Chapter 4

The Integumentary System

Lecture Presentation by
Steven Bassett
Southeast Community College
Introduction

• The integumentary system is composed of:
  • Skin
  • Hair
  • Nails
  • Sweat glands
  • Oil glands
  • Mammary glands
Introduction

- The skin is the most visible organ of the body
- Clinicians can tell a lot about the overall health of the body by examining the skin
- Skin helps protect from the environment
- Skin helps to regulate body temperature
Integumentary Structure and Function

• Cutaneous Membrane
  • Epidermis
  • Dermis

• Accessory Structures
  • Hair follicles
  • Exocrine glands
  • Nails
Figure 4.1 Functional Organization of the Integumentary System

**Integumentary System**

**FUNCTIONS**
- Physical protection from environmental hazards
- Synthesis and storage of lipid reserves
- Coordination of immune response to pathogens and cancers in skin
- Sensory information
- Synthesis of vitamin D$_3$
- Excretion
- Thermoregulation

**Cutaneous Membrane**

- **Epidermis**
  - Protects dermis from trauma, chemicals
  - Controls skin permeability, prevents water loss
  - Prevents entry of pathogens
  - Synthesizes vitamin D$_3$
  - Sensory receptors detect touch, pressure, pain, and temperature
  - Coordinates immune response to pathogens and skin cancers

- **Dermis**
  - Papillary Layer
    - Nourishes and supports epidermis
  - Reticular Layer
    - Restricts spread of pathogens penetrating epidermis
    - Stores lipid reserves
    - Attaches skin to deeper tissues
    - Sensory receptors detect touch, pressure, pain, vibration, and temperature
    - Blood vessels assist in thermoregulation

**Accessory Structures**

- **Hair Follicles**
  - Produce hairs that protect skull
  - Produce hairs that provide delicate touch sensations on general body surface

- **Exocrine Glands**
  - Assist in thermoregulation
  - Excrete wastes
  - Lubricate epidermis

- **Nails**
  - Protect and support tips of fingers and toes
Integumentary Structure and Function

• Cutaneous Membrane
  • Epidermis
    • Superficial epithelium
  • Dermis
    • Underlying connective tissue
    • Deep to the dermis is the hypodermis
      • Also known as the subcutaneous layer or superficial fascia
      • This is not normally considered to be a part of the integument
Figure 4.1 Functional Organization of the Integumentary System (1 of 2)

Cutaneous Membrane

<table>
<thead>
<tr>
<th>Epidermis</th>
<th>Dermis</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Papillary Layer</strong></td>
<td><strong>Reticular Layer</strong></td>
</tr>
<tr>
<td>• Nourishes and supports epidermis</td>
<td>• Restricts spread of pathogens penetrating epidermis</td>
</tr>
<tr>
<td></td>
<td>• Stores lipid reserves</td>
</tr>
<tr>
<td></td>
<td>• Attaches skin to deeper tissues</td>
</tr>
<tr>
<td></td>
<td>• Sensory receptors detect touch, pressure, pain, vibration, and temperature</td>
</tr>
<tr>
<td></td>
<td>• Blood vessels assist in thermoregulation</td>
</tr>
</tbody>
</table>

- **Epidermis**
  - Protects dermis from trauma, chemicals
  - Controls skin permeability, prevents water loss
  - Prevents entry of pathogens
  - Synthesizes vitamin D3
  - Sensory receptors detect touch, pressure, pain, and temperature
  - Coordinates immune response to pathogens and skin cancers

- **Dermis**
  - Restricts spread of pathogens penetrating epidermis
  - Stores lipid reserves
  - Attaches skin to deeper tissues
  - Sensory receptors detect touch, pressure, pain, vibration, and temperature
  - Blood vessels assist in thermoregulation
Integumentary Structure and Function

• Cutaneous Membrane
  • Accessory Structures
    • Hair follicles
    • Exocrine glands
      • sweat glands/sebaceous glands
    • Nails
    • Arrector pili muscles
Accessory Structures

**Hair Follicles**
- Produce hairs that protect skull
- Produce hairs that provide delicate touch sensations on general body surface

