Extracellular vesicles

- Brain-derived exosomal hemoglobin transfer contributes to neuronal mitochondrial homeostasis under hypoxia
- Delivery of LOXL1-AS1-siRNAs using targeting peptide-engineered extracellular vesicles with focused ultrasound to suppress medulloblastoma metastasis
- Direct SERS profiling of small extracellular vesicles in cerebrospinal fluid for pediatric medulloblastoma detection and treatment monitoring
- Biomimetic extracellular vesicles derived from chimeric antigen receptor monocytes to treat glioblastoma: An efficient and safe intranasal drug delivery nanoplatform
- Multimodal Imaging of Brain Metastasis-Derived Extracellular Vesicles Using Superparamagnetic Iron Oxide Nanoparticle Labeling
- First-In-Human Application of Human Umbilical Cord-Derived Extracellular Vesicles in Tethered Spinal Cord Release Surgery
- Advanced Therapeutic Approaches Based on Small Extracellular Vehicles (sEVs) For the Regeneration of Spinal Cord Injuries
- Cargo of small extracellular vesicles from neuronal origin shows progression of dementia in individuals with Down syndrome

Extracellular vesicles (EVs) are small, membrane-bound structures released by cells into their extracellular environment. They play a crucial role in intercellular communication and the transfer of biomolecules between cells. EVs are involved in various physiological and pathological processes and have garnered significant attention in research and clinical applications.

Types

There are three main types of extracellular vesicles:

Exosomes: Exosomes are the smallest type of EVs, typically ranging from 30 to 150 nanometers in diameter. They are formed within the endosomal system and are released when multivesicular bodies fuse with the cell's plasma membrane. Exosomes contain a variety of bioactive molecules, including proteins, lipids, nucleic acids (such as microRNAs and mRNAs), and other cellular components. These molecules can be transferred to recipient cells, where they can influence cellular functions.

Microvesicles (also known as shedding vesicles or ectosomes): Microvesicles are larger than exosomes, with diameters ranging from 100 to 1,000 nanometers. They are formed by the outward budding and fission of the cell's plasma membrane. Like exosomes, microvesicles carry various bioactive molecules and can facilitate cell-to-cell communication.

Apoptotic Bodies: Apoptotic bodies are larger vesicles (typically >1,000 nanometers in diameter) that are released by cells undergoing apoptosis, a programmed cell death process. These vesicles contain cellular debris and fragments of the dying cell, and they are often taken up by phagocytic cells for clearance.

Extracellular vesicles are involved in a wide range of biological processes, including immune response modulation, tissue repair, and the spread of pathogens. They have also gained significant attention in the fields of cancer research, regenerative medicine, and diagnostics. Researchers are exploring their potential as biomarkers for various diseases and as therapeutic delivery vehicles for targeted drug

delivery.

Studying extracellular vesicles and their cargo is challenging due to their small size and heterogeneity. Various techniques, including electron microscopy, flow cytometry, nanoparticle tracking analysis, and RNA sequencing, are used to isolate and analyze EVs and their contents.

Proteomic landscape of extracellular vesicles

The **proteomic landscape of extracellular vesicles (EVs)** refers to the full spectrum of proteins found inside EVs, which are tiny membrane-bound particles released by cells into the surrounding environment. These vesicles play crucial roles in cell communication and the transport of bioactive molecules between cells, tissues, and organs.

The proteomic landscape of EVs includes: 1. **Proteins**: A variety of proteins that can serve as biomarkers, regulators, or functional molecules. These proteins can reflect the state of the cells from which the EVs were derived, such as whether the cells are healthy, stressed, or diseased. 2. **Proteomic analysis**: Techniques like mass spectrometry are used to identify and quantify the proteins in EVs. This allows scientists to map out how the protein content of EVs changes under different conditions (such as disease or treatment) and understand the biological roles these proteins might play. 3. **Variability with health conditions**: The proteomic content of EVs can vary depending on the health of the tissue or the stage of disease, making EVs useful for understanding conditions like cancer, neurological diseases, or intervertebral disc degeneration. EVs are considered potential biomarkers for disease progression and therapeutic response.

In essence, studying the proteomic landscape of EVs helps researchers understand how cells communicate with each other, how disease affects this communication, and how EVs can be used for diagnostics or therapies.

Brain-derived extracellular vesicles

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Extracellular Vesicle–Based Therapy

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