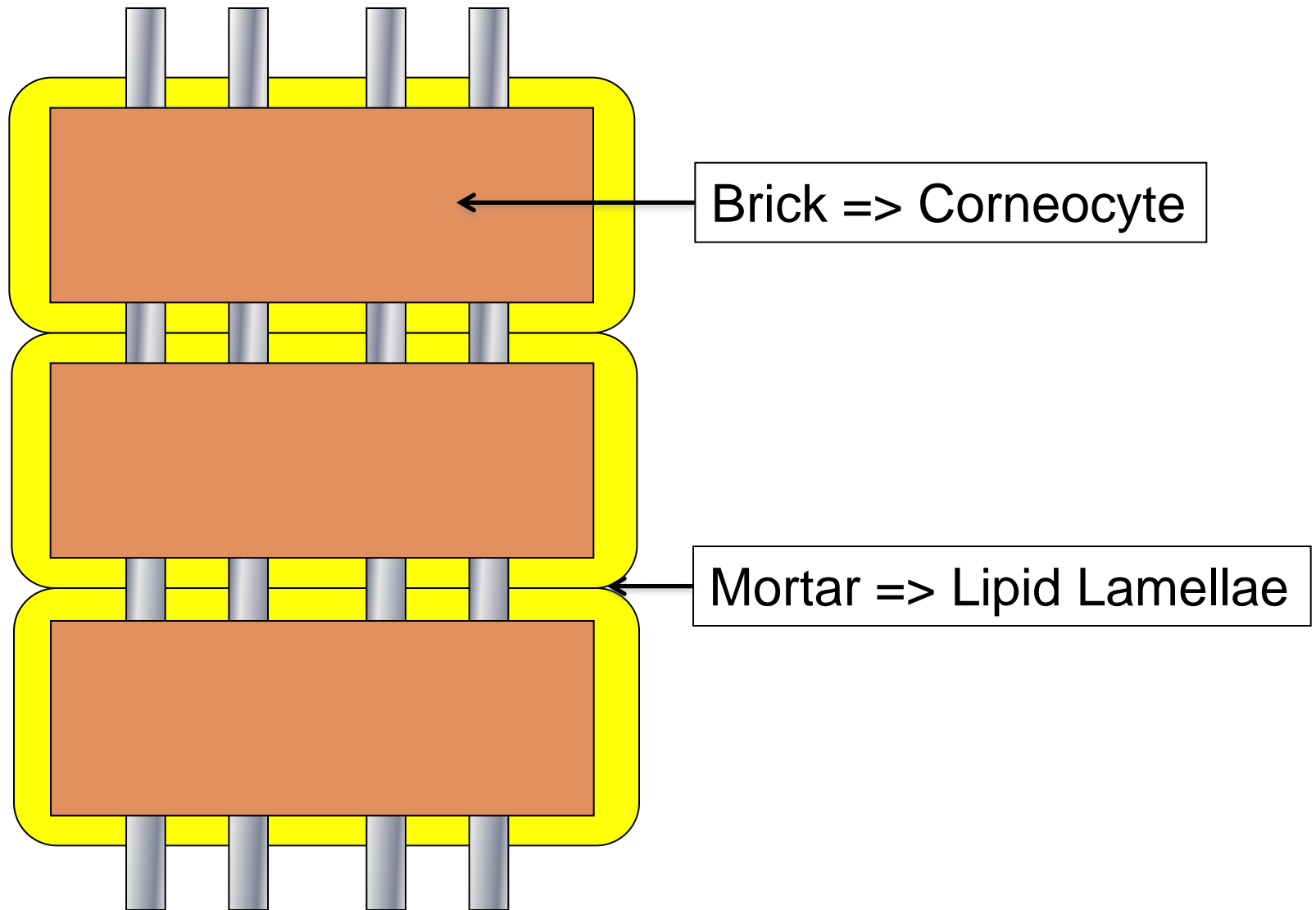
Allergens  
& Irritants



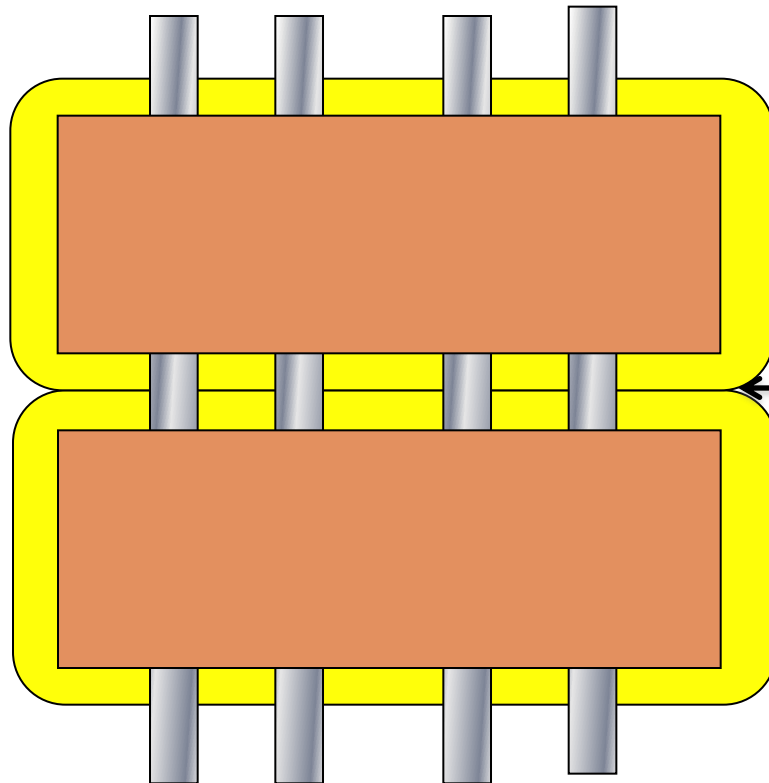
pH 5.5



Water



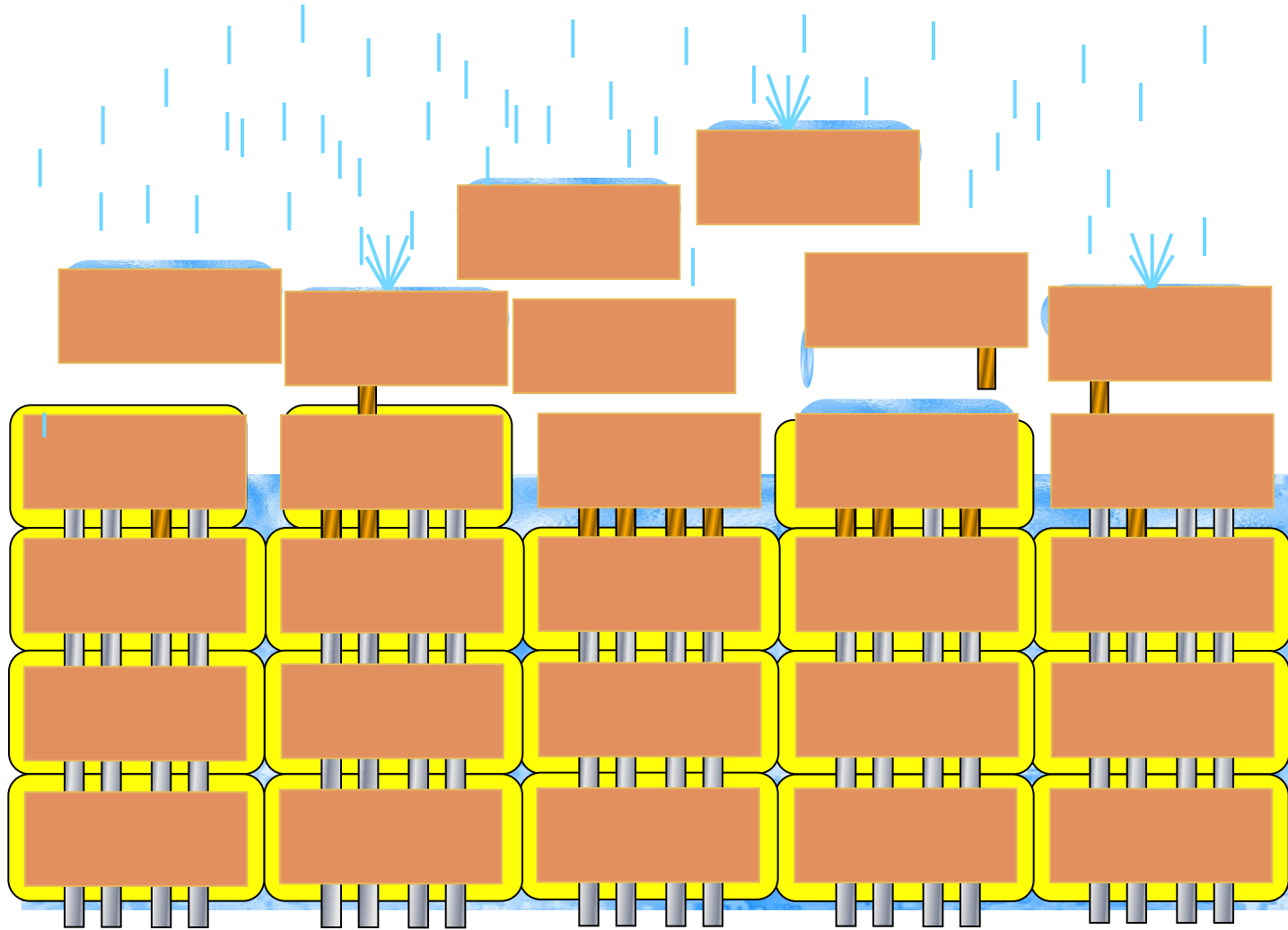


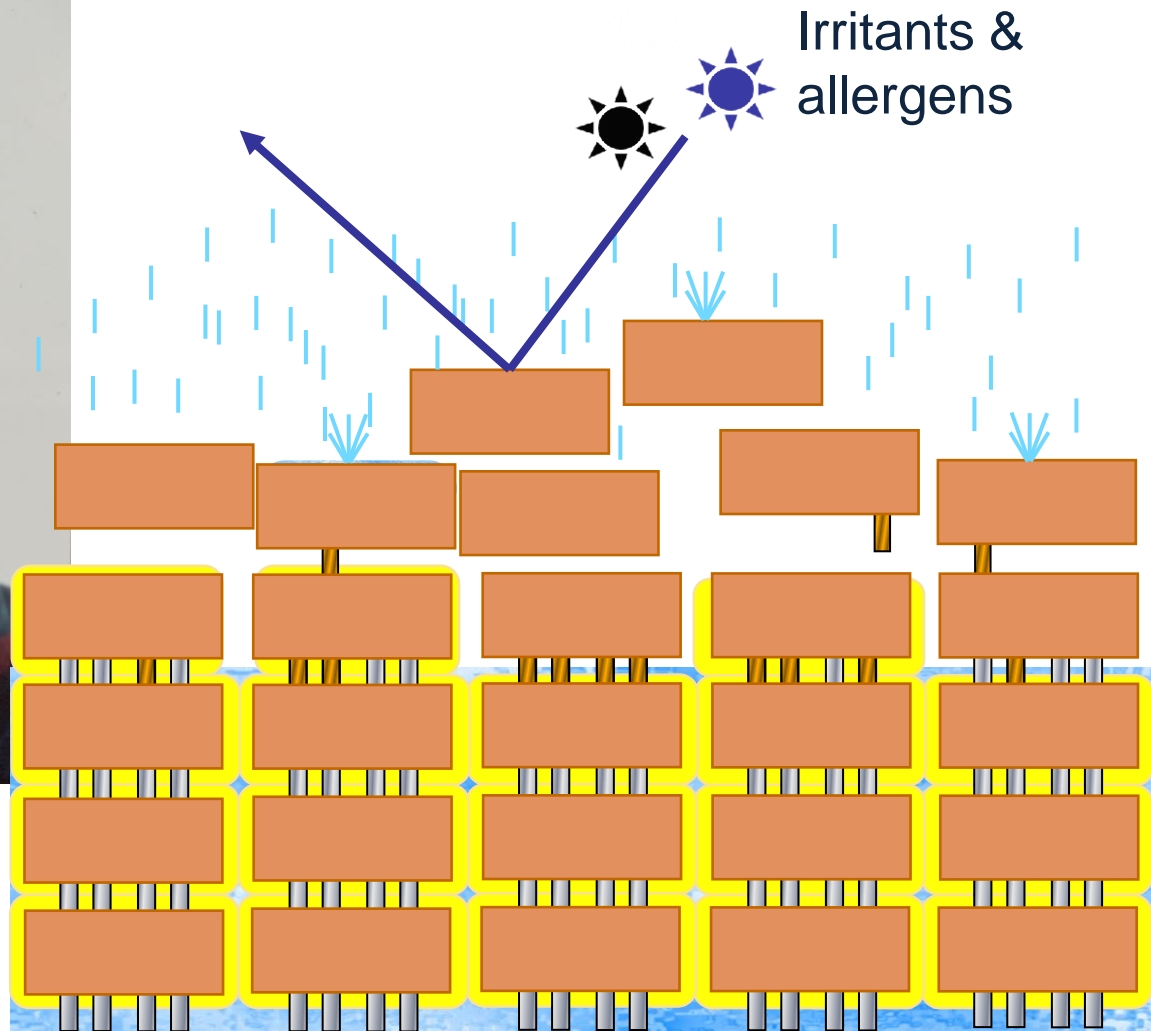


Mortar => Lipid Lamellae

Ceramides  
+  
Fatty acids  
+  
Cholesterol

