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Stem Cell Science
THE Aesthetic Show 2010 Review
Aesthetic Patient Enhancement Winners

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Spencer A. Brown, Ph.D.

“For aesthetic medicine, by necessity and for convenience, one’s own fat can be harvested, processed for ADSCs, and then safely transplanted back via a procedure known as cell augmented lipotransfer (CAL).”

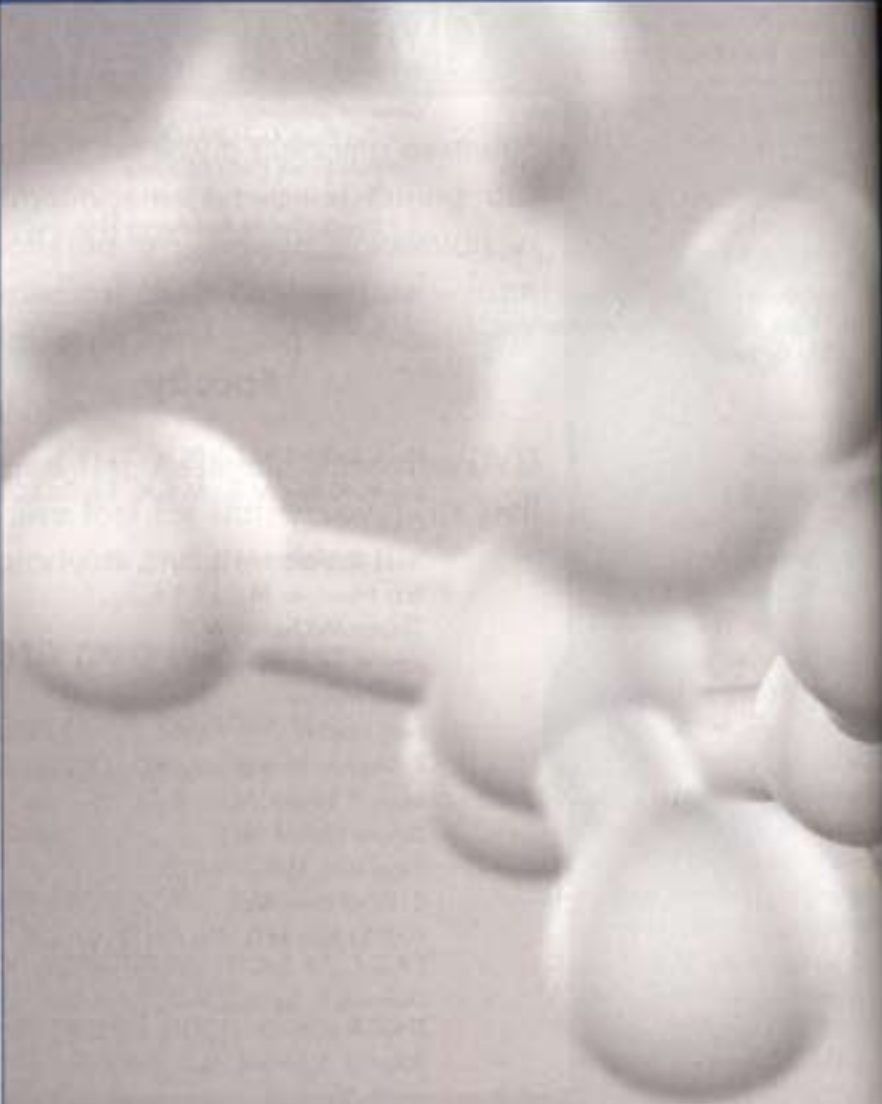
Although the first reported case of Autologous Fat Transfer (AFT) occurred over a century ago, it has only more recently progressed toward becoming a truly promising procedure. Despite the controversy surrounding stem cells, some experts believe that their significant regenerative properties may be the missing link to truly revolutionizing AFT.

In 1893 German physician Franz Neuber performed the first documented use of AFT for cheek reconstruction using upper arm fat.¹ Despite successful transfer, there were complications including infection and necrosis. “Unfortunately, we have only made small, incremental steps in improving fat grafting despite more than 100 years of clinical experience,” reported Gordon H. Sasaki, M.D., a plastic surgeon in Pasadena, Calif. “With few notable exceptions, the clinical longevity and predictability of outcomes is highly variable, especially in larger volume cases. The graft may convert to fibrous tissue with associated formation of nodules and oil cysts.”



Gordon H. Sasaki, M.D., F.R.C.S.
Clinical Professor
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Graft survival depends largely on the nourishment of transplanted tissue by nearby indigenous tissues until neovascularization takes place. Thus, the problem, according to Dr. Sasaki, appears to be a lack of proper nourishment of the graft. “The larger the graft,” he observed, “the less likely it will survive.” Furthermore, additional contributing factors that have been cited include: “reduction in fat cell viability during harvest, preparation or injection, as well as suboptimal injection sites.”





