Potential Therapeutic Effects of Mesenchymal Stem Cells (MSCs) on Parkinson's Disease

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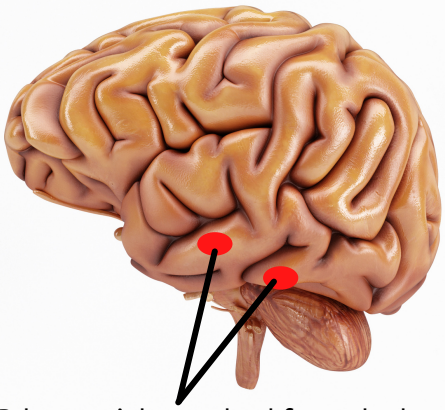


PD has mainly resulted from the loss of dopamine-producing neurons located in the substantial nigra

PARKINSON'S DISEASE (PD)

One of the most common aging-leading neurodegenerative diseases

Usually happens in 50-70 decades of patient's life

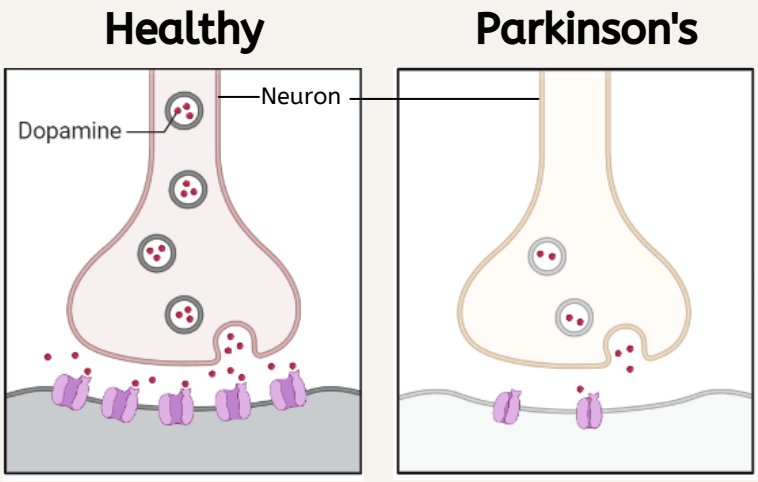
Diagnosis: the presence of abnormal protein aggregates (Lewy bodies) inside nerve cells

PROGRESSIVE LOSS OF DOPAMINE

Dopamine, as a chemical signal transmitter, transmit chemical messages through neurons

In healthy neurons, dopamine is produced and transmitted for body action such as muscle movement.

As less and less dopamine is produced by the neurons affected by Parkinson's disease, less message is trasmitted for body action



SYMPTOMS

Slowness of Movement

Speech Changes

Tremor

Loss of Smell

Impaired Balance

MESENCHYMAL STEM CELLS

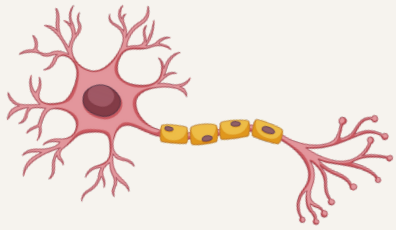
Mesenchymal Stem cells (MSCs) are multipotent which can duplicate and differentiate into multiple specialized cells such as bone cells, skin cells, neural cells, etc.

MSCs are easy to isolate, have great proliferative potential, not easy to age, immune modulation

Mesenchymal Stem cells

THERAPEUTIC EFFECTS OF MSCs ON PARKINSON'S DISEASE

1. MSCs help to restore the functions of damaged dopamine-producing neurons



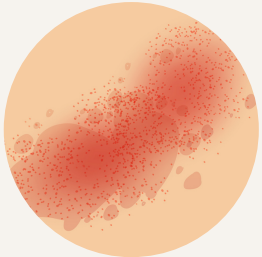
MSCs secrete a variety of **biological factors**, such as neurturin and BDNF, can help to restore the functions of dopamine-producing neurons.

2. MSCs secrete BDNF that can provide neuroprotection

BDNF functions in support **neuron survival and development**, showing a neuroprotective effect to protect neurons from death.

It also stimulate **neurogenesis**, a process by which new neurons are formed.

3. Immunomodulation effect



Neurodegeneration is always accompanied by inflammation. MSCs transplant can help to modulate the immune response by **suppressing the inflammation** and significantly slow down or even stop the inflammatory-mediated degeneration of dopamine-producing neurons.

REFERENCE

1.Wilkins, A., Kemp, K., Ginty, M., Hares, K., Mallam, E., & Scolding, N. (2009). Human bone marrow-derived mesenchymal stem cells secrete brain-derived neurotrophic factor which promotes neuronal survival in vitro. Stem cell research, 3(1), 63-70. 2. Chen, Y., Shen, J., Ke, K., & Gu, X. (2020). Clinical potential and current progress of mesenchymal stem cells for Parkinson's disease: a systematic review. Neurological Sciences, 41(5), 1051-1061. 3. Joyce, N., Annett, G., Wirthlin, L., Olson, S., Bauer, G., & Nolta, J. A. (2010). Mesenchymal stem cells for the treatment of neurodegenerative disease. Regenerative medicine, 5(6), 933-946. 4. Volkman, R., & Offen, D. (2017). Concise review: mesenchymal stem cells in neurodegenerative diseases. Stem cells, 35(8), 1867-1880.

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