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Plant exosomes products in the Egyptian market: Innovation, regulatory gaps, and scientific controversy

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Abstract

Plant derived extracellular vesicles (PDEVs), often marketed as plant based exosomes, have gained attention in regenerative medicine and aesthetic dermatology due to their biocompatibility and bioactive cargo. This narrative review critically examines commercially available PDEV based products in the Egyptian market, focusing on their reported composition, proposed mechanisms of action, regulatory status, and current clinical evidence. Products including V-Tech Serum® (Promoitalia, Italy), Rx Elysee Exosome PDRN Ampoule® (Dermafirm, South Korea), Glow Exosome® (Louisderma, France), and ExoLure VISAGE® (Hyalure, Italy) are discussed. Available data suggest potential roles in skin rejuvenation, wound healing, and hair restoration; however, product specific clinical evidence remains limited. Significant gaps persist regarding standardized manufacturing methods, transparency of bioactive components, and regulatory oversight. Future well designed clinical trials and standardized characterization protocols are essential to validate safety, efficacy, and reproducibility of PDEV based therapies in aesthetic and therapeutic dermatology.

Keywords: Plant derived extracellular vesicles; Exosome like nanoparticles; Aesthetic dermatology; Regenerative medicine; Regenerative aesthetics; Exosomes; Stem cells; Regeneration; Biostimulation; Orthomolecular.

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Introduction

Exosomes are extracellular vesicles (EVs) that play a fundamental role in cell-to-cell communication, carrying essential biomolecules such as proteins, lipids, and RNA to regulate biological processes. They are naturally secreted by almost all cell types and have been extensively studied in regenerative medicine due to their potential in tissue repair, immune modulation, and anti-inflammatory effects. Exosomes can be categorized into different types based on their cellular origin, including mammalian-derived exosomes (such as mesenchymal stem cell-derived exosomes), bacterial exosomes, and plant-derived exosomes.[1-10]

Although the term; exosomes is widely used in commercial marketing, true exosomes are defined as endosome derived extracellular vesicles characterized by specific biogenesis pathways and surface markers. In plant systems, the majority of isolated vesicles are more accurately described as plant derived extracellular vesicles (PDEVs) or exosome like

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nanoparticles (ELNs), as definitive evidence of endosomal origin remains limited. For scientific accuracy, this review adopts the term PDEVs while acknowledging the widespread commercial use of the term (plant based exosomes).

Extraction and manufacturing of exosomes

The isolation and purification of exosomes involve advanced biotechnological methods such as ultracentrifugation, size-exclusion chromatography, and precipitation techniques. These methods ensure high-purity exosome preparations for therapeutic and cosmetic applications. Unlike mammalian-derived exosomes, plant-derived exosomes are extracted from plant stem cells, fruits, and medicinal herbs, providing a sustainable and non-immunogenic alternative.[11,12]

Plant exosome manufacturing and constituents

Plant exosome formulations typically contain essential bioactive molecules such as antioxidants, growth factors, flavonoids, and polysaccharides, which contribute to their anti-inflammatory and regenerative properties. Techniques such as microfiltration, differential centrifugation, and nanotechnology-based processing are used to isolate and refine these plant-derived vesicles. The main advantages of plant exosomes over mammalian-derived exosomes include their stability, ethical sourcing, and enhanced biocompatibility.[13,14]

Applications of plant exosomes in medicine and aesthetic dermatology

Plant exosomes have demonstrated remarkable potential in multiple medical and aesthetic fields. In regenerative medicine, they have been utilized for wound healing, inflammatory modulation, and tissue regeneration. In dental applications, plant-derived exosomes are being explored for periodontal tissue repair and osteogenesis. In aesthetic medicine, these exosomes have gained popularity for their role in skin rejuvenation, hydration, and collagen stimulation, making them a promising non-invasive alternative to traditional anti-aging treatments.[15-17]

FDA approval and off-label uses

Currently, no exosome or plant derived extracellular vesicle based products have received approval from the U.S. Food and Drug Administration (FDA) for therapeutic or aesthetic indications. While some mammalian exosome formulations are under investigational new drug (IND) status for specific medical applications, IND designation does not constitute regulatory approval. The FDA has issued warnings regarding the unapproved clinical use of exosome products, particularly for injectable applications. Despite this, PDEV based products are frequently used off label in aesthetic practice, primarily via topical application or in conjunction with microneedling. In Egypt and other emerging markets, regulatory oversight remains limited, highlighting the need for clearer regulatory frameworks and post market surveillance.

