

Stem Cells for Skin Rejuvenation: Are We There Yet?

Clinical trials around the world have been examining how to harness the powers of human stem cells to perform feats such as healing wounds, repairing or growing new tissues and organs, and treating diseases such as cancer, diabetes, and neurodegenerative disorders. Given the ethical debate surrounding the use of embryonic stem cells, some researchers have been tapping into adult stem cells as a viable alternative source and finding dermal stem cells particularly promising.

Freda Miller, a neurobiologist at the University of Toronto who focuses on regenerative medicine, has been exploring ways to use special skin stem cells her team discovered, called “skin-derived precursors” (SKPs) or “skips,” to generate other kinds of tissue to treat brain and spinal cord diseases.¹ University of Calgary scientists Jeff Biernaskie and Vincent Gabriel are exploring whether a dermal stem cell precursor found in hair follicles could help improve split-thickness skin grafting for treating deep burns and wounds.² At the University of Colorado, researcher and professor of dermatology Dennis Roop has been studying the genetic detours that can make normal skin stem cells malignant or underlie inherited skin fragility syndromes, such as epidermolysis bullosa simplex.³

In cosmetic dermatology, dermal stem cells are creating excitement too. Hollywood dermatologist Harold Lancer, an advocate for noninvasive rejuvenation procedures, recently told *Elle* magazine that stem cells are the hottest thing since Retin-A.⁴ Much like botulinum toxin (Botox) went from being used to treat blepharospasm and strabismus to being explored as a cosmetic treatment, stem cell therapy has been carving a similar path from disease treatment to antiaging beauty fix.

Swapping the scalpel for a syringe, some cosmetic surgeons and dermatologists are embracing a novel procedure called the “stem cell face-lift,” which involves the injection of patients’ own stem cells. The less invasive procedure is believed to plump up and tone aging skin by signaling the body’s skin cells to step up production of new fibroblasts and

collagen. Lancer offers stem cell face-lifts too, using his U Autologous personalized skin care line. The procedure involves harvesting stem cell-rich body fat from a patient’s hips or abdomen via mini-liposuction and sending it to a laboratory where adult stem cells are isolated and cultured to produce a cocktail of cytokines, growth factors, and matrix proteins and then blended into a base of “antioxidants, peptides, and other clinically proven anti-aging ingredients,” according to the product’s website.⁵ Growing interest in using adipose-derived stem cells (ADSCs) is due to this type of stem cell being a readily accessible, abundant source and having the potential to differentiate into various tissues and organs. Kim and colleagues, for example, who explored possible clinical uses for these adult stem cells, were able to show that injecting ADSCs into mice with ultraviolet B radiation-induced wrinkles could reduce cell death and stimulate collagen synthesis of human dermal fibroblasts.⁶

Another option for consumers is over-the-counter face creams made from stem cells. Lifeline, for example, is a high-end product line making headlines and is made using stem cells from unfertilized eggs donated by in vitro fertilization laboratories and clinics.⁷ Consumers should know, however, that these brave new cosmaceuticals do not contain live stem cells but a yield of their by-products. The hype and the hope are that stem cell extracts, such as proteins, can jumpstart aging skin’s ability to repair and renew itself. Not all products touting “stem cell technology” are made from human stem cells either. Many of them contain ingredients derived from plant stem cells.⁸ For example, Dior’s Capture Totale Multi-Perfection line uses a rye-based, patented ingredient that supposedly signals subcutaneous cells to produce fibroblasts.⁴

Although stem cells have been praised as the Holy Grail for regenerative medicine, science still has to work out some kinks. Getting stem cells to replicate in high enough numbers for certain procedures, such as blood transfusions, is one issue. Another is getting them to do what one wants—that is, programming stem cells in their earliest stage, when they have not yet been designated for any one purpose, such as making bone cells, heart cells, or neuronal cells.

As for aesthetic applications, the science still has to firm up. A recent cautionary tale in the media recounts how a

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woman developed tiny, painful bone fragments around her eyes after a stem cell-enhanced face-lift.⁹ The woman's cosmetic surgeon had isolated adult mesenchymal stem cells from her abdominal fat, which were injected into the face. She also received injections of a commonly used dermal filler that incorporates calcium hydroxyapatite (50% of bone is a modified form of hydroxyapatite). Bone fragments developed, so the woman had to undergo surgery to remove the misguided bone.

Unfortunately, scientific claims to date about stem cells for face-lifts do not hold up yet, according to a literature review of 24 studies from the past 20 years.¹⁰ Atiyeh and colleagues suggest that what is being offered currently is at best "stem cell-enriched lipofilling" and that face-lifts go beyond what amounts to volumetric enhancement. There is no evidence "other than anecdotal claims to support antiaging effects of stem cells," they conclude.

When botulinum toxin first appeared on the scene, it was met with enthusiasm but also caution due to potential adverse effects, such as facial asymmetry caused by inappropriate neurotoxin placement. Stem cell therapy too will have to offer more scientific proof of safety and efficacy before it finds acceptance. According to a joint position statement by the American Society for Aesthetic Plastic Surgery and the American Society of Plastic Surgeons, "the scientific evidence and other data are very limited in terms of assessing the safety or efficacy of stem cell therapies in aesthetic medicine."¹¹ To date, there are only preliminary findings from small clinical studies conducted by product manufacturers. The more robust evidence we see, the closer our field may get to adding another tool to our arsenal, for both skin rejuvenation and more serious dermatologic conditions.

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