

Development and Ageing



Introduction

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- ◉ Maintaining or recovering a youthful appearance is a multibillion dollar industry driven by the desire for healthy, great-looking skin—regardless of age.
- ◉ Like other organs of the body, the physiological functions and structures within the skin continuously decline with advancing age.



Introduction

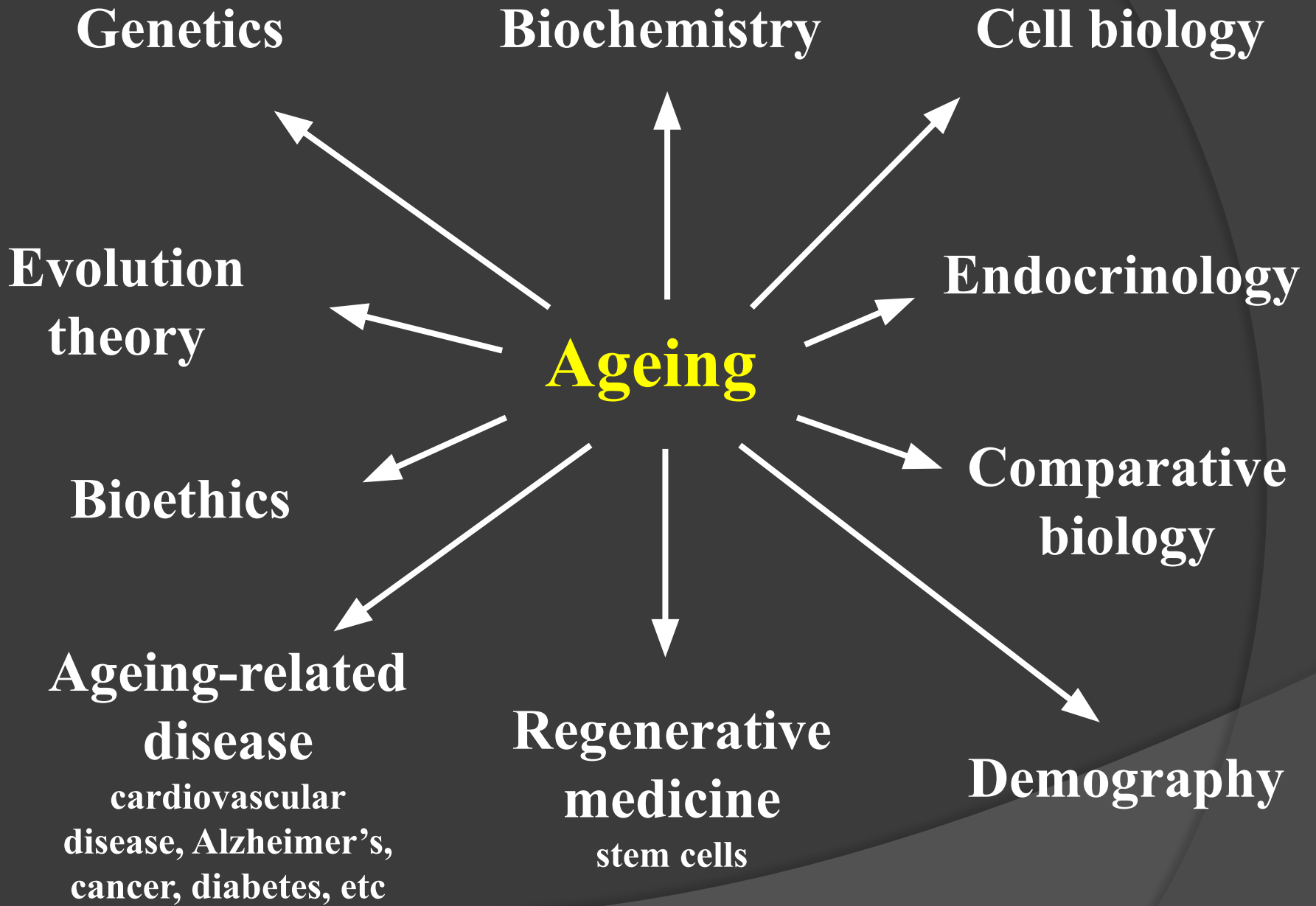
- ◉ Learning more about the process of skin aging can help us understand how we can delay and minimize some of the natural skin-aging processes.



Signs of Aging Skin

- ◉ Whether consciously or not, we associate the age and attractiveness of an individual with the appearance of his or her skin. Outward signs we associate with aging skin include:
 - Dry skin.
 - A dull, rough complexion.
 - Fine lines and deep wrinkles.
 - Loss of firmness along the jaw line and around the eyes.
 - Enlarged pores.
 - Clusters of irregular pigmentation often referred to as age spots.





Fat



-A youthful look depends on having the right amount of facial fat in right places. Redistribution, accumulation, and atrophy of fat lead to facial volume loss.

- Some areas lose fat (forehead and cheeks).
- Other areas gain fat (mouth and jaw).
- Modification of the fat pads leads to contour deficiencies.

