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COGNITION ENHANCERS-A NOVEL APPROACH USING HERBAL DRUGS-A REVIEW

Shruti Pillai 1, Lakshmi Thangavelu *2

Affiliation:

1 BDS Student, Saveetha Dental College & Hospitals, Chennai.

2 Reader, Department of Pharmacology, Saveetha Dental College & Hospitals, Chennai.

ABSTRACT

Extensive research in the recent times has shown that plant derived products and traditional herbs possess cognition enhancing properties. Herbal medicines have a plenty of plants and herbs with various medicinal and pharmacological importance and hence there is always a search for an herb with new bioactive molecules. Some of the most important nootropic herbs showing promising activity in cognition enhancement like *Emblica officinalis*, *Ginkgo biloba*, *Centella asiatica*, *Curcuma longa*, *Azhadirachta indica* as well as a polyherbal preparation called ABANA have been discussed briefly.

Keywords: Cognition enhancer, nootropic herbs, bioactive molecules

INTRODUCTION

Cognition can be defined as the ability of an individual to judge, think, learn, perceive, remember and understand things that lead to the awareness of the world around us.

Cognition enhancement may be defined as the amplification or extension of core

capacities of the mind through improvement or augmentation of internal and external information processing systems.¹

Nootropics also called memory enhancers, neuro enhancers or cognition enhancers, is the fusion of two words: nous meaning-

mind/understanding and tropos meaning- to turn towards. This term is given to the variety of substances that improve mental functions like memory, intelligence, alertness, attention, reasoning etc.

Cognition enhancers either improve the oxygen supply to the brain or stimulate nerve growth, thus supplying high levels of neurotransmitters to the brain.

While cognitive enhancers are still viewed as science fiction by most of the general public, there is extensive research from neuroscience and clinical trials that backs up their effectiveness.

This review examines the proven cognition enhancing effects of certain herbal drugs.

COGNITIVE DYSFUNCTION

Cognitive dysfunction (also known as brain fog) is the loss of intellectual functions such as thinking, remembering, and reasoning of sufficient severity to interfere with daily functioning. Patients with cognitive dysfunction have trouble with verbal recall, basic arithmetic, and concentration.³ Ageing plays an important role in the development of cognitive dysfunction such as age associated memory impairment (AAMI) by causing impairment in Long Term Potentiation (LTP) induction and synaptic plasticity.²

MECHANISM OF ACTION

The basic mechanism behind the memory formation is SYNAPTIC PLASTICITY-changes in the strength and sizes of synapses that increase or decrease efficiency of transmission.¹ Memories are stored in network of brain cells, by interconnecting neuronal dendrites. **LONG TERM POTENTIATION** is an important aspect of synaptic plasticity.

HERBS FOR COGNITIVE ENHANCEMENT

Memory herbs increase the level of neurotransmitters particularly acetyl choline, and improve blood flow to brain, thus increasing its oxygen and nutrient supply. These herbals are well tolerated, with comparatively lesser side-effects and abundantly available.

HERBAL COGNITIVE ENHANCERS

EMBLICA OFFICINALIS (common name- Amla)

Active ingredient: Phyllemblin

Mani Vasudevan conducted a clinical study on the effects of anwala churna on brain cholinesterase activity. It was administered orally in 3 doses (50, 100, 200 mg/kg) for 15 days to different groups of young and aged mice. Elevated plus maze and passive avoidance apparatus showed the dose

dependent improvement in memory of mice. Thus it can be useful in the management and treatment of Alzheimer's disease.⁴

Abo Golechha M. *et al.* proved the beneficial effect of the hydro alcoholic extract of the fruits of *Emblica officinalis* (EO) on memory impairment in Swiss albino mice which were administered scopolamine to induce amnesia. Then the *Emblica officinalis* extract was administered intraperitoneally (150, 300, 450 and 600 mg/kg) for 7 consecutive days to different groups of mice. The mice were sacrificed on the 8th day following assessment of memory. The result was the reversal of Scopolamine induced amnesia. Thus it has memory enhancing, antioxidant and anti-cholinesterase activity.⁵

GINKGO BILOBA

(Common name-Ginkgo/Japanese silver apricot/Kew tree)

Active ingredient-flavone glycosides

Paul R. Soloman *et al* conducted a six week randomized, double blind, placebo controlled, parallel group trial for effects of *Ginkgo biloba* on memory. Standardized neurophysiological tests of verbal and non-verbal learning, memory, attention; self-report questionnaires for memory were

done. But the results of this 6 week study did not prove the effectiveness of ginkgo in memory enhancement⁶

But according to the investigation carried out by Mix J A and Crew W D Jr., participants who received 180 mg of *Ginkgo biloba* extract EGb 761 daily for 6 weeks exhibited significant improvement on task assessing and speed of processing abilities. This test was also a double blind, fixed dose, placebo controlled, parallel group experimental design.⁷

An article described a 30 day randomized, double blind, placebo-controlled clinical trial in which 61 people were administered *Ginkgo biloba* extract and placebo for 14 days in random order. This analysis shows significant improvement in speed of information processing working memory and executive processing.⁸

Another study shows that administration of *Ginkgo biloba* and *Panax ginseng* combination to healthy people can increase their cognitive function especially attention.