**Exocrine Glands**
- Assist in thermoregulation
- Excrete wastes
- Lubricate epidermis

**Nails**
- Protect and support tips of fingers and toes
Integumentary Structure and Function

• Functions Include:
  • Physical protection
  • Regulation of body temperature
  • Excretion of products
  • Synthesis of products
  • Sensation
  • Immune defense
Figure 4.2 Components of the Integumentary System (1 of 2)

<table>
<thead>
<tr>
<th>Cutaneous Membrane</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epidermis</td>
</tr>
<tr>
<td>Dermis</td>
</tr>
<tr>
<td>Papillary layer</td>
</tr>
<tr>
<td>Reticular layer</td>
</tr>
</tbody>
</table>

Subcutaneous layer (hypodermis)

Capillary loop of subpapillary plexus
The Epidermis

• Thick and Thin Skin
  • Thick skin
    • Found on palms and soles
    • Made of five layers of cells
  • Thin skin
    • Found on the rest of the body
    • Made of four layers of cells
The Epidermis

- There are four cell types found in the epidermis
  - **Keratinocytes**
    - Produce a tough protein called keratin
  - **Melanocytes**
    - Pigment cells located deep in the epidermis
    - Produce melanin (skin color)
  - **Merkel cells**
    - Sensory cells
  - **Langerhans cells**
    - Wandering macrophages
The Epidermis

• Layers of the Epidermis
  • **Stratum basale** (*stratum germinativum*)
    • Deepest layer
  • **Stratum spinosum**
  • **Stratum granulosum**
  • **Stratum lucidum**
  • **Stratum corneum**
    • Most superficial layer
The Epidermis

• Layers of the Epidermis
  • **Stratum basale**
    • Location of melanocytes
    • Cells in this area are undergoing active reproduction
  • **Stratum spinosum**
    • Keratinocytes are bound together by **desmosomes**
The Epidermis

• Layers of the Epidermis
  • **Stratum granulosum**
    • Keratinocytes produce lots of keratin
  • **Stratum corneum**
    • Superficial layer
    • Consists of interlocking, dehydrated, dead cells
### Figure 4.3 The Structure and Layers of the Epidermis

<table>
<thead>
<tr>
<th><strong>Epidermis</strong> (five layers)</th>
<th><strong>Characteristics</strong></th>
</tr>
</thead>
</table>
| **Stratum corneum**         | - Multiple layers of flattened, dead, interlocking keratinocytes  
                              - Typically relatively dry  
                              - Water resistant but not waterproof  
                              - Permits slow water loss by insensible perspiration |
| **Stratum lucidum**         | - Appears as a glassy layer in thick skin only |
| **Stratum granulosum**      | - Keratinocytes produce keratohyalin and keratin  
                              - Keratin fibers develop as cells become thinner and flatter  
                              - Gradually the cell membranes thicken, the organelles disintegrate, and the cells die |
| **Stratum spinosum**        | - Keratinocytes are bound together by maculae adherens attached to tonofilbrils of the cytoskeleton  
                              - Some keratinocytes divide in this layer  
                              - Langerhans cells and melanocytes are often present |
| **Stratum basale**          | - Deepest, basal layer  
                              - Attachment to basal lamina  
                              - Contains epidermal stem cells, melanocytes, and Merkel cells |

### Dermis

- Appears as a glassy layer in thick skin only.
- Keratinocytes produce keratohyalin and keratin.
- Keratin fibers develop as cells become thinner and flatter.
- Gradually the cell membranes thicken, the organelles disintegrate, and the cells die.
- Keratinocytes are bound together by maculae adherens attached to tonofilbrils of the cytoskeleton.
- Some keratinocytes divide in this layer.
- Langerhans cells and melanocytes are often present.
The Epidermis

• Epidermal Ridges
  • Stratum germinativum forms **epidermal ridges**
  • Ridges (**dermal papillae**) extend into the dermis
  • Creates ridges we call fingerprints
Figure 4.7 The Structure of the Dermis and the Subcutaneous Layer

- Capillary loop of subpapillary plexus
- Dermal papillae
- Epidermal ridges
- Papillary layer
- Reticular layer
- Subpapillary plexus
- Cutaneous plexus
- Lymphatic vessel
- Adipocytes
The basic organization of the epidermis. The thickness of the epidermis, especially the thickness of the stratum corneum, changes radically depending on the location sampled.

