Histological changes associated with extracellular matrix-remodeling topical therapy

Antoanella Calame¹, MD and Alan D Widgerow MBCh (MD);² MMed (MHS); FCS (Plast); FACS

¹Director, Compass Dermatopathology, San Diego, CA Chief of Dermatology, Scripps Memorial Hospital, La Jolla Volunteer Clinical Professor of Dermatology, UC San Diego
²Professor Plastic Surgery, Director Center for Tissue Engineering, Dept. of Plastic Surgery, University of California, Irvine and Chief Medical Officer Alastin Skincare Carlsbad, CA

BACKGROUND

Skin aging occurs through intrinsic processes (genetics, cellular metabolism, hormones and fibroblast senescence) and extrinsic factors (photodamage, sunlight exposure, pollutants, chemicals, toxins) resulting in gradual loss of elasticity, fine lines and a slowed turnover of regenerating cells. In young healthy skin, the proteolytic systems can effectively prevent the accumulation of damaged proteins both intracellularly and within the ECM, whereas in older, damaged skin the systems become inefficient and 'clogged' with these protein fragments. UV irradiation can reduce collagen production by fibroblasts by approximately 80%. Fragmentation of this collagen in the ECM environment prevents good fibroblast attachment resulting in round, inefficient, senescent cells, thought to be the major cause of the reduced collagen production in both photoaged and chronologically aged human skin fibroblasts.

Tracking these changes within the skin and measuring efficacy of topical formulations can be challenging. To date the gold standard for in vivo ‘proof of concept’ and objective measurement of efficacy is the histological assessment of skin biopsy samples. Alterations manifesting as cellular changes and ECM remodeling are considered good evidence of efficacy. To validate the scientific narrative that has been developed for innovative skincare products incorporating a proprietary blend of selected peptides and botanicals, Histological examinations in subjects in their 60s assessing changes related to topical application of product to the skin.

HISTOLOGICAL CHANGES following TOPICAL APPLICATION

Figure 1: H&E staining (100X) showing ECM and epidermal changes following 3-week topical application of TriHex peptide and botanical containing anhydrous gel to the pre-auricular region at baseline, 3 weeks and 8 weeks (male 60s) results in significant gradual increase in dermal Elastin staining post-treatment. (Abcam Anti-Elastin mouse monoclonal antibody [BA-4] 1:100 dilution)

The dramatic stimulation of Elastin does not only manifest in those who demonstrate little dermal Elastin staining at baseline. In fact, some subjects show significant Elastin staining in the pre-treatment biopsy specimens. In these cases, topical application of the product often results in not only an increase in Elastin staining, but also significant, gradual, uniform redistribution of Elastin throughout the upper dermis (Figure 4).

REFERENCES


CONCLUSION

Biopsy and histological assessment of topical formulations have long been regarded as the ‘gold-standard’ for in vivo confirmation of efficacy. Using this time-tested analysis, we have been able to demonstrate significant changes within the ECM and related cellular structures that validate the scientific narrative of ECM recycling and skin bed preparation for peri-procedure use and long term skin maintenance. Aesthetic Guide 2016; (May/Jun): 1-8.

Individual results may vary. Data on file at ALASTIN Skincare. Photos provided by Dr. Sabrina R Flick.

In addition, the serum (anti-aging line) uses the same TriHex peptide and botanical technology to clear the matrix and stimulate new collagen and elastin production, with added ingredients to create some plumping of the skin (Figure 7A, B).

Figure 7A: (A) Topical application of the TriHex and botanical anti-aging line to the crow's feet region at baseline and 12 weeks (female 61 years) results in significantly decreased solar elastosis with new collagen formation, improved commissure and epidermis. - H&E staining (100X). (B) This manifests clinically as reduced wrinkles with improved texture and tone in the crow's feet area.

Figure 7B: Sections stained with an immunohistochemical stain for Procollagen-I show slight staining in the upper and mid dermis at baseline and increased staining in the upper and mid dermis at 3 weeks of topical application.

Figure 3: Elastin immunohistochemical staining of sections from biopsies taken at baseline and following 3-week topical application of the Tri-Hex and botanical containing serum to the forearm (male 63 years) (100X) shows a striking increase in the amount of dermal Elastin staining post-treatment. (Abcam Anti-Elastin mouse monoclonal antibody [BA-4] 1:100 dilution)