Experts Debate

Significance of Stem Cells in Autologous
Fat Transfer Procedures

To combat these issues, Sydney Coleman, M.D., a plastic surgeon at Tribeca Plastic Surgery in New York, N.Y., created the LipoStructure[®] technique. With this method, body fat is gently harvested with a syringe, refined with minimal handling and layered into minuscule strands. This layering helps to ensure that nutrition can be exchanged through capillaries in the enveloping tissue, which is essential for the fat to survive.² "The gentle implantation of aliquots of harvested fat by syringe is meant to preserve fragile adipose tissue as it is placed near vascularized tissue," Dr. Sasaki explained. "Though this micro droplet method is scientifically sound, graft preservation has varied between 30% and 90%, even in the best of hands."

As a consistently reproducible, safe and cost-effective alternative to implants and dermal fillers, using a patient's own tissue for augmentation or reconstruction seems to offer obvious practical benefits. "Ultimately, AFT may even replace artificial implants entirely, though I think we're still a ways away from that," noted Spencer A. Brown, Ph.D., director of plastic surgery research at the Nancy L. and Perry Bass Advanced Wound Healing Laboratory at the University of Texas Southwestern Medical Center (Dallas, Texas).

Therefore, scientists are studying stem cells in the hopes that, when properly harnessed, they will advance AFT by improving the viability of transferred fat. "Stem cells are characterized by their ability to replicate themselves through mitosis and, under certain conditions, differentiate into any of a range of specialized cell types found within the body," explained Dr. Brown. "To the public, the best known sources of adult (as opposed to embryonic) stem cells are probably umbilical cord blood and bone marrow."

However, as fate would have it, perhaps the most readily available source of adult stem cells are found in adipose tissue. According to Sharon McQuillan, M.D., director of the Ageless Aesthetic Institute (Weston, Fla.), the concentration of adult



Sharon McQuillan, M.D.
Director
The Ageless Aesthetic Institute
Weston, FL

stem cells within fatty tissue is greater than that of bone marrow by a factor of fifty. "The use of one's own tissue to repair or restore – known as regenerative medicine – is rapidly turning to adipose tissue as a virtual gold mine," she said. "It is inexpensive, abundant and can be easily harvested in a simple outpatient procedure."

"Studies are being conducted worldwide in the use of adipose derived stem cells [ADSCs] for treating heart disease, stroke, lung disease, orthopedic injuries, diabetes, neurologic disorders and more," Dr. McQuillan continued. "For aesthetic medicine, by necessity and for convenience, one's own fat can be harvested, processed for ADSCs, and then safely transplanted back via a procedure known as cell augmented lipotransfer [CAL]."

After harvest, according to Dr. Brown, ADSCs are concentrated into the stromal vascular fraction [SVF], which contains multiple cell types. "ADSCs are proven to be capable of differentiation, which is what makes them so valuable," he said, "although the exact mechanism of action by which that happens is not yet fully understood."

Once cell augmented fat is transplanted, it is believed that the high concentration of immature adipocytes and stem cells are responsible for success of the graft. These stem cells secrete growth factors, improve the blood supply and create an optimal environment for engraftment. "What's more, we've noticed anecdotally that the quality of skin near the graft improves, suggesting further regeneration that takes place simply through the presence of concentrated viable stem cells. This procedure offers both improved stability and regenerative potential that cannot be achieved with simple fat transfer," Dr. McQuillan added.

According to Dr. McQuillan, "Body shaping by liposuction is the second most popular surgical aesthetic procedure, and it's still a growth area." Furthermore, "since society now values selective volumizing as youthful and aesthetically pleasing, there's even more potential for growth. CAL allows surgeons to offer their patients facial, breast and gluteal enhancements utilizing their own tissue, making this an affordable, reliable and natural way to turn back the hands of time."

However, for John A. Millard, M.D., a plastic surgeon in Lone Tree, Colo., one

question remains; what do stem cells really bring to the table when it comes to AFT? "I do not know of any peer-reviewed science that has conclusively shown that CAL really adds anything above fat grafting itself," he reported. "There is some literature showing promising early results when adding platelet-rich plasma to harvested fat, and there is anecdotal evidence that adding stem cells may improve yields, but the body of hard science just isn't available yet. I haven't seen evidence that it's better than a technically well done AFT procedure, or that it achieves consistent, reproducible results better than something else."



John A. Millard, M.D.
Plastic Surgeon
Lone Tree, CO

"Ultimately the boon with stem cells in aesthetic medicine may not be in larger scale AFT, but in helping grow supplies of one's own autologous fat to assure an adequate supply for grafting," said Dr. Millard. "In my experience the people who often need AFT have little fat to begin with, giving us a comparatively limited supply of harvestable fat without a way to generate more."