Bone

AGE: 35



AGE: 45



AGE: 55

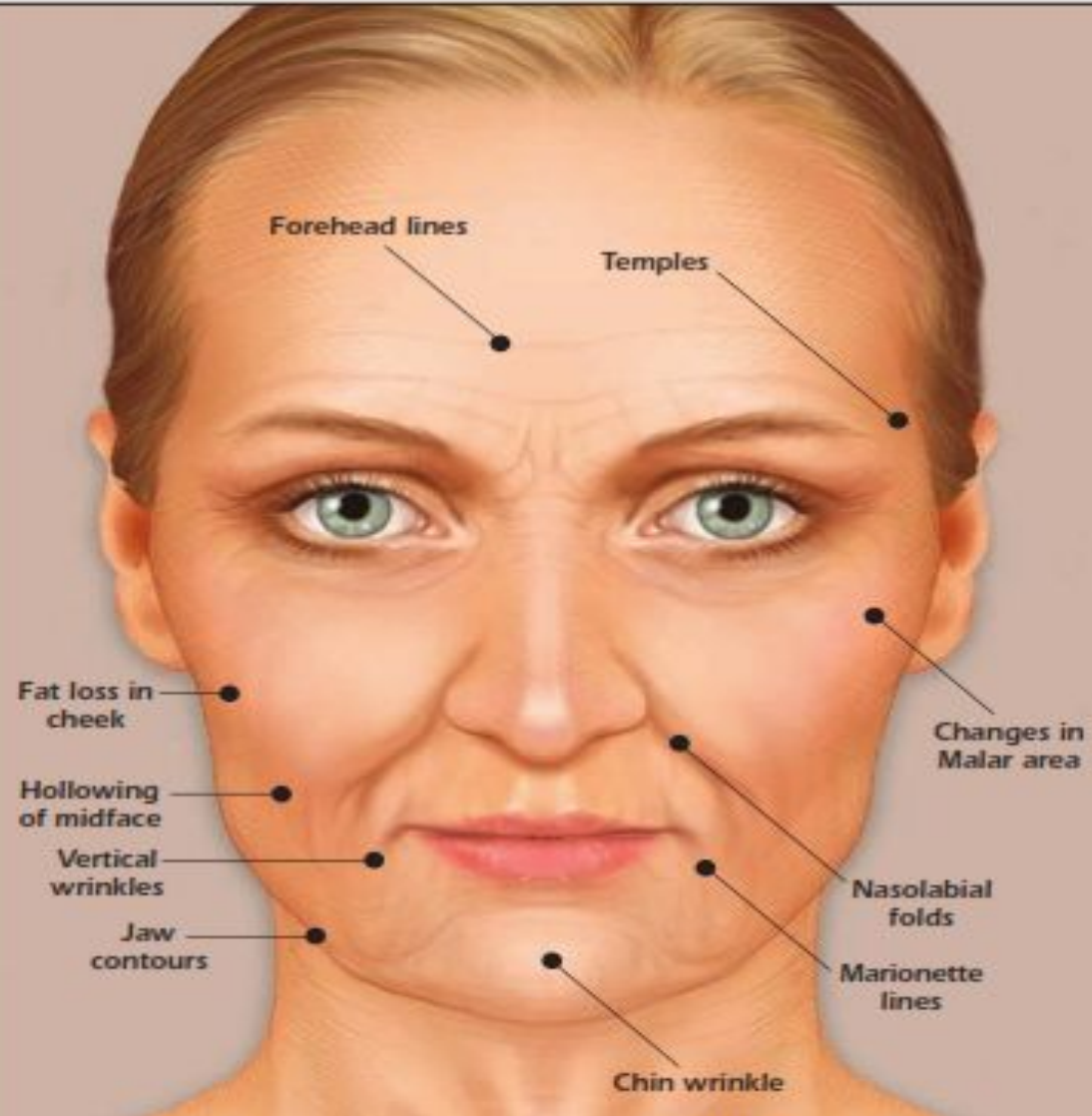


- There is a significant loss of facial bone with age.
- Aging of the craniofacial skeleton may be due to changes in relative dynamics of bone expansion and bone resorption.
- Bone resorption leads to biometric volume loss.
- Without the structural support of bone, there are noticeable changes in the other layers of overlying soft tissue and skin

Signs of Facial Aging

- Greater visibility of bony landmarks, lines and wrinkles
- Prominence of transverse forehead lines
- Nasolabial folds become more prominent
- Hollowing of the mid-face (loose skin)
- Changes in area around the mouth (vertical wrinkles, lip thinning and flattening)
- Development of prejowl depression

VISIBLE SIGNS OF AGING



What Causes Aging?

- ⦿ There are three types of aging responsible for the decline in skin health and function:
 - **Biological aging** (intrinsic)—The result of changes, often genetically determined, that occur naturally within the body.
 - **Environmental aging** (extrinsic)—The result of free radical damage generated by accumulated exposure to sunlight (photoaging), pollution, or cigarette smoke.
 - **Mechanical aging**—The result of continually repeated wrinkle-causing behaviors.

Biological Aging

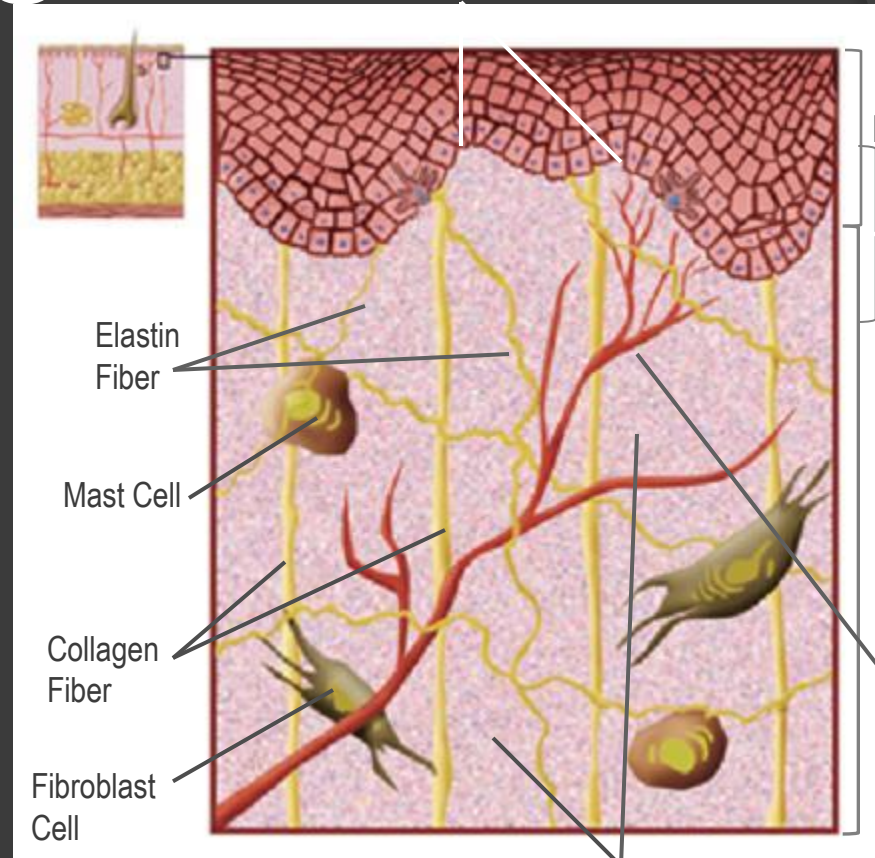
What is Biological Aging?