Thin skin covers most of the exposed body surface. (During sectioning the stratum corneum has pulled away from the rest of the epidermis.)

Thick skin covers the surfaces of the palms and soles.
Figure 4.5 The Epidermal Ridges of Thick Skin

- Pores of sweat gland ducts
- Epidermal ridge

SEM × 25

© 2015 Pearson Education, Inc.
The Epidermis

• Skin Color
  • Due to:
    • Dermal blood supply
    • Thickness of stratum corneum
    • Various concentrations of carotene and melanin
      • Under genetic control
The Epidermis

• Skin Color
  • Dermal blood supply
    • Reduction in blood flow results in a pale color
    • Sustained reduction in blood flow results in cyanosis
The Epidermis

• Epidermal Pigment Content
  • Carotene
    • Derived from carrots, corn, and squash
    • Can convert to vitamin A
      • Vitamin A is needed for synthesis of visual pigments in the photoreceptors of the eyes
  • Melanin
    • Produced and stored in melanocytes
    • Creates natural skin color and tan
      • Protects the skin against UV radiation
This micrograph indicates the location and orientation of melanocytes in the stratum basale of a dark-skinned person. Melanocytes produce and store melanin.
The Epidermis

- Melanocyte Activity
  - Exposure to UV light
  - Increases the rate of melanin formation
  - Tanning begins
- Repeated exposure to UV light:
  - Can result in long-term epidermal and dermal damage
  - Results in abnormal connective tissue structure
  - Results in premature wrinkling
  - Can result in epidermal skin cancer
The Epidermis

• Vitamin D Formation
  • UV light converts a cholesterol-related precursor
  • Converts to vitamin D
  • Vitamin D$_1$ undergoes changes in the liver and kidneys
  • Vitamin D$_1$ converts to the active form of vitamin D (calcitriol)
The Dermis

- The dermis consists of two layers
  - Papillary layer
    - Superficial dermis
  - Reticular layer
    - Deep dermis
The Dermis

• Papillary Layer (Details)
  • Consists of:
    • Loose connective tissue
    • Dermal papillae
    • Capillaries
    • Nerve axons
The Dermis

• Reticular Layer (Details)
  • Consists of:
    • Interwoven network of dense irregular connective tissue
    • Hair follicles
    • Sweat glands
    • Sebaceous glands
The Dermis

- **Wrinkles**
  - The interwoven collagen fibers provide tensile strength
  - The elastic fibers allow the skin to stretch and recoil.
  - Skin wrinkles are due to:
    - Age
    - Change in hormone levels
    - UV light
The Dermis

• **Stretch Marks**
  • Extensive stretching during pregnancy (or excessive weight gain) can cause reticular fibers to break
  • The skin does not recoil
  • The skin wrinkles and creases resulting in stretch marks
The Dermis

• Lines of Cleavage
  • Collagen and elastic fibers have a tendency to organize themselves in a parallel pattern
  • In certain areas of the body, there is a pattern of cleavage lines due to stress or a specific type of movement
  • To reduce scar formation (extensive damage to the fibers), surgeons try to cut parallel to the lines of cleavage
Figure 4.8 Tension Lines of the Skin

ANTERIOR \hspace{5cm} POSTERIOR
The Dermis

- Contains a Network of:
  - Blood vessels
  - Lymph vessels
  - Nerve fibers
The Dermis

• Blood Supply to the Skin
  • Arteries and veins form the cutaneous plexus
  • Smaller blood vessels form the subpapillary plexus
• Function
  • Thermoregulation
  • Blood flow to the skin is regulated to help maintain constant flow to other tissues of the body
Figure 4.2 Components of the Integumentary System

**Cutaneous Membrane**
- Epidermis
- Papillary layer
- Reticular layer
- Subcutaneous layer (hypodermis)

**Dermis**
- Capillary loop of subpapillary plexus

**Accessory Structures**
- Hair shaft
- Pore of sweat gland duct
- Tactile corpuscle
- Sebaceous gland
- Arrector pili muscle
- Sweat gland duct
- Hair follicle
- Lamellated corpuscle
- Nerve fibers
- Sweat gland
- Artery
- Vein
- Cutaneous plexus
- Fat

