

## Editorial by the Guest Editor

### The Epidermal Barrier Structure and Functions

The epidermis is an important barrier for preventing the organism from the invasion of pathogens, the involuntary uptake of external chemicals and the uncontrolled loss of water and solutes. This multiple barrier is vital to survive in a terrestrial environment without desiccating and for our protection as we are continuously challenged by external stimuli, e.g. mechanical insults, ultraviolet light, micro-organisms and allergens. It is particularly fulfilled by the product of its terminal differentiation, the horny or cornified layer (also known as the stratum corneum), but the upper nucleated keratinocyte layer was recently shown to be also involved in the barrier.

Terminal differentiation of keratinocytes is an oriented and complex program from the basal layer, where proliferative cells are present, to the surface of the epidermis through the spinous and granular layers: the cells progressively express in a sequential manner specific genes and undergo a series of structural and metabolic modifications. Finally, the granular keratinocytes experience a specialized form of programmed cell death called cornification, leading to the accumulation of corneocytes in the stratum corneum. Cornification is characterized by the elimination of all the organelles and the nucleus, and by the formation of a resistant shell at the cellular periphery, the cornified cell envelope. At the same time, desmosomes, the intercellular junction structures, are transformed into corneodesmosomes and the keratin intermediate filaments form a macrofibrillar intracellular matrix, thanks to the aggregating effect of an abundant basic protein called filaggrin. Finally, the corneocytes are embedded in lipidic lamellae.

Recent insights in highly prevalent inflammatory skin diseases, such as atopic dermatitis and psoriasis, have stressed the importance of the epidermal barrier. A compromised barrier might even have profound consequences for the sensitivity to asthma.

Detailed knowledge about the epidermal barrier functions is therefore essential for the understanding and treatment of skin diseases but also for biotechnological and cosmetical applications.

This special issue is aimed at providing a recent update on this rapidly evolving field. It also addresses the description of techniques recently developed to study the structure of the stratum corneum and to facilitate the penetration of bioactive molecules through this layer. We have invited the contribution of several leading contributors to the field who are members of the European Epidermal Barrier Research Network, a network presented in the next page by his President Martin Behne.

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