- ⦿ Everyone has a biological clock or chronological age determined by their genetic makeup. This applies to the skin as well. As our biological clock ticks, our skin gradually loses its ability to function as it once did.
- ⦿ Biological aging occurs as a result of natural changes within the body that are manifested as outward signs of aging on the skin.



Biological Aging

- Often changes associated with biological aging are the result of a gradual shift in the balance of certain hormones and messenger molecules excreted by other glands and organs within the body. Many of these changes are genetically determined and cannot be stopped.



Delaying Biological Aging

- Research is beginning to reveal that a healthful diet full of antioxidant-rich fruits and vegetables, along with nutritional supplementation and topical application of key nutrients, may help decrease the intensity and delay the onset of many of these changes.



INTRINSIC SKIN CHANGES

- **Epidermis**

- Keratinocytes demonstrate slower turnover.
- Keratin sloughs more slowly with thickening of keratin layer.
- Melanocytes decrease in number and produce less melanin.
- Uneven melanin pigment distribution.
- Flattening of the epidermis-dermis junction.
Prone to blistering.

◎ Dermis

- Fibroblasts – Decreased number and less collagen production.
- Collagen – Decreased quantity. Abnormal, weakened structure.
- Elastin – Thickened fibers with less elasticity.
- Matrix – Decreased quantity.
- Blood vessels – dilated, thinned and weakened walls, prone to rupture.

◎ **Subcutaneous Layer**

- Fat loss and thinning.
- Weakening of the retaining ligaments.
- Fewer blood vessels.
- Sweat glands - decreased.
- Sebaceous glands – Fewer with less sebum production.
- Hair shafts – fewer and thinner with less pigment.

Cytoskeleton and Skin aging

- ⦿ Aged skin has increased rigidity
- ⦿ Due to an increase in F actin filaments
- ⦿ Important in age related loss of elasticity of the skin.

Endocrine System and Aging

- ◉ With aging, the levels of epidermal precursor of vitamin D3 decrease.
- ◉ Older individuals are more susceptible to vitamin D3 deficiency in absence of regular sun exposure.
- ◉ May lead to osteoporosis, psoriasis and skin cancer

Endocrine System and Aging

- Estrogen stimulates fibroblasts to make collagen
- Decreased levels of estrogen are associated with loss of collagen and increased wrinkling
- HRT protects skin from aging

Baumann, L. "A dermatologist's opinion on hormone therapy and skin aging," *Fertility and Sterility* 2005 Aug;84(2):289-290.

Age related changes in metabolic functions

- ⦿ **Reduced oxidative phosphorylation by mitochondria**
- ⦿ **Diminished synthesis of structural, enzymatic and regulatory proteins**
- ⦿ **Decreased capacity for uptake of nutrients**
- ⦿ **Increased DNA damage and diminished repair of chromosomal damage**
- ⦿ **Accumulation of oxidative damage in proteins and lipids (eg lipofuscin pigment)**
- ⦿ **Accumulation of advanced glycosylation end products**

Morphological alterations

- ◉ Irregular and abnormally lobed nuclei
- ◉ Swollen, pleomorphic and vacuolated mitochondria
- ◉ Decreased endoplasmic reticulum
- ◉ Distorted Golgi apparatus

Environmental Aging

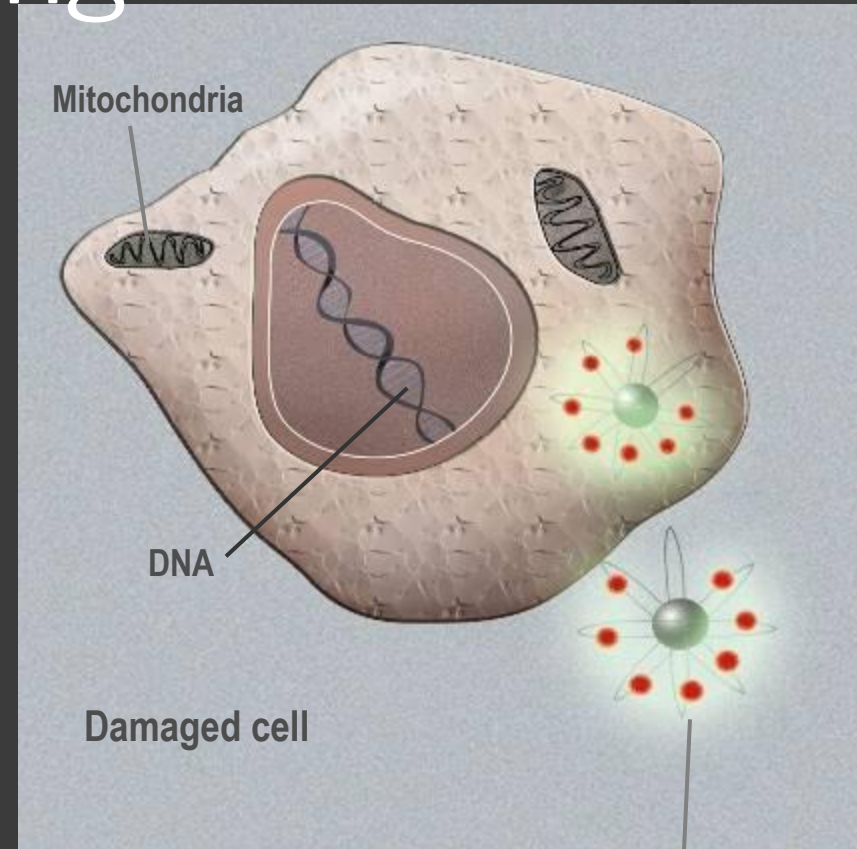
Environmental Aging

- ◉ Environmental aging occurs as a result of exposure to harsh weather conditions and daily exposure to trillions of free radicals from a variety of sources:
 - The sun's ultraviolet rays (photoaging)
 - Pollution
 - Smoke
 - External stress