© 2015 Pearson Education, Inc.
The Dermis

• Nerve Supply to the Skin
  • Function
    • Controls blood flow to the skin
    • Adjusts gland secretion rates
    • Monitors sensory receptors
  • Examples
    • Tactile corpuscles (light touch receptors)
    • Ruffini corpuscles (stretch receptors)
    • Lamellated corpuscles (deep pressure and vibration receptors)
Figure 4.2 Components of the Integumentary System

**Cutaneous Membrane**
- Epidermis
- Dermis
  - Papillary layer
  - Reticular layer
- Subcutaneous layer (hypodermis)

**Accessory Structures**
- Hair shaft
- Pore of sweat gland duct
- Tactile corpuscle
- Sebaceous gland
- Arrector pili muscle
- Sweat gland duct
- Hair follicle
- Lamellated corpuscle
- Nerve fibers
- Sweat gland
- Artery
- Vein
- Cutaneous plexus
- Fat

© 2015 Pearson Education, Inc.
The Subcutaneous Layer

• The subcutaneous layer is deep to the dermis
• Also called the hypodermis layer
• Also referred to as the superficial fascia
• Not technically considered a part of the integument
• Helps stabilize the integument
The Subcutaneous Layer

• Consists of:
  • Adipose tissue
  • Major blood vessels

• Due to the location of the vessels, we have terms such as:
  • Hypodermic needles
  • Subcutaneous injections
Figure 4.2 Components of the Integumentary System

**Cutaneous Membrane**
- Epidermis
- Papillary layer
- Reticular layer
- Subcutaneous layer (hypodermis)

**Dermis**
- Capillary loop of subpapillary plexus

**Accessory Structures**
- Hair shaft
- Pore of sweat gland duct
- Tactile corpuscle
- Sebaceous gland
- Arrector pili muscle
- Sweat gland duct
- Hair follicle
- Lamellated corpuscle
- Nerve fibers
- Sweat gland
- Artery
- Vein
- Cutaneous plexus
- Fat
Accessory Structures

• Includes:
  • Hair follicles
  • Sebaceous glands
  • Sweat glands
  • Nails
Figure 4.2 Components of the Integumentary System

**Cutaneous Membrane**
- Epidermis
- Papillary layer
- Reticular layer
- Subcutaneous layer (hypodermis)

**Dermis**
- Capillary loop of subpapillary plexus

**Accessory Structures**
- Hair shaft
- Pore of sweat gland duct
- Tactile corpuscle
- Sebaceous gland
- Arrector pili muscle
- Sweat gland duct
- Hair follicle
- Lamellated corpuscle
- Nerve fibers
- Sweat gland
- Artery
- Vein
- Cutaneous plexus

**Fat**
Accessory Structures

• Hair Follicles and Hair
  • Found everywhere except:
    • Palms
    • Soles of feet
    • Sides of the fingers and toes
    • Lips
    • Portions of genitalia
      • Glans penis
      • Clitoris
      • Labia minora
      • Inner surface of labia majora
Accessory Structures

• Hair Follicles and Hair
  • Hair follicles and hair structure
    • Hair papilla and hair bulb
    • Matrix
    • Soft keratin and hard keratin
    • Internal root sheath and external root sheath
    • Glassy membrane
    • Connective tissue sheath
A diagrammatic view of a single hair follicle.
Hair Structure

The medulla, or core, of the hair contains a flexible **soft keratin**.

The cortex contains thick layers of **hard keratin**, which give the hair its stiffness.

The cuticle, although thin, is very tough, and it contains hard keratin.

Follicle Structure

The **internal root sheath** surrounds the hair root and the deeper portion of the shaft. The cells of this sheath disintegrate quickly, and this layer does not extend the entire length of the hair follicle.

The **external root sheath** extends from the skin surface to the hair matrix.

The **glassy membrane** is a thickened, clear layer wrapped in the dense connective tissue sheath of the follicle as a whole.