Plant exosome technology

Plant exosomes are derived from botanical sources such as stem cells, fruits, and medicinal herbs. These vesicles carry bioactive molecules, including growth factors, antioxidants, lipids, and proteins, which contribute to their regenerative properties. Unlike mammalian-derived exosomes, plant exosomes are non-immunogenic, ensuring a lower risk of adverse reactions while maintaining high therapeutic potential.

Isolation methods of plant-based exosomes

The extraction and isolation of plant-derived exosomes involve advanced biotechnological methods to ensure their purity and bioactivity. Common techniques include:

- ***Ultracentrifugation:*** A high-speed centrifugation process used to separate exosomes from plant cell lysates based on size and density.

- ***Size-Exclusion Chromatography (SEC):*** A filtration-based approach that separates exosomes from other cellular components based on molecular weight and size.
- ***Differential centrifugation:*** A stepwise process involving multiple centrifugation cycles at increasing speeds to remove debris, larger vesicles, and isolate pure exosome fractions.
- ***Polymer precipitation:*** The use of specific polymers to precipitate exosomes from plant extracts, enhancing their yield while maintaining bioactivity.
- ***Microfluidic-based isolation:*** A novel method using microchannels and nano-filters to isolate plant exosomes with high efficiency and scalability.

At present, publicly available information on the specific isolation methods used by manufacturers of V-Tech Exosome, Elysee Exosome, Glow Exosome and ExoLure Exosome is limited. Many of these companies consider their proprietary techniques confidential, and detailed descriptions are not disclosed in official product literature. While general isolation methods such as ultracentrifugation and chromatography are commonly used in plant-derived exosome technology, direct confirmation from manufacturers or scientific publications is required to assign a particular technique to each product. Future research should aim to clarify the exact methodologies used to ensure transparency and facilitate comparative analysis.

Available plant-based exosome products in Egypt

a. ***Rx Elysee Exosome PDRN ampoule:*** A formulation enriched with PDRN, sodium DNA, and plant-based exosomes, designed to promote skin elasticity, hydration, and barrier function.

b. ***Glow exosome:*** A plant-exosome-enriched product designed to improve skin radiance and texture.

c. ***V-tech serum:*** Developed by Promoitalia, this system combines plant-derived exosomes, polynucleotides (PDRN), and biomimetic peptides to enhance skin rejuvenation and collagen production.

d. ***ExoLure VISAGE:*** An advanced exosome-based treatment targeting skin and hair regeneration, leveraging plant-derived vesicles for enhanced cellular rejuvenation.

Comparative analysis of product efficacy

Each of these products varies in its composition and targeted dermatological benefits. While some prioritize hydration and elasticity (e.g., Elysee Exosome), others focus on advanced collagen stimulation and wound healing (e.g., V-Tech Exosome). Comparative studies and clinical evaluations are necessary to establish the superiority of one formulation over another based on parameters such as patient satisfaction, biomolecular efficacy, and long-term safety **(Table 1)**.

Clinical applications and potential advantages

Plant-based exosomes have shown promising applications in:

Wound healing: Accelerating tissue repair and minimizing scarring.

Inflammatory skin conditions: Reducing oxidative stress and modulating immune responses to treat conditions like acne and dermatitis.

Hair restoration: Promoting follicular health and stimulating hair growth. Preclinical studies suggest that exosomes can stimulate dermal papilla cells, activate hair follicle stem cells, and promote angiogenesis, leading to potential benefits in treating hair loss conditions. A review of clinical studies indicated that while early evidence is promising, larger well-designed trials are necessary to establish efficacy and safety.

Skin rejuvenation: Enhancing collagen synthesis, reducing fine lines, and improving overall skin texture. A comprehensive literature review emphasized their role in extracellular matrix reconstruction and angiogenesis, which are vital for skin rejuvenation.

Table 1 Comparison between different plant based exosomes in the Egyptian market.