# The Normal Skin Barrier

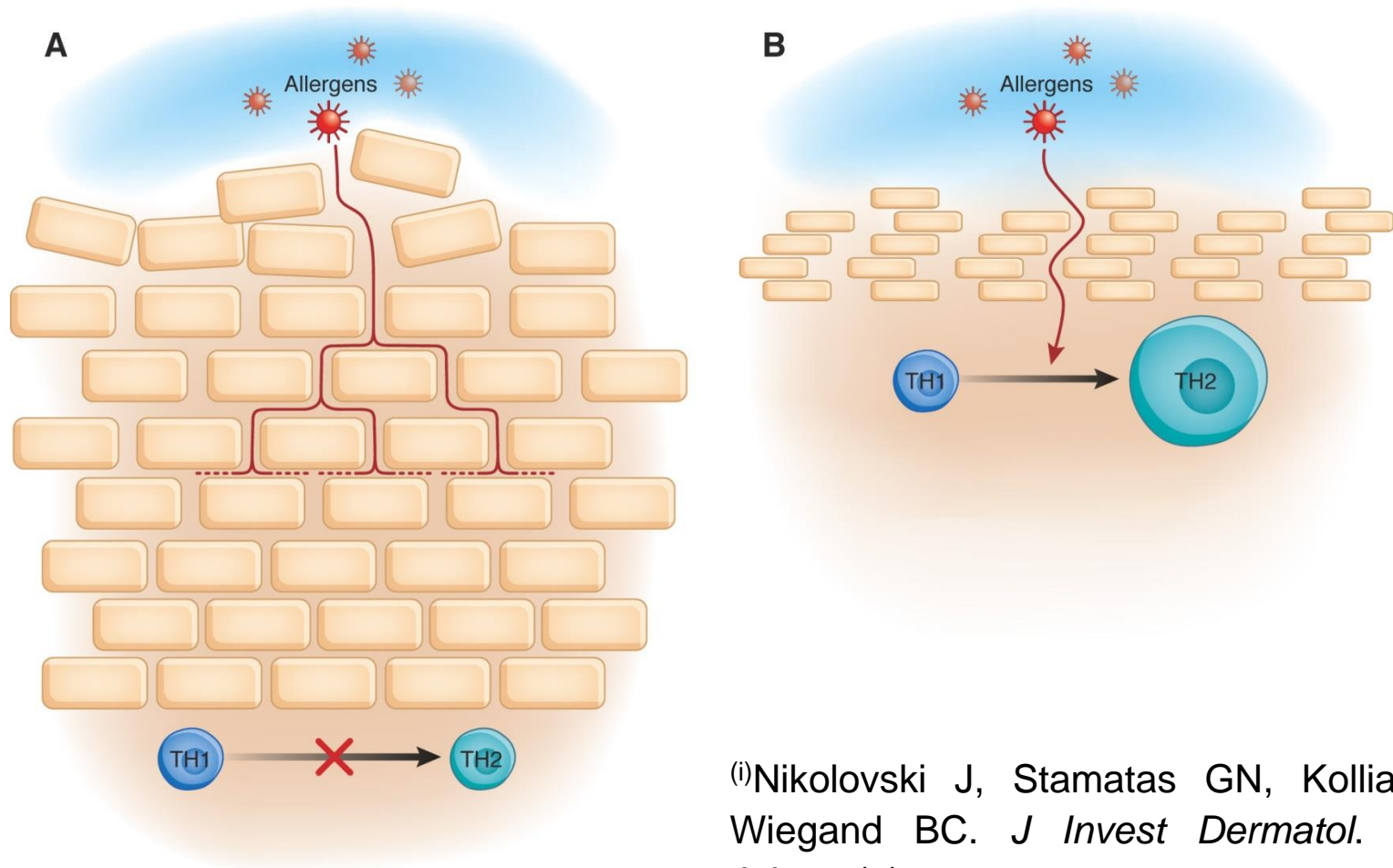




# What goes wrong in childhood eczema?



# Infant skin has a low epidermal barrier reserve<sup>(i)</sup>

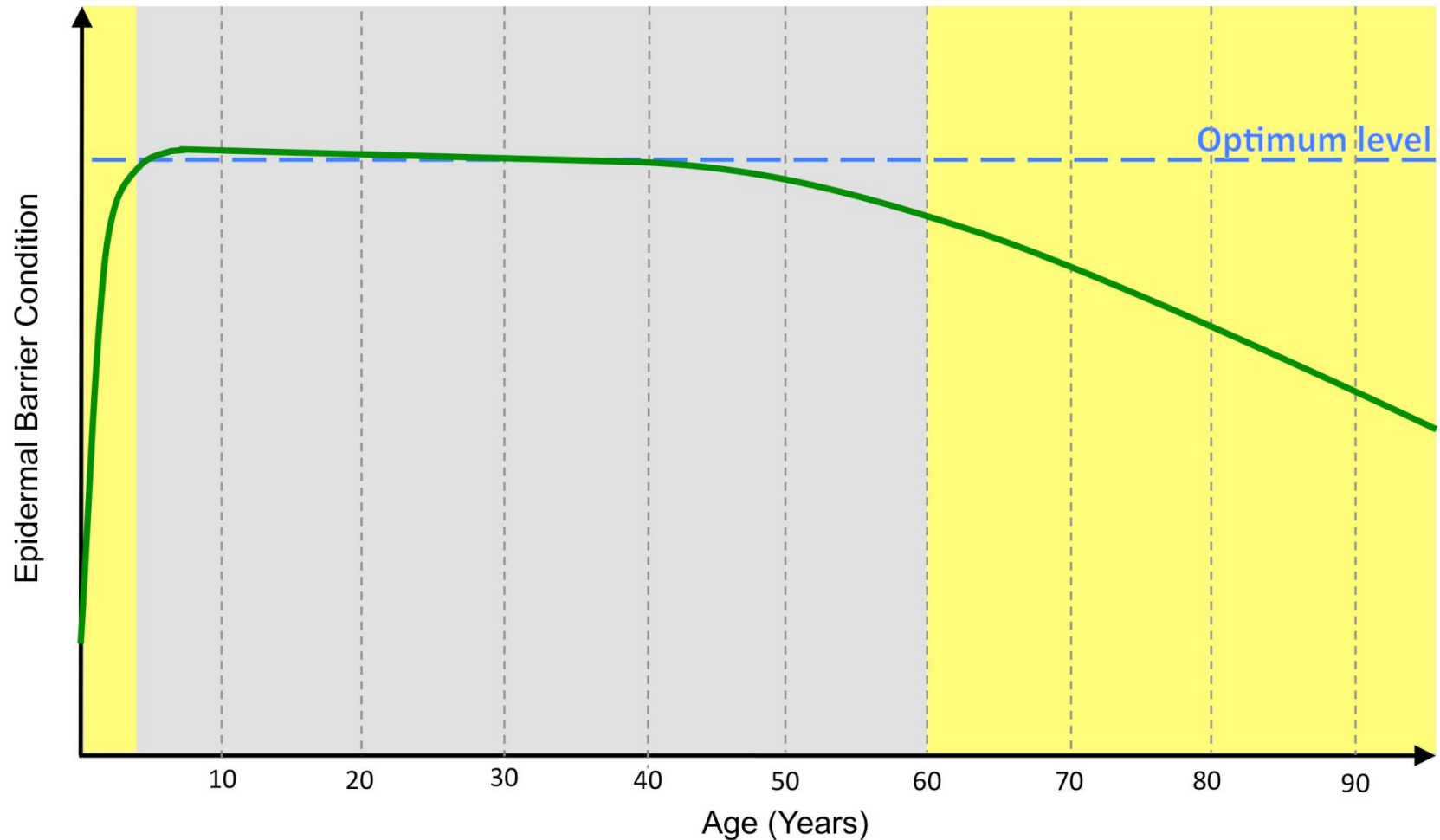


<sup>(i)</sup>Nikolovski J, Stamatas GN, Kollias N, Wiegand BC. *J Invest Dermatol.* 2008 Jul;128(7):1728-36