Environmental Aging

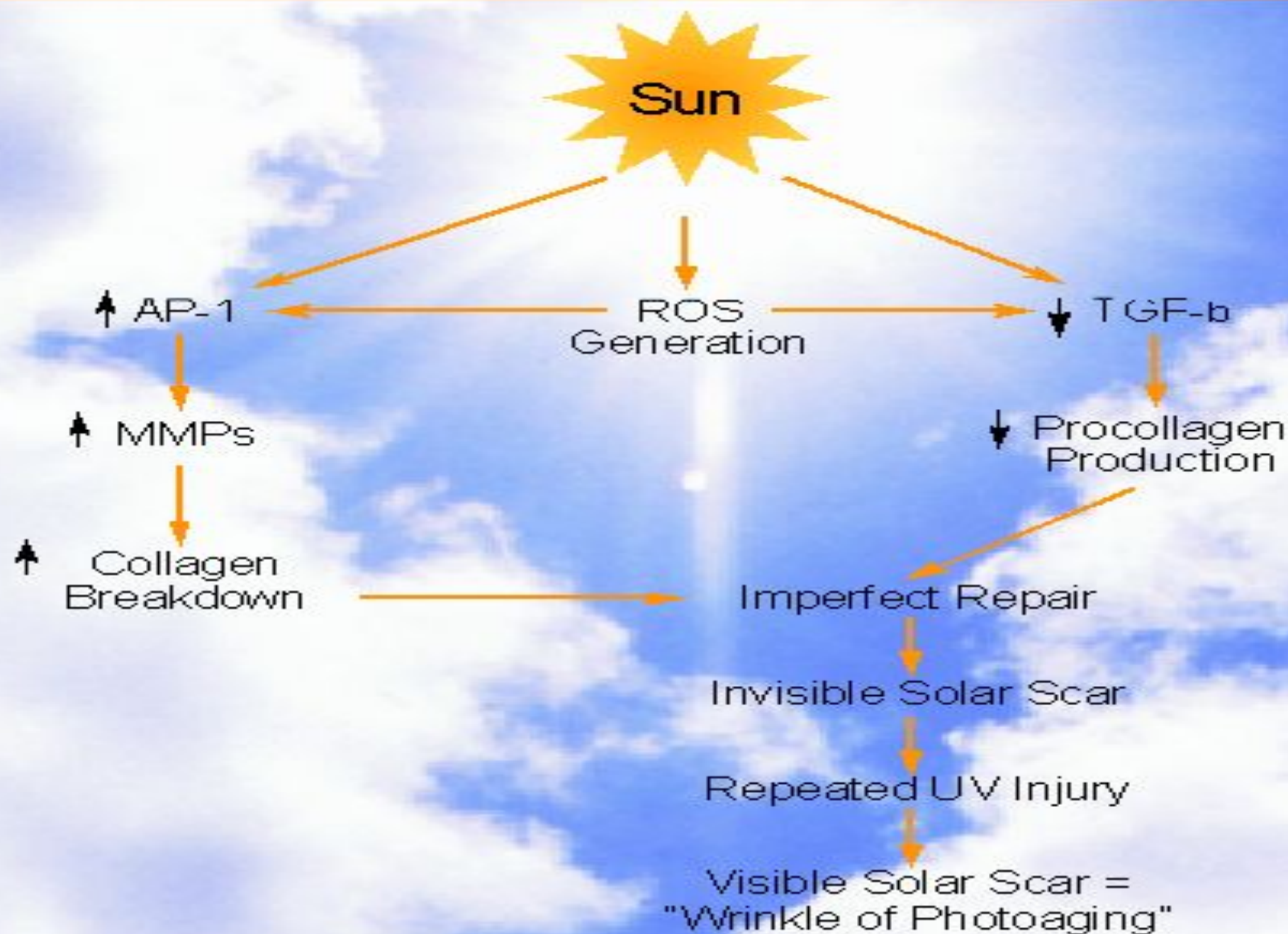
- Free radicals damage lipids, proteins, and DNA, which have the following effects on our cells:
 - Limits ability of cells to function.
 - Cripples the integrity of overall cell composition.
- Years of accumulated environmental stress on cellular structures results in the premature aging of the skin.



Free radicals damage lipids, proteins, and DNA

Environmental Stressors

- **Sun exposure** leads to photoaging. Photoaging damages collagen, elastin, melanocytes, and the moisture barrier, resulting in wrinkles, sagging, uneven skin tone, dark spots, and a rough, dry texture.
- **Pollution** damages skin by increasing free radical production and amplifying the effects of UV radiation.
- **Harsh weather (dry, wind, and cold)** depletes skin of essential moisture, resulting in a rough texture and fine, dry lines.
- **Cigarette smoke** increases free radical production and may decrease collagen and elastin production. Cigarettes also significantly decrease the supply of oxygen to skin cells.



Photoaging

- ⦿ Although cigarette smoke, exposure to harsh weather conditions, and pollution are prolific contributors to environmental aging, UV damage from the sun's rays accounts for 90 percent of premature skin aging.
- ⦿ The damage to skin components caused by both prolonged and incidental sun exposure is called photoaging.



Mechanical Aging

Mechanical Aging

- ⦿ Mechanical aging occurs as a result of habitual muscle movements repeated day after day and year after year, and generally results in deep wrinkles along stress lines and loss of skin firmness.



Wrinkle-Causing Behaviors

- Although it is unrealistic to avoid some wrinkle-causing behaviors such as smiling and frowning, the following behaviors should be avoided to help prevent premature signs of mechanical aging:
 - Squinting
 - The thinker stance (resting chin or cheek in the hand)
 - Sleeping on your side or stomach
 - Scrubbing with hot water
 - Weight fluctuation
 - Unbalanced diet and lack of sleep
 - Pursing the lips while smoking or drinking from a straw



Evidence of Aging Changes in Physiology

Evidence of Aging—Changes in Skin Physiology

- Skin aging results from the deterioration of structures in the skin and the slowing of healthy skin function.
- Let's take a closer look at the visible signs of skin aging and what is happening inside the skin to cause these changes.



