Skin

I wear my skin as thinly as I have to, armor myself only as much as seems absolutely necessary.

Skin by Dorothy Allison
The Skin

- The approximate chemical composition of the skin is:
  - Water 70.0%
  - Protein 25.5%
  - Lipids 2.0%
  - Trace Minerals 0.5%
  - Rest 2.0%
The Skin’s Job

• First it must protect the body against invasion from microorganisms and against losing fluid and drying out.
• However, this barrier must still be open and permeable enough to allow an exchange of warmth, air and fluids.
• It also must act as the sensory organ for our delicate sense of touch
• The skin regulates the body temperature by evaporating water.
Figure 1-2.
Histopathology of the epidermis demonstrating the four layers. (Image courtesy of George Ioannides, MD).
Skin A&P

- The outer surface of the skin, the epidermis, is comprised of hard, flattened dead cells.
- Beneath this are living cells which are somewhat larger, and at deeper layers of the skin, the skin cells are larger and more round.
- At the bottom layer, there are new cells growing and pushing upward to the surface. As cells are pushed to the surface, they become flattened and lose most of their water content through pressure and dehydration.
Figure 1-1.
The epidermis is made up of four layers as shown.
Epidermis

- The epidermis is the thinnest skin layer - at a maximum 1 millimeter or as thin as a pencil line.
- The epidermis consists of three interwoven types of cells - the keratinocytes which make the protein keratin, the melanocytes which produces the suntanning pigment melanin which protects us from ultraviolet radiation, and the Langerhans cells which are part of the immune system and intercept foreign substances that try to pass through the skin.
The keratinocytes are embedded in a lipid matrix that resembles bricks and mortar. Natural moisturizing factor (NMF) is present within the keratinocytes. NMF and the lipid bilayer prevent dehydration of the epidermis.
Skin Protection

• The most important types of protective substances in the outer layer of skin are the keratin proteins and the skin lipids.

• The outer layer becomes a formation of 15-20 layers of horny cells (like the horns of cattle) that are embedded in a matrix of skin lipids.
Ooh-la-la

• The epidermis has numerous nerve endings that make the skin a sensory organ which detects warmth, cold, light, taste and touch. Your skin shows emotions when fear causes the skin to grow pale and embarrassment causes a red blush.
The Dermis

• The dermis is a thick, supple and sturdy layer of connective tissue and makes up about 90 percent of the skin's thickness.

• The dermis a dense meshwork of collagen and elastin fibers, two connecting proteins.
The Dermis

- This meshwork supports tiny lymph and blood vessels that allow the skin to breathe and be nourished, as well as the nerves, muscle cells, sweat and sebaceous glands, and hair follicles.

- This layer contains the special cells that repair the skin, such as the fibroblasts that synthesize the skin proteins such as collagen and elastin.
The Dermis

• The sebaceous glands make the special oils for the skin and hair. Normal functioning of the sweat and sebaceous glands is essential for a healthy skin.

• Together these glands provide the "acid mantle", the natural protective covering which protects the skin.
Figure 2-1.
Histopathology of the dermal-epidermal junction. The basement membrane separates the epidermis and the dermis. (Image courtesy of George Ioannides, MD).
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.
The Fat

- The subcutis is the deepest layer of the skin, composed primarily of fat. The subcutaneous layer manages the skin's functions of feeding, excreting and heat exchange. The key cells are fat cells or adipocytes that provide energy, serve as a heat insulator for the body, and act as a shock absorber to protect underlying tissue against mechanical trauma and helps give your skin its resilience.
Skin Firmness, Elasticity, and Moisture-holding.

• Collagen and elastin are the skin proteins responsible for elasticity, tone and texture. Glycosoaminoglycans (GAG's or mucopolysaccharides) and proteoglycans hold water in the skin (these are very similar to mucus proteins) and are the true skin moisturizers.
Skin Firmness, Elasticity, and Moisture-holding.

- In contrast, cosmetic moisturizers cover the skin with a water impermeable barrier such as petrolatum or a heavy oil.
- This artificially slows the loss of moisture from the skin and gives the skin a temporary appearance of plumpness and fullness.
Major Skin Molecules - Collagen, Elastin, GAG’s and Proteoglycans

- Collagen forms the structural network of our skin and is the most abundant protein in the body. It is composed mainly of glycine, proline and hydroxyproline.
Collagen

• It is one of the strongest proteins in nature and gives skin its strength and durability.

• As we age, it is believed that collagen begins to deteriorate and causes the skin to become thinner and sag.
Elastin

• Elastin is similar to collagen but is a more stretchable protein that maintains the skin's elasticity.

• It provides the matrix that holds individual skin cells in place. Elastin also contains two unique amino acids, desmosine and isodesmosine.

• The two proteins together permit the skin to stretch, then regain its original shape.
NMF

• GAGs contain special sugars such as glucosamine hydrochloride, N-acetyl glucosamine, and glucosamine sulfate that have high water-holding properties.
• These are built into larger water-holding chains of sugars such as hyaluronic acid, keratin sulfate, heparin, heparin sulfate, dermatin sulfate, and chondroitin sulfate.
Proteoglycans

• Proteoglycans are larger molecules with many attached GAG’s.
• Proteoglycans are linear GAGs made up of repeating disaccharide units composed of sugars (glucuronic or iduronic acid) and hexosamines (glucosamine or galactosamine) that are bound to a protein core.
Proteoglycans

• The abundance of hydroxyl, carboxyl and sulfate groups makes the GAGs intensely hydrophilic (water-loving) molecules able to form porous, hydrated gels.

• Hydrated GAG's cushion and provide mechanical support to tissues.
Collagen and Elastin in Cosmetics Have No Effect on Skin

• Neither collagen or elastin in the cosmetics are able to penetrate the skin.
Cosmetic Products to Improve Skin Condition

- Other proteins, as hydrolyzates (fragments of the original protein), are often incorporated into skin and hair products. In conditioning shampoos they can help "bulk-up" the hair. However, because the original protein has been broken down, the source of the protein is of little consequence.
Skin pH and the Acid Mantle

• The acid mantle, the combination of sebum (oil) and perspiration, on the skin's surface protects the skin and renders the skin less vulnerable to damage and attack by environmental factors such as sun and wind and less prone to dehydration.

• Normal skin pH is somewhat acid and in the range of 4.2. to 5.6.
Acid Mantle

• It varies from one part of the body to another and, in general, the pH of a man's skin is lower (more acidic) than that of a woman's.

• The acid mantle inhibits the growth of foreign bacteria and fungi and the skin remains healthier, and has fewer blemishes. Acne, allergies and other skin problems become more severe when the skin become more alkaline.
Sensitivity Issues with pH

• The pH system works in 10-fold multiples and each pH unit represents a 10-fold difference in alkalinity.

• For example, a soap with a pH of 10.5 has 10-times the alkalinity of a soap of pH 9.5.

• "Mild" soaps are often alkaline (pH 9.5-11), and remove the natural acid protection as well as extracting protective lipids (fats) from the skin.
Sensitivity Issues with pH

• Irritated and eczematous skins tend to have a more alkaline pH, and washing with soap can increase this alkaline state and make the skin even more vulnerable to irritation and infection.