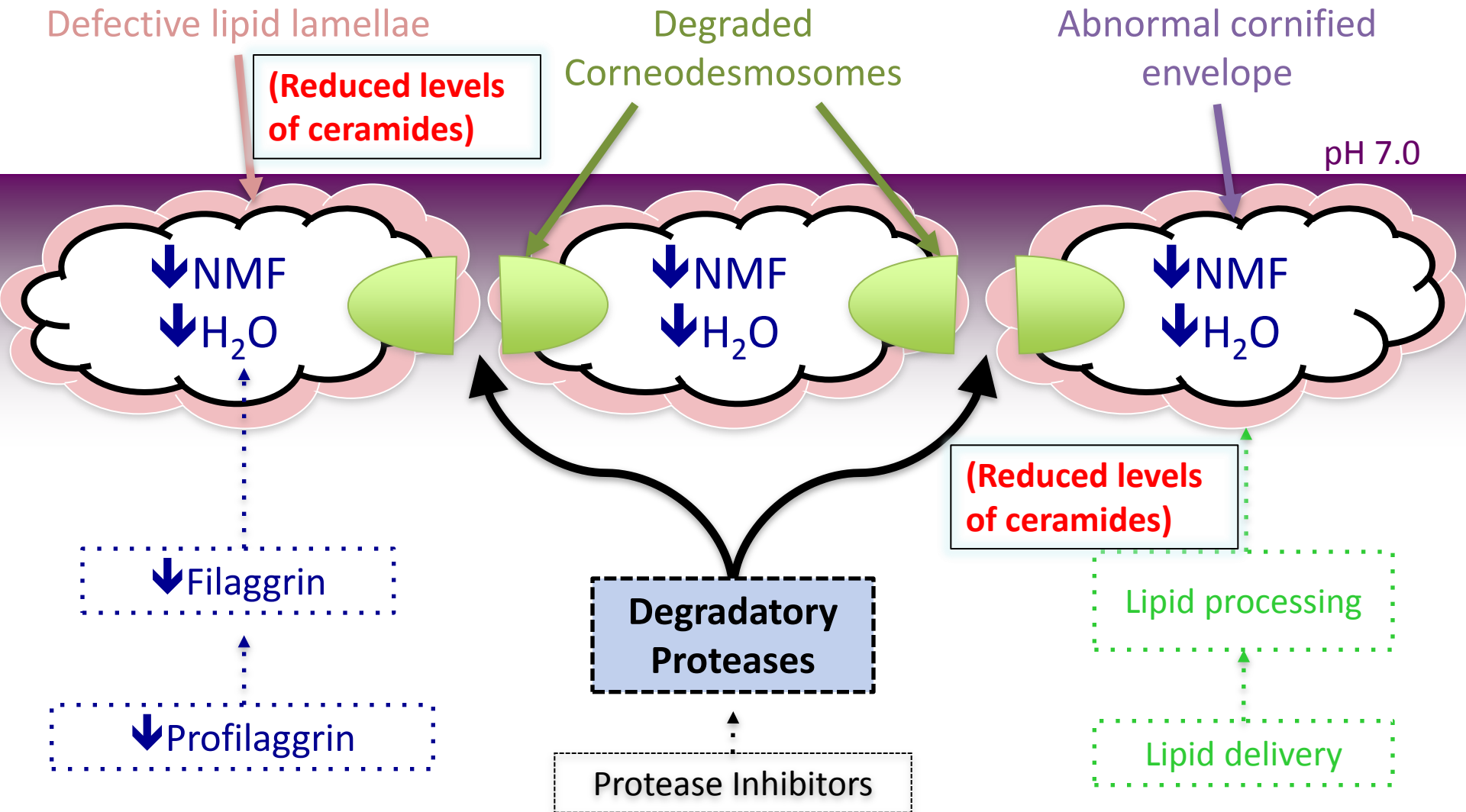
(picture:)

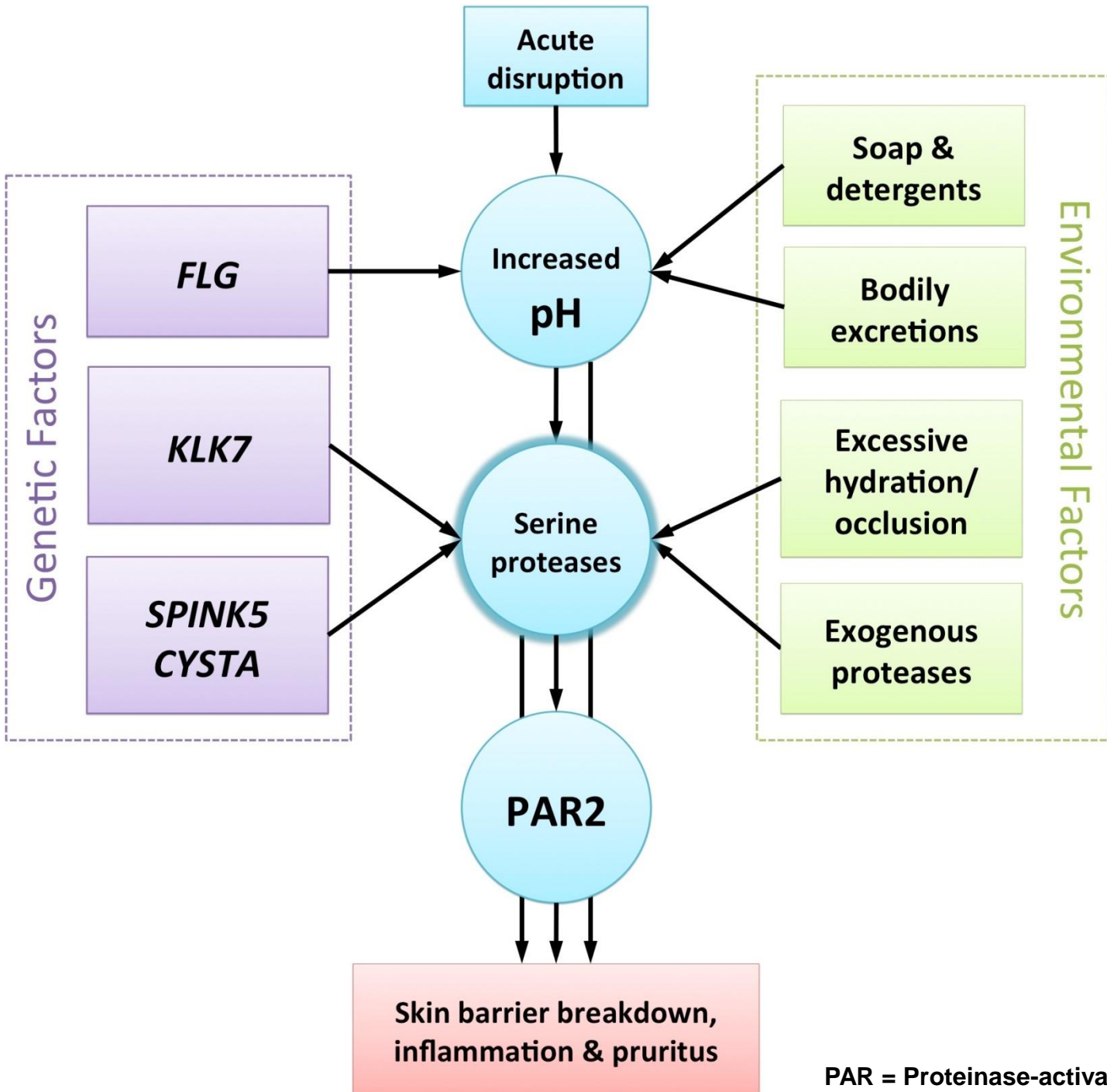
Cork MJ, Danby SG, Vasilopoulos Y, Hadgraft J, Lane ME, Moustafa M, Guy RH, Macgowan AL, Tazi-Ahnini R, Ward SJ. Epidermal barrier dysfunction in atopic dermatitis. *J Invest Dermatol.* 2009 Aug;129(8):1892-908

