

MIRACLE Academy

قال تعالى (يَرْفَعُ اللَّهُ الَّذِينَ آمَنُوا مِنْكُمْ وَالَّذِينَ أُوتُوا الْعِلْمَ دَرَجَاتٍ)

تفريغ الكوزموتكس
زميلتكم إسراء ملكاوي



لجان الرُفعات

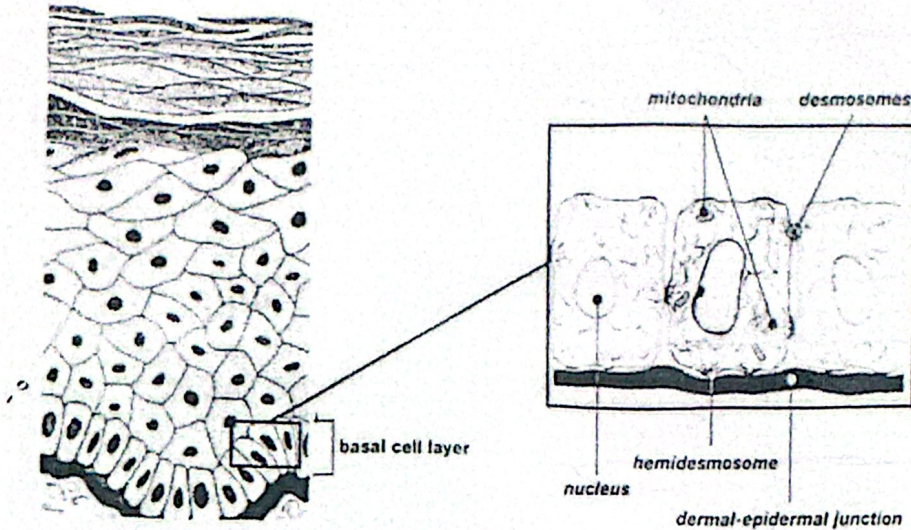
اسماء صبر دلانه

* **Basal layer:** located at the base of the epidermis, cells are cuboidal in shape, responsible for maintaining the epidermis by continually renewing the cell population

مسئولين عن تجديد خلايا البشرة

Layers of the Epidermis

Basal Cells



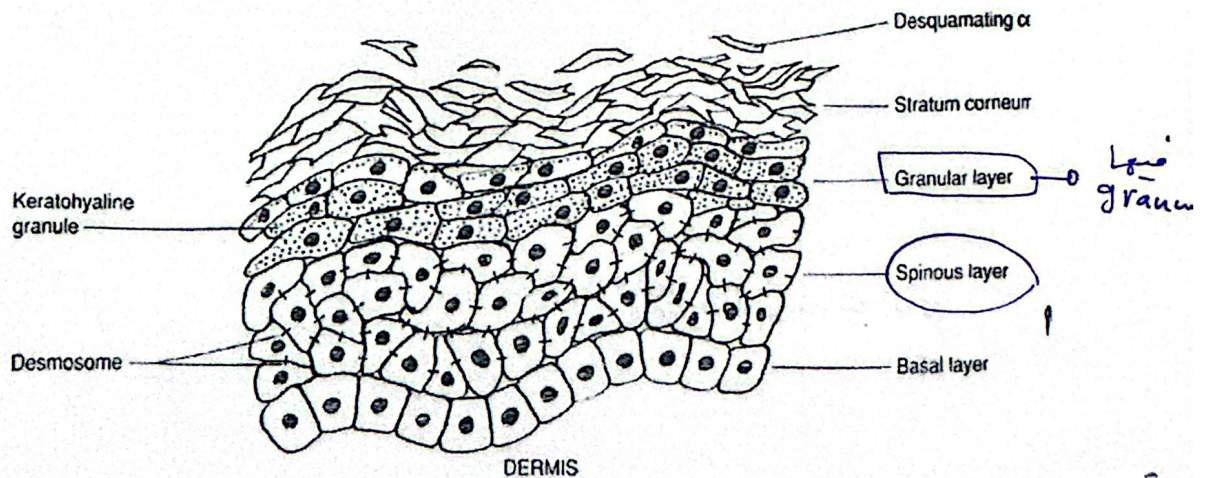
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اسماء صبر

Spinous layer: the cells have spiny attachments called desmosomes

Protein attachment
نزي الصغ



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Granular layer:

لويحات
الطبقة
الغنية
بـ
الحمض
الفسفوري

- Is named for the granules that appears in the cells:
- 1. Keratohyalin granules full of protein (filaggrin, Loricrin)
- 2. Lamellar bodies contain lipids, proteolytic enzymes involved in desmosomes hydrolysis, defensins
- * At the granular layer keratinocytes are transformed to corneocytes also called squames to form the SC:

تختفي النواة

1. The nucleus is digested
2. The cytoplasm disappears
3. The lipids are released into the intercellular space
4. The cell membrane is replaced by a cell envelope (made of cross-linked protein with lipids covalently attached to its surface)

بشور البقيرات التي تبصر داخل Keratin الى

granular layer
عنازل
خلايا SC

1/2/3/4

تتغير
بالخلية
بالحامض
جوانح

cell envelop
للخلايا او يكون بدال
cell membrane

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Granular layer:

