Supplementary Table. Comparison of Plant and other-Derived Types of Exosomes. (**Abbreviations:** DUC, differential ultracentrifugation; GUC, gradient Ultracentrifugation; SEC, size exclusion chromatography; UF, centrifugal ultrafiltration.)

Feature	Plant-Derived Exosomes	Mammalian-Derived Exosomes	Bacterial-Derived Exosomes	Fungal-Derived Exosomes	Synthetic/Engineered Exosomes	Milk-Derived Exosomes	Parasitic-Derived Exosomes
Source	Plants (e.g., fruits, vegetables)	Mammalian cells (e.g., immune, stem, tumor cells)	Bacteria (e.g., Gram-positive or Gram-negative bacteria)	Fungi (e.g., Candida, Cryptococcus)	Artificially synthesized or engineered from natural exosomes	Mammalian milk (e.g., cow, human)	Parasites (e.g., Leishmania, Plasmodium)
Size	50–200 nm	30–150 nm	20–300 nm	40–250 nm	Variable, depending on design parameters	50–200 nm	50–150 nm
Composition	Lipids Proteins RNAs, Bioactive compounds (e.g., polyphenols)	Lipids Proteins (e.g. Tetraspanins) miRNAs	Lipids (e.g., lipopolysaccharides) Proteins DNA/RNA	Lipids proteins RNAs	Customizable; can include specific lipids, proteins, and nucleic acids	Lipids Proteins, miRNAs	Lipids Proteins RNAs
Biocompatibility	High; low immunogenicity	High; potential immunogenicity depending on the source	Can be immunogenic due to bacterial components (e.g., endotoxins)	Moderate; potential immunogenicity	Designed for high biocompatibility; depends on engineering	High; generally well-tolerated	Moderate to low; potential immunogenicity

Therapeutic Potential	Rich in bioactive compounds Ued in drug delivery and disease modulation	Used for cell signaling Immune modulation Drug delivery	Emerging applications in immunotherapy and vaccine delivery	Potential in antifungal therapies and immune modulation	Tailored for specific therapeutic applications, including targeted drug delivery	Applications in nutraceuticals and drug delivery systems	Potential in vaccine development Modulating immune responses
Ease of Production	Easily isolated from plant materials Scalable	Requires cell culture systems More complex and costly	Requires bacterial culture systems Moderate complexity	Requires fungal culture systems Moderate complexity	Production depends on synthesis methods; can be complex	Easily isolated from milk Scalable	Requires parasitic cultures Complex and potentially hazardous
Stability	High stability under various conditions (e.g., pH, temperature)	Sensitive to pH, temperature, and storage conditions	Moderate stability; depends on bacterial species and preparation	Moderate stability; influenced by fungal species	Stability varies; can be engineered for enhanced stability	High stability; suitable for various applications	Moderate stability; depends on parasite species

Cost	Low cost; plant materials are abundant and inexpensive	Higher cost due to complex isolation and purification processes	Moderate cost; bacterial cultures are relatively inexpensive	Moderate cost; requires specialized fungal cultures	Variable cost; depends on materials and methods used	Low cost; milk is readily available	High cost; parasitic cultures are complex and require specialized facilities
Safety Concerns	Generally safe Minimal risk of pathogen transmission	Potential risks include contamination or tumorigenicity	Risk of endotoxin contamination (e.g., lipopolysaccharides)	Potential presence of pathogenic fungal components	Safety depends on design Off-target effects are possible	Generally safe Minimal risk of contamination	Potential safety risks due to pathogenic content
Applications	Nutraceuticals Drug deliver Immune modulation	Cancer therapy Regenerative medicine Vaccine delivery	Immunotherapy Vaccines, antimicrobial therapies	Vaccine development Anti-fungal targets Immune modulation	Targeted drug delivery Gene therapy Precision medicine	Gut health Nutraceuticals Drug delivery	Vaccine development Immune response modulation
References	**(128-131)**	**(26, 116-118, 132, 133)**	**(124, 134-137)**	**(125, 126, 138-140)**	**(120, 121, 141-143)**	**(122, 123, 144-146)**	**(127, 147-149)**