# When is the skin barrier not optimum?



# A Defective Skin Barrier in AD

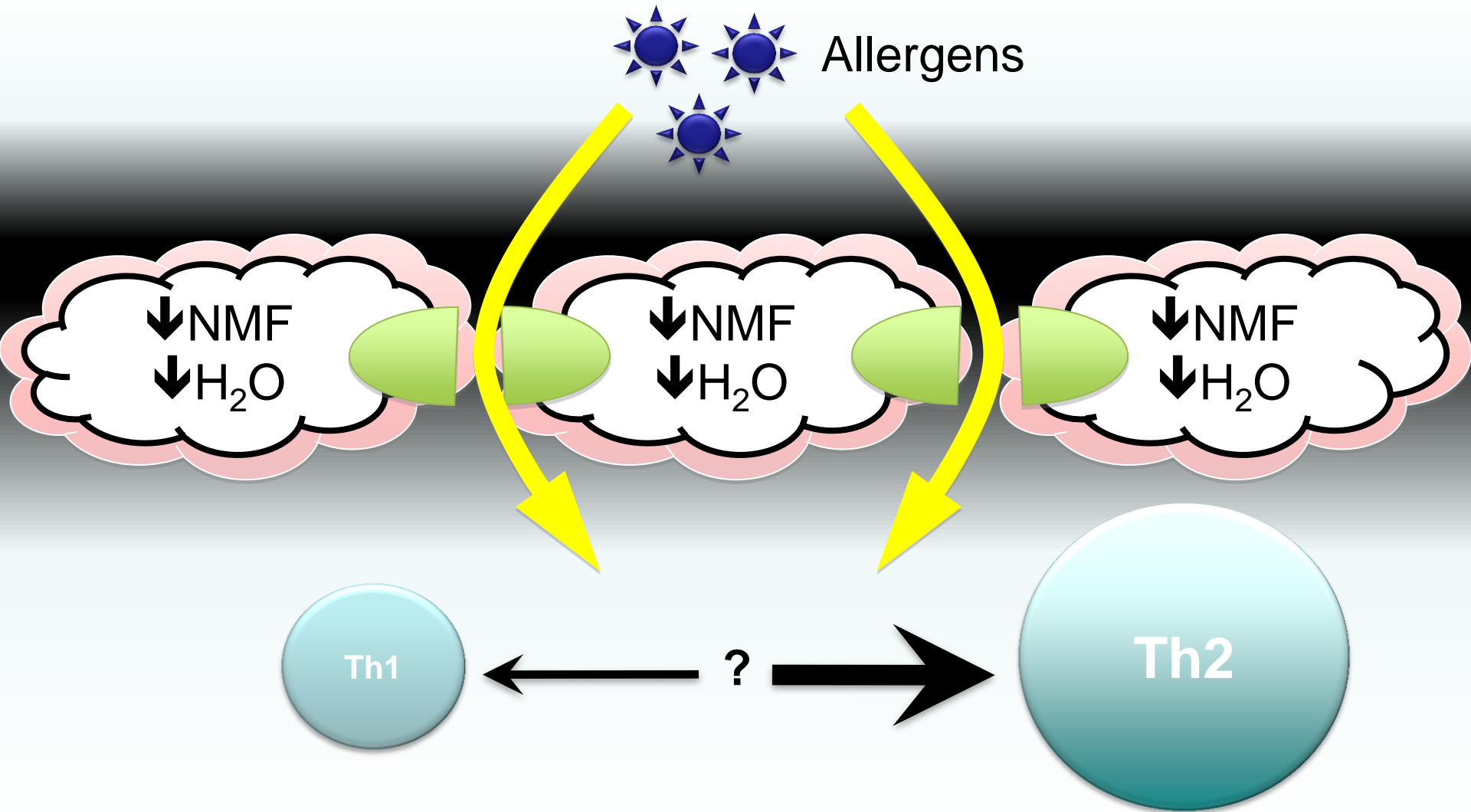


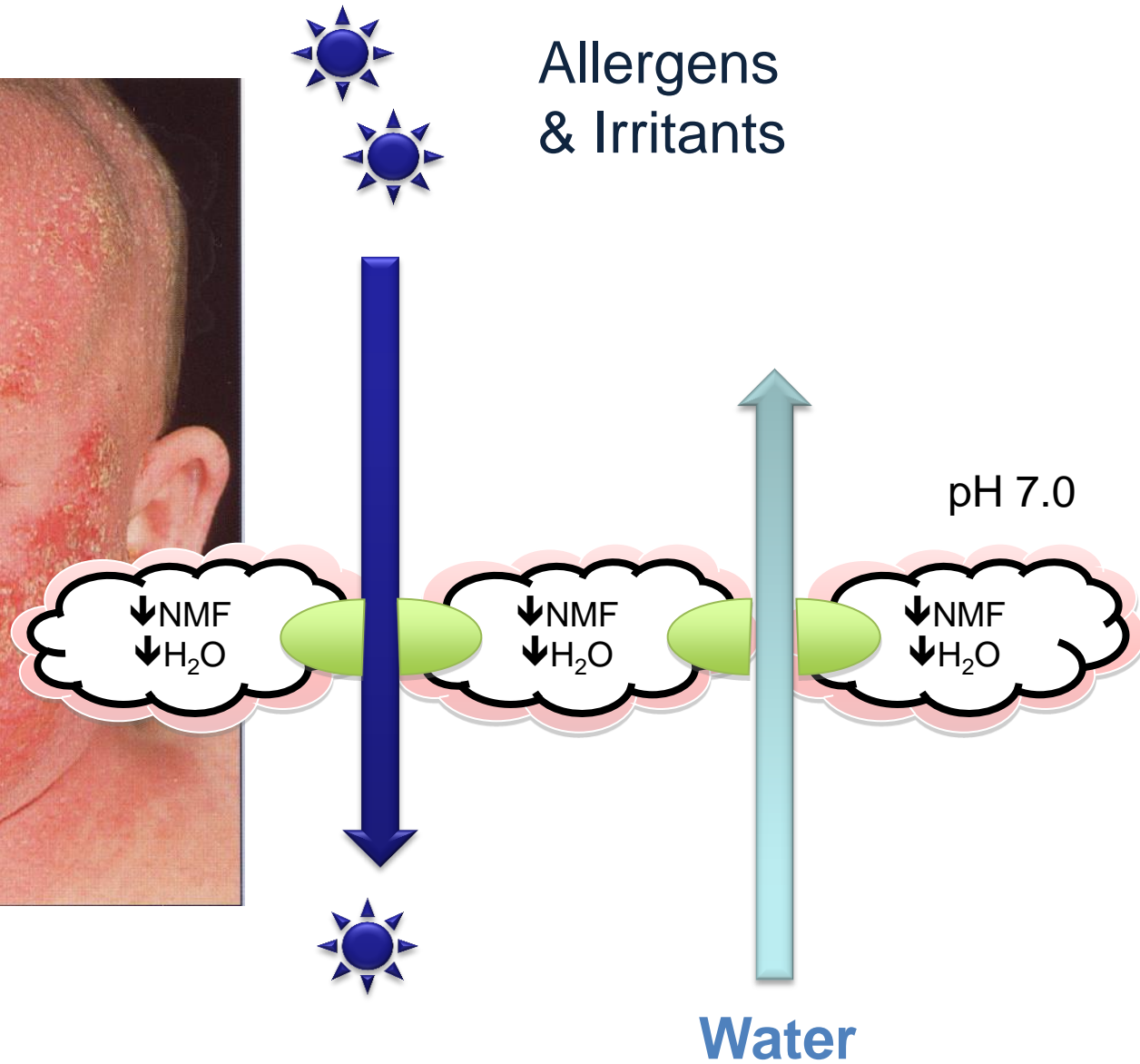


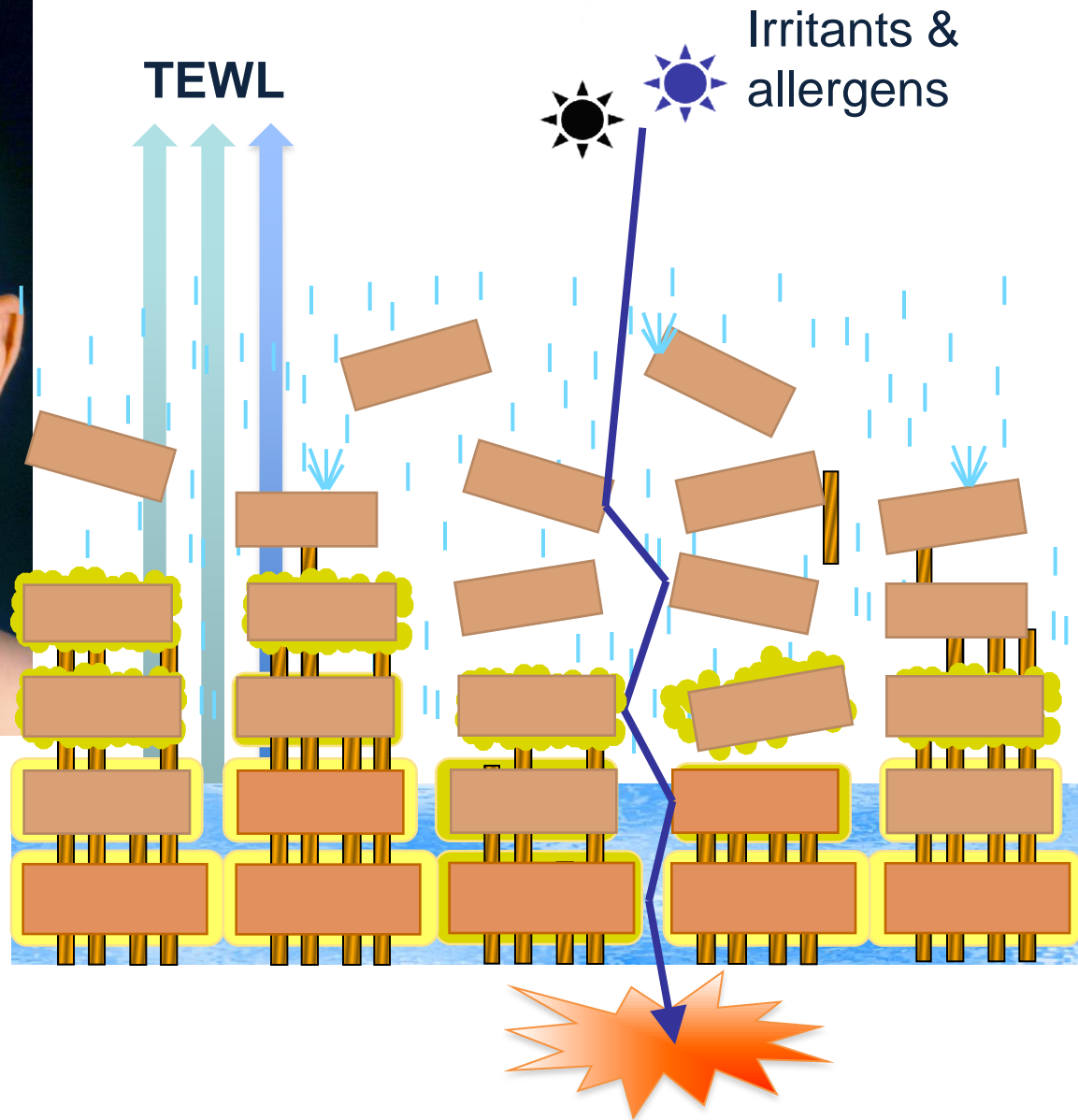
PAR = Proteinase-activated Receptor-2



# An allergic response is elicited







What do we mean by irritants?

