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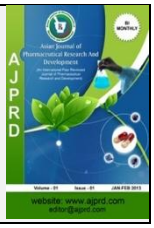

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Review Article

Buckyballs In The Treatment of Alzheimer's Disease

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A B S T R A C T

Buckyball is the first nanoparticle discovered in the year 1985 by the trio scientists Richard Smalley, Harry Kroto, and Robert Curl. Buckyballs also called as fullerene. Fullerene is a powerful antioxidant that reacts with free radicals that cause cell death. Fullerenes and their derivatives have the Antiviral activity to treat the HIV infection. Two of the several brain changes that occur in Alzheimer's disease are β-amyloid plaques and tau tangles present outside and inside the neurons respectively. The changes in brain, cerebrospinal fluid and blood indicate the earliest sign of Alzheimer's disease (biomarkers) even in the absence of memory loss. Ukrainian scientists discovered Carbon 60 or C-60 or Fullerene or Buckyballs. Through the microinjection C60HyFn (0.46nmol/µl) is injected into the hippocampus. It reduces the deposition of β-amyloid in the pyramidal neurons of hippocampal CA 1 neuron.

KEYWORDS: Fullerene, Alzheimer's disease, Stages of Alzheimer's disease, Drinking Ukrainian Buckyballs

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1. INTRODUCTION

Buckyballs also called as Fullerene (C60). Buckyball is a common name for the molecule called Buckminsterfullerene It is the first nanoparticle discovered in the year 1985 by the three scientists who work at the Rice University named Richard Smalley, Harry Kroto and Robert Curl[1]. These three scientists awarded a Nobel Prize in chemistry in 1996. Fullerenes exist in different shapes like tubes, spheres, cubes, etc. Fullerenes are made up of only one carbon and hallow space inside the structure. Based on the structural variations, various types of fullerenes were discovered. They are the buckyball cluster, nanotubes, mega tubes, polymer, nano-anion, buckminsterfullerene. Fullerene is synthesized by using the arc discharge method and analyzed by using HPLC. When administered orally, they are not absorbed because of poor water solubility; while given through I.V injection they get rapidly distributed into various tissues[2]. Poor water solubility can be overcome by methods like hydroxylation, amination, Prato reaction, bingel reaction. Hydroxylation is a very popular water-solubilization method, despite its lack of specificity[3]. All these interesting properties will bring a bright future for fullerene as medicinal agents.

Fullerene is a powerful antioxidant that reacts with free radicals that cause cell death. Most pharmaceutical companies are using fullerene for controlling the neurological damage of diseases like Alzheimer's disease and Lou Gehrig's disease[4]. Fullerenes and their derivatives

have the antiviral activity to treat the HIV infection. Dendrofullerene has anti-protease activity and the trans-2-isomer is a strong inhibitor of HIV-1 replication[5]. Mast cells in the body are the main cause of allergic reactions. These fullerene derivatives control these reactions by acting on mast cells in the body. Fullerene is being investigated further in a new way to control the mast cells from causing Asthma and Arthritis[6].

2. HISTORY OF DISCOVERY OF FULLERENE

Carbon atoms in a single hexagonal sheet of graphite are completely naked above and below. In the periodic table, we are having one atom which satisfies the bonding of the nearest neighbor's in two dimensions. Carbon makes chemically stable two-dimensional, one-atom-thick membrane in 3D[7]. Vaporization of carbon species is a technique used to produce and detect this molecule from the surface of a solid disk of graphite using a focused pulsed laser into a high-density helium flow. This resulting forms the carbon cluster.

C60 form is called a truncated icosahedron, which looks like a soccer ball. It consists of 12 pentagons and 20 hexagons. These 3 scientists conducted the study, with 3 graduate students. Smalley has started the experiment by guiding the local carbon in the apparatus. This is before the Kroto's arrival, after 4 days Kroto has arrived. While Kroto directs the experiment the students ran the machine [8].

Two significant results arise in ten days of the experiment. Smalley put the first one as "Kroto's long carbon snakes", the second one is "a previously unknown molecule of pure carbon." By using the helium as the carrier gas, the students noticed in Kroto's words "something quite remarkable takes place" an odd peak in the mass spectroscopy of the molecule formed into vapor. The peak occurred at sixty carbon atom and seventy carbon atom. C60 and C70 are very strong. Most experiments are focused on C60.

3. ALZHEIMER'S DISEASE

Alzheimer's disease is a type of brain disease. This disease cannot be noticeable quickly. Only after a few years the symptoms arises such as memory loss, language problem. The neurons in the brain get damaged which are involved in the thinking, memory, and learning. As time passes the symptoms get increased and the person is unable to do his daily activities. In the final stage of the disease, the person requires care. At this point, the individual is said to have dementia [9].

