Cellular and Molecular Aspects of Parkinson Treatment: Future Therapeutic Perspectives

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Parkinson?s disease is a neurodegenerative disorder accompanied by depletion of dopamine and loss of dopaminergic neurons in the brain that is believed to be responsible for the motor and non-motor symptoms in this disease. The main drug prescribed for Parkinsonian patients is l-dopa, which can be converted to dopamine by passing through the blood-brain barrier. Although l-dopa is able to improve motor function and improve the quality of life in the patients, there is inter-individual variability and some patients do not achieve the therapeutic effect. Variations in treatment response and side effects of current drugs have convinced scientists to think of treating Parkinson?s disease at the cellular and molecular level. Molecular and cellular therapy for Parkinson?s disease include (i) cell transplantation therapy with human embryonic stem (ES) cells, human induced pluripotent stem (iPS) cells and human fetal mesencephalic tissue, (ii) immunological and inflammatory therapy which is done using antibodies, and (iii) gene therapy with AADC-TH-GCH gene therapy, viral vector-mediated gene delivery, RNA interference-based therapy, CRISPR-Cas9 gene editing system, and alternative methods such as optogenetics and chemogenetics. Although these methods currently have a series of challenges, they seem to be promising techniques for Parkinson?s treatment in future. In this study, these prospective therapeutic approaches are reviewed.

Gene therapy

l-dopa

Molecular mechanisms

Parkinson?s disease

Transplantation therapy

3 (3,4 dihydroxyphenyl)lactic acid

aromatic levo amino acid decarboxylase

aurantiin

baicalein

curcumin

daidzein

epigallocatechin gallate

esculin

genistein

ginkgolide B

ginsenoside Rb 1

ginsenoside Rd

ginsenoside Re

ginsenoside Rg 1

guanosine triphosphate cyclohydrolase I

hyperin

isorhynchophylline

levodopa

magnolol

puerarin

quercetin

resveratrol

salvianolic acid B

stepholidine

tetramethylpyrazine

thymoquinone

triptolide

tyrosine 3 monooxygenase

umbelliferone

unindexed drug

biological product

brain depth stimulation

cell therapy

chemogenetics

CRISPR-CAS9 system

genetic procedures

human

human embryonic stem cell

immunotherapy

mesencephalic tissue

molecular therapy

motor performance

nonhuman

nuclear reprogramming

optogenetics

Parkinson disease

pluripotent stem cell

quality of life

Review

RNAi therapeutics

stem cell transplantation

treatment response

viral gene delivery system

animal

biological model

cell transplantation

gene editing

gene therapy

immunology

Parkinson disease

Animals

Biological Products

Cell Transplantation

Gene Editing

Genetic Therapy

Humans

Models, Biological

Parkinson Disease