# Identifying irritants: ask about skin care regime

- Bath or shower
- How often, per day, per week
- Products used for washing/showering, added to bath
- Products used for laundry





# Common irritants



# Common cause of irritancy!



TOO MUCH WASHING!!!!

# Itching: some simple tips

## STOP ALL IRRITANTS:

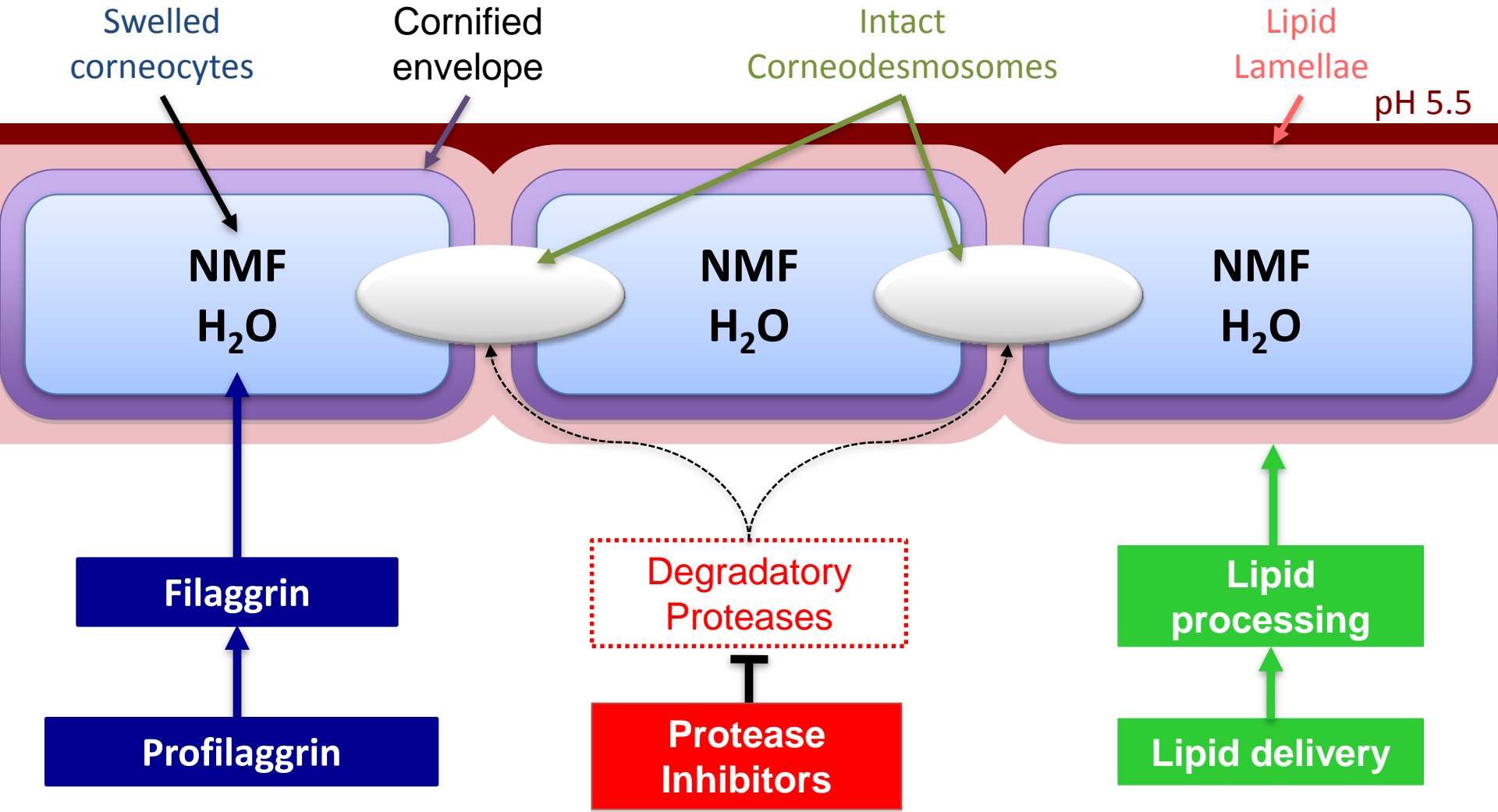
- Shower gels
- Soaps
- Biological washing powders
- Fabric conditioners
- Leave on moisturiser
- NOT AQUEOUS CREAM



