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# Effects of Gc-MAF on Alzheimer's Disease Induced by Streptozocin in Rats

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**ABSTRACT**

**Introduction:** Alzheimer's disease (AD) is a neurodegenerative disease that is estimated that this debilitating neurodegenerative disorder currently affects 50 million patients worldwide. The deposition of amyloid-β (Aβ) in the brain parenchyma and the cerebral vasculature, with intraneuronal neurofibrillary tangles and the gradual loss of synapses, are central neuropathological hallmarks of AD. Despite many advances, the existing drugs are not very effective, and there is no definitive cure for Alzheimer's, so efforts to find effective treatments continue. Gc protein-derived macrophage-activating factor, a single-chain polypeptide with 458 amino acids and a molecular mass of approximately 51.2 kDa, is a vitamin D-binding protein that has important physiological functions such as involvement in the transport and storage of vitamin D, destroying extracellular G-actin, increasing activity chemotactic, antiangiogenic and antitumor activity. The effects of this protein have been investigated in breast cancer, autism, and CNS disorders such as multiple sclerosis. Considering the limited studies of Gc-MAF in the nervous system and especially neurodegenerative diseases such as Alzheimer's, the present study investigates the effects of Gc-MAF on brain histopathological changes, the activity of myeloperoxidase enzymes, as well as memory and learning in STZ-induced Alzheimer's disease in rats.

**Methods and Materials:** In this study, 24 male Wistar rats weighing 250 to 300 grams were randomly divided into four groups (each group=6 rats): control, Gc-MAF alone, Alzheimer (ALZ), and ALZ + Gc-MAF. For induction of Alzheimer's disease, streptozocin was injected intracerebroventricularly at a dose of 3 mg/kg in two doses. Gc-MAF was administered at 40 ng/kg through IP injection for 14 days. On the 15th day, the Barnes test was performed to measure rats' memory and learning capacity. Then, animals were euthanized, and the brain tissue sample was removed for histological and enzymatic studies.

**Results:** Our histopathological results after H & E staining showed that in the control group, the neurons are in a regular pattern, and in the Alzheimer's group, there are many pyknotic, wrinkled, and dead neuron cells. Administration of Gc-MAF improved the histopathological changes induced by Alzheimer's disease, and compared to the Alzheimer's group, the number of pyknotic and dead neurons was reduced. The results from the Barnes test showed that the memory and learning in the rats that received Gc_MAF were increased and improved compared to the Alzheimer group. The results of the myeloperoxidase enzyme activity test showed that the administration of Gc_MAF made this group's average closer to the average of the control group.

**Conclusion and Discussion:** Our results showed that treatment with Gc-MAF can benefit Alzheimer's disease by improving brain histopathology and partially by improving memory and learning.

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