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# The PENETRATION Question

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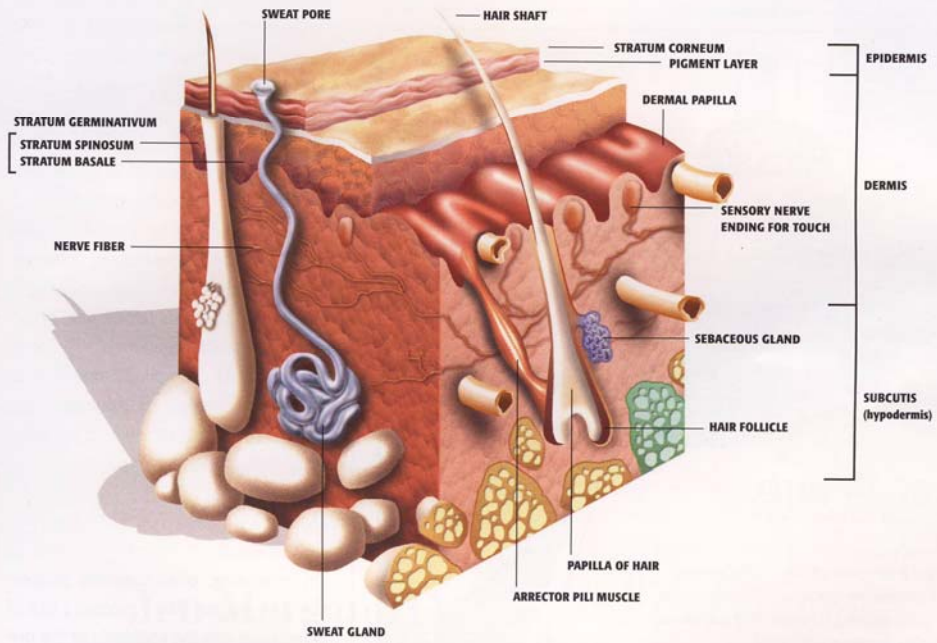


Penetration of skin care ingredients is a long-debated topic, and recent developments have brought the issue to the forefront once again in the minds of manufacturers, formulators, buyers and consumers. The market is saturated with products that promise results: creams that penetrate to the level of the muscles, serums that repair the DNA, lotions and potions that fill in wrinkles. What is fact? What is hope? What is necessary?

First, a brief look at the structure of the skin. The top layer, the epidermis, measures about a millimeter thick. Four sub-layers make up the epidermis, the outermost of which, called the stratum corneum, serves as a protective barrier against the elements. Under the epidermis lies the dermis, and below that, the hypodermis. It is in these inner layers where hair follicles, sweat and oil glands, blood vessels and nerves are housed, as well as collagen and elastin, which can cause visual aging as they breakdown.



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## Recent Developments in Penetration Technologies

Manufacturers typically talk about either nano-technology or liposomes when explaining the penetration of their products. Nanoparticles are tiny synthetic molecules – controlled in structure, form and size – that carry cosmetic ingredients into the skin. They're mainly used for minerals such as titanium oxide. Liposomes surround and protect a product's molecules to prevent them from breaking down before reaching their destination, much the way bubble wrap protects precious cargo during shipping.

While nanotechnology and liposomes have made headlines, few studies have confirmed their efficacy in penetrating the skin's outer layer, the epidermis.

Before conducting further studies regarding product penetration, however, we should step back and ask a more basic question – is deeper penetration better? Not necessarily. Indeed, as discussed below, should compounds merely penetrate the outermost layer of the skin – the stratum corneum – they would still effectively protect and rejuvenate.

## Don't Disregard Superficial Penetration

An interesting, often-forgotten perspective is to suggest that a product's lack of penetration into the epidermis or the dermis is actually not a bad thing. Since the stratum corneum is key in maintaining healthy skin – it acts as a protective barrier, prevents water loss, balances bacteria, is involved in anti-inflammatory processes and preserves an acidic pH – keeping it healthy might be the most important goal in skin care. Penetration of antioxidants and other anti-aging ingredients through the stratum corneum serves to protect it against environmental damages and oxidation, enabling it to more effectively perform its essential functions as the

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skin's first line of defense against the environment. This means the deeper layers of the skin are better protected, resulting in healthier skin and a more youthful appearance, despite the fact that skin care products may not be reaching the skin's inner layers.

The stratum corneum, or SC, is tricky, however. Although it is composed of dead, or non-dividing cells, it remains a live, or metabolically active, tissue. According to the "Skin Care and Cosmetic Ingredients Dictionary," it is considered so important and critical to product penetration, skin hydration and the reduction of skin sensitivity that it is often studied apart from the other epidermal layers.

The SC is impermeable except for a small quantity of water, which is delivered by the epidermis to hydrate its external layers and maintain its elasticity.

However, although one of the SC's key roles is to act as a barrier and thus prevent external molecules from penetrating the skin, cosmetologists and pharmacologists are highly interested in the ways in which it could actually support or enhance penetration. Methods of penetrating the SC include through the cells or hair follicles.

It should be noted that various biological and physicochemical factors influence the rate of penetration of a molecule through the stratum corneum. Biological factors include age, condition, metabolism, hydration of the skin and compound-skin interaction. Physicochemical factors include molecular mass, concentration, solubility, pH variations, co-solvents and temperature, among others. Variations in the skin's structure also affect the penetration of molecules into the skin. ■

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## The Perspective of the FDA

The Federal Food, Drug and Cosmetic Act (FD&C Act) defines cosmetics as products intended to be applied to the human body for cleansing, beautifying, promoting attractiveness or altering the appearance but without affecting the body's structure or functions. According to the FDA, no substance regulated as a cosmetic penetrates to the skin's deeper layers where a physiological effect can be achieved. Indeed, again per the FDA, products that penetrate the skin's deeper layers are classified as pharmaceuticals and as such are regulated much more stringently. Advances in science and technology – and marketing – have given rise to "cosmeceuticals," which in the minds of consumers bridge the gap between traditional cosmetics and pharmaceutical products (i.e., penetrate deep enough to have a "more than cosmetic" effect). However, the FDA does not recognize the term "cosmeceuticals."

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