Evidence of Aging

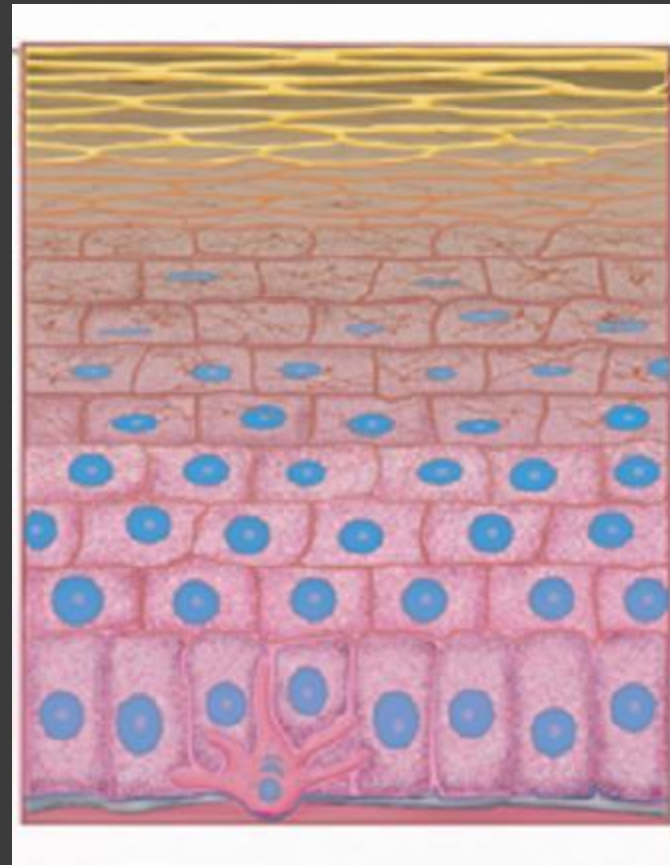
- Dry skin
- Dull, rough complexion
- Fine lines and deep wrinkles
- Loss of firmness
- Enlarged pores
- Age spots



Dry Skin

Evidence of Aging—Dry Skin

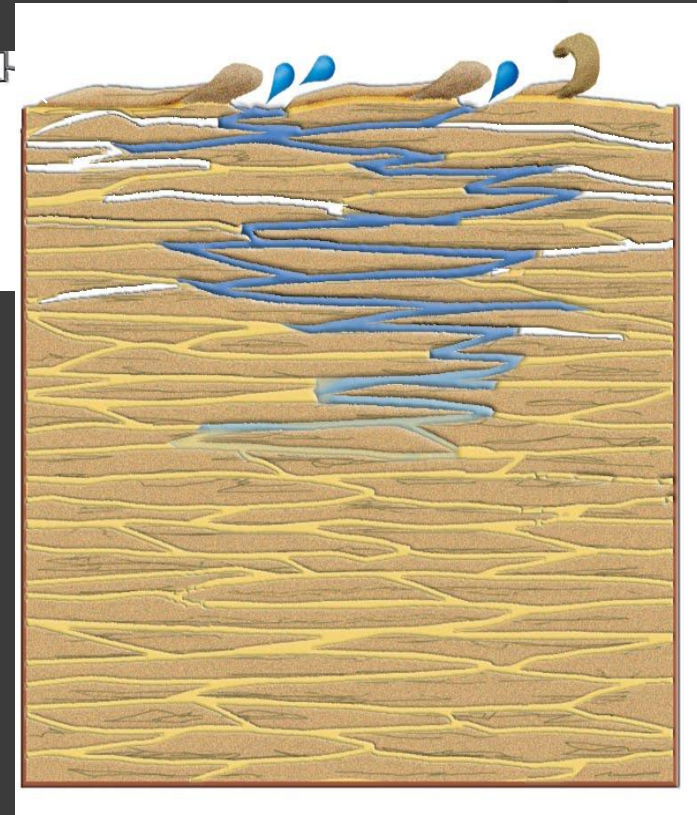
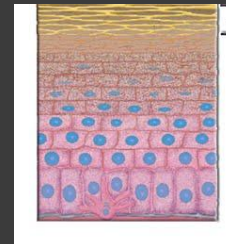
- Healthy, young skin maintains appropriate moisture levels through the sealing properties of the moisture barrier, which is composed of keratin-filled keratinocytes (skin cells) surrounded by and sealed together with interspersed epidermal lipids (ceramides, lipids, and fatty acids).



Stratum
Corneum
(Moisture Barrier)

Evidence of Aging—Dry Skin

- As we age, the skin produces fewer ceramides, lipids, and fatty acids to seal the moisture barrier, resulting in an increase in transepidermal water loss and dryness. Decreased production of epidermal lipids is attributed to the natural decline in hormone levels.



