Chapter 18
The Impact of Oxidative Stress Biomarkers on Memory in Individuals With Schizophrenia and Antioxidant Use

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ABSTRACT

Schizophrenia (SCZ) is a persistent psychotic condition that profoundly affects cognitive abilities across multiple domains, encompassing attention, working memory (WM), short-term and long-term memory, auditory processing, verbal and visuospatial learning, decision-making, problem-solving, and social-cognitive skills. While the etiology of SCZ is complex, oxidative stress (OS) is implicated in its pathology and represents a major theory concerning its onset. In this chapter, the authors adopt a comprehensive approach by integrating both the oxidative and inflammatory theories to provide a more comprehensive explanation for the observed cognitive decline in SCZ patients. By examining the interplay between these factors, they aim to elucidate the intricate mechanisms underlying cognitive deterioration in SCZ and contribute to a deeper understanding of the condition. They conducted an extensive search of MEDLINE, EMBASE, PsycINFO, Microsoft Academic Search Engine, and Google Scholar to identify articles establishing connections between OS and

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cognitive abilities. Additionally, they explored potential antioxidant treatments for enhancing memory in SCZ patients. To evaluate the efficacy of antioxidants, they incorporated studies involving individuals with SCZ as well as other psychiatric disorders like Alzheimer's disease (AD) to assess the effects of antioxidant consumption on cognitive changes. The role of OS in comprehending the pathology of SCZ is of paramount importance. Moreover, evidence suggests that the utilization of antioxidants can contribute to the amelioration of cognitive symptoms, including improvements in memory function.

INTRODUCTION

Schizophrenia (SCZ) is a psychotic disorder that may lead to severe cognitive impairment. In conjunction with positive and negative symptoms, individuals with SCZ frequently encounter substantial cognitive impairments. Oxidative stress (OS) may partially explain cognitive symptoms associated with SCZ.

This review investigates the cognitive effects of OS focused on potential relevance to SCZ patients and animal models of SCZ. Our primary objective is to enhance our understanding of cognitive change through an investigation of the oxidative and inflammatory theories. These theories provide valuable perspectives on the underlying mechanisms involved in intricate cognitive processes. By delving into these theories, we aim to shed light on the intricate workings of cognitive change such as change in attention and memory.

Oxidative Stress in Schizophrenia

OS, which refers to an imbalance between the generation of reactive oxygen species (ROS) and the body's antioxidant defense mechanisms, has become recognized as a substantial contributor to the underlying mechanisms of several psychiatric disorders, including SCZ (D. M. Wang et al., 2022) and Alzheimer's Disease (AD) (Nunomura et al., 2006). Numerous oxidative OS markers, including nitric oxide, catalase (CAT), and superoxide dismutase, have been extensively documented in previous studies in relation to SCZ (M. Zhang, Zhao, He, & Wan, 2010). Moreover, biomarkers such as superoxide dismutase levels have been linked to extrapyramidal symptoms called tardive dyskinesia (Uludag, Wang, & Zhang, 2022), a common side effect of both first and second generation antipsychotic medications (Uludag, Wang, Mohamoud, Wu, & Zhang, 2023). A previous investigation also established an association between tardive dyskinesia and specific symptoms of SCZ (Uludag et al., 2021). These findings underscore the importance of further exploring the role