**A longitudinal section and a cross section through a hair follicle**
Figure 4.10bc Hair Follicles

**Diagrammatic view along the longitudinal axis of hair follicles**

- Hair shaft
- External root sheath
- Connective tissue sheath of hair follicle
- Internal root sheath
- Glassy membrane
- Cuticle of hair
- Cortex of hair
- Medulla of hair
- Matrix
- Hair papilla
- Subcutaneous adipose tissue

**Histological section along the longitudinal axis of hair follicles**

LM × 200

© 2015 Pearson Education, Inc.
Accessory Structures

• Hair Follicles and Hair
  • Functions of hair
    • Protection from UV light
    • Insulation
    • Guards entrance to nose and ears
    • Movement of the hair sends impulses via nerves to the brain (presence of root hair plexus)
      • Such as when a bug is crawling on your arm
    • Contraction of the arrector pili muscles
      • Results in goose bumps
Figure 4.2 Components of the Integumentary System

**Cutaneous Membrane**
- **Epidermis**
- **Papillary layer**
- **Reticular layer**
- **Subcutaneous layer (hypodermis)**

**Accessory Structures**
- Hair shaft
- Pore of sweat gland duct
- Tactile corpuscle
- Sebaceous gland
- Arrector pili muscle
- Sweat gland duct
- Hair follicle
- Lamellated corpuscle
- Nerve fibers
- Sweat gland
- Artery
- Vein
- Cutaneous plexus
- Fat

© 2015 Pearson Education, Inc.
Accessory Structures

• Types of Hair
  • Vellus
    • Covers most of the body
  • Intermediate
    • Covers arms and legs
  • Terminal
    • Covers the head
    • Comprises the eyebrows
    • Comprises the eyelashes
Accessory Structures

• Hair Color
  • Due to:
    • Variation in melanin production by the melanocytes
      • More melanin creates darker hair
    • Melanin production decreases with age
      • Decreased production results in gray hair
    • Lack of melanin and the presence of air bubbles in the hair shaft results in white hair
Accessory Structures

• Hair Color
  • Influenced by:
    • Genetics
    • Hormones
    • Environmental factors
Accessory Structures

• Growth and Replacement of Hair
  • Each hair follicle goes through a growth cycle
    • Active stage
      • Hair grows about .33 mm per day
      • This lasts for two to five years
    • Resting stage
      • Hair loses its attachment to the follicle
      • Hair becomes a club hair
    • Club hair is lost and a replacement hair is produced
The active phase lasts two to five years. During the active phase, the hair grows continuously at a rate of approximately 0.33 mm/day.

2. The follicle then begins to undergo regression, and transitions to the resting phase.

3. During the resting phase, the hair loses its attachment to the follicle and becomes a club hair.

4. When follicle reactivation occurs, the club hair is lost and the hair matrix begins producing a replacement hair.
Accessory Structures

• Glands in the Skin
  • Sebaceous glands
  • Sweat glands
    • Apocrine glands
    • Ceruminous glands (a type of apocrine gland)
    • Mammary glands (a type of apocrine gland)
    • Merocrine glands

• Gland function
  • Lubricates the epidermis, excretes waste, assists in thermoregulation
Accessory Structures

- Sebaceous Glands
  - Secrete **sebum** to lubricate the skin
  - Holocrine secretions
  - Can be either simple alveolar or simple branched alveolar
  - Found all over the body except for the palms and soles
  - Found in high concentrations on the forehead, face, and upper back
  - If the ducts become blocked, acne may occur
Sebaceous Glands

- Secrete oily lipid (sebum) that coats hair shaft and epidermis
- Provide lubrication and antibacterial action

Typical Sebaceous Glands
Secrete into hair follicles

Sebaceous Follicles
Secrete onto skin surface
Accessory Structures

• Sweat Glands
  • Apocrine glands
    • High concentration in the armpit and nipple regions
    • Produce an odorous secretion
    • Secretions may contain pheromones
    • These are the secretions that babies smell in order to detect and “feel safe” with mom
    • Males have these secretions as well
    • Mechanism of secretion is merocrine
Accessory Structures

- Sweat Glands
  - Merocrine glands
    - Also known as *eccrine* glands
    - Found all over the body
    - Found in high concentrations on the palms and soles
    - Produce sweat for cooling purposes
Sweat Glands

- Produce watery solution by merocrine secretion
- Flush epidermal surface
- Perform other special functions

