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## The Neuroprotective and Neuroregenerative Actions of Hydrogen Sulphide Donor, Intracerebral MSCs, Ginko Biloba and Kefir in Attenuating Neuropathological Hallmarks of Alzheimer's Disease Induced by Lipopolysaccharide

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### Background

Memory and learning disorders have been characterized by being devastating long-term incurable diseases. Deep Brain stimulation via using neuroprotective inducers for treatment of brain structure degenerative diseases such as Alzheimer's disease (AD) can be considered as being a promising successful therapy due to its various underlying mechanisms for improving brain dysfunction by increasing synaptic transmission and neurogenesis.

### Objectives

The main aim of this study is to suggest therapeutic protocol having the potentials for restoring neural cells and resolving neuropathological deposited hallmarks including both positive and negative lesions such as amyloid plaques, tau protein and synaptic loss.

### Materials and Methods

Rats were divided into nine groups: (G1) control; (G2) rats received lipopolysaccharide (LPS) for inducing nongenetically manipulated neuroinflammatory AD type; (G3) LPS induced rats received NaHS; (G4) LPS induced rats received mesenchymal stem cells (MSCs) intracerebrally; (G5) LPS induced rats received MSCs+NaHS; (G6) LPS induced rats received kefir+Ginko Biloba (GB); (G7) LPS induced rats received MSCs+kefir+GB; (G8) LPS induced rats received NaHS+kefir+GB; (G9) LPS induced rats received MSCs+NaHS+kefir+GB.

### Results

AD induction by LPS resulted in downregulation of cystathionine  $\beta$  synthase enzyme (CBS) relative gene expression and glutathione (GSH) brain tissue level accompanied with overexpression in amyloid- $\beta$  protein, mitogen-activated protein kinases (MAPK), tau protein, ACAT (Acyl-CoA: cholesterol Acyl transferase) relative gene expression and malondialdehyde (MDA) brain tissue level in addition to elevated caspase-3 serum activity level.

### Conclusion

The implantation of amyloid relieving therapy that do have a wide clinical impact if initiated at a benign plaques stage before being transferred into irreversible type. The following effects have been observed following the administration of suggested medical protocol composed of MSCs and/or NaHS and/or kefir+GB where a decrease in AD aggregates has been observed by functioning as neuroregenerative. In addition to the advantage of being easily implemented on human research subjects as a result of its safety but with more clinical care obligations.

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