The Human Skin: An Overview

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1 A Few Figures About the Skin

Area: 1.8 m²
Average thickness: 1.2 mm
Average volume: 3.5 dm³ = 0.035 m³
Weight with blood: 4.7 kg
Weight without blood: 4.2 kg
Ratio area/thickness = 150,000

The skin participates in many physiological and pathological events and processes of the human organism, owing to its large area of contact with the internal milieu, but also to its volume and variety of tissues. The cutaneous expression of internal diseases is frequent, varied, and often specific.

2 Skin Structure

The general structure of the skin is a stratified tissue whose four layers are, from the top to the bottom, the stratum corneum (8–20 μm thick, could go up to 1.5 mm on palms and soles), the viable epidermis (30–80 μm), the dermis (1–2 mm), and the hypodermis or subcutis (0.1 to several cm) (Fig. 1). Each of these layers has its own physiology, functions, and evolution along life.

2.1 Annexes

The skin is a heterogeneous organ (dead tissue, epithelium, connective tissue, muscles, etc.), and furthermore it harbors four types of independent mini-organs, also called skin appendages:

- The nails, growing at a speed of 3 mm/month on hands and 1–1.5 mm/month on feet, with this speed decreasing with age (Scher and Daniel 2007)
- The pilosebaceous follicles and hair: between 90,000 and 130,000 on the scalp, with a terminal hair diameter of 40–120 μm, depending of the phototype; 60–100 hair fall per day, and they grow at a speed of 0.35–0.44 mm/day, (1 cm/month, 12 cm/year) (Blume-Peytavi 2008; Guichard et al. 2013)
- The eccrine sweat glands (three millions)
- The apocrine sweat glands (armpit, perineum)

2.2 Variations

Topographical variations in its structure and functions are considerable: the scalp, the skin of the face, the dorsal skin of the hands and feet, the
palms and soles, the armpits, and the perineum have their own anatomy, functions, and reactivity (Tagami 2008; Sandby-Møller et al. 2003; Waller and Maibach 2006).

To briefly give some examples, in usual temperature and hygrometric atmosphere conditions (20–22 °C, 40–60 %), skin sebum excretion could vary from 0 (arms, legs, etc.) to more than 200 μg/cm² (greasy subjects forehead), and hydration index could go from 10 (dry skin on the legs) to 100 (well-hydrated skin on the forehead, without unity).

Aging (intrinsic or extrinsic) is obviously modifying skin structure (Lévêque and Agache 1993):

- Hydration presents maximum values between 20 and 40 and then regresses.
- Elasticity is the mechanical property that better reflects skin aging: it decreases and becomes oriented with age, is sun exposure dependent, and more important on women, and its values decrease from head to feet.
- Skin microrelief, roughness, and wrinkles are not involving on the whole body in the same manner, again depending on topology (gravity, expressions, etc.) or environmental factors (sun, tobacco, etc.), along life (Guinot et al. 2006);
- Microcirculation: capillary density, structured at the beginning even if variable in density in different body areas (mean of 60–70/mm²), could worse until a disorganized (orientation), heterogeneous (size, shape of the capillaries) network, characterized by a density of 30/mm² or less.

The skin characteristics are also function of sex and ethnicity of the subject; it could even be dependent on the side of the face (Mac-Mary et al. 2010) or environmental factors (season, weather, etc.) (Fanian et al. 2013).

Due to these important variations, parameters previously cited appear in publications in comparison before and after a treatment, rather than compared to “normal” or “pathologic” values.

3 Skin Functions

3.1 Specific

- Self-maintenance and self-repair (but there is no repair of appendages)
- Mechanical protection: resistance to frontal and tangential shocks, attenuation of external pressures, body external shape maintenance through reversible deformations, adhesion of the palms and soles to objects in the hand and on the ground
- Chemical barrier: limitation of foreign substances penetration, prevention of water and endogenous fluid loss
- Protection against ultraviolet rays
- Protection against environmental pathogenic microorganisms
- Social and psychological function through the physical aspect and mimic

3.2 Exerted in Cooperation with Other Organs

- Sensory function: tactile senses, perception of temperature and pain and even of light (popliteal region) (Campbell and Murphy 1998)
- Body temperature control: especially regulation of heat gains and losses
- Immune function: the skin is the first line of information and defense in the process of immunity, especially “delayed immunity”
- Ossification: synthesis of provitamin D (vitamin D is responsible for the intestinal absorption of calcium)
- Sexual function: conversion of testosterone into more active dihydrotestosterone

References


