Preservation of Epidermal Integrity and Function by PROTECTAMI®: A New Natural Path Devoted to Skin Care

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Abstract

Protectami® is a hydrophilic extract of Padina pavonica that offers a unique mode of action never seen before in the cosmetic industry. This remarkable activity is Protectami®'s ability to promote epidermal cell communication and cohesion by optimising the skin's calcium-dependent metabolism.

We have demonstrated that Protectami® enhances the rate of synthesis of desmosomial proteins and intermediate filaments (cytokeratins). These proteins play a major role in epidermal cohesion. Protectami® reinforces the network in epithelial tissue leading to a better cell communication via gap junctions. Even when its efficacy was challenged by the presence of polluting agents (i.e.: nicotine and sulphuric acid), Protectami® protected skin integrity and function.

Introduction

Epidermis: a complex structure with a complex function

The external tissue of the skin is the epidermis. The main function of the epidermis is the protection of the organism. The epidermis is composed of keratinocyte cells organised in stratified layers. These cells contain a cytoskeleton system formed by cytokeratins which are responsible for cell shape. In response to epidermal differentiation, there is a modulation in the expression of the various layers of the epidermis from the basal to the suprabasal layers. Desmosomes, a type of protein junction structure, ensure the cohesion of the cells and layers. These are similar to the press studs and fasten cells one to another. Desmosomes are highly organised and build intercellular adhering plates where filaments of cytokeratins are anchored. Most desmosomial formation takes place in the basal layer where there is a favourable arrangement of keratinocytes, as they are in close proximity with one another. Having a particular structure at the junction of the basal layer with the dermis (hemi-desmosomes), desmosomes evolve from one layer to the next until they are incorporated into the corneodesmosomes and reach their final destination in the stratum corneum level. Here enzymes break these cells down as part of the desquamation process. The resulting "clipped" architecture of the epidermis not only explains its cohesion but also the need for good intercellular communication for proper functioning.

Epidermis and calcium-dependent structures

Calcium is the major component of an organism's skeleton. In addition to its role in structure, calcium is an excellent carrier of information between cells. In cell culture, when specific channels in cellular membranes altered the calcium concentration in the intercellular medium, changes occurred in electric potentials and cell behaviour.

In mammals, the epidermis contains a large amount of calcium. This mineral plays an important role in cell metabolism and particularly in the formation of those structures involved in skin firmness and resistance: cytokeratins and desmosomes.

During the ageing process, the "synthesis/degradation" balance shifts toward the degradation pathway, thus leading to significant decreases in the amounts of cytokeratins and desmosomes in the epidermis. The reasons for this shift are twofold. There is an increase in protein degradation in addition to a general decrease in protein synthesis activity.

Consequently, keratinocytes lose their organisation and synchronisation and the maturative wave disappears leading to skin ageing.

Protectami®: an innovative action in cosmetics

Protectami® is derived from Padina pavonica, a brown algae. In the sea, it exhibits a well-organised deposit of calcium carbonate on its surface. The formation of this exoskeleton must be the consequence of biological messengers initiating the crystallisation of aragonite, because this phenomenon cannot occur without some type of stimulation in seawater. After exploring the natural potential of a Padina pavonica extract, it appears that an active in the extract stimulates calcium-dependent epidermal cell structures such as desmosomial proteins and cytokeratins. The result of these investigations is Protectami®, an innovative product ushering in a new