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Picosecond Technology Transforms Tattoo Removal

According to research from Medical Insight, Inc., 21% of all adults in the U.S. have at least one tattoo. However, about half of those who have tattoos want them removed at some point in life. Existing for many years, tattoo removal with energy and laser-based systems offers predictable outcomes, though the process often requires multiple, and at times, painful treatment sessions to achieve results. With the introduction of picosecond technology, the field of tattoo removal is experiencing a significant transformation. Two clinical studies have demonstrated that this groundbreaking technology addresses darker, multi-colored and complex tattoos more efficiently, with more thorough removal in much less time.

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AAD 2013 Preview
Aesthetic Market Forecast
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January/February 2013
Circulation 25,000
www.miinews.com

Significant Clinical Research
Supports Science Behind Epionce Skincare

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"When I became a dermatologist, I had a vision of being able to treat and clear skin conditions and diseases in people of all ages with long lasting results."

By Carl R. Thornfeldt, M.D.

When I became a dermatologist, I had a vision of being able to treat and clear skin conditions and diseases in people of all ages with long lasting results. However, after a couple of years of private practice, I realized that the tools available to me were preventing my patients from achieving the clearance I wanted them to have.

In my clinical practice I observed skin diseases, particularly polymorphous light eruption (PMLE) and asteatotic dermatitis (ASD), which indicated we were lacking an understanding of skin function and structure. In addition, our treatment success for completely clearing common chronic inflammatory, scaly skin diseases like psoriasis and dermatitis was modest, but keeping them clear was poor. PMLE is commonly known as a "sun allergy" that presents with itchy red bumps or hives, or dermatitis patches beginning on any sun exposed site on the body, usually starting in the Spring. Despite any of our treatments, most PMLE patients completely cleared by about the beginning of August. I also noticed that ASD or "winter itch" would start about the first of the year, usually on lower legs, then spreading to the feet, hands and trunk. After months of battling this disease, ASD would spontaneously clear by mid-April.

While treating these skin diseases I realized PMLE resolved when the stratum corneum was thickened – as summer progressed – and ASD resolved as stratum corneum dehydration and fracturing resolved – when the ambient humidity and warmth increased. In both cases inflammation resolved and the stratum corneum barrier was strengthened. This was also the answer for treatment of the chronic inflammatory scaly skin diseases and maintaining remission. As the standard treatment, corticosteroids were effective in reducing inflammation, but induced further barrier thinning and disruption, allowing pollutants and chemicals to penetrate through to a greater degree. They also stimulated growth of pro-inflammatory microbes, thus, when treatment stopped, chronic inflammation roared back. It became evident that the skin barrier was usually connected with inflammation, which was critical in a significant number of skin disorders. This was my "epiphany," in a science sort of way.

In 1988 Dr. Kligman and Dr. Lavkes, who discovered Retin-A®, documented inflammation playing a role in extrinsic skin aging. I believed more scientific investigation in all physiologic aspects of skin barrier and cutaneous inflammation, including their regulation, was warranted, which led to a scientific hypothesis: "If we could optimize the structure and function of the skin, could we treat skin diseases and conditions better, and prevent them from flaring or rebounding?" However, 25 years ago, the epidermis was considered to be like a cellophane wrap of dead and inactive cells.

My involvement in fundamental skin biology research, most notably with Dr. Peter Elias, Dr. Kenneth Feingold, Dr. Walt Holleran and Dr. Ruby Ghadially

two decades ago, resulted in an understanding of the brick and mortar skin barrier structure, as well as chronic vs. acute cutaneous inflammation. We found that a variety of environmental exposures damage the skin by disrupting its barrier, inhibiting repair and activating multiple inflammatory cascades that damage existing cutaneous structures. Research showed that pollution, sunlight, smoking and poor diet disrupt the skin barrier, in addition to X radiation, heat, age, humidity extremes, high testosterone, low estrogen, severe emotional and physical stress, ingestion of lipid-lowering medications, insufficient consumption of "good" fats, excess consumption of "bad" fats and sugars, and exposure to heavy metals in diet and contact in workplace. Moreover, a number of compounds used in therapeutic products for skin diseases and conditions, including propylene glycol, lactic acid, retinoic acid, as well as the preservatives formaldehyde, quaternium 15 and sodium lauryl sulfate not only induced barrier disruption but also activated inflammation.

We soon realized that skin conditions and diseases, characterized by both chronic inflammation coupled with compromised barrier permeability, include not only visible skin aging, but also sensitive skin; all dermatoses (eczema), including atopic, seborrheic, chronic contact and asteatotic; ichthyoses, keratosis pilaris, rosacea, PMLE, certain types of psoriasis and premalignant actinic keratosis. Therefore, the foundation of the most effective and longest lasting remission of these diseases rests upon optimizing barrier function and safely reversing and preventing destructive chronic inflammation.

Chronic inflammation is activated by any persistent or recurrent barrier disruption in two ways. First, protective endogenous inflammatory pathways are initiated by the release of biologic response modifiers sequestered in granules within the deepest stratum corneum corneocytes. These are extruded when the granules are disrupted by barrier injury. In addition, pro-inflammatory insults penetrate at a much greater amount and more depth, magnifying its inflammatory effect.