CENTELLA ASIATICA

Active constituents- saponin (medacoside, asiaticoside, medacassoside), asiatic acid and a new triterpenic acid

Stimulatory- nervine tonic, rejuvenant, tranquilizer and intelligence promoting activity.

Anil Kumar investigated the neuroprotective effects of *Centella asiatica* against intracerebroventricular Colchicine induced cognitive impairment and oxidative damage.

In this study, Colchicine (15g/15 l) was administered in lateral ventricle of male wistar rats and Morris water maze and plus-maze performance tests were conducted to assess memory. Colchicine caused the impairment of memory and its damage. It was observed that administration of 150 and 300 mg/kg, p.o of *Centella asiatica* extract for 25 days beginning 4 days prior to colchicine administration lowered memory impairment thus proving the neuroprotective effect of *Centella asiatica*.⁹

Also it has been proved that the leaf extract of *Centella asiatica* can result in neuronal dendritic arborization.¹⁰

CURCUMA LONGA (common name- Curcumin)

Active ingredient-Curcuminoids

Suzhen Dong *et al* investigated the efficacy of *Curcuma longum* in neuroprotective

Activity Assessment of behavioral performance and hippocampal cell proliferation In aged rats after 6-12 weeks of curcumin fortified diets, was done and the result was the enhancement of spatial and non-spatial memory, neural development and neurotransmission.¹¹

T. Peeyush kumar *et al* evaluated the effect of curcumin in modulating the altered dopaminergic receptors, CREB and phospholipase C in cerebral cortex and of Cerebellum STZ induced diabetic male wistar rats. Radioreceptor assays and gene Expression shows reduction in diabetes induced alteration of dopamine, transcription factor CREB and phospholipase C. thus it helps in improving the cognitive functions associated with cerebral and cerebellar regions of the brain.¹²

AZADIRACHTA INDICA (common name- Neem)

Active Ingredient :Nimbidin

M. Raghavendra *et al*. studied the role of aqueous extract of *Azadirachta indica* leaves in experimental model of Alzheimer's disease in rats.

Tests like open field test, elevated plus-maze behavior test, Porsolt's Swim test, Morris water maze test. Conditioned avoidance behavior was carried out.

Morris water maze test showed memory enhancement by *Azadirachta indica* by reversing the neurological changes.¹³

ABANA

ABANA is an **Indian ayurvedic polyherbal drug**

Milind Parle did an extensive research on the effects of Abana on memory and brain cholinesterase activity in mice.

Abana contains *Terminalia arjuna*, *Withania somnifera*, *Tinospora cordifolia*, *Nepeta hindostana*, *Phyllanthus emblica*, *Terminalia chebula*, *Dashamoola*, *Eclipta alba*, *Glycyrrhiza glabra*, *Centella asiatica*, *Asparagus racemosus*, *Piper longum*, *Carcum copticum*, *Convolvulus pluricaulis*, *Santalum album*, *Elettaria cardamomum*, *Cinnamomum cassia*, *Boerhaavia diffusa*, *Ocimum sanctum*, *Cyperus rotundus*, *Nardostachys jatamansi*, *Acorus calamus*, *Emblica ribes*, *Zingiber officinale*, *Syzygium aromaticum*, *Celestrus paniculatus*, *Foeniculum vulgare*, *Rosa damascena*, *Crocus sativus*, *Asphaltum*, Jaharmohra, Abhrak bhasma, Akik pishti, Yakut pishti, *Corallium rubrum* and serpent stone.

In an investigation, Swiss albino mice were divided into group of six and Abana (50, 100, 200 mg/kg) was administered orally for 15 days to young and aged mice. 90

minutes after the last dose administration on the 15th day, mice were trained using elevated plus maze and passive avoidance apparatus.

Memory was recorded after 24 hours on the 16th day. It was observed that the acetyl choline levels in brain increased through a decrease in cholinesterase activity, thus improving the memory in young as well as aged mice. Thus this formulation has a potential for the management of Alzheimer's disease.¹⁴

CONCLUSION

Herbal drugs can be preferred as the first choice for cognitive disorder as they are relatively safe and better tolerate. but many herbal medicines are sold over-the-counter as dietary supplements. FDA should have a control over the sale of herbal drugs too, as some of them can also result in adverse reactions. Thus, both patients and health care providers must educate themselves on the contraindications and adverse effects of herbal medicines, as well as pharmaceutical medications, to avoid improper use. Thus the search for herbal drugs for the satisfactory cure and effective management of cognitive disorders with minimal side-effects is still on.

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