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FROM BASIC RESEARCH TO DRUG DEVELOPMENT: THE STORY OF COPAXONE (GLATIRAMER ACETATE) IN THE TREATMENT OF MULTIPLE SCLEROSIS AND POTENTIAL APPLICATIONS FOR ADDITIONAL PATHOLOGIES

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Multiple sclerosis (MS) is currently recognized as complex diseases in which inflammatory autoimmune reactivity in the central nervous system (CNS) results in demyelination, axonal and neuronal pathology. Treatment strategies aim to reduce the detrimental inflammation and induce neuroprotective repair processes. The synthetic copolymer Copaxone (glatiramer acetate, GA), an approved drug for the treatment of MS, is the first and so far the only therapeutic agent to have a copolymer as its active ingredient. Using the animal model of MS -experimental autoimmune encephalomyelitis (EAE), the immunomodulatory mechanism of action of GA was elucidated. It was found that GA treatment induces immunomodulatory shift from the inflammatory towards the anti-inflammatory pathways, such as Th2-cells that cross the blood brain barrier (BBB) and secrete *in situ* anti-inflammatory cytokines, as well as T-regulatory cells (Tregs) that suppress the disease. Furthermore, recent studies revealed neuroprotective and repair consequences of GA treatment in the CNS. These include elevation in neurotrophic factors expressions, remyelination and neurogenesis. Based on its immunomodulatory mode of action, additional potential applications of GA were investigated, such as prevention of immune rejection, improvement of stem cells engraftment and amelioration of inflammatory bowel diseases (IBD).

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