According to Dr. Brown, the FDA is watching the development of this technology closely. "The FDA doesn't get involved when you're just taking fat from one site and implanting it elsewhere in the donor's body," he noted. "The fat is handled during efforts to preserve and refine harvested tissue to optimize AFT results; it may be filtered and washed, treated with collagenase, then centrifuged and who knows what else. During this process, the product may be metabolically modified from what was originally harvested; therefore, regulations changed in 2004 to reflect this. A stem cell preparation must now be tested like a drug and device manufacturers must prove that their processors do not cause cell changes or, if the material is changed, that it is still safe."

Professional organizations within the industry are also wary because the implantation of stem cells has been shown to boost tumor growth *in vitro*. "There is evidence that isolated adipocyte-derived stem cells,

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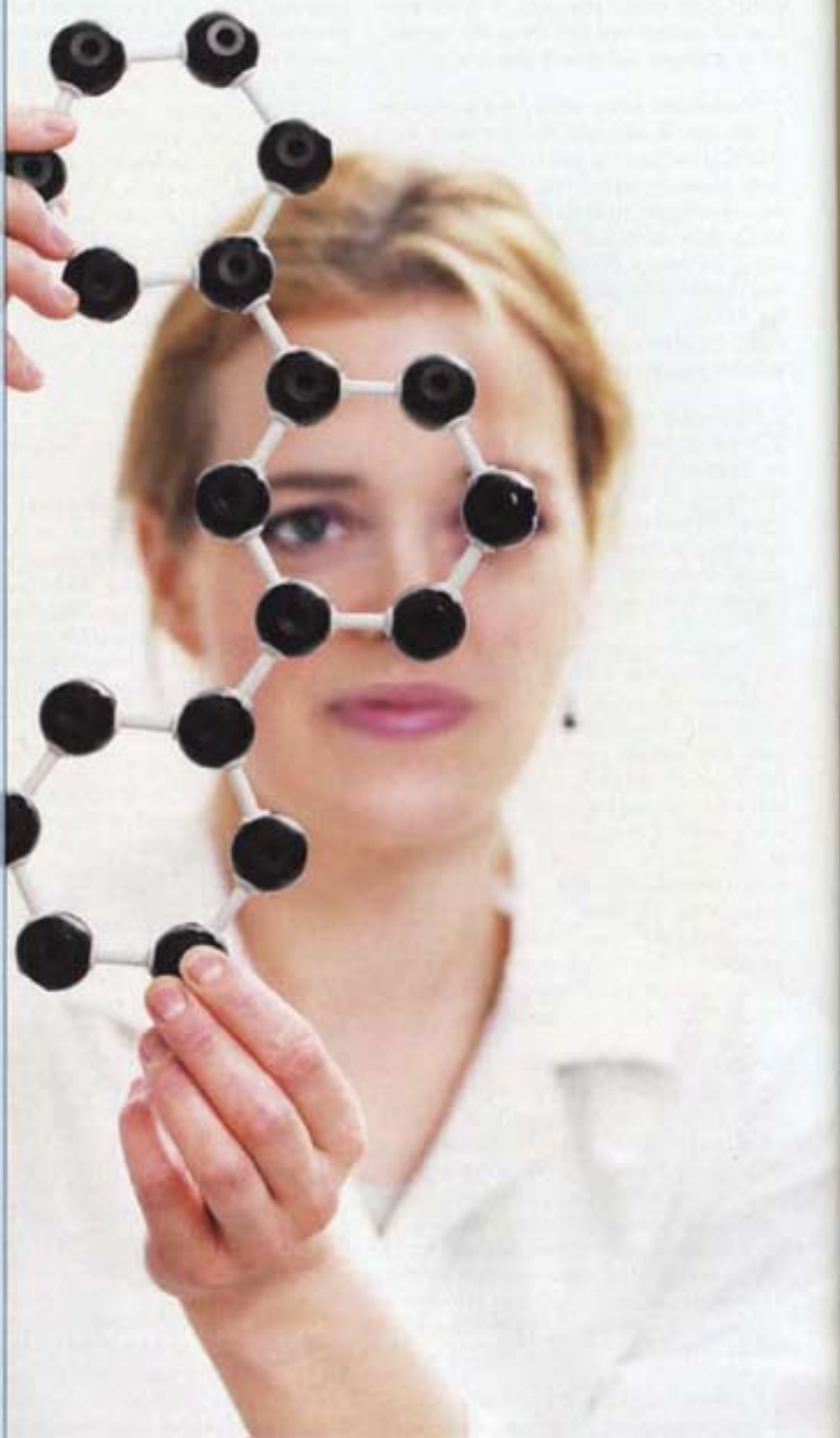
placed in the presence of a tumor in pre-clinical animal models, cause rapid tumor growth," Dr. Brown reported. Given that many AFT procedures involve breast augmentation, concern is understandable.