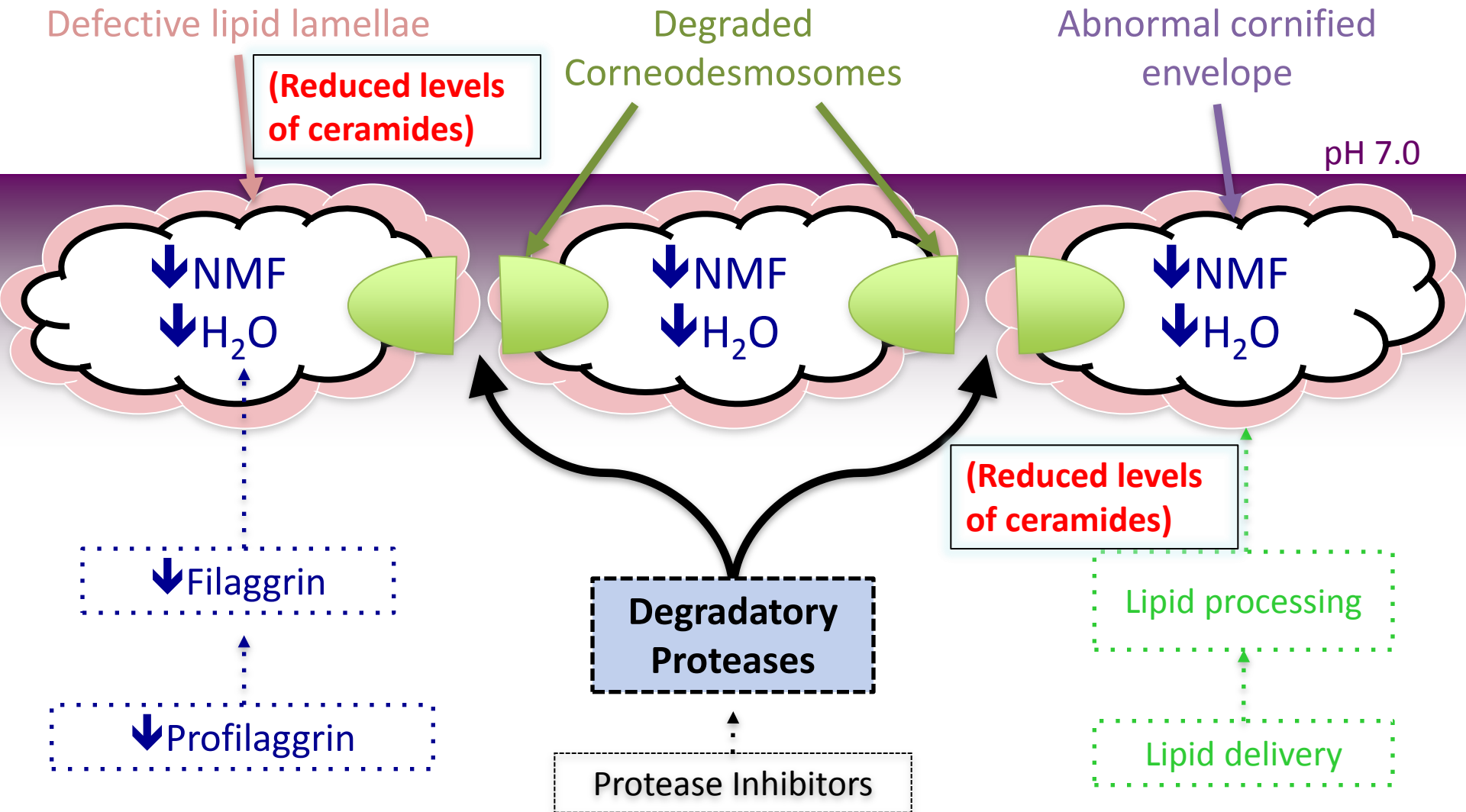


The effect of topical  
products/treatments on pH and  
protease activity

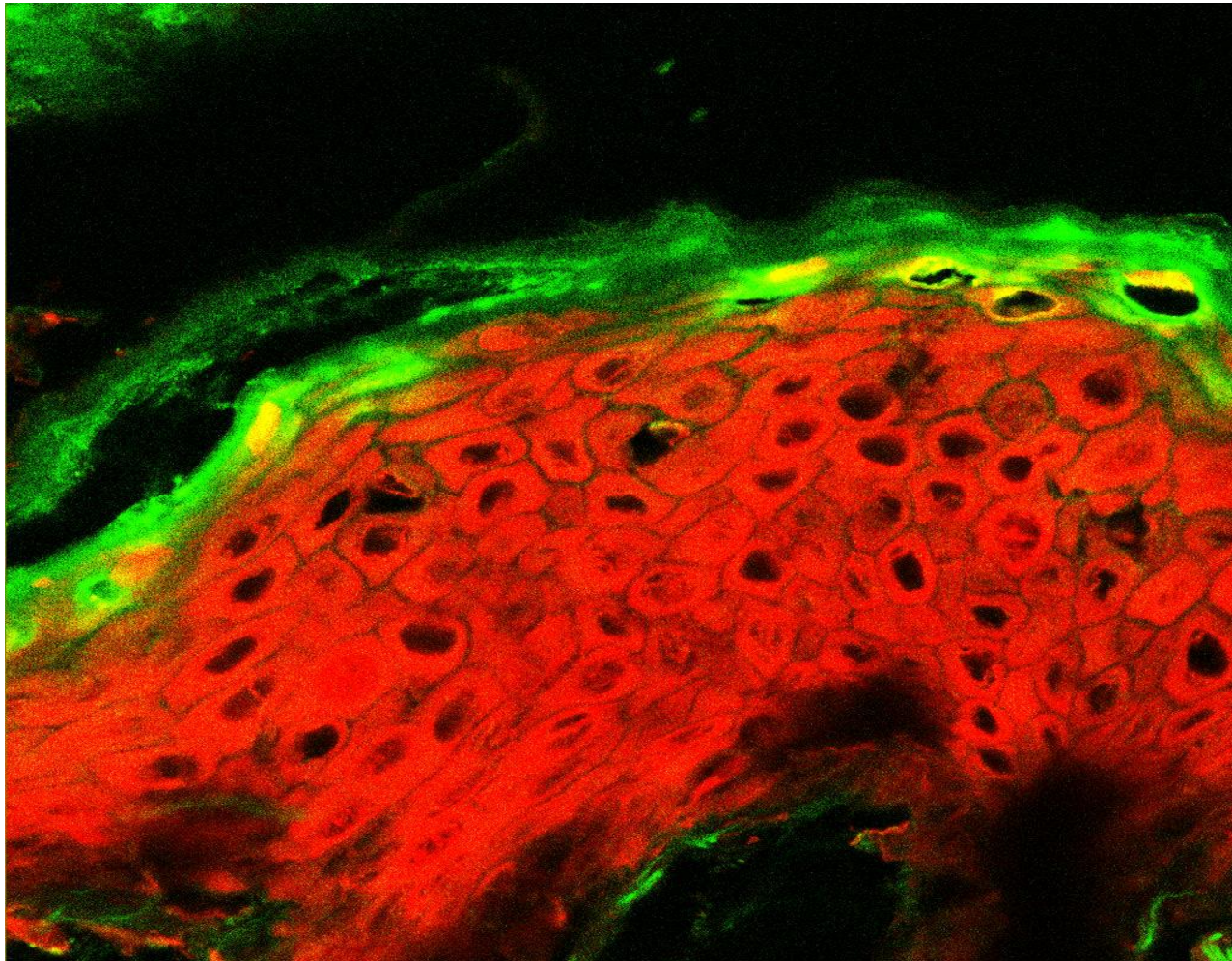
# A Healthy Skin Barrier



# A Defective Skin Barrier in AD



# Protease activity in the skin barrier



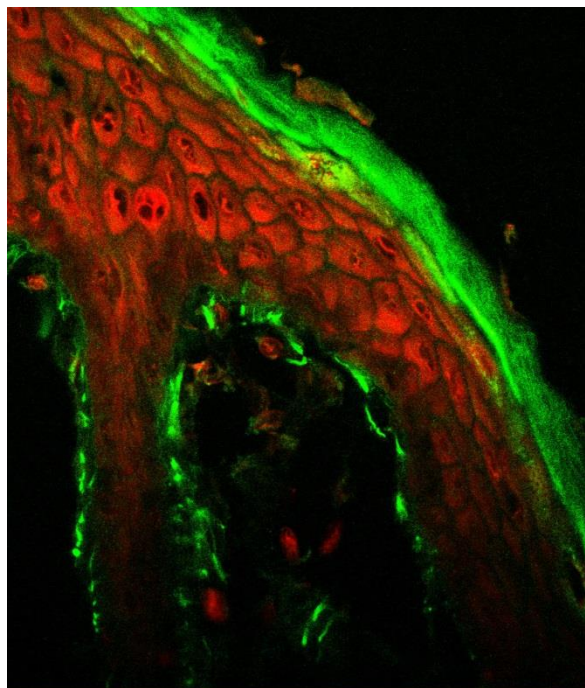
Protease Activity  
(in the stratum corneum  
- no red stain)

Nucleated layers  
(nuclear material  
stained red)

