

# EXOSOMES, The Hottest Topic in Regenerative Aesthetics

Endless regenerative possibilities in one powerful package.

By Cheryl Whitman



**You've probably heard about exosomes recently. Exosomes are one of the most exciting advances in skin care.**

## What are Exosomes?

An exosome, in simple terms, is a tiny sack that forms inside a cell. It contains some of the nucleic acids (DNA, RNA), proteins, lipids and metabolites from the cell. These sacks are formed by all cells, including cancer cells. They serve as messengers, traveling through the blood stream, so cells throughout the body can communicate. Exosomes can release growth factors and facilitate other beneficial processes. However, not all exosomes are created equal.

According to "The Biology, Function, and Biomedical Applications of Exosomes," published Feb. 7, 2020, in Science, "Exosomes are associated with immune responses, viral pathogenicity, pregnancy, cardiovascular diseases, central nervous system–related diseases and cancer progression. Proteins, metabolites and nucleic acids delivered by exosomes into recipient cells effectively alter their biological response.

Such exosome mediated responses can be disease promoting or restraining." In short, exosomes can be good or bad for your health depending on what cargo they carry. Their cargo is dependent upon what cell type produced them.

## How do Exosomes and Stem Cells Differ?

Stem cells can become any type of cell within the body. They serve as building blocks and repair devices in your body. Exosomes are tiny sacks or bubbles called extracellular vesicles, which are released by all types of cells in the body, including, but not exclusively, from stem cells.

Exosomes contain nearly three times the amount of growth factors as do adult stem cells. Having more growth factors means a better ability to restore and revitalize target cells.



**Exosomes are a promising treatment for hair loss.**

Natural Drug Delivery System Exosomes hold promise as a safe and effective natural delivery system for therapeutic drugs because the body readily allows them to pass through cell walls, and in some cases, they can even transit the blood-brain barrier. Due to their extremely small size (1/100th the size of a cell), exosomes are considered to be promising as a tool for drug delivery to targeted organs.

Exosomes deliver their surface protein and cytoplasm (the material in the cell) to the recipient cell by fusing with the target-cell membrane causing the cell to open up. Exosomes then enter the cell, release their cargo and affect the physiological and pathological processes of that cell. This uptake process is rapid and temperature sensitive; uptake is decreased by low temperature. Research is continuing into how to optimize their utilization as a drug delivery system.

Almost all bodily fluids contain exosomes, and those exosomes contain structures formed within every cell type. These exosome cargos are often disease-specific such as viral infections, neurodegenerative diseases (Alzheimer, Huntington disease) and cancer. As a result, exosomes are being extensively studied as a source of molecular markers for use in early disease detection.

## Facial Regeneration/Anti-aging

Although exosomes are secreted by all cell types, those that are derived from stem cells (undefined cells that can develop into any cell type) have a powerful role in regenerative medicine by facilitating healing and repair processes. As this type of exosome has significant regenerative capabilities, they are used in anti-aging facial aesthetics and hair restoration. The National Institutes of Health states, "preclinical studies in aesthetics have demonstrated promising effects of exosomes on skin rejuvenation and hair growth."

Exosomes have several benefits for tissue regeneration including antioxidant and anti-inflammatory effects. They can be used to significantly increase skin collagen and elastin. This can result in changing the

appearance of scars, decrease skin irritation, help with acne, address sagging skin and reduce age spots and wrinkles.

One-way exosomes can be used in a facial procedure is by combining them with micro-needling treatments. Exosomes are diffused over the outer skin layers, releasing growth factors to injured skin, thereby activating an enhanced wound healing process and tissue remodeling. Using micro-needling in combination with exosomes can have a direct impact on skin tone and texture issues, hyperpigmentation, scarring from acne and other common complexion concerns.

The extent of your condition will also affect the rate at which you experience results. For most patients, the most apparent results tend to appear within three to four months of treatment, and the best, most dramatic results appear within nine months.

## Treatment of Alopecia

In addition to facial anti-aging treatments, exosomes show promise in treating hair loss. Alopecia (hair loss) is caused by the degeneration of hair follicles, which may be due to a number of different reasons. Alopecia can be treated by applying exosomes derived from dermal papilla cells.

The exosomes are injected directly into the scalp just below the hair follicles where they regulate hair follicle growth and stimulate the outer root sheath cells encouraging hair growth. The exosomes accelerate the onset of anagen (the active phase of the hair growth cycle), delay catagen (the transitional phase of the hair growth cycle), cause hair shafts to lengthen and improve root sheath viability.

Exosomes hold promises for treatment and prevention of alopecia. Patients using exosome therapy for alopecia saw benefits for six to nine months following conclusion of treatment.



## **Intravenous exosome therapy for pain management**

Exosomes versus PRP Therapy Exosome therapy and PRP therapy utilize the same approach, using growth factors to facilitate collagen growth. The main difference is that the growth factors in exosomes are not acquired from a patient's own blood, they are derived in the lab. Furthermore, exosomes are 100 times more powerful than treatments with PRP. These messengers carry essential ingredients like collagen, growth factors, enzymes and proteins that when applied to the skin will regenerate the cells, resulting in more youthful looking skin.

