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Male versus female skin: What dermatologists and cosmeticians should know

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ABSTRACT

Introduction: The skin is important for the perception of health and beauty. Knowledge of the physiological, chemical, and biophysical differences between the skin of male and female patients helps dermatologists develop a proper approach not only for the management of skin diseases but also to properly take care of cosmetic issues. The influence of genetic and environmental factors on skin characteristics is also critical to consider.

Methods: A literature search of PubMed and Google was conducted to compare the biophysical and biomechanical properties of the skin of male and female patients using the keywords "skin", "hydration", "water loss", "sebum", "circulation", "color", "thickness", "elasticity", "pH", "friction", "wrinkle", "sex", "male", and "female".

Results: A total of 1070 titles were found. After removing duplications and non-English papers, the number was reduced to 632. Of the 632 titles, 57 were deemed suitable for inclusion in this review. The studies show that the skin parameters of hydration, transepidermal water loss, sebum, microcirculation, pigmentation, and thickness are generally higher in men but skin pH is higher in women.

Conclusions: These parameters can be considered as age markers in some cases and are susceptible to change according to environment and life style. Biometrological studies of the skin provide useful information in the selection of active principles and other ingredients of formulations to develop a specific approach for cosmetic treatments.

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Contents

Introduction	0
Hydration	0
Transepidermal water loss	0
Sebum	0
Skin thickness	0
Skin pH	0
Microcirculation	0
Skin color	0
Skin elasticity	0
Skin friction	0
Human face geometry	0
Wrinkles	0
Conclusions	0
References	0

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Introduction

The skin is the largest multifunctional organ in the body. It functions as a protective physical barrier by absorbing ultraviolet radiation and preventing microorganism invasion and chemical penetration. The skin also controls the passage of water and electrolytes and has a major role in the thermoregulation of the body, in addition to its immunological, sensory, and autonomic function. Understanding the physiological, chemical, and biophysical characteristics of the skin helps us develop a proper approach for the management of skin diseases. However, the influence of genetic and environmental factors on the skin is also critical to consider.

Researchers have assessed skin parameters in different parts of the body in men and women separately. The knowledge of sex-linked cutaneous differences might help in study planning and the development of female- versus male-specific products for more appropriate dermatological treatments or cosmetic interventions.

There are sex-related differences in anatomy, physiology, epidemiology, and the manifestations of several diseases. With regard to skin disorders, infectious diseases are presented more in men but psychosomatic problems, pigmentary disorders, certain hair diseases, and autoimmune and allergic diseases are more common in women. Indeed, there are more sex-associated dermatoses in women and the occurrence and prognosis of certain skin malignancies are related to sex-related differences (Chen et al., 2010).

The mechanisms that underlie sex-related differences in skin diseases are mostly unknown. Sex hormones, behavioral factors, ethnicity, and differences in environment may all contribute to these differences. A better understanding of sex-related differences in human health and diseases will help better prevent, diagnose, and treat skin diseases (Chen et al., 2010).

A literature search of PubMed and Google was conducted through February 2017 using keywords including "skin", "hydration", "water loss", "sebum", "circulation", "color", "thickness", "elasticity", "pH", "friction", "wrinkle", "sex", "male", and "female". Only articles of high quality that directly pertained to the biophysical and biomechanical properties of the skin in men and women were included.

A total of 1070 titles were found. After the removal of duplications and non-English papers, this number was reduced to 632 titles, of which 57 were deemed suitable for inclusion in this review by 2 of the authors (A.F. and P.H.).

Hydration

Stratum corneum (SC) hydration has an important role in skin function, such as the regulation of epidermal proliferation, differentiation, and inflammation. Table 1 provides the findings of studies that compared skin hydration between male and female skin.

Mac-Mary et al. (2006) showed that natural mineral water supplementation may be used to improve the hydration of skin dryness as a complementary cosmetic approach. Liu et al. (2012) found that sun-induced changes of SC hydration vary with age and sex in a normal Chinese population. Sun-exposure effect in SC hydration was not significant in young men and women but was significant in aged women. The reduction of SC hydration was significant on the forehead and dorsal hand of sun-exposed subjects. Sun-induced reduction of SC hydration was more obvious on the dorsal hand of aged women than that of men ($p < .001$). Furthermore, the SC rehydration capacity in sun-exposed aged female subjects was significantly lower than that of age-matched male subjects.

A German study conducted by Luebberding et al. (2013) demonstrated that young men showed higher levels of SC hydration in comparison with women. However, SC hydration was stable or even increased in women during their lifetime but decreased over time in men beginning at age 40 years. In a study by Man et al. (2009),

SC hydration on the forehead in both men and women age >70 years was lower than that in younger age groups. SC hydration on the forehead in both men and women was not significantly different from that on the forearm. A comparison of age-matched men and women by Rogiers et al. (1990) demonstrated no sex-related differences in SC hydration.

Li et al. (2014) enrolled 86 patients in Chengdu, China in a single-center, non-interventional study. Candidates had two study visits (summer of 2010 and winter of 2011) at which dermatologists measured transepidermal water loss (TEWL), skin hydration, sebum secretion, fine lines/roughness, melanin/erythema, temperature, and color and clinically graded participants' skin. They found that the skin of female participants was significantly more hydrated than that of male participants.

Transepidermal water loss

TEWL is used to assess skin water barrier function. Jacobi et al. (2005) and Wilhelm et al. (1991) reported equal TEWL in both sexes in their studies. However, Luebberding et al. (2013) showed that in participants age <50 years, TEWL in men was significantly lower than in women of the same age, regardless of the location. The difference in evaporimetry results between men and women diminished with increased age at all localizations except for the forearm. In participants age 50 to 60 years, TEWL on the forehead, cheeks, and neck in men was higher than in women of the same age. In general and regardless of age, men showed significantly lower TEWL than women. In most sites, water loss was stable or increased over subjects' lifetime in both sexes.

Both Tupker et al. (1989) and Lammintausta et al. (1987) could not establish a difference in TEWL between men and women under basal conditions. Neither the number of tape strippings required for perturbing the barrier nor the rates of barrier recovery were significantly different in women compared with men (Reed et al., 1995). A summary of TEWL in male and female skin is presented in Table 2.

Sebum

Table 3 presents the findings of studies that compared skin sebum in male versus female skin. Jacobi et al. (2005) and Wilhelm et al. (1991) reported that sebum production was equal in the skin of men and women. However, Bailey et al. (2012) found higher sebum levels in male subjects in different parts of the face, except for the forehead, where female subjects had higher sebum levels.

Luebberding et al. (2013) demonstrated that sebum content in men was relatively stable on the cheeks and increased slightly on the forehead with age but progressively decreased in women over their lifetime. In a study by Man et al. (2009), sebum content on the forehead was higher in men ages 13 to 70 years than in age-matched women.

Men have been reported to have higher sebum production and larger pore size (Pochi and Strauss, 1974). A Korean study of 30 male and 30 female subjects found a striking positive correlation between male sex, pore size, and sebum excretion (Roh et al., 2006). In a study by Mizukoshi and Akamatsu (2013), sex-related differences and men's subjective perceptions of skin and daily skin care habits were investigated using simple instrumental measurements. The results showed that male skin had two specific characteristics because of the excess amount of sebum: impaired barrier function and a lack of appropriate skin care regimen due to tacky feeling. In a comparison of sebum secretion by sex, the skin of female participants was less oily on the face and neckline (Li et al., 2014).

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