Skin Rejuvenation with Enzymatic Exfoliation (Actizyme®)

Authors: Walter P. Smith Ph.D., Future Beauty Laboratory, Wellington, Florida
Michael Bishop, Active Organics, Inc. Lewisville, Texas USA

Abstract

Actizyme® is a bio-mimetic Cathepsin D analog which can exfoliate the *stratum corneum* via enzymatic proteolysis of exposed desmosomal linkages. Both immediately, and over time, this increased exfoliation results in a dramatic improvement in skin benefits.

We have compared the immediate, short and longer term effectiveness of Actizyme® with other anti-ageing ingredients such as peptides, retinoids and alpha hydroxy acids. Previous studies have demonstrated that Actizyme® has long term effects comparable to these ingredients. From a mechanism view, while Actizyme® directly exfoliates like AHAs, the specific site hydrolysis of desmosomal linkages also creates bio-active peptides in situ. We determined the Rejuvenation Index (% increase in SC replacement rate + % reduction in wrinkles after two week + % improvement in skin smoothness after one treatment/ neurosensory irritation potential).

Actizyme® was far more effective at increasing immediate skin smoothness than the other treatments and had a very low irritation rate. Consequently the determined RI's ranged from 23.2 for Actizyme® to 6.8 for lactic acid, 6.5 for retinol, and 10.2 for an anti-ageing hexa-pepetide.

We examined the morphology of exfoliated squames and observed that more than 70% of the exfoliated cells were in a single cell configuration compared to less than 30% for the other treatments. Single cell exfoliation is a gentler process and will not result in flaky or rough skin and will preserve barrier integrity.

When tested monadically Actizyme® upregulated several genes involved in epidermal proteolytic activity. In double-blind clinical tests we observed Actizyme® had dramatic effects on improving the following skin properties: 1. Skin brightness, 2. Overall facial youthfulness, 3. Skin resilience and sagging, 4. Skin integrity.

Introduction

Ongoing research has established the importance of exfoliation in maintaining a healthy skin barrier and improving cosmetic properties [1]. Both short term and long term effects on epidermal and dermal structure and function have been clarified [2-4]. These effects can include a better organized *stratum corneum* with improved barrier function and hydration [5, 6].

Desquamation (exfoliation) at the skin surface in a healthy, young epidermis is balanced by the mitotic development of new cells at the basal layer at a one to one correspondence [7]. This process is dependent upon endogenous proteolytic enzymes or proteases [8]. During ageing exfoliation and cell replacements rates decrease, and often there is an uncoupling between the number of exfoliated cells and basal layer replacements [9,10]. Decreased endogenous proteolytic activity is, in part, responsible for this uncoupling effect [11], and the resulting consequences.

Cathepsin D, an aspartyl protease, has been well characterized and is the most important endogenous protease involved in the normal exfoliation process [12]. The active form of the enzyme is localized within the *stratum corneum* and has maximal activity at pH 3. At the *stratum corneum* (pH 5.5) the enzyme is still quite active; however, its activity drops rapidly as pH increases above 5.5. This is likely a safety check, to prevent activity within deeper layers of the epidermis. The activity spectrum and localization of this enzyme also makes it perfectly suited to complete the final stages of exfoliation at the epidermal surface. Cathepsin D decreases with age, parallel decreases in *stratum corneum* replacement rates and barrier function [13]. All these factors make Cathepsin D, or other analogous acid proteases, perfect choices for use as topical exfoliants.

In this article we will review the effects of a Cathepsin D-like aspartyl protease, (CLP), derived from the mushroom, Mucor Miehei [14]. This enzyme exhibits an activity vs. pH profile very similar to that of Cathepsin D, and it maintains substantial proteolytic activity at the pH found within the *stratum corneum*.