Feature	*V-Tech Serum*	*Rx Elysee Exosome PDRN ampoule*	*Glow Exosome*	*ExoLure VISAGE*
Market name	V Tech System	Elysee Exosome	Glow Exosome by EVERA	ExoLure Exosome
Source	Plant-based + PDRN	Plant-based + PDRN	Plant based	Manufacturer reported bioactive components
Key ingredients	High molecular weight polynucleotides 2% (20mg/ml) Synthetic exosomes with biomimetic peptides(20mg) Oligopeptide–20 Acetyl decapeptide–3 Plant stem cells	water, polydeoxyribonucleotides, p198, sodium hyaluronate, sodium chloride, potassium phosphate, disodium phosphate, potassium chloride, mannitol, acetyl octapeptide-3, acetyl hexapeptide-8, hydrolyzed collagen, sodium dna, dipeptide-2, tripeptide-1, niacinamide, glutathione, carnosine, pentapeptide-13, acetyl tetrapeptide-5, centella asiatica leaf vesicles, copper tripeptide-1	Hydrolyzed collagen, Hyaluronic acid, Succinic acid, peptides and amino acids.	hyaluronic acid, growth factors, peptides, Carboxymethylcellulose, placenta and plant-derived exosomes
Mechanism of action	Skin rejuvenation, collagen stimulation	Hydration, elasticity, skin barrier repair	Skin radiance, even tone	Hair & skin regeneration
Primary indications	Anti-aging, wound healing	Skin hydration, elasticity	Skin brightening, anti-pigmentation	Hair restoration, skin rejuvenation
Isolation method of vesicle like particles	not publicly disclosed by the manufacturer	not publicly disclosed by the manufacturer	not publicly disclosed by the manufacturer	not publicly disclosed by the manufacturer
Clinical Evidence	Limited published studies	Limited published studies	Limited published studies	Limited published studies
Regulatory status (FDA approval)	Not FDA-approved, used off-label - Company recommends to be used topically or with micro needling	Not FDA-approved, used off-label - Company recommends to be used topically or with micro needling	Not FDA-approved, used off-label - Company recommends to be used topically or with micro needling	Not FDA-approved, used off-label - Company recommends to be used topically or with micro needling

Current limitations and need for product-specific research

While the general benefits of exosomes are supported by emerging research, there is a notable lack of product-specific clinical trials for the aforementioned plant-based exosome products. This gap underscores the need for:

- ***Standardized clinical trials:*** Conducting rigorous, standardized clinical trials to evaluate the safety and efficacy of each product.
- ***Transparency in manufacturing processes:*** Disclosing detailed information about the extraction, purification, and formulation processes to ensure reproducibility and safety.

- ***Long-term safety data:*** Establishing long-term safety profiles through extended follow-up periods in clinical studies.

In conclusion, while exosome-based therapies hold significant promise in aesthetic dermatology, the specific efficacy of products like V-Tech Exosome System, Elysee Exosome PDRN Ampoule, Glow Exosome and ExoLure Exosome remains to be conclusively determined through dedicated research and clinical validation.

Challenges and future perspectives

Despite their benefits, plant-derived exosome therapies face challenges related to standardization, scalability, and regulatory approvals. Future advancements should focus on optimizing extraction methods, ensuring consistent bioactivity, and conducting large-scale clinical trials to validate their efficacy. Although the previously mentioned products in this review and other products as well are marketed in the aesthetic community as plant-based, a detailed assessment of their composition suggests that they may contain additional bioactive components beyond purely plant-derived exosomes. Some formulations incorporate polynucleotides (PDRN), growth factors, or other biologically active molecules that may originate from non-plant sources. This highlights the importance of transparency in product labeling and the need for standardized characterization methods to accurately define the composition of exosome-based formulations. Clear distinction in sourcing and processing methods will help ensure informed decision-making for both researchers and practitioners.

Limitations

This review is limited by the scarcity of independent, peer reviewed clinical studies evaluating commercially available PDEV based products. Most data are derived from manufacturer provided information or extrapolated from preclinical studies on plant derived vesicles. Additionally, the lack of transparency regarding isolation methods and vesicle characterization restricts reproducibility and comparative assessment. Consequently, conclusions regarding efficacy and safety should be interpreted cautiously.

Conclusion

Plant-based exosomes show significant promise in dermatological applications, there is a lack of direct comparative studies evaluating the efficacy of specific commercial products available in the Middle Eastern markets. Future research should focus on conducting well-designed clinical trials to assess and compare the effectiveness of these products, thereby guiding clinicians in making informed decisions regarding their use in aesthetic and therapeutic dermatology. Further research and comparative clinical trials will be crucial in solidifying their role in aesthetic medicine and regenerative dermatology.

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Author's contribution

NA: conceptualized the study, designed the methodology, collected and analyzed the data, drafted the manuscript, and critically revised it for intellectual content..

AG,NS,JK,MG: reviewing the manuscript, providing suggestions for wording, and approving the final version for submission.

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