Dr. Sasaki was of the same opinion, "Although there isn't much evidence that implanting stem cell rich fatty tissue in the breast increases the risk of cancer, a conservative approach is certainly warranted."

Another issue surrounding stem cells for AFT is the rapid development and marketing of a procedure that, according to experts, is still in its infancy. "People are advertising stem cell breast augmentation when we don't really know exactly what that is," Dr. Millard stated. "This industry is replete with notorious early adopters and it's hard to trust what they say. That's not to say that early adopters don't play a pivotal role in the development of new procedures, but how do you know what their experience really is? Stem cell technology has too much potential to be squandered by those looking to build and hop onto the bandwagon before it is truly ready."

According to Dr. Millard, there is currently only one liposuction device FDA cleared for fat harvesting in combination with an adjunctive tissue collection device. "Others are in development," he added, "and I'm hoping they come with a lot of solid science behind them. Many of us are waiting for this technology but we don't want to see it go down in flames just because someone is trying to make a quick buck."

"Although the aesthetic industry is developing this technology for cosmetic enhancement, its potential goes far beyond aesthetic medicine," Dr. McQuillan added. "Studies are also being conducted in the use of ADSCs for the treatment of traumatic and ischemic soft tissue injuries with remarkable success."



1. Neuber F. Fettransplantation. Chir Kongr Verhandl Dtsch Ges Chir. 1983;22(66).

2. Coleman SR. Facial recontouring with liposuction. Clin Plast Surg. 1997;24(2):347-367.

Physicians Trust Alma Devices to Treat Top Indications



Bruce Katz, M.D.
Clinical Professor of Dermatology
Mount Sinai School of Medicine
New York, NY

"The most common conditions we treat include wrinkles, sun damage, vascular and pigmentary malformations, cellulite, skin laxity and acne scarring. We rely on Alma's product portfolio to help us successfully treat our diverse patient population."

By Kevin A. Wilson, Contributing Editor

One of the challenges presented in aesthetic practices today is finding the perfect blend of treatment options to meet a patient's expectations and lifestyle. Accent^{XL}, Harmony^{XL} and Pixel CO₂ from Alma Lasers, Inc. (Buffalo Grove, Ill.), offers practitioners an array of solutions to effectively treat the most commonly seen conditions, while still meeting their patient's needs.

According to Bruce Katz, M.D., dermatologist, researcher and medical director of Juva Skin and Laser Center in New York, N.Y., "the most common conditions we treat include wrinkles, sun damage, vascular and pigmentary malformations, cellulite, skin laxity and acne scarring. We rely on Alma's product portfolio to help us successfully treat our diverse patient population."

"These days the challenge with treating mild-to-moderate wrinkles and sun damage is the balancing act between efficacy and the amount of downtime the patient will tolerate," he continued. For that Dr. Katz relies on the powerful, but relatively gentle, Pixel CO₂. "It's a fractional laser that allows us to tailor treatment energies to whatever downtime the patient can afford, the number of sessions they're willing to undergo, and most importantly, to properly address the severity of each patient's condition. Pixel CO₂ allows us to adapt appropriately."

Acne scarring presents a different set of challenges Dr. Katz pointed out. "This condition has a major impact on quality of life, self-confidence and social interactions, especially among teenagers and young adults. We need to be able to blend and smooth irregularities caused by the scarring for

a more uniform and natural look." Dr. Katz uses the Pixel CO₂ for this as well. "It has achieved the best results for our patients with the added benefit of minimal pain and downtime."

"What's even more exciting is that Harmony^{XL}'s fractional erbium technology allows us to successfully treat acne scarring in darker skin," he added. Although treating darker skin tones with a laser can be a challenging prospect, this erbium laser is well suited for the job due to the character of its energy. "In Asia, particularly China and Japan, I have found they rarely use fractional CO₂, instead relying on erbium as their workhorse. There is much less heat generated and less peripheral build-up of energy."

Dr. Katz also uses Harmony^{XL} for vascular and pigmentary malformations. "The 515, 540 and 570 nm modules available on the platform help heat and disperse pigment and hemoglobin based on selective photothermolysis, much the same as with intense pulsed light. It's one more way the device adds versatility and efficacy."

To round out Dr. Katz's practice, he uses Alma's Accent^{XL} for skin tightening and treatment of cellulite all over the body. "It is one of the most effective devices on the market today," Dr. Katz stated. "Also, there are no disposables to deal with, making the machine cost-effective as well." As with the other Alma devices, Accent^{XL} treatments are virtually painless and there is no downtime. Patients are treated and can immediately return to their regular routine as soon as they leave the office.