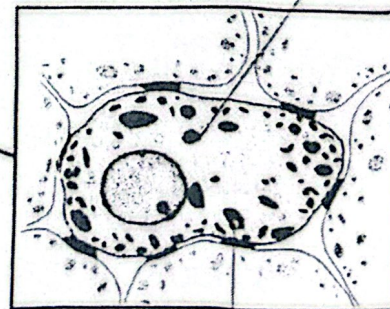
Layers of the Epidermis

Granular Cell



granular layer

Odland bodies contained here



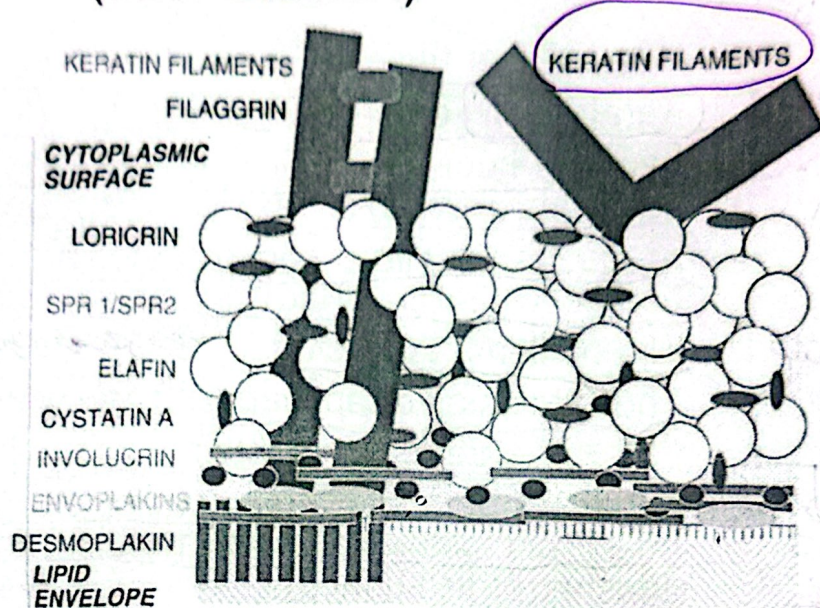
keratohyalin granules

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الـ cell membrane يتحول إلى الحائل The (cornified cell envelope) (after Steinert)

- 15 nm thick
- 66% Loricrin
- Involucrin is on the outer surface
- Keratin fibers attach to inner surface
- Lipids are attached to the outer surface



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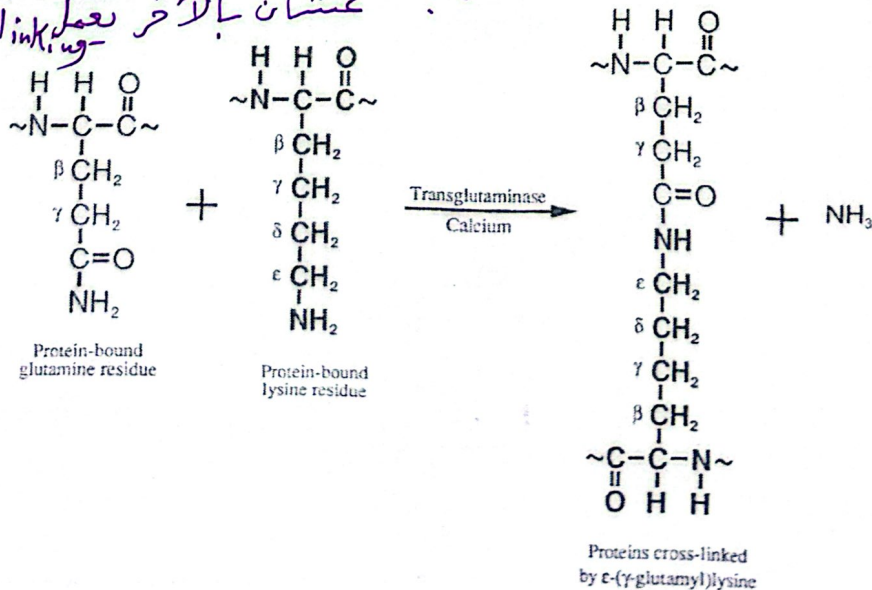
Protein مع lipid مع Keratin كله حبيب مع بعض لي شكل
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cornified cell envelope

كل واحد يصنع طريقاً أن تزيماً

Transglutaminase:

A membrane bound enzyme that forms the cornified cell envelope by cross-linking proteins with isopeptide bonds.

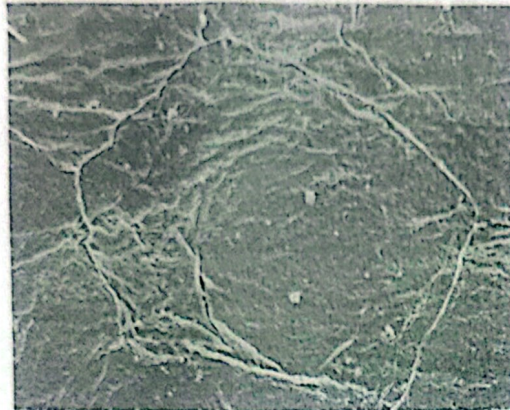
بـ ربط البروتينات مع بعض
عشان بالآخر يعمل Cross link في



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SEM of Corneocytes



- The corneocytes that results from this transformation is a flat cell (a hexagon or pentagon) with a surface area of $1000\mu\text{m}^2$ and a thickness of 0.5 to $1\mu\text{m}$

