



Review Article

Memory Enhancing Medicine: Do they really work?

Vishal Jadhav*, Priyadarshani Ladhav, Rupali Rathod

Department of pharmaceuticals Sumantai Institute of Pharmacy, Bambrud kh. Pachora, Dist. Jalgaon, Maharashtra, India.

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ABSTRACT

Dementia is a syndrome usually occurs in Alzheimers (AD) disease and vascular dementia (VD) due to disease in brain drugs considers cognitive enhancers includes dietary product and supplimentracetams, stimulant dopaminergics, cholinergics, GABA blockers, glutamate activator and harmones etc. in recent years research on medicinal plants have been studied for nootropic activity memory gives an individual the capability to learn and adpt from previous experience and the power of recalling the previous learn facts, skill and habits. Some the herbs that help in enhancing on memory are bacopa, monniera, eithania somnifera rodiola rosea, ginkgo biloba, not all of them are healthy or safe to use but can still have mental benefits. The main aim of this article is to give up the data on memory enhancing drugs and plants with nootropic property their role in biochemical activity and enhancing memory discussed.


INTRODUCTION

Memory is the ability of an individual to record sensory stimuli events information. This ability is shared to various extents, depending on the structural complexity of the nervous system memory is the central component of what we intend when we refer to cognitive function together with the other pillars of cognition constituted of problem-solving ability, creative imagination, intuition and attention. A large number of studies have shown that the cholinergic

system plays an important role in learning and memory. More ever a loss of cholinergic neurons and reduce choline-acetyltransferase activity in the cerebral cortex and hippocampus are consistent with finding in Alzheimer disease recent news reports that an electrical brain stimulation technique improve memory draws attention to the extraordinary progress that neuroscience has made in understanding the structure and organization of memory from a medical point of view drugs able to improve cognitive functions sometime referred

*Corresponding Author: Vishal Jadhav

Address: Department of pharmaceuticals Sumantai Institute of Pharmacy, Bambrud kh. Pachora, Dist. Jalgaon, Maharashtra, India.

Email : rvj01062511@gmail.com

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to as nootropic or smart drug the cognition enhancer may be used to combat health condition that interfere with the process learning of a healthy emotional state^[1]

What Are Nootropics

Nootropics, often referred to as "smart drugs," comprise a diverse range of substances. The term "nootropic" was introduced by Cornelius E. Giurgea in 1972/1973 to characterize compounds that primarily enhance cognitive functions, such as memory and learning, particularly in cases where these functions are compromised. Essentially, they impact the metabolic processes of neurons within the central nervous system (CNS). The word is derived from two Greek terms: *nöös*, meaning thought, and *tropein*, meaning to direct. There is no standardized method for classifying these substances. Some researchers differentiate between traditional nootropics and those that boost brain metabolism, while others merge these categories or prefer the term cognitive enhancer over nootropic.^[24]

Mechanisms of Action

Nootropics do not function directly by releasing neurotransmitters or as ligands for receptors, but instead enhance the availability of glucose and oxygen in the brain, exhibit antihypoxic properties, and safeguard brain tissue from neurotoxicity. They also have a beneficial impact on the synthesis of neuronal proteins and nucleic acids and promote phospholipid metabolism in neurohormonal membranes. Certain nootropics have been shown to influence the removal of oxygen free radicals, exhibit an anti-aggregation impact, and enhance erythrocyte flexibility. This enhances the rheological characteristics of the blood and promotes blood circulation to the brain. These compounds are active in metabolism, yet most nootropics do not exhibit immediate effects from a single dose, necessitating prolonged use to yield results. They must be capable of crossing the blood–brain barrier to enhance brain

metabolism, and prolonged use is essential for attaining lasting changes.^[24]

Indications:-

Nootropics are utilized in acute or subacute situations to address issues related to memory, consciousness, and learning difficulties. They are suggested for early brain damage, which presents as memory loss, intellectual impairment, and alterations in consciousness. This state is known as acute psychoorganic syndrome (POS). It is generally reversible, yet in certain instances, it may advance to dementia. Acute POS may result from brain injury, infection, stroke, or substance intoxication (such as alcohol, drugs with central anticholinergic properties, or carbon monoxide). Delirium tremens also fall under the POS group. Additional signs may involve long-term conditions affecting cognitive abilities like intellectual disability or memory loss. Nootropics are frequently administered in such instances, yet their effectiveness, particularly in cases of advanced dementia, is debatable. They appear to be more successful in individuals with mild cognitive issues or what is referred to as benign senescent forgetting, where brain function is merely impaired without the onset of dementia. Nootropics are occasionally utilized for attention and memory issues caused by fatigue and tiredness. They are likewise utilized by children with minimal brain dysfunction syndrome and individuals with encephalopathy, and their impact on myalgic encephalomyelitis (chronic fatigue syndrome) has also been evaluated. Nootropics are used as cognitive enhancers for individuals diagnosed with Alzheimer's disease, schizophrenia, hyperkinetic disorder, or senile dementia.^[24]

Nootropic Treatment:-

Nootropics are generally quite well accepted. Their effectiveness relies on the dose size, and in reality, giving too small a dose is a frequent error. Treatment must persist for a minimum of 2–3



weeks after the impairment of consciousness has resolved. A clinical tool has been created to evaluate the extent and length of diminished awareness. Three aspects of behavior, including motor response, verbal performance, and eye-opening, are assessed separately. These are documented and regularly assessed based on the chart. Adverse effects of nootropics are infrequent and seldom severe. Besides individual intolerance, there may sometimes be an upsurge in unwanted activity, a sleep disturbance, or a rise in libido. Nootropics are not recommended for those with hypersensitivity, during pregnancy, or while nursing. ^[24]

Memory enhancement is possible...?

