Silk protein, sericin as a cognitive enhancer in Alzheimer’s disease

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Introduction: Alzheimer’s disease (AD) is a well-known neurodegenerative disorder characterized by formation of amyloid plaques and neurofibrillary tangles and loss of neurons is the most common type of dementia, also called as Senile Dementia of Alzheimer Type (SDAT) which frequently occurs in elder people. At present, AChE inhibitors, Anti-amyloid vaccine and Vitamin E are recommended to treat AD but long-term exposure to these drugs causes side effects. Since treatment of AD with a single drug is not a realistic option due to its complicated nature, combination therapy of AChE inhibitor along with Antioxidants is felt necessary to treat Alzheimer’s disease effectively. Therefore, it is worthwhile to identify new and selective AChE inhibitors with an Antioxidant nature from natural source. Hence, in the present investigation, the natural bioproduct of silk viz. the Silk Protein, Sericin, having several beneficial qualities viz., Anti-bacterial, Antioxidant, Wound healing, Anti-tumor activity etc. has been chosen to evaluate its potential as “Cognitive enhancer”, AD-induced rat model by conducting experiments on Morphometric changes along with Learning and Memory efficiency; on Cholinergic system, Antioxidant system and Histological aspects in selected regions of control and experimental rat brain.

Materials and methods: In the present study, male albino rat, Rattus norvegicus of three months old, weighing 160 ± 20g, obtained from Sri Venkateswara Enterprises, Bangalore were maintained in our laboratory according to the instructions of Behringer (1973) and as per the approval of the Institutional Animal Ethical Committee.

Extraction of sericin: Raw Silk cocoons, purchased from local market of Chittoor were boiled in water for 1 hour and the resulting solution was cooled and filtered. After repeating this process for 3 times, the filtrate was concentrated by using Hahnvapor Rotary Evaporator (HS-2005V). 95% ethanol was added to the extract to precipitate Sericin, collected by filtration, dried at 40oC, powdered and finally preserved in a clean container for further use. 8% SDS PAGE was done to confirm the presence of Sericin, based on the molecular weight.

Statistical analysis: Standard methods such as Anova and Dunnett’s post-hoc were applied.

Results: Morphometric and Behavioural Aspects - The results on the Morphometric Aspects revealed that the control rats have registered a gradual gain in their body weights from 15th day to 90th day. While the experimental rats treated with Sericin, the rats attained more body weights (16.67%) than the control, AD-induced rats lost their body weights (54.00%) and became weak. However, the AD-induced rats simultaneously treated with Sericin gained their body weights and reached to almost the control levels. Similarly, from the Behavioural Aspects, it was evident that while AD-induced rats showed a significant increase in the escape latency time, AD-induced rats treated with Sericin showed significant recovery tendency from 30th day (3.57%) to 90th day (76.13%) against AD-induced rats.

Cholinergic system and antioxidant systems: The results in the present study on the cholinergic system revealed that while ACh content was significantly elevated, AChE level was inhibited in all selected brain regions of rats treated with Sericin alone when compared with AD-induced rats and normalcy was restored on treatment with Sericin thus demonstrating the Anti-Cholinesterase properties of Sericin. Similar reversal effects of Sericin on the antioxidant system consisting of Superoxide Dismutase, Catalase and Glutathione Reductase were noticed which reiterated the antioxidant properties of Sericin. From all these findings, it was finally concluded that, Sericin can be use as a potential cognitive enhancer in general and Alzheimer’s Disease in particular.

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