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تغييرات عشان تقدر خلايا
Keratinocyte
barrier تقوم بواجبها

* Keratohyalin Proteins

Filaggrin:

وجود في granular layer

* يكون موجود في filaggrin

- Contains a high level of positively charged amino acids

- Filament-aggregating proteins = filaggrin

The role of filaggrin is to help form the keratin microfibrils

- After filaggrin forms the microfibrils it is modified to come off the microfibrils

- It is then digested by enzymes to produce important components of the natural moisturizing factor (NMF) of the SC

low molecular weight compounds

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weight compounds

highly hygroscopic

hygroscopic

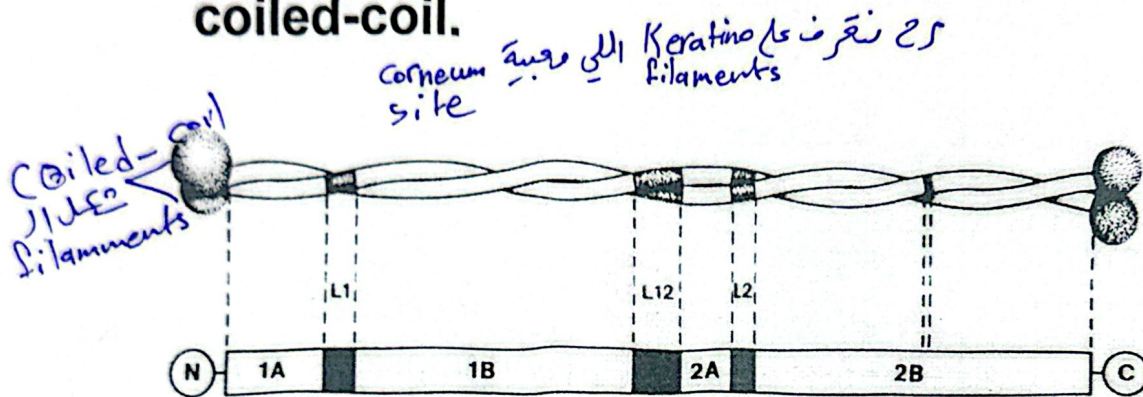
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حتى الـ NMF قتل شغالة

وجودهم مهم حتى تحافظ الـ
Corneum site
نسبة ترطيب معينة

Formation of the coiled-coil

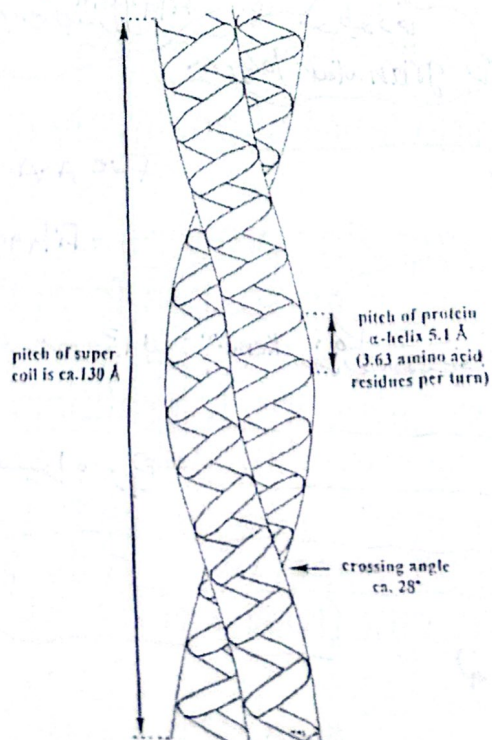
Two keratin chains interact to form a coiled-coil.



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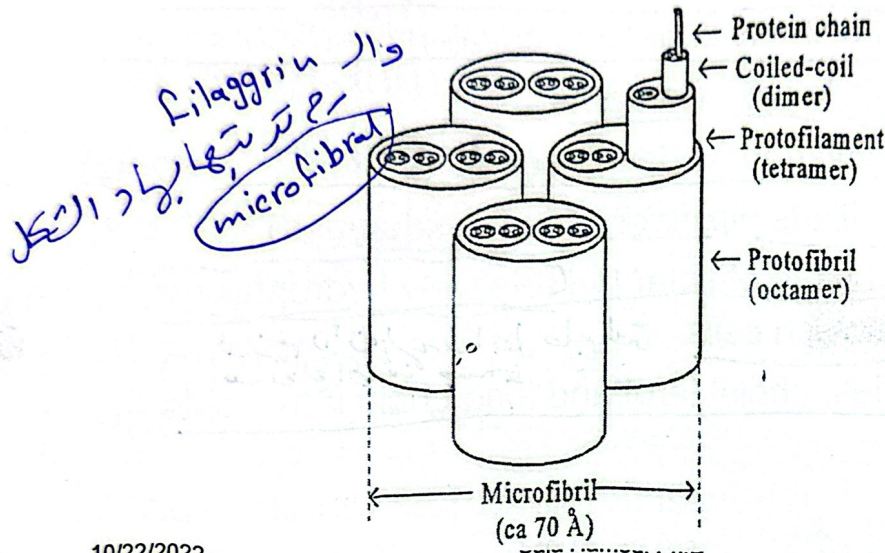
The Coiled Coil



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The microfibril

In the stratum granulosum filaggrin interacts with keratin coiled-coils causing condensation to a 32 chain structure called the microfibril