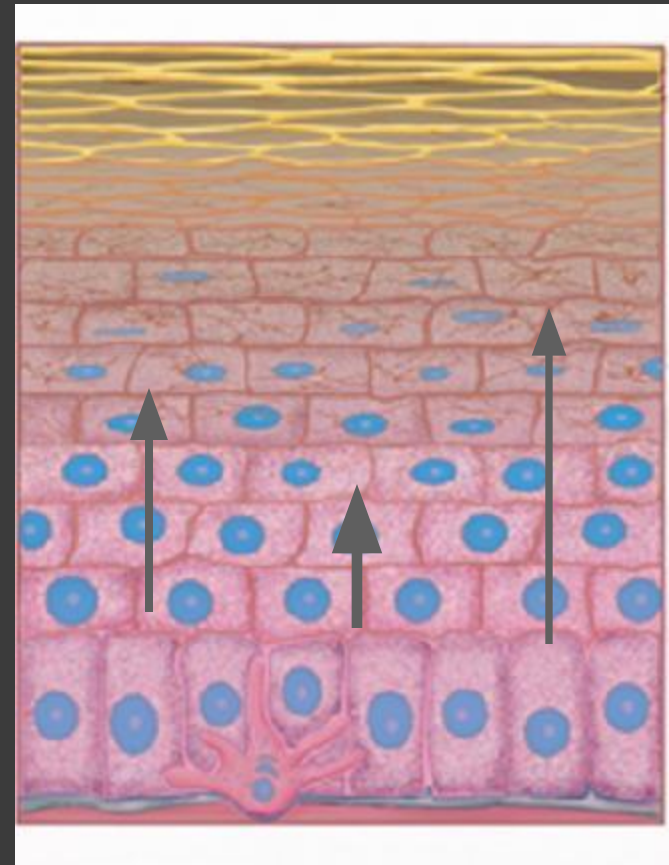
Evidence of Aging—Dry Skin

- ◎ Several other preventable factors can also strip epidermal lipids and cause excessive dryness.
 - **Improper skin care**—Using harsh cleansers and neglecting to supplement the skin with rich, nourishing moisturizers.
 - **Harsh weather conditions**—Enduring extreme temperatures and wind without adequate moisturizers and protection.
 - **UV radiation**—Neglecting to protect skin with sunscreen from the sun's UV rays.

Dull, Rough Complexion

Evidence of Aging—Dull, Rough Complexion

- Healthy, young skin remains smooth and radiant because fresh, new cells are brought to the surface as older cells are continuously shed.
- The skin cells in the bottom layer of the epidermis (*Stratum basale*) constantly divide through cell division, forming new keratinocytes.
- This regenerative process is called **skin cell renewal**.



Layers of Epidermis

Basal Cells Divide

Cell Renewal Decreases

- As we age, the rate of skin cell renewal decreases, causing cells to become more sticky and to not shed as easily. As a result of cell renewal decreasing, the skin becomes thinner and more susceptible to environmental damage, especially photodamage from the sun's UV rays. Eventually, the skin appears dull and rough in texture.



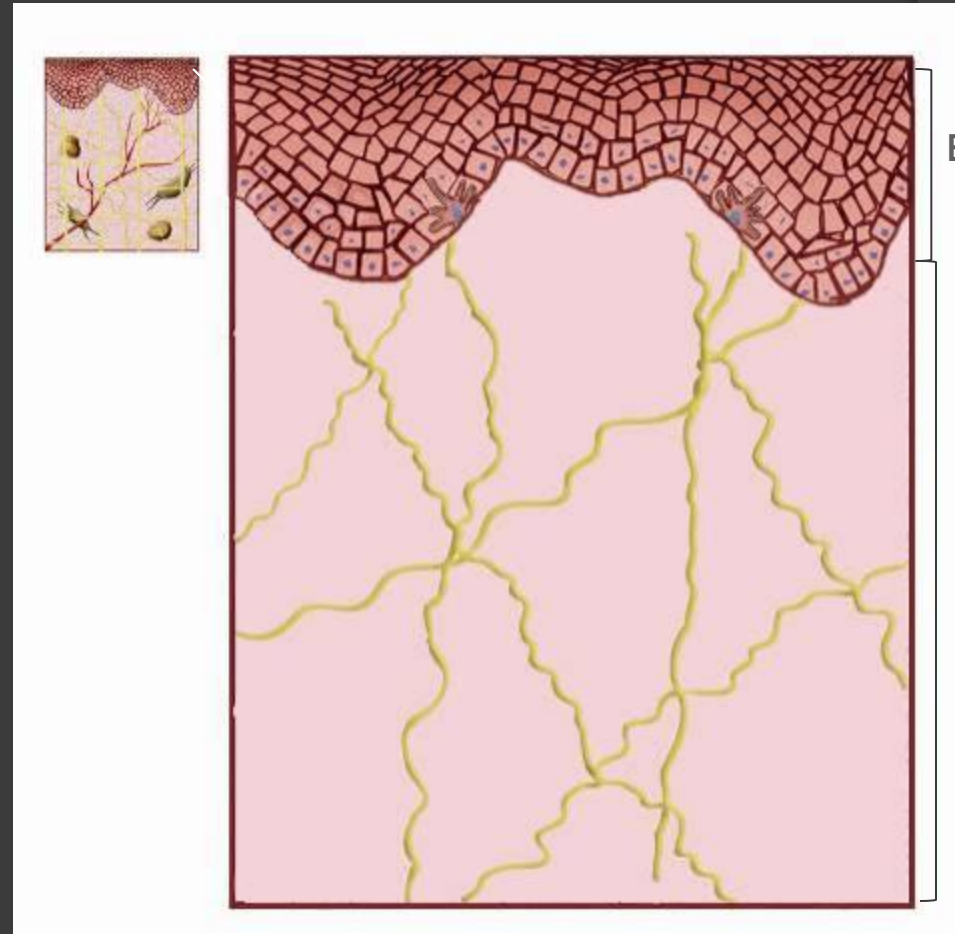
Why Skin Cell Renewal Declines

- ◎ The process of skin cell renewal declines as we age because of several factors:
 - **Weakened blood vessels** in the dermis and a **flattening of dermal papillae** decreases the surface area between the dermis and epidermis across which nutrients can diffuse. This process decreases nutrient and oxygen supplies to the basal cells in the lower epidermis.
 - **UV exposure** can penetrate the epidermis, damage basal cells, and slow their rate of division.
 - **Failure to exfoliate the surface of the skin** with physical and chemical exfoliates for the purpose of smoothing the skin and stimulating cell renewal.

