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APPOINTMENT

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EXOSOMES TREATMENT FOR ALS/MND

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Exosome Treatment for ALS/MND

Exosome therapy for ALS/MND aims to deliver therapeutic molecules, such as neurotrophic factors and microRNAs, to motor neurons. Administered systemically, exosomes cross the blood-brain barrier, potentially slowing disease progression by promoting neuronal survival and modulating inflammation. Clinical trials are necessary to consider efficacy and safety fully.

❖ Advantages of Exosome Treatment

- **Targeted Delivery**: Exosomes offer precise delivery of therapeutic cargo to motor neurons, ensuring treatment efficacy while minimizing off-target effects.
- **Neuroprotection**: Loaded with neurotrophic factors, exosomes promote motor neuron survival and function, potentially slowing disease progression and preserving motor abilities.
- **Anti-inflammatory Effects**: Exosomes carry anti-inflammatory molecules that can dampen neuroinflammatory processes implicated in ALS/MND, reducing neuronal damage and enhancing neuroprotection.
- **Low Immunogenicity**: Exosomes derived from the patient's own cells or engineered to evade immune recognition have minimal-

immunogenicity, reducing the risk of adverse immune reactions and improving treatment safety.

- **Non-invasive Administration:** Systemic administration of exosomes via intravenous injection or other routes is minimally invasive, enhancing patient comfort and compliance compared to invasive procedures.

- **Disease Modification:** By addressing underlying cellular mechanisms such as oxidative stress, protein aggregation, and mitochondrial dysfunction, exosome therapy has the potential to modify disease course and offer long-term benefits beyond symptomatic relief.

- **Versatility:** Exosomes can transport various bioactive molecules, including proteins, nucleic acids, and lipids, allowing for tailored treatment approaches that can address diverse aspects of ALS/MND pathology.

- **Potential for Personalized Medicine:** Exosome therapy can be customized based on patient-specific needs, such as disease stage, genetic background, and responsiveness to treatment, optimizing therapeutic outcomes and minimizing adverse effects.

These advantages collectively highlight the potential of exosome treatment for ALS/MND, although further research and clinical trials are necessary for comprehensive validation and integration into clinical practice.

❖ Mode of Action in ALS/MND

The mode of action of exosome therapy in treating ALS/MND involves several key mechanisms:

- **Neuroprotection**: Exosomes can carry neurotrophic factors, antioxidants, and other molecules that promote the survival of motor neurons. By delivering these neuroprotective factors directly to affected cells, exosome therapy aims to mitigate neuronal damage and enhance neuronal resilience against disease-related stressors.

- **Anti-inflammatory Effects:** Exosomes can transport anti-inflammatory molecules, such as cytokine inhibitors and microRNAs, which modulate neuroinflammatory processes implicated in ALS/MND pathology. By dampening excessive inflammation in the central nervous system, exosome therapy may reduce neuronal damage and slow disease progression.

- **Modulation of Protein Aggregation:** ALS/MND is characterized by the accumulation of misfolded proteins, such as TDP-43 and SOD1, leading to neuronal dysfunction and death. Exosomes may contain molecules that modulate protein aggregation-

pathways, promoting protein clearance and-reducing the burden of toxic protein aggregates in motor neurons.

- **Enhancement of Cellular Repair Processes:** Exosomes can stimulate endogenous cellular repair mechanisms, such as autophagy and mitochondrial biogenesis, which are crucial for maintaining neuronal health and function. By promoting cellular repair and regeneration, exosome therapy may support motor neuron survival and improve functional outcomes in ALS/MND patients.

- **Modulation of Glial Activation:** Glial cells, including astrocytes and microglia, play a significant role in ALS/MND pathogenesis through their involvement in neuroinflammation and neuronal support. Exosome therapy may modulate glial activation and function, promoting a neuroprotective environment and enhancing neuronal survival in ALS/MND.

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