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- At the SG/SC interface keratinocytes are transformed to corneocytes
- Keratinocytes are normal cells with the normal constituents of cells i.e cell membrane, nucleus, cytoplasm
- Corneocytes or squames are flat cells with no cytoplasm, full of condensed keratin fibers and covered by a very tough structure called the cell envelope

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Stratum Corneum

تختلف عدد طبقاتها حسب الجسم

- On most body sites it is 12 to 16 cell layers thick
 - Flattened cells called corneocytes or squames with resistant cell envelope and covalently attached lipids
 - Content is keratin filaments
 - Squames joined by desmosomes (protein glue spots)
- Intercellular lipids (lipids outside the squames)
 - Multiple layers of polar but relatively hydrophobic lipids between cells لا يتم لأنزيم في الجلد خارج الخلية ما يخلق الطبقة من صلب
 - Ceramides, cholesterol and long chain fatty acids

Lamellar body
التي في الطبقة
granular layer

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SC thickness and TEWL with Body Site

كلما زاد عدد

BODY SITE	SC LAYERS كلما زاد عدد	TEWL منه يقل فقد
Face n = 84	9 ± 2	No Data
Forehead n = 8	9 ± 1	No data
Eyelid n = 16	8 ± 2	15
Cheek n = 43	10 ± 2	11
Upper Arm n = 2	14	4
Back n = 3	13 ± 3	5
Abdomen n = 44	14 ± 4	4
Thigh	16 ± 4	4
Forearm n = 4	16 ± 4	4-6*

Trans epidermal
water
loss

Data from Ya-Xian et al Arch Dermatol Res 291:555-559(1999)

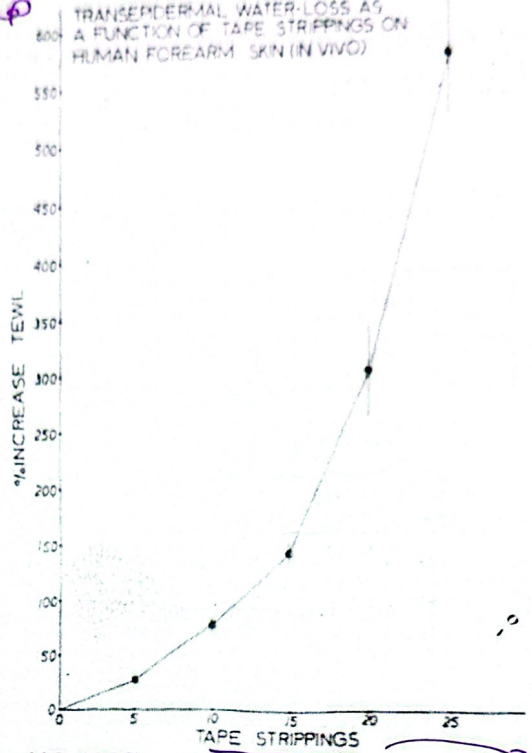
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تؤدي TEWL إلى زيادة فقدان الماء من الجلد SC كلما خربت barrier properties

فقدان الماء من الجلد ما اصفه يحصل الى الخارج وطبقه من الجلد / غرض من هذا هو

The barrier to water loss through the skin (TEWL) is the stratum corneum and removing the SC by tape stripping leads to dramatically increased TEWL



From MS thesis of Scott Coapman UC 1988

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التي هو ولا شيء تقريبا على الجلد layer
تقيس TEWL كل حاجب Tape هو صيغ TEWL في جرح زئير (وهي العلاقة
العضية) (تحت) ونفقد الماء الزائد) وبغير ذلك
الحفاظ صحتها

Stratum Corneum

Cell membrane + true cells
Corneum site

- The SC is modeled as a brick wall
- Bricks = The corneocytes with their resistant cell envelopes and keratin microfibrils
- The bricks are linked by desmosomes
- Mortar = layers of lipids found between cells
- The lipid is the main barrier to water passing out through the SC

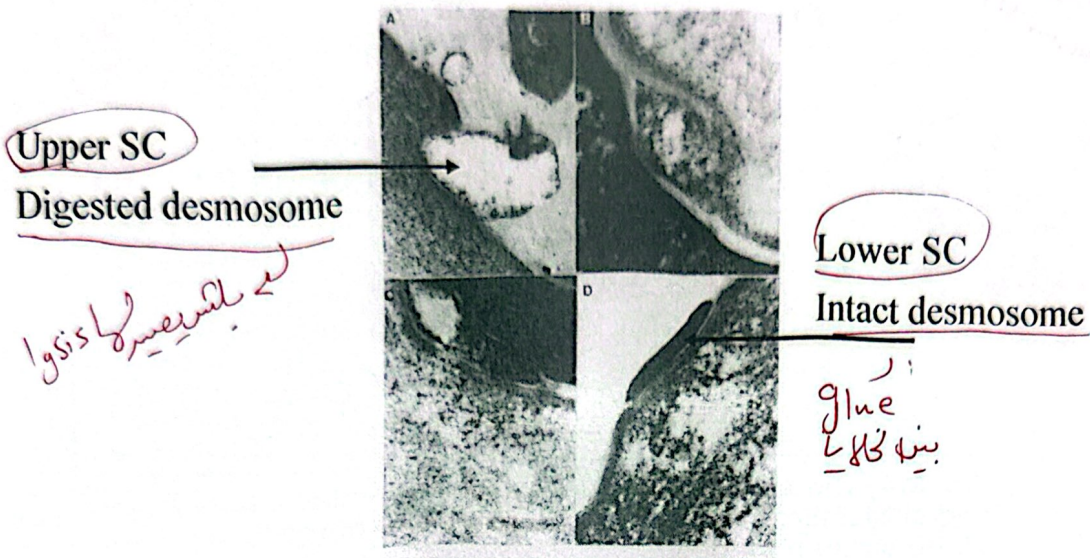
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Scanned with
 CamScanner™

