

## Lithium - The Combatant against Ageing.



Ageing is defined as combination of various biological, mental and social changes which drastically affects the life of a person. The biological basis behind this process is still not clear. According to various researches, two factors are proposed which influence the process of ageing. Firstly, the gene expression which regulates the conservation, mending and defence response of a cell. Second factor includes the environmental and dietary factors which induces cumulative damages at various levels.

The nematode, *C. elegans* is considered as model organism for studying ageing due to its short life span of 2-3 weeks. Three main metabolic pathways are studied which influence the rate of ageing: 1) Restriction of calories, which affect the FOXO3/Sirtuin pathway, 2) IGF-1-like signalling pathway, 3) Activity of the electron transport chain in mitochondria.

Lithium is an element used as a mood stabilizer, to treat the patients suffering from bipolar disorder. Recent studies suggest that, it pave the way, as an anti-aging drug. The ideal model for experimental studies on human genetics is the fruit fly or *Drosophila melanogaster*, since the insect shares 75% of the similar genes as in humans. The studies revealed that low doses of lithium in early adult life increased the life expectancy by 15-18%, regardless of the insects' genetic makeup.

The mechanism of the element lithium to increase the life span was to block the activity of a molecule called glycogen synthase kinase-3 (GSK-3). Besides this, it also promotes the activity of a molecule called nuclear factor-like 2 (NRF-2), which protects the cells against oxidative stress. The oxidative stress is considered to play a vital role in the ageing process.

As we know that "energy is the currency of the body," then phosphate groups are the dollar bills. The group of enzymes called kinase galvanize other chemicals by adding a phosphate group to them. The GSK-3s are considered as kinase amplifiers. They activate the substrate by addition of phosphate groups, thus increasing the potential of a cell.

Also, the senile diseases like Alzheimer's and Parkinson's are associated with GSK-3 preventing the progress of disease. GSK-3 $\beta$  is concerned with

the creation of amyloid plaques in the brain, which is one of the aetiology for the cause of Alzheimer's disease. This was the motivation for trials of lithium against AD, which have shown early signs of success. On the basis of these findings, the researchers advocate that targeting GSK-3 could be a promising war against ageing.

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