Dermis

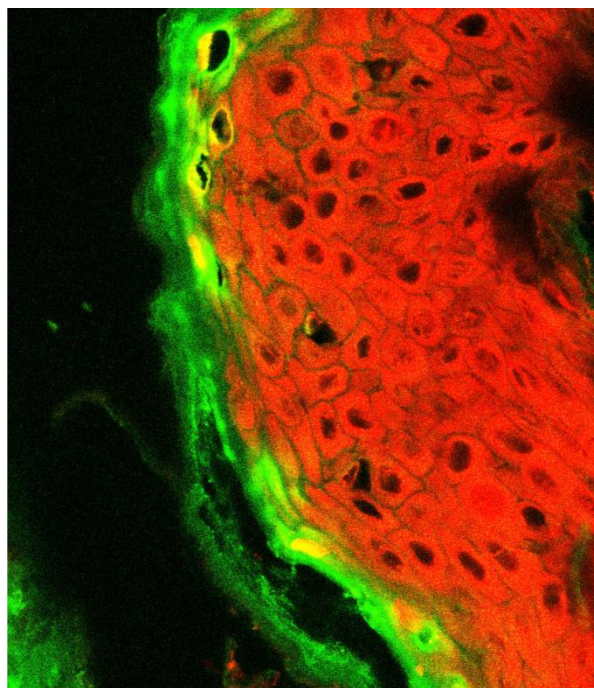


# The effect of pH on skin barrier protease activity: clinical relevance



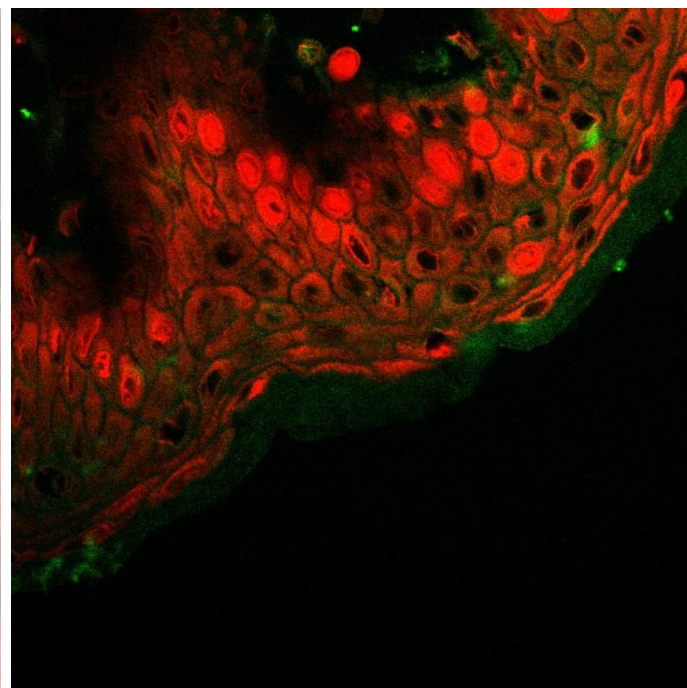
pH 8.5

Acute AD pH 7.3



pH 7.0

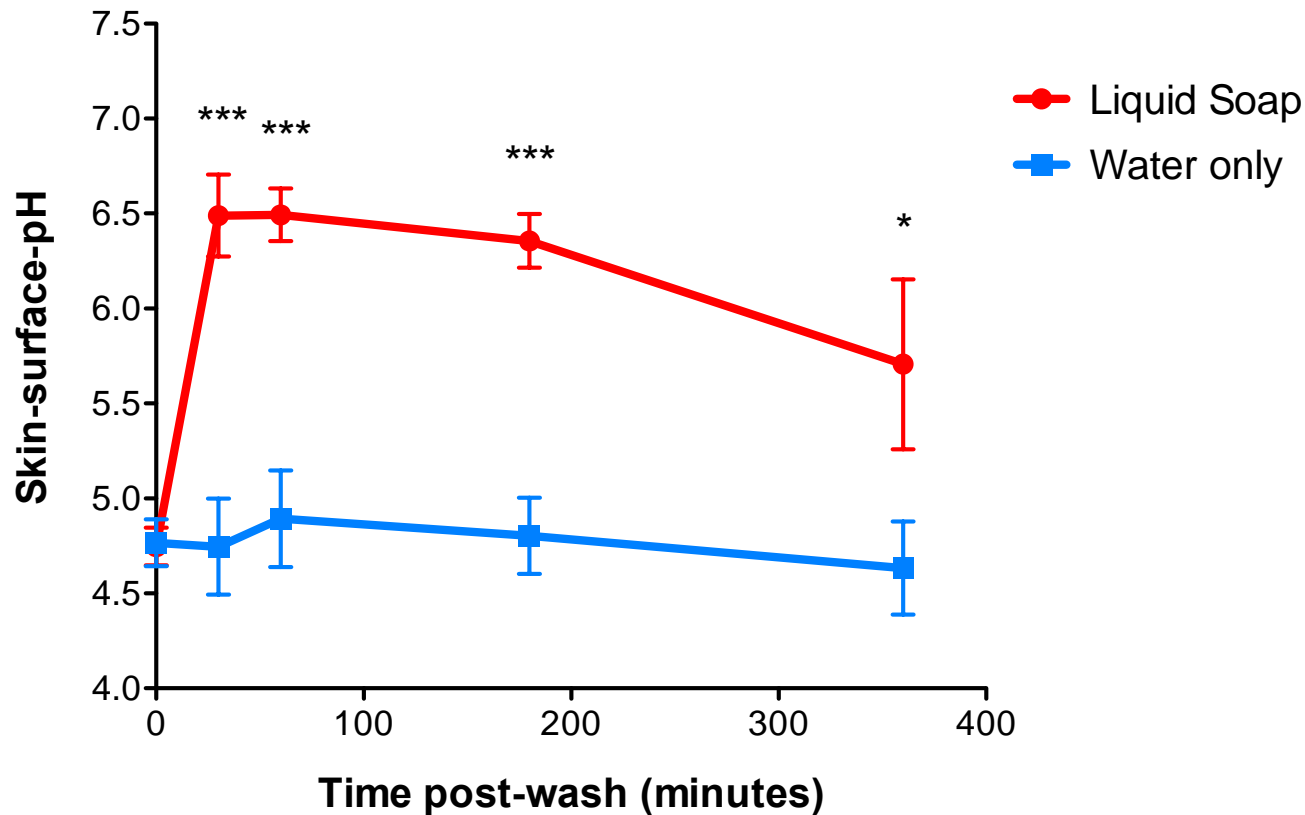
Current AD pH 5.7



pH 5.0

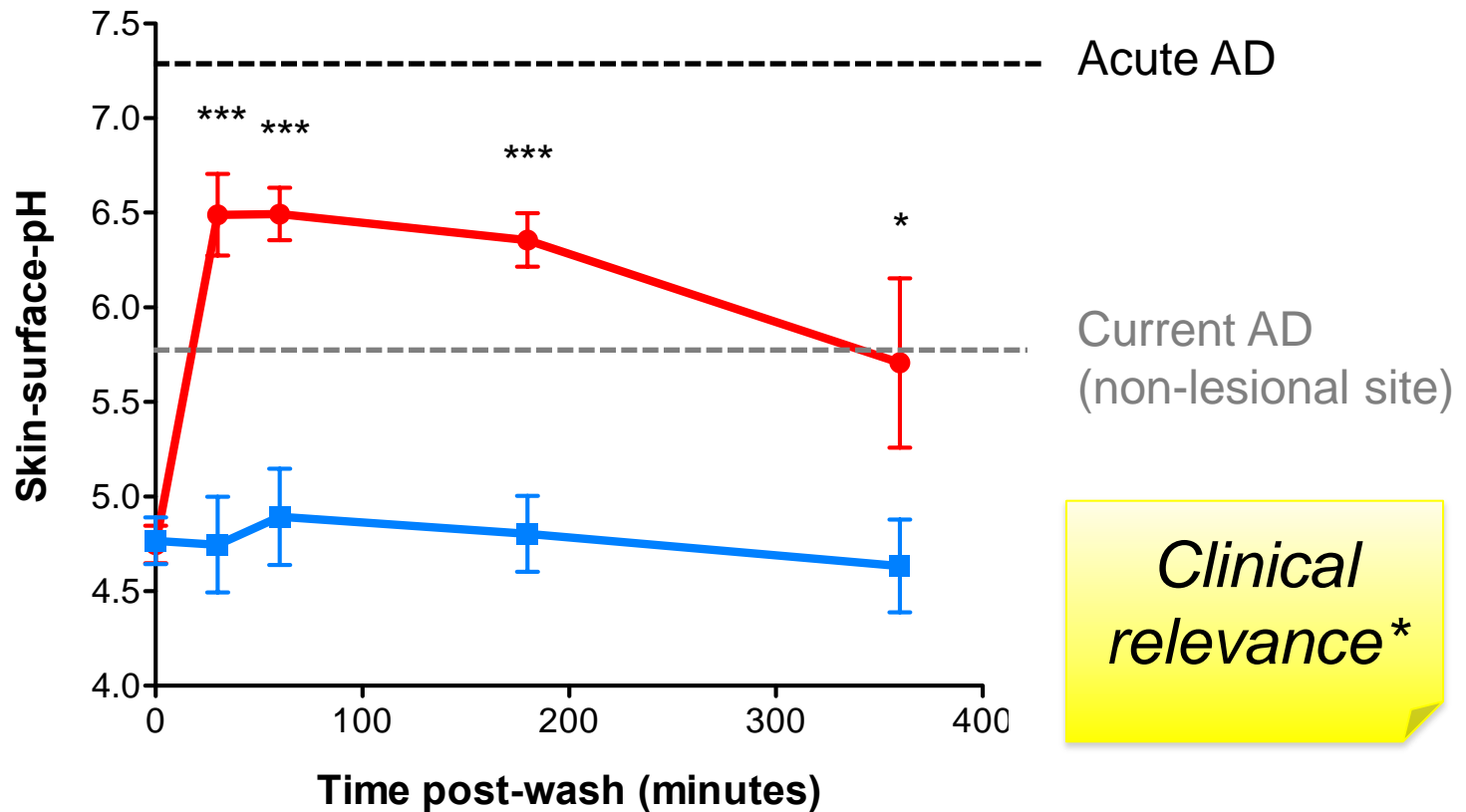
Normal skin pH 5.0

# The Effect of Washing with Liquid Soap on Skin Surface pH



\* $p < 0.05$ ; \*\*\* $p < 0.001$ ;  $n = 3$

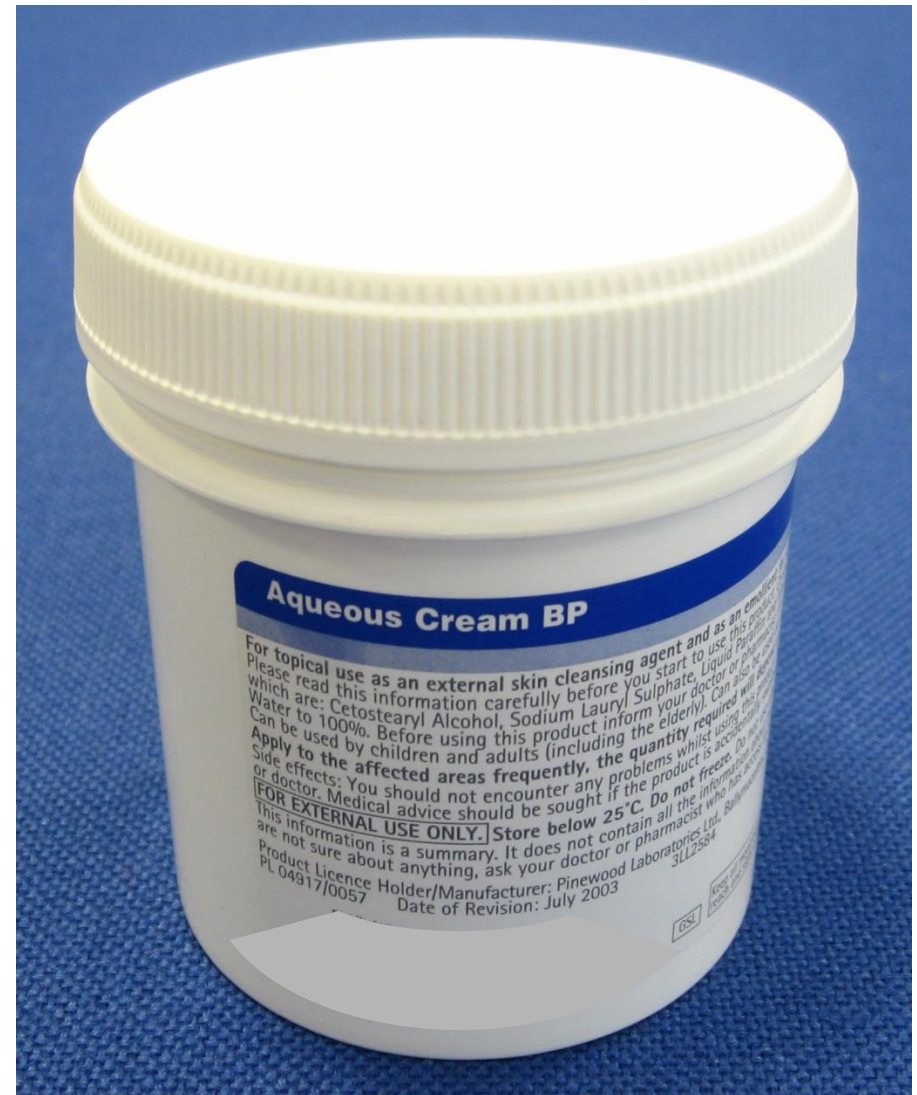
# The Effect of Washing with Liquid Soap on Skin Surface pH



\* $p < 0.05$ ; \*\*\* $p < 0.001$ ;  $n = 3$

Aqueous cream –  
first appeared in  
the BNF in 1958

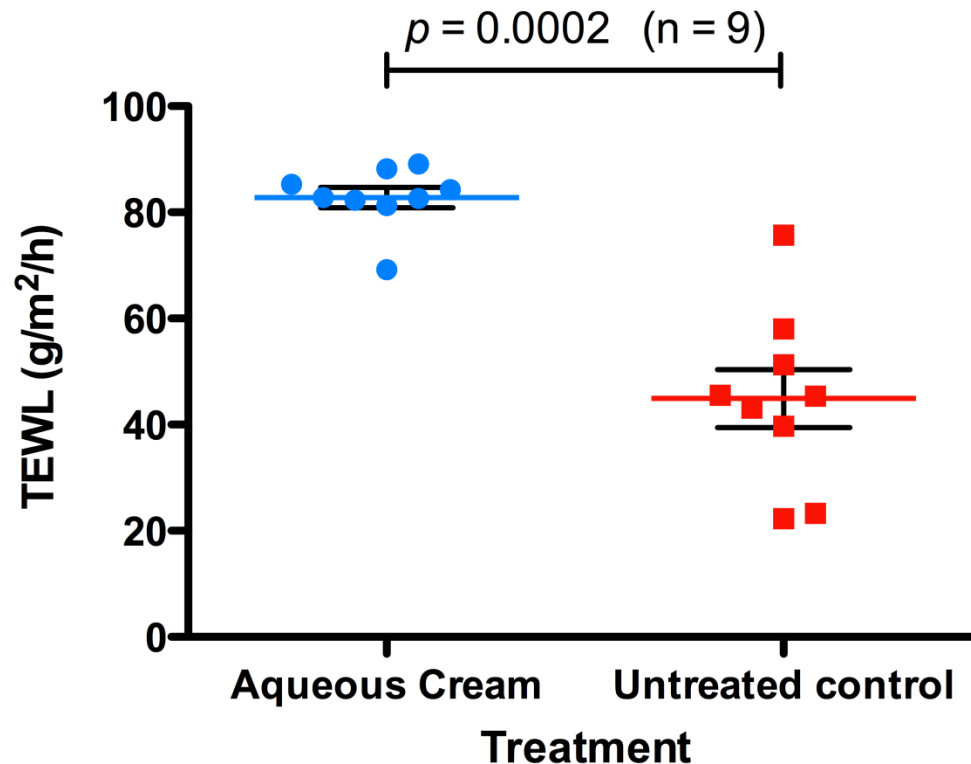
Its formulation containing  
SLS remains largely  
unchanged today





# Aqueous Cream Leave-On compared with No Treatment for 4 weeks

## Skin Barrier Integrity: End Point



# THE LANCET

## Atopic eczema and domestic water hardness.

*“Living in a hard water area is significantly associated with an increased lifetime prevalence of AD”*

Confirmed by 2 replicate studies (in Japan and Spain)