Desmosomes in the SC

Desmosomes are digested to allow desquamation



Rawlings et al (JSCC 45, 203, 1994)

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ceramide
Cholesterol
long chain fatty acid
lipid

Stratum Corneum

- The lipids organize into multiple layers between the SC cells
- The SC contains no phospholipids
- Phospholipids are broken down by phospholipases in the lower SC
- This produces fatty acids which may play a role in producing the acid pH of the SC (SC surface pH 4-5.5)

phospholipids
Cell membrane
خاصية النفاذية وأنها تعطي
النفاذية

The SC acidic pH (acid mantle) may play a role in protecting against colonization of skin surface by harmful bacteria

منه صيد
فهم احاط على
pH للجدار
تكون
acidic

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الليبيد الموجود في
الخلايا
Corneam site

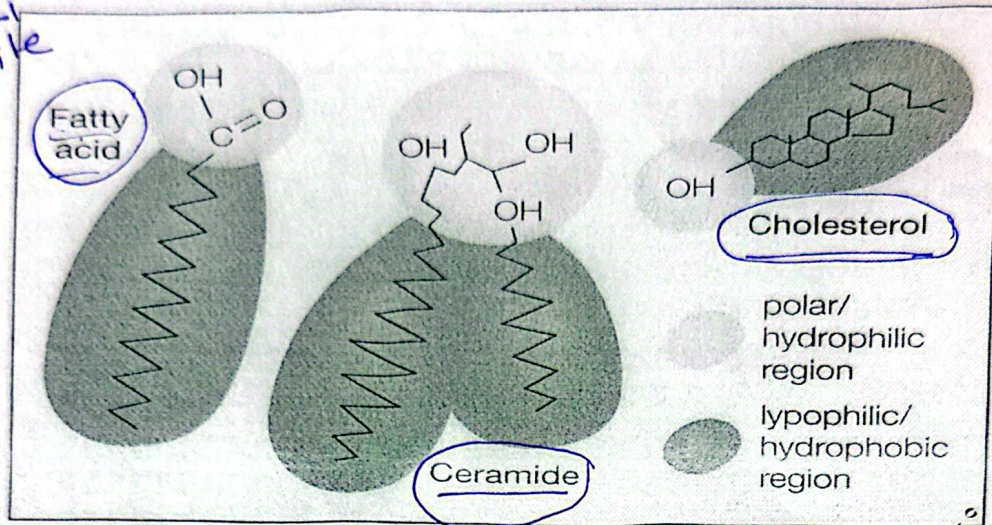


Fig. 2.4 Three classes of polar lipids, ceramides, fatty acids, and cholesterol, are the main constituents of the lipid matrix of the stratum corneum

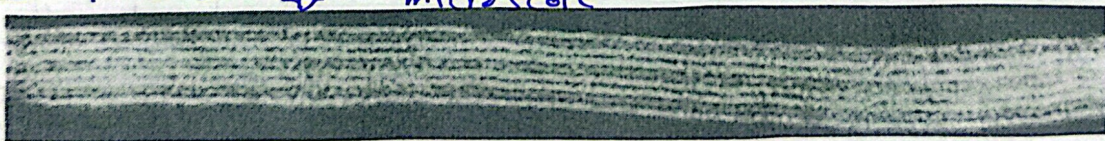
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The barrier lipids of the SC

There are multiple lipid layers
between the cells

شيفون الـ lipid طبقات بين
الخلايا
Scanning
microscope



Micrograph courtesy of Ronald Warner

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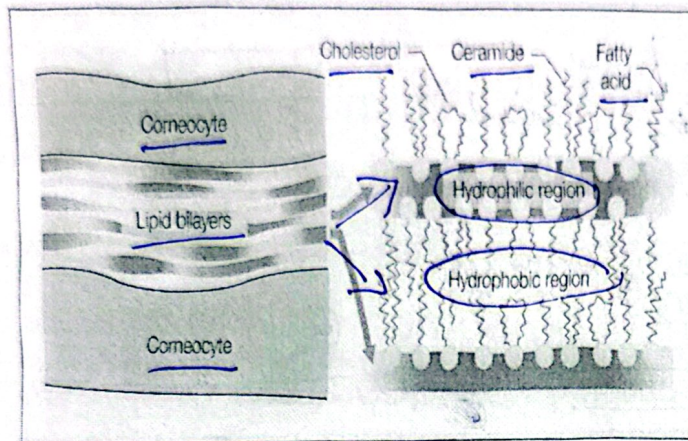


