Abstract

Glutathione redox imbalance in brain disorders.

Gu F, Chauhan V, Chauhan A.

NYS Institute for Basic Research in Developmental Disabilities, Staten Island, New York, USA.

PURPOSE OF REVIEW: Glutathione (GSH) is a major endogenous antioxidant. Several studies have implicated GSH redox imbalance in brain disorders. Here, we summarize current evidence on how GSH depletion and GSH-related enzyme deficit are involved in the pathology of brain disorders such as autism, schizophrenia, bipolar disorder, Alzheimer's disease, and Parkinson's disease.

RECENT FINDINGS: Many studies with animal models of various brain disorders and/or with clinical samples from humans with neurodegenerative and neuropsychiatric disorders have demonstrated altered levels of GSH and oxidized glutathione (GSSG), decreased ratio of GSH/GSSG, and/or impaired expressions or activities of GSH-related enzymes in the blood or brain of these individuals. GSH depletion can lead to abnormalities in methylation metabolism and mitochondrial function. A few studies showed that a GSH deficit occurs prior to neuropathological abnormalities in these diseases. The potential therapeutic agents for brain disorders include N-acetylcysteine, liposomes encapsulated with GSH, and whey protein supplement, which can increase the GSH levels in the brain and alleviate oxidative stress-associated damage and may improve the behavior of individuals with brain diseases.

SUMMARY: GSH plays an important role during the onset and progression of neuropsychiatric and neurodegenerative diseases. GSH redox imbalance may be a primary cause of these brain disorders and may be used as a biomarker for diagnosis of these diseases. N-acetylcysteine and other agents that can increase the concentration of GSH in the brain are promising approaches for the treatment of these brain disorders.

PMID: 25405315