Exosomes are still a new hair loss therapy method. While exosomes and PRP both use growth factors to stimulate hair growth, they target different components of the scalp. Exosomes target existing stem cells in the scalp area, while PRP triggers tissue repair and regeneration.

## **Exosomes for Pain Management**

In the United States today, approximately 7.5% of the population, or about 1 out of every 13 people, suffers from chronic pain. Chronic pain is a common condition that seriously affects a person's quality of life; people who suffer from chronic pain may experience anxiety, depression, insomnia and other negative emotions. Currently, chronic pain treatments are

nonsteroidal anti-inflammatory drugs (like ibuprofen and naproxen) and opioids.

Sadly, these drugs are often insufficient to bring relief, or cause severe side effects and may be addictive.

A 2019 study by the National Library of Medicine, titled "Mesenchymal Stem Cells and their Exosomes: Promising Therapeutics for Chronic Pain," concluded that intravenous exosome therapy is "a potent alternative for the treatment of chronic pain." Exosomes treat pain by targeting damaged cells and directing them to regenerate. This reduces inflammation and pain and promotes natural healing without addictive medications.

Another study, published by the National Library of Medicine in 2020, (Exosomes as a new pain biomarker opportunity) found that exosome-based treatments reduced pain with fewer side effects than current drug based treatments while imparting potential immunoprotected and anti-inflammatory effects. Studies were conducted on different chronic pain diseases such as osteoarthritis, rheumatoid arthritis, inflammatory bowel diseases, neuro-degenerative pathologies, complex regional pain syndrome and peripheral nerve injury. This next-generation treatment strategy shows promise in the treatment of chronic pain and enhancement of tissue repair.

## Exosomes in Topical Skin Care Products

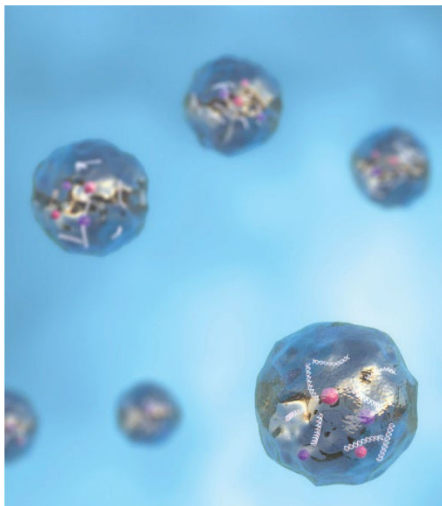
Exosomes have been studied as a treatment for a variety of skin conditions, ranging from wound healing to skin pigmentation to psoriasis. Exosomes have huge potential as therapeutic cosmetic ingredients. They promote wound healing by stimulating the development of new blood vessels, promote collagen synthesis and hasten the growth of new cells, helping wounds close faster. They may also help minimize scarring.

As skin cells age, they produce less collagen. This leads to fine lines, wrinkles and sagging. Topical application of exosomes, particularly after microneedling or laser treatments, encourages tired skin cells to take up

the exosomes and begin rejuvenating the skin by increasing collagen and elastin production. The result is smoother, firmer and better hydrate skin that glows.

The anti-inflammatory properties of exosomes help reduce the itchy red patches of psoriasis and atopic dermatitis (eczema). Exosome therapy reduces recovery time following cosmetic procedures and may reduce the number of treatments required to obtain optimal results.

Exosomes remain active for a period of six to eight months post treatment, so the results last much longer than neurotoxin injections or dermal fillers.



**The development of exosomes is rapidly advancing.**

## The Future of Exosomes in Aesthetics

Glynis Ablon, M.D., FAAD, founder of the Ablon Skin Institute and Research Center in Manhattan Beach, CA explains, "I do think the future really is exosomes, and we've only hit the tip of the iceberg. The development of exosomes really is rapidly advancing and it's important to note that there are two main sources of exosomes, which are the bone marrow stem cells and umbilical cord stem cells, and each have their own unique differences. Both can be engineered for skin and hair signaling, and they both have regenerative qualities or abilities including angiogenesis,

collagen synthesis and inflammatory regulation. And there's one company that's actually taking the best of both worlds and mixing bone marrow and umbilical cord mesenchymal stem cells that will be available soon, so [it is] very exciting."

Jordan Plews, Ph.D., CEO of Elevai Labs, Inc. also believes exosomes are here to stay. "The field of extracellular vesicles is rapidly evolving and exosomes along with it. While the aesthetics industry is often focused on results, which are important but can often be subjective, the next generation of exosome treatments is likely to come from increased understanding of the science.

In addition, new biotechnological advances will likely allow us to expand our ability to control, tune and modulate the cargo of exosomes. At least a few pharmaceutical companies have already started exploring the combination of gene editing technologies like CRISPR and looking at ways to use it to affect exosome production. Eventually, it may well be possible to very tightly control intercellular messages in the form of exosomes using next generation gene editing tools."

## Legality and Risks of Exosomes

There are some risks with injectable and/or infusible exosome therapies. Currently, the FDA (US Food and Drug Administration), has not approved any injectable or infusible exosome products for any uses.

## Summary

Exosomes hold great potential in the world of medical aesthetics, as well as throughout other medical applications. Research into this exciting field is continuing at breakneck speed and the hope of FDA approval of their use remains strong.