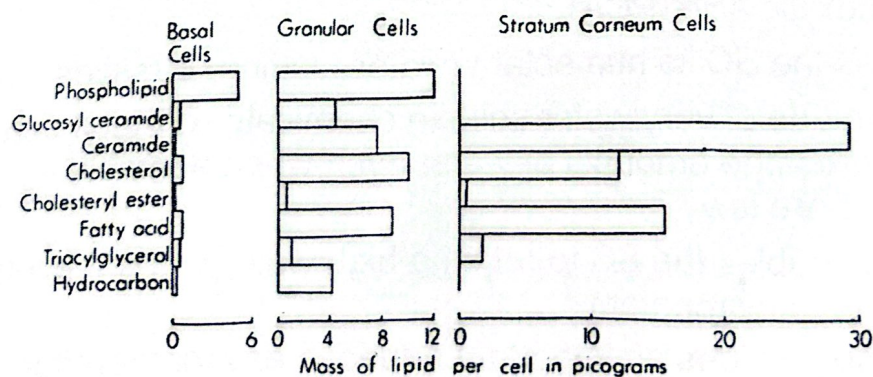
Fig. 2.5 The stratum corneum lipid matrix has a multiple bilayer organization formed by the spontaneous alignment of polar and non-polar regions of the ceramide, cholesterol, and fatty acid molecules

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Lipid distributions in the epidermis

Note that there are no phospholipids in the SC



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Stratum Corneum

- The Horny layer function as a protective layer It defends us against:
 - ① Dehydration (i.e. prevent transepidermal water loss (TEWL))
 - ② External toxins
 - ③ Bacterial infection
 - ④ Protect the more fragile keratinocytes below from mechanical disruption
- Byproducts formed from the breakdown of filaggrin (i.e. amino acids and their metabolites) are called Natural Moisturizing Factor (NMF)
- Extracellular lipids and intracellular NMF play an important role in skin hydration

الموجودين داخل SC
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الموجودين داخل SC
Corneum site Saja Hamed, Ph.D

Natural Moisturizing Factor

- Inside the cells of the SC
- NMF consists of lactate, amino acids, pyrrolidone carboxylic acid (PCA)
- Gives the SC its humectant (water-binding) qualities
- It is made of very water soluble chemicals so that it can absorb large amounts of water even when humidity levels are low
- This enables the SC to retain a high water content even in a dry environment
- It also provides an important aqueous environment for enzymes

مكونة من مواد
Chemical compounds
low molecular weight
that have
hygroscopic properties
(love water)

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Just smile and say
الله كريم

Natural Moisturizing Factor

يكون عندهم حراشف جلد الأشخاص

- Ichthyosis vulgaris patients → sever dryness and scaling of the skin (في صورة بعد سترلايدين وهو علاج جيني)

- Normal skin washed with soap has lower levels of NMF compared to skin not washed with soap (إذا بغسل كثير)

- Levels of NMF decline with age → contribute to the increased incidence of dry skin in the elderly population (يقل مع العمر)

كلما تقدمت بالعمر لو ما استخدمتني أو جلي أو شغل بيته (يكون ايدل جافة)

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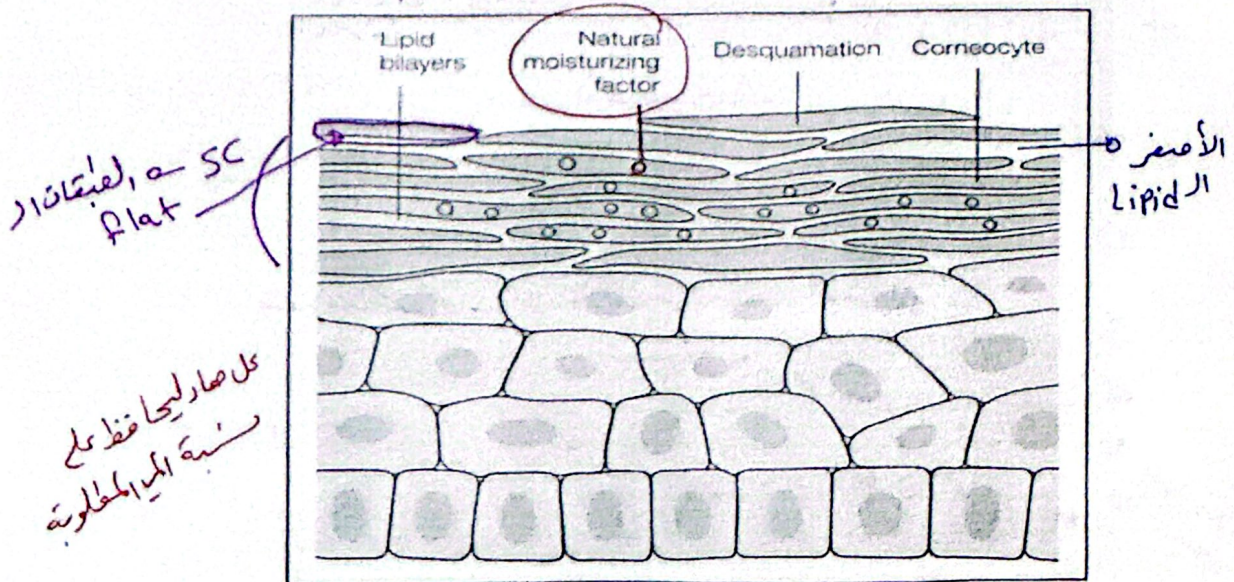
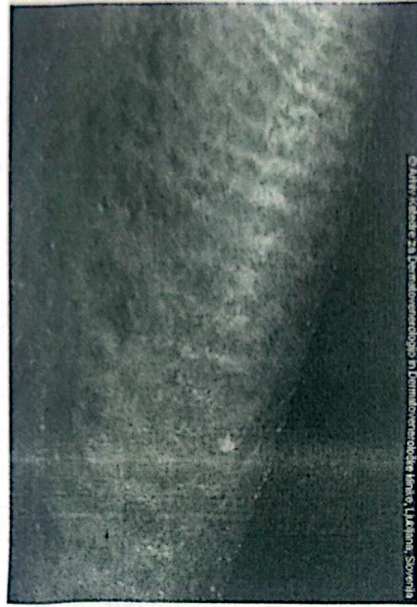


Fig. 2.2 The four key processes for the formation and functioning of the stratum corneum

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Ichthyosis vulgaris results from a defect in profilaggrin synthesis.