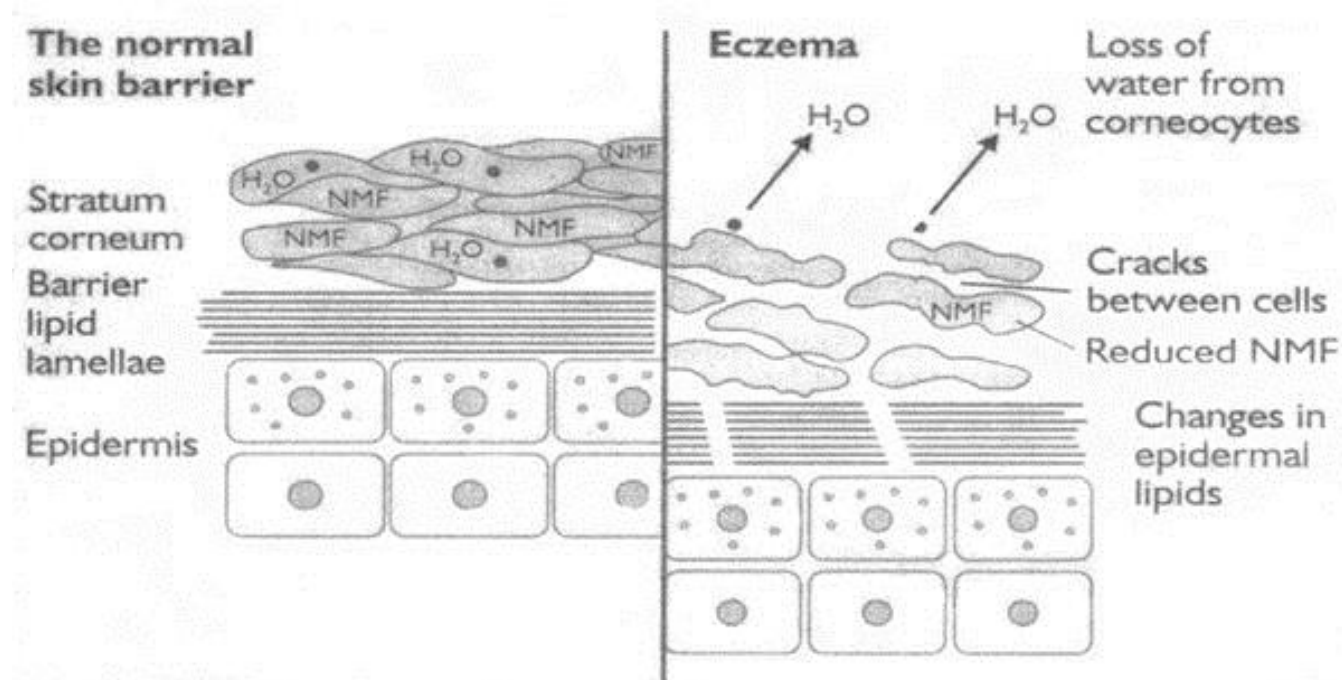
# A Randomised Controlled Trial of Ion-Exchange Water Softeners for the Treatment of Eczema in Children

Kim S. Thomas, Tara Dean, Caroline O'Leary, Tracey H. Sach, Karin Koller, Anthony Frost, Hywel C. Williams, and the SWET Trial Team

*PLoS Med.* 2011 February; 8(2): e1000395.

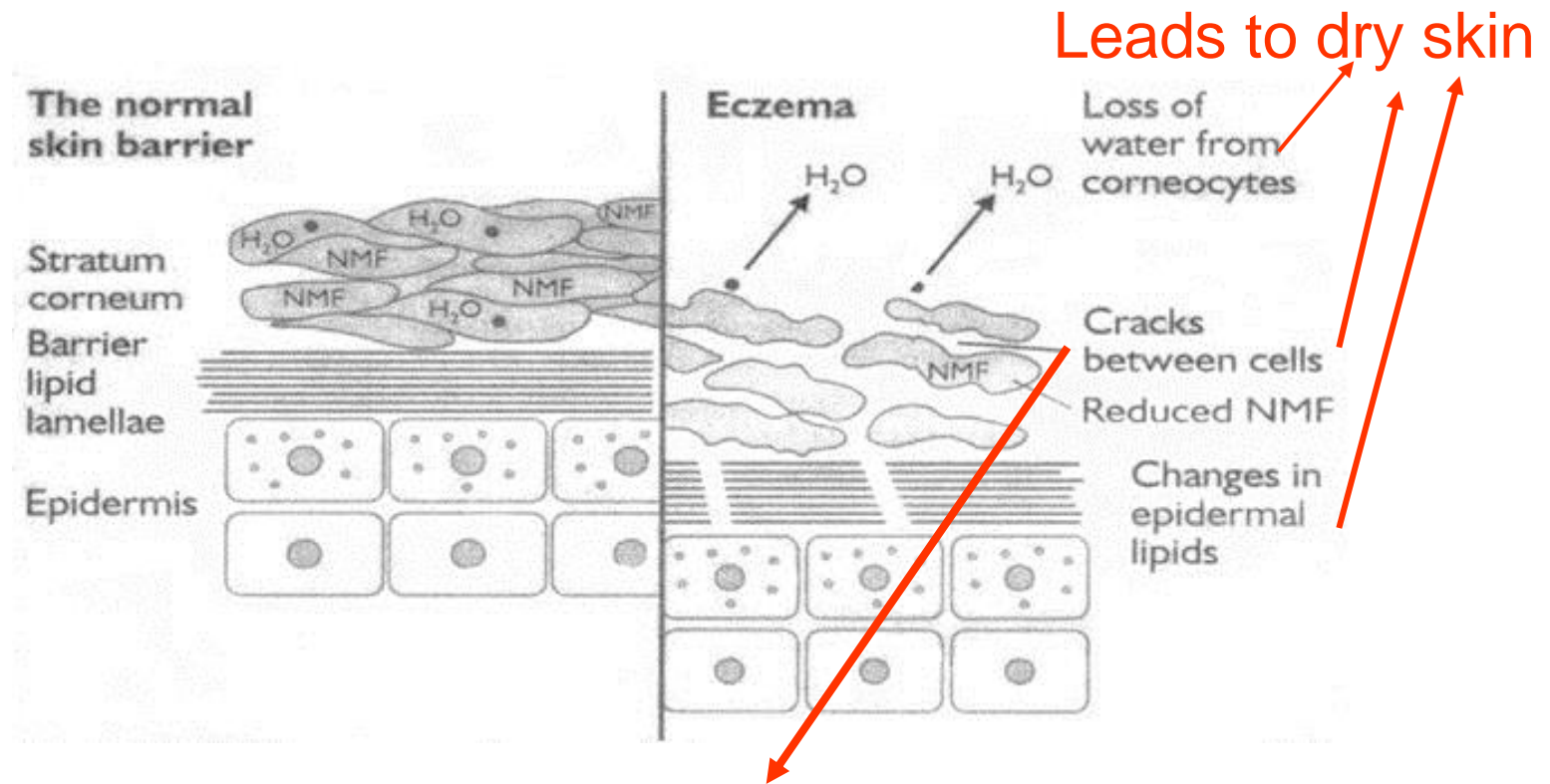
To summarise

# Atopic eczema: pathophysiology

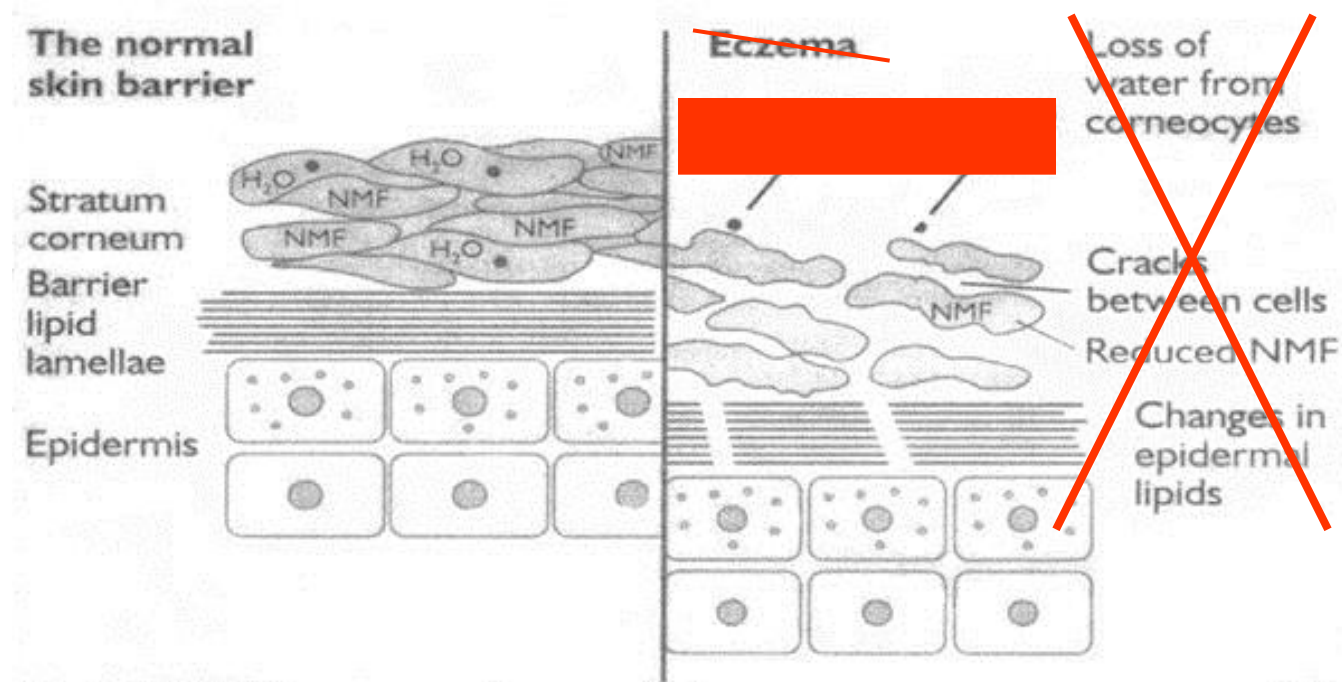


*BRICK WALL THEORY*

# The Brick Wall theory



# Brick wall theory: correct barrier function



Correcting barrier function reduces dry skin and penetration of irritants and inflammation

EMOLLIENTS  
EMOLLIENTS  
EMOLLIENTS!