Apocrine Sweat Glands

- Limited distribution (axillae, groin, nipples)
- Produce a viscous secretion of complex composition
- Possible function in communication
- Strongly influenced by hormones
- Merocrine secretion mechanism

Merocrine Sweat Glands

- Widespread
- Produce thin secretions, mostly water
- Controlled primarily by nervous system
- Important in thermoregulation and excretion
- Some antibacterial action

Ceruminous Glands

- Secrete waxy cerumen into external ear canal

Mammary Glands

- Apocrine glands specialized for milk production
Accessory Structures

- Sweat Glands
  - Mammary glands
    - A special type of apocrine gland
    - Produce milk under the control of hormones from the pituitary gland
  - Ceruminous glands
    - A special type of apocrine gland
    - Found only in the ear canal
    - Produce cerumen (earwax)
    - Provide minimal protection associated with the ear
<table>
<thead>
<tr>
<th><strong>Sweat Glands</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Produce watery solution by merocrine secretion</td>
</tr>
<tr>
<td>• Flush epidermal surface</td>
</tr>
<tr>
<td>• Perform other special functions</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Apocrine Sweat Glands</strong></th>
<th><strong>Merocrine Sweat Glands</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Limited distribution (axillae, groin, nipples)</td>
<td></td>
</tr>
<tr>
<td>• Produce a viscous secretion of complex composition</td>
<td></td>
</tr>
<tr>
<td>• Possible function in communication</td>
<td></td>
</tr>
<tr>
<td>• Strongly influenced by hormones</td>
<td></td>
</tr>
<tr>
<td>• Merocrine secretion mechanism</td>
<td></td>
</tr>
<tr>
<td>• Widespread</td>
<td></td>
</tr>
<tr>
<td>• Produce thin secretions, mostly water</td>
<td></td>
</tr>
<tr>
<td>• Controlled primarily by nervous system</td>
<td></td>
</tr>
<tr>
<td>• Important in thermoregulation and excretion</td>
<td></td>
</tr>
<tr>
<td>• Some antibacterial action</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Ceruminous Glands</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Secrete waxy cerumen into external ear canal</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Mammary Glands</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Apocrine glands specialized for milk production</td>
</tr>
</tbody>
</table>
Accessory Structures

• Nails
  • Function
    • Provide protection for the tips of the fingers and toes
  • Structure
    • Free edge
    • Lateral nail fold
    • Lunula
    • Eponychium
    • Hyponychium
Direction of growth

Free edge

Lateral nail fold

Nail

Lunula

Eponychium

Proximal nail fold

View from the surface
Figure 4.15c Structure of a Nail

- Eponychium
- Proximal nail fold
- Nail root
- Lunula
- Nail body
- Hyponychium
- Epidermis
- Dermis
- Phalanx

Longitudinal section
Aging and the Integumentary System

- Epidermis becomes thinner
- Dermis becomes thinner
- Number of Langerhans cells decreases
- Vitamin D production declines
- Melanocyte activity declines
- Glandular activity declines
Aging and the Integumentary System

• Hair follicles stop functioning
• Skin repair slows down
• Blood supply to the dermis decreases
  • This makes it difficult to dissipate heat
  • Exposure to heat (sun or sauna) can cause dangerous high body temperatures
• Hair and body fat distribution begins to fade
  • Due to decrease in sex hormones
Figure 4.16 The Skin during the Aging Process

**Fewer Active Melanocytes**
- Pale skin
- Reduced tolerance for sun exposure

**Fewer Active Follicles**
- Thinner, sparse hairs

**Reduced Skin Repair**
- Skin repairs proceed more slowly.

**Decreased Immunity**
- The number of dendritic cells decreases to about 50 percent of levels seen at maturity (roughly age 21).

**Thin Epidermis**
- Slow repairs
- Decreased vitamin D production
- Reduced number of Langerhans cells

**Reduced Sweat Gland Activity**
- Tendency to overheat

**Changes in Distribution of Fat and Hair**
- Due to reductions in sex hormone levels

**Dry Epidermis**
- Reduction in sebaceous and sweat gland activity

**Reduced Blood Supply**
- Slow healing
- Reduced ability to lose heat

**Thin Dermis**
- Sagging and wrinkling due to fiber loss