Loss of Firmness

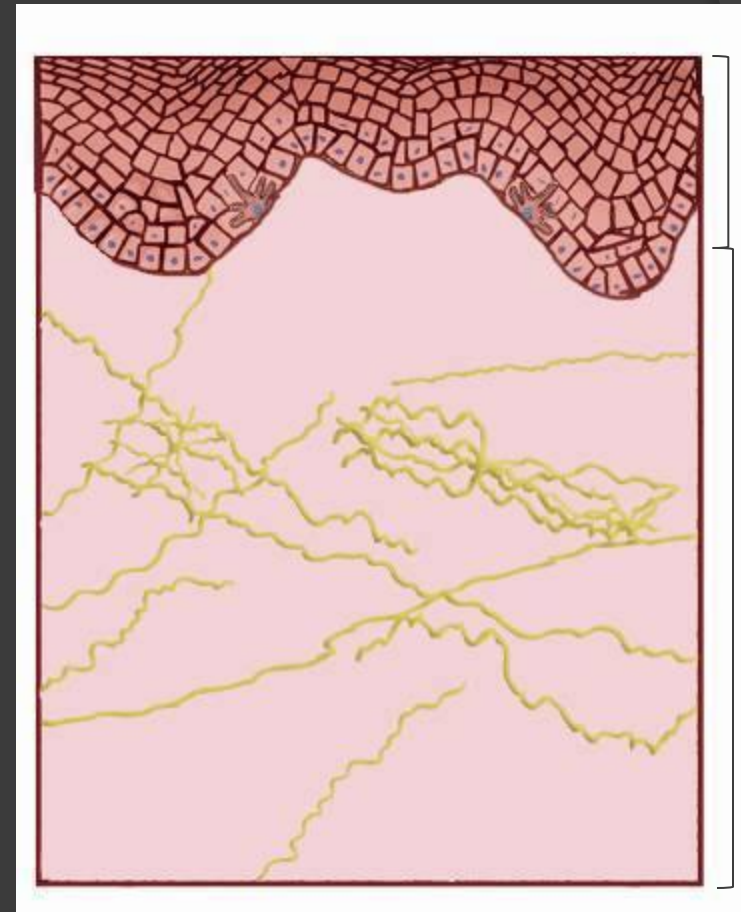
Evidence of Aging—Loss of Firmness

- Another skin structural protein found in the dermis is elastin. This coil-like protein has the ability to snap back into place after stretching, giving the skin its elastic quality.



Evidence of Aging—Loss of Firmness

- As we age, elastin fibers lose much of their resilience and elastin production within the fibroblasts decreases. This overall decline in healthy elastin levels results in areas of decreased firmness, especially along the jaw line, neck, and around the eyes.



Evidence of Aging—Loss of Firmness

- ◎ All three types of aging contribute to the skin's loss of firmness:
 - As we age, our body naturally produces more of the hormone DHT. As DHT levels increase, elastin production is inhibited in the fibroblasts.
 - UV rays can penetrate the skin to damage elastin-producing fibroblast cells.
 - Mechanical stress due to repeated wrinkle-causing behaviors can permanently stretch out elastin fibers.
 - As skin cell renewal decreases, wounds heal more slowly and the skin thins, becoming more susceptible to environmental damage. This can lead to damaged fibroblasts and decreased elastin levels.

Enlarged Pores

Evidence of Aging—Enlarged Pores

- To a large degree, pore size is determined by genetics, but as we age, our pores tend to appear larger. The pore's enlarged appearance is due to a buildup of dead cells around the pore.



Evidence of Aging—Enlarged Pores

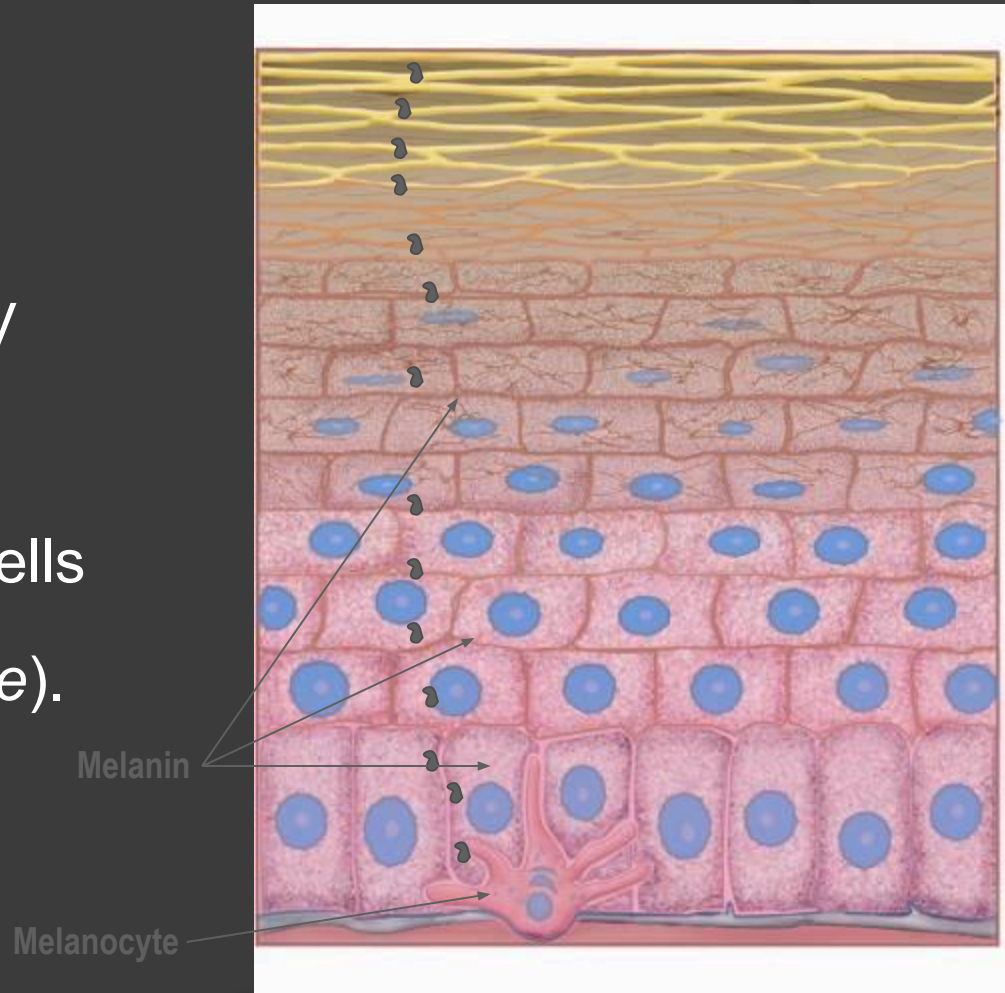
- As more collagen breaks down and production slows, the supportive structures surrounding cells decrease and cells can appear stretched.
- Keeping the skin exfoliated and the pores clear will help reduce the appearance of pore size. Also, consistently using a sunscreen to protect collagen will help maintain pore size.