It has been discovered that five pathways of inflammation are activated with stratum corneum barrier damage. The first four include the release of cytokines such as interleukins and tumor necrosis factor alpha, growth factors such as transforming growth factor beta, histamine and nuclear receptors such as PPAR and LXR. All of these paths ultimately upregulate matrix metalloproteinases (MMPs), which induce micro scars that evolve into wrinkles, and dysplasia that progresses to skin cancer and skin sensitivity. Bacterial invasion that is increased with barrier damage upregulates inflammation via toll like receptor activation. Two other inflammatory pathways involving the skin, but not related to barrier function, include glycation and upregulation of arachidonic acid synthesis.

Acute inflammation characterized by polymorphonuclear leukocytes infiltration, proliferation and chemotaxis is necessary for protection and initiating repair. It changes into chronic inflammation 12-20 days after the skin is damaged.

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Epionce Skincare Line

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Chronic inflammation is characterized by lymphocytic cell infiltration and up-regulation of MMPs. With frequent, recurrent or prolonged insult, accumulation of excessive amounts of MMPs results in excessive damage of collagen and elastin fibers and glycosaminoglycans. Reversing and preventing this destruction is needed, with therapeutic ingredients focusing on chronic inflammation, while at the same time attempting to slam the incompetent skin barrier shut.

Barrier repair has five pathways that lead to increased keratinocyte proliferation, which then leads to enhanced differentiation into the protein bricks of the barrier, corneocytes and rejuvenation of lipid lamellae mortar. This requires the key physiologic lipids, cholesterol, ceramide and free fatty acids, in a specific molar ratio to maximize repair of the barrier. Many different ratios were tested but the ratio ultimately used in Epionce products accelerated barrier repair by nearly 2.5 times over any other.

We also found that it was not possible to produce a chemically and visually stable multicomponent formulation that would optimize barrier repair and prevent / reverse chronic inflammation using known synthetic ingredients at that time. Thus we turned to herbal extracts that each offered multiple biological functionalities within the skin. In nature, these herbs contain many stable, but biologically active molecules that perform many different functions for the plant. After years of research, I settled on a barrier repair formula based on extracts of safflower, rosa canina, avocado and flax. This product accelerated barrier repair more than twice as effective as 100% petrolatum and four times better than any commercially available product used by the dermatology community as an over the counter moisturizer.

Additionally, we created an anti-inflammatory formulation based on extracts of date, meadowfoam, apple, flax and avocado, which were more potent than grape, olive, teas and soy, respectively. This product inhibited chronic inflammation 2.5 times better than 1% hydrocortisone. The barrier repair and anti-inflammatory components were formulated together then tested for safety, since clients desire products that are effective and safe. On the repeat insult patch test neither irritant nor allergic contact reactions were induced with this formulation.

A double-blind prospective controlled clinical trial, graded by third party investigators of enough human subjects to determine a statistically significant value is the key test to dermine if a product is effective. The marketed final formulation should be tested for true efficacy. This type of study is not required to market a cosmeceutical, but there is no other scientifically valid method to determine effectiveness of a product. I felt it was critically important that the new products we were developing adhere to this standard.

Epionce products have been tested against six different prescription products and were superior to all six. Initially, retinoid induced contact dermatitis was effectively treated by Epionce Renewal Facial Cream, which was superior to

mometasone. This product was used twice daily with once daily Epionce Lytic Lotion, to assess impact upon visible photo-aging. In a six month 25 subject trial, the Epionce regimen was numerically superior in reducing tactile roughness, fine lines, wrinkles, clarity and visible actinic keratosis, while the comparative prescription product was numerically superior in reversing mottled hyperpigmentation and laxity.

Histologically, Epionce significantly ($p<0.05$) increased epidermal glycosaminoglycans by 13.3%, double that of the competitive prescription product. Upon dermal ultrasound, Epionce produced a highly statistically significant ($p<0.001$) doubling of the dermis, by 20.8%, measured by density versus the competitor. No subjects experienced true contact dermatitis with Epionce; 20% noted only transient eyelid erythema. Conversely, 40% of the subjects treated with the competing product experienced frank contact irritant dermatitis.

To prove a concept is valid, a second formulation with different ingredients but the same mechanisms of action for the concept is required. Epionce Intensive Nourishing Cream containing potato and yeast peptides for barrier repair, an anti-inflammatory triterpenoid that also realigns elastin fibers (ursolic acid) was formulated with azelaic acid (<1%). A 12 week study against the most potent antioxidant product on the market at that time was conducted. At six weeks, Epionce Intensive Nourishing Cream was significantly superior ($p<0.05$) in reducing shallow wrinkles, with triple the efficacy of the market leader, as well as twice as effective in reducing laxity and hyperpigmentation.

Epionce was also superior in reducing roughness and improving clarity. One-third of the patients treated with the leading product dropped out of the study after the six week point due to moderate-to-severe contact irritant reactions. As with the photo-aging trial, Epionce improved the dermis by 19.4% at 12 weeks, as measured by extensibility, doubling the effect of the remaining subjects being treated with the competitive leading product. One Epionce subject dropped out due to eyelid irritation, but this was the only Epionce subject to drop out of any blinded clinical trial that included nearly 390 subjects.

Since this project began, a total of 15 blinded clinical trials have been performed with Epionce products; study data is accessible on the Epionce website. Epionce was designed to focus on the foundational mechanisms of skin diseases as skin aging, which includes repairing and optimizing barrier function, while reversing and preventing inflammation. The clinical research documents that Epionce is not only novel, but we as a company supremely regard safety and efficacy.

The testimonials I hear from my patients have been incredibly gratifying. Many people with a hypothesis never see it come to fruition. I feel blessed to witness the success of Epionce, and I truly believe that it helps me be a better dermatologist, and can help your patients achieve their maximal clinical results as well.

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