عالة على 2.
- ممكن
يتخفف فقط
#.

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الطبقة التي تحت epidermis

Keratinocytes = epidermis

Dermis

وهذا الألياف ما فيها خلايا

Collagen fibers = dermis

مسؤولة عن سماكة الجلد

It is responsible for the thickness of skin:

- ① Varies over different parts of the body
- ② Double between the ages of 3 and 7 years and at puberty

تضاعف السماكة عند عمر 3-7 سنوات وكمثال عند البلوغ

- ③ Decrease with aging

بعد سن 40 مع التقدم في العمر

Consists mostly of collagen

Primary cell type is (fibroblasts)

فيها خلايا تسمى

They produce collagen, elastin, other matrix proteins, and enzymes (e.g. collagenase)

لهم مهمة لصنع الماتريكس

Nerves, blood vessels, sweat glands, and immune cells (e.g. mast cells, lymphocytes, and macrophages)

Fibroblast
يقوم بعمل

dermis
عناصرها

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مكونات الdermis بالانفسوري

Dermis:

- The dermis is composed of an amorphous intercellular substance. Within this amorphous substance are:

- * Cells of the dermis
- * Collagen and elastin fibers
- Blood vessels → fibroblast زي
- Nerves and sensory organ
- sebaceous glands
- Hairs
- Sweat glands

- Its upper level has projections that extend into depressions in the epidermis

منطقة التقاء dermis مع epidermis ← معمولة بين dermis لها
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 Projections حيث تطل جوار areas (الصورة صلاية ٦٠) بعد لا يدرك من هاي
 - ليس هاي ال Projection في تضلوا احيطتهم في Flat = بسهولة بنسختها اذ بعض
 - أقالهم بدخلوا بعض فيسير في قوة و بعض هاي القوة الجذر
 * وكمات شكل dermis الذي زي صليك بسا عد بتغذية ال epidermis لأنه فاعنده
 epidermis blood vessels

Papillary dermis: ①

- uppermost portion
- Contain fine, delicate type III collagen fibers شرحها

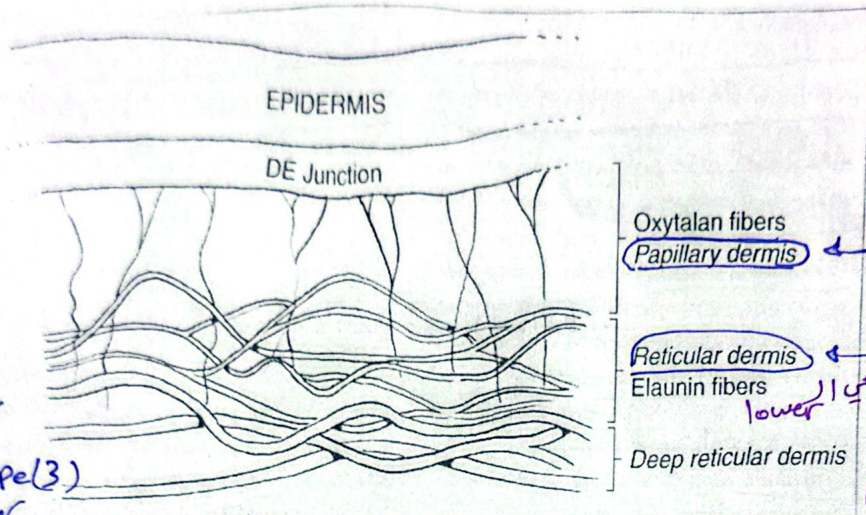
Reticular dermis: ②

- lower portion
- It is a net of thick, dense connective tissue composed primarily of thick type I collagen fibers
- Type I collagen provides support and bulk to the skin

الجزء
Predominant collagen fiber

الجزء
العلوي منها القريب
من البشرة
Papillary dermis

سموه
dermis
لأنه
Collagen fiber predominate
fine delicate type (3)
collagen fiber



الجزء
الجزئين

ووجدوا
لأنه
Predominate collagen fiber
thick dense
Connective tissue.
Composed mainly of type (1) collagen fiber