Two of the several brain changes that occur in Alzheimer's disease are β-amyloid present outside the neuron may contribute to cell death by interfering with neuron-to-neuron at the synapse, while tau tangles present inside the neuron does not allow any nutrients or other molecules inside the neuron[10]. The drugs used to treat Alzheimer's disease are Donepezil, Memantine, and Rivastigmine, given by oral and transdermal routes. There will be some common side effects like nausea, vomiting, headache, fatigue, dizziness, etc.

Stages of Alzheimer's disease

There are three stages. Preclinical stage, Mild Cognitive Impairment (MCI), Dementia.

a. Preclinical stage

This stage is still under investigation. The changes in brain, cerebrospinal fluid and blood indicate the earliest sign of Alzheimer's disease (biomarkers) even in the absence of memory loss. Most research is required to identify the symptoms before it gets widespread in hospitals[11].

b. Mild Cognitive Impairment due to Alzheimer's disease

People with MCI have brain changes i.e. elevated levels of β-amyloid. Non- modifiable risk factors and modified risk factors are identified for MCI. The non-modifiable risk factors include sex, age, and genetic factors, and modifiable risk factors such as level of education, vascular risk factors and imagining biomarkers. Only parents and friends can recognize the symptoms. A recent analysis found that after 2 years people age 60 will develop dementia[12.]

c. Dementia due to Alzheimer's disease

Dementia can be noticeable by memory, thinking and behavioral symptoms identified in daily life. The person with dementia experiences multiple symptoms changing from period to period. These symptoms changes from mild to moderate to severe from person to person [13].

Diagnosis of Alzheimer's disease

Doctors use several methods to determine whether a person is having a memory problem has "possible Alzheimer's dementia" or "probable Alzheimer's dementia". The doctor may ask the person or family or friends about the past reports. Overall health, diet, daily activities, changes in behavior and personality. Doctors conduct tests like Blood or Urine tests, CT or MRI scans, memory tests, genetic tests. The doctor prescribes the medicine to suppress the disease to some extent. It is not completely cured. For this reason, to treat Alzheimer's disease, Ukrainian scientists discovered C60 water-soluble treatment.

4. DRINKING UKRAINIAN BUCKYBALLS

The invention of drugs for the prevention and treatment of Alzheimer's disease is the most important challenge for researchers in the 21st century. Synthesis of water-soluble fullerene and carbon nanotubes for drug development is growing rapidly in the U.S.A., Asia, and Europe.

Ukrainian scientists discovered Carbon 60 or C-60 or Fullerene or Buckyballs. They are water-soluble, made progress on Alzheimer's treating it with a Fullerene water solution. This was approved as the Dietary Supplement by the Ukrainian Ministry of Health in 2010. They started producing drinking water in Ukraine with 0.0002mg/100ml of fullerenes[14].

The experimental model of Alzheimer's disease is conducted under the direction of Igor Jakovljevic Podolsky. In 2007, he first discovered the neuroprotective properties of water molecules. He published his work in 2012 January revealed the influence of fullerene water causes the neurodegenerative process of memory loss.

For the first time by using transmission electron microscopy in vitro they found that water-soluble fullerene prevents and destroys the β-amyloid. By this, they concluded that the C60 in vitro anti-aggregation has a strong effect on the β-amyloid peptides. Through the microinjection C60HyFn (0.46nmol/µl) is injected into the hippocampus. It reduces the deposition of β-amyloid in the pyramidal neurons of hippocampal CA1 neurons. Due to the introduction of hippocampus Aβ 1-42 (1.6 nmol/µl), microinjection C60HyFn (0.46nmol/µl) prevents the violation of spatial memory.

The formation of amyloid is prevented by fullerene and destroyed treads of amyloid, which led to a reduction of neurodegenerative changes in the brain of rats and restores memory. Water has fullerene antiamiloidnymi properties. Into the nasal passages, the patients will spray water fullerene, and drink a certain pattern[15].

5. CONCLUSION

Alzheimer's disease is a brain disease, which is occurring 15 to 20% of individuals after the age of 60. The symptoms are memory loss, unable to think and learn. Doctors use several methods to identify and diagnosis the disease. But it cannot be completely cured. For this reason the Ukrainian scientist discovered the Fullerene Water Solution and is injected into the hippocampus to reduce the β-amyloid peptide. We can assume that in the first half of the 21st century will be based on fullerene development for effective prevention and treatment of Alzheimer's disease.

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