Age Spots

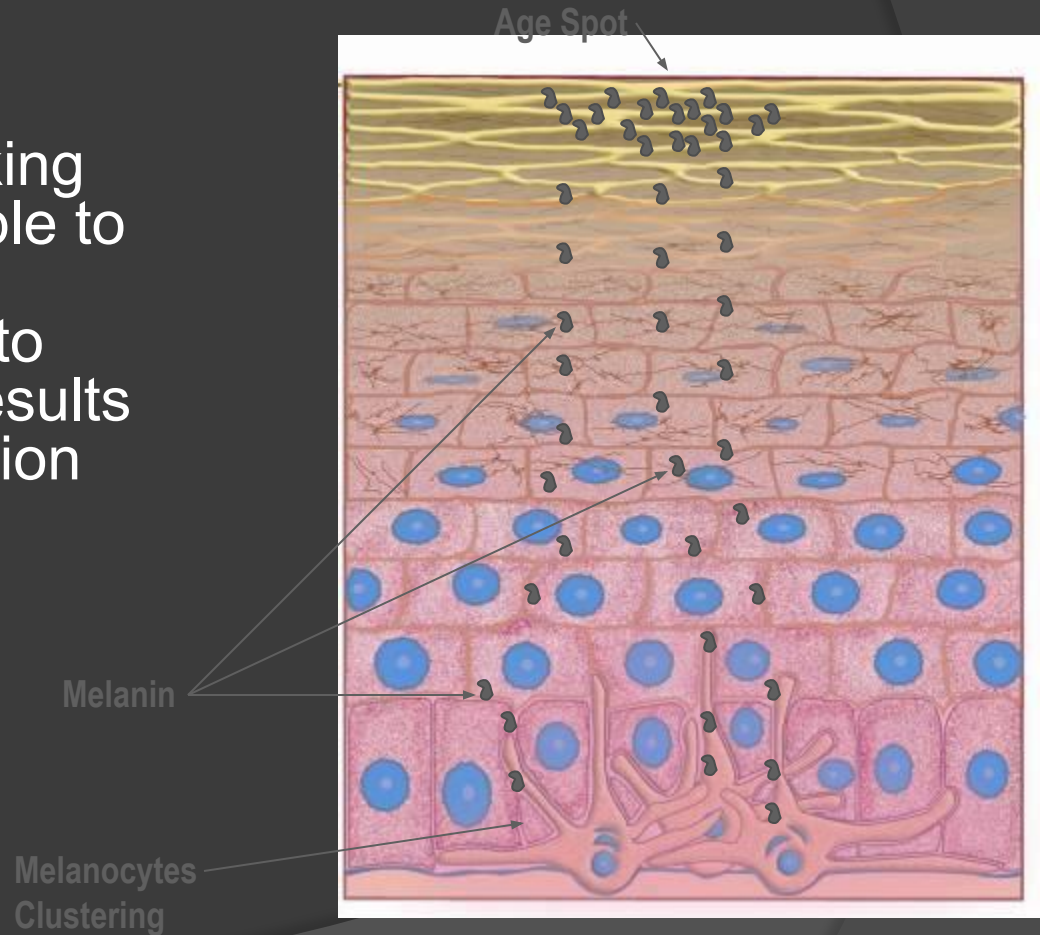
Evidence of Aging—Age Spots

- Normal skin pigmentation helps protect healthy skin from the stress of mild UV exposure. Melanin, the skin's photoprotective pigment, is produced in specialized melanocyte cells in the lowest layer of the epidermis (*Stratum basale*).



Evidence of Aging—Age Spots

- As we age, melanocyte activity decreases, making the skin more susceptible to UV damage. With age, melanocytes also tend to cluster together. This results in patches of pigmentation called age spots.



Evidence of Aging—Age Spots

- Many factors contribute to the clustering of melanocytes as well as the production of age spots:
 - **Hormone imbalances** that occur with advanced age result in fewer melanocytes and can also trigger excessive melanin production by remaining melanocyte clusters.
 - **UV light rays stimulate melanocytes** to produce skin pigment.
 - UV light can also penetrate the skin and **damage melanocyte DNA**, which can stimulate melanocytes to enlarge and cluster together.

Evidence of Aging—Age Spots

- ◎ Factors contributing to the clustering of melanocytes as well as the production of age spots (continued):
 - Poor skin care habits can lead to skin irritation, which triggers melanin production.
 - As the cell renewal cycle decreases, wounds heal more slowly and the skin thins, becoming more susceptible to environmental damage. This can lead to damaged melanocytes and abnormal pigmentation.

Prevent Premature Skin Aging with Proper Skin Care

Is Skin Aging Inevitable?

- ◉ Because youthful, healthy skin portrays confidence and beauty, we are all concerned with what we assume is inevitable skin aging.
- ◉ The good news is that we have more control than we realize over the rate at which our skin ages.



Proper Skin Care

- ① Maintaining youthful skin starts with good skin care. Using products specifically formulated for your skin type is the first step to preventing unnecessary skin damage.



UV Protection

- ⦿ The majority of premature, avoidable skin aging is caused by UV radiation, so it is absolutely essential to use a daytime moisturizer with sunscreen.
- ⦿ Even if you aren't in the sun for extended periods, effects of incidental sun exposure accumulate and show up on the skin.



Turning Back Your Skin's Clock

- ◉ Even if you did not properly care for your skin in years past, there are many technologically advanced ingredients and exceptional botanicals that help repair sun damage and reverse some of the effects of both biological and mechanical aging.





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