Effects of C_{60} derivatives on in vitro amyloidogenesis of Aβ (1-42) peptide of the brain

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Alzheimer's disease (AD) is an important problem of modern psychiatry and neurology. One of the hallmarks of this disease is the accumulation of aggregates of amyloid β-peptide (Aβ-peptide) in the brain, leading to neurodegeneration. The main strategy in the treatment of AD is to prevent the formation and destroy aggregates of the Aβ-peptide. Owing to the antioxidant and neuroprotective properties, fullerenes can be considered as potential drugs for the treatment of neurodegenerative diseases. A new stage in the study of antiamyloid properties of fullerenes began thanks to the synthesis of a series their water-soluble derivatives.

Using electron microscopy, we showed that these fullerene C_{60} derivatives (the sodium salt of polycarboxylic derivative of C_{60}, fullerenol, the complexes of fullerene with polyvinylpyrrolidone, C_{60}-NO_2-proline, C_{60}-$(NO_2)_2$-proline, and C_{60}-NO_2-proline-NO_2) destroyed amyloid fibrils of Aβ(1-42) peptide of the brain and also prevented their formation. These data were confirmed by the fluorescence analysis with using the dye thioflavin T. We also investigated the toxicity of the fullerene C_{60} derivatives on the cell culture Hep-2. The sodium salt of the polycarboxylic derivative of C_{60} showed toxicity in the concentration range 2-0,16 mg/ml. For the other fullerene C_{60} derivatives, no cytotoxicity in the same range of concentrations was found.

The data showed that all agents studied, except the sodium polycarboxylic derivative of C_{60}, corresponded two requirements to the development and application of drugs for treatment AD, namely low toxicity and high antiamyloid potential.

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