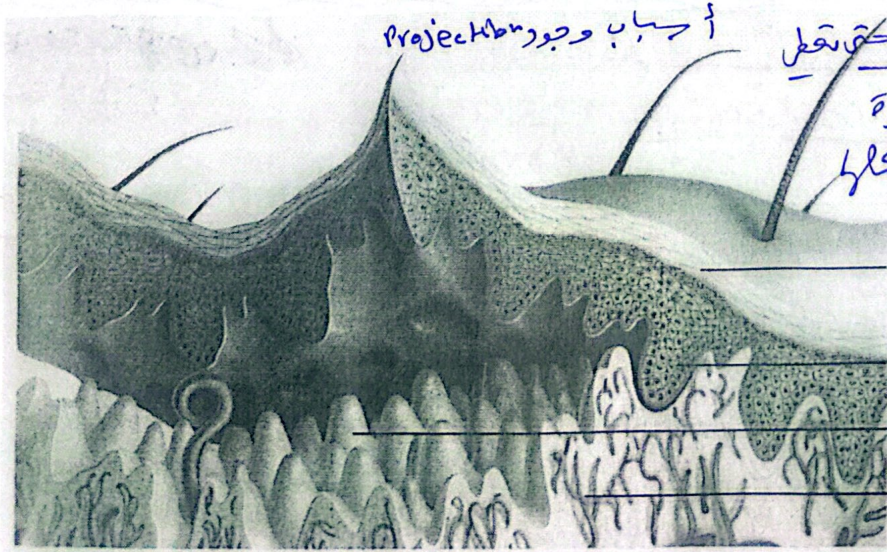
حتى توصل
Blood vessels
لأخرى نقطة في
- Epidermis
حتى يصير تبادل المغذيات

Figure 2-2. The elastic fiber network in the dermis consists of immature oxytalan fibers in the superficial dermis and the more mature elaunin fibers in the middle dermis. The most mature elastic fibers are unnamed and are found in the deep reticular dermis.

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أما في لقطة مدعمة وصحية لل
deep part

The junction between the epidermis and dermis is known as the dermal-epidermal junction (DEJ)



أما وجود
Projections

anchoring
تثبيت قوة
عنا نصلدها

Keratinous layer
+
القشرة بلا ودية
Epidermis
Projections of the dermis
Blood vessels

الدعوية
لل
epidermis

Schematic representation of the wave-like junction between the epidermis and the dermis, with corresponding projections and depressions.

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Collagen

- Give the skin its strength
- Comprises 70-80% of dermis dry weight
- A complex family of 18 proteins (11 are present in the dermis) *التي في الجلد موجودة 11*
- Is synthesized in the fibroblasts as procollagen:
 - Proline (Prolyl hydroxylase) → hydroxyproline *ليستحول للبرولين*
 - Lysine (lysyl hydroxylase) → hydroxylysine *ليستحول لللايسين*
 - Both reactions require the presence of Fe^{++} , ascorbic acid, and α -ketoglutarate *حديد*

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*هذه مهمة جداً لصحة الجلد
وذلك من خلال
بعض مرض (سيفير)*

Major Collagen Types Found in the Dermis

Type	Other Name	Location	Function	% of Dermis	Associated Diseases
I (1)		Bone, tendon, skin	Gives tensile strength	80%	Aging
III (3)	"Fetal collagen"	Dermis, gastrointestinal vessels	Gives compliance	15%	Aging
IV	أكثر بروتين	Basement membranes	Forms a lattice		
V	type	Diffuse, dermis	Unknown	4-5%	
VII (7)	Anchoring fibrils		Stabilizes DEJ		EBA, dystrophic EB
XVII	BPAG2 (BP180)	Hemidesmosome	Stability		BP, HG

Collagen is found in many vital structures of the DEJ and in the dermis. Defects in these collagens, or antibodies directed toward these important collagens, can result in dermatologic diseases.

*هذه موجودة في
dermal epidermal
junction*

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*وظائفها
تعمل*

شكل ٤.٤
من
الجلد
dermis

Elastin

- They are thinner than collagen fibers
- Responsible for the skin's elasticity
- Forms a delicate, freely branching fibers which can be stretched by 100% or more but return to their original length when the stress is removed
- Elastin degrades with significant levels of sun exposure = Elastosis
- Collagen and elastic fibers are embedded in a water-binding, gelatinous like ground substance that contains glycosaminoglycans

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Substances (ground) like ground substances
dermis, joint, etc. هي التي تعطي الجلوتين
like ground substances

Ground substance

- Proteoglycans = جزيئات وظيفية
- Role:
- Support for other dermal components
- Mediate attachment of fibroblasts and growth factors involved in dermal repair

① in tissue remodeling and in wound healing
② following cosmetic procedures.

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Glycosaminoglycans (GAGs)

- Polysaccharide chains composed of repeating disaccharide units that are linked to a core protein + مع
- They bind water → may contribute to the maintenance of salt and water balance
- GAGs content decrease with aging ↓
- The most abundant GAGs in the dermis is Hyaluronic acid (HA) and dermatan sulfate م
- HA is a popular ingredients in cosmetic products because it acts as a humectant

HA موجودة بحيث صلا لملء wrinkle

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منتجات HA صلا يكون الهيدروكسيل في البشرة بس الهيدروكسيل فيها كتر قليل
وال بروتين بس في كبريت HA صلا في كبريت

What is the Net Charge of the proteins found in the skin's

upper layer?

negative charge

Isoelectric Point = 3.5-4.5

PH = 4.5-5.5

for skin

* isoelectric Point

لذا اكانت ال PH اقل منها

فيكون +ve أكثر

البروتين

واذا اكانت ال PH اللي بكونها

Isoelectric Point

تكون -ve

* حرم مغرفة

Conditioning

Hand sanitizers

مرات بكون المعقدات اللي
لذا اغسلت

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تم بحمد الله يا ربنا الله وان الله لطيف خبير