The brains incredible ability to reshape itself holds true when it comes to learning and memory. You can harness the natural power of neuroplasticity to increase your cognitive abilities enhance your ability to learn new information and improve your memory at any age. Eat a brain boosting diet you probably already know that a diet based on fruits, vegetables, grain such diet can also improve memory research shown that omega-3 fatty acid health, meat, butter, cheese, cream, milk increase your risk of dementia and impair concentration and memory. The brain boosting diet is powerful antioxidants that protect against free radical that can enhance memory and mental alertness and slow brain aging. ^{3,4, 11}



Neurobiology of Memory :-

The formation of long-term memories a function necessary for an adaptive survival memories exist in different form and rely on distinct neural system on the basis of their duration memories can be classified into short and long term while short memory is the ability to hold and recall information for a short period at the time and long term memories store information for long lasting periods. Memories can also be classified occurring to their behavioral manifestation. Which reflects the use of distinct underlying

network. Major dysfunction is between explicit (eg. declarative) and implicit (eg. Procedural memories.) Researches on the biochemical basis of LTP in the hippocampus have allow to obtain important regarding the molecular process sub serving memory through synaptic plasticity further work is needed to elucidate the biology of memory formation in pathological condition and early development phases.

Table No. 1 The 14 best Nootropic and smart drugs ^{10,15,24}

Sr. No.	Drug Name	Quantity	Working
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1	Caffeine	40-300 mg	Caffeine is increase your alertness, improve attention.
2	L-Theanine	50 mg	It increase feeling of calmness increase creativity.
3	Creatine	5 mg	Creatine is amino acid increase short term method.
4	Bacopa monnieri	300-600 mg for several month	It is improve memory information processing.
5	Rhodiola rosea	Tacking small daily	It reduce associated mental fatigue.
	Panax ginseng	200-400 mg	It improve the mental function.
	Ginkgo Biloba	120-240 mg	It improve memory beneficial in stressful situation.
6	Nicotine	Due to risk of addiction nicotine not recommended	It boosts alertness and attention.
7	Noopept	10-30 mg	It improve memory by increasing BDNF.
8	Piracetam	100-500 mg	It improve memory in adult it give effect lacking.
9	Phenotropil	100 mg	It is memory-enhancing benefits in healthy adult.
10	Modafinil (Provigil)	200 mg	It reduce drowsiness and improve brain function
11	Amphetamines (Adderall)	Only taken as prescribe	It improve the brain function with ADHD.
12	Methylphenidate (Ritalin)	It taken as prescribed it is powerful stimulation	It enhance memory and attention.

Biochemical Action Of Memory Enhancing Herbs

Memory Enhancing Effect of Emblica officinalis :-

Amla churna produced a dose-dependent improvement in memory of young and aged rat. Amla churna may prove to be a useful remedy for the management of alzheimers disease due to its multifarious beneficial effect such as memory improvement and reversal of memory deficits, it reversed the dementia induced by scopolamine and diazepam.^{1, 2, 13, 20}

Ashwagandha

- Total alkaloid extract (Ashwagandha, Ashwagandholine) at within somnifera roots has been studied for its effect on central nervous system.

- The effect of sitoindosides-VII-x and within isolated from aqueous methanol extract of roots.
- Study on brain cholinergic, glutamatergic and GABA receptors in male wistar rat.
- M1-muscarnic - cholenergic receptors binding in lateral and medial septum as well as in frontal cortices.
- M2- Muscarinic receptors binding sites were increased in a number of cortical region including cigulate frontal, piriform parital.
- The compound slightly enhanced acetylcholinesterase (AChE) activity in the lateral septum.^{2, 24, 9}

Ginkgo Biloba (Ginkgoaceae)

- Ginkgo Biloba (Ginkgoaceae) is also known as maidan hair tree, kew tree, ginkyo, yinsing.



2. The ginkgo shows the memory enhancing action by increasing the supply of oxygen.
3. The ginkgo biloba increase the or improve the memory in stressful situation.
4. In vitro study indicates that ginkgo extract had an anti amyloid aggregation effect.
5. Ginkgo biloba can improve behavioral adaptation despite adverse environmental events shown in rat through reward versus stress testing to obtain drinking water.
6. The main medicinal constituents are found in the gink go leaf these includes flavonides.
7. G-biloba extract has also been reported to increase transthyretin RNA levels in mouse hippocampus this mechanism may also protect against amyloid deposition in brain with improvement in sentence repetition, logical memory.^{7, 2, 13, 6}



Fig no. 2 Marketed product of Ginkgo Biloba Zingiber Officinali (Zingiberaceae)

1. The rhizomes of zingiber officinali exhibits a wide range of pharmacological properties including antilipidemia, aptiomatic, anti-inflammation.
2. According to Arabian folklore, singer has been claim to improve memory.
3. Zingiber officinale significantly improve learning and memory. Its major active constituentare gingerian, gingerolzingerone.
4. Ginger have congntive enhancing effect and neuroprotective effect at ginger is partly due to its antioxidant activity.^{23, 22}
- permeability of the blood brain barrier to precursor at DA and 5-HT.
2. Effect of Rhodiola rosea if stimulate the neurotransmitters such as epinepherin, serotonin and nicotinic cholinergic effect.²
3. The cognitive Functions of the Cerebral cortex and the attention memory and learning function of the prefrontal and frontal cortex were found to be enhanced .
4. The agents (memory retrieval) that block Ach suppress the activity of these ascending pathway and interfere with memory.

Rhodiola Rosea

1. Rhodiola rosea it enhances the effect of these neurotransmitter on the brain by increasing the

Table No. 2 Benefits and Side effects of memory enhancing medicine ^{19, 24}

Benefits	Side effects
Improve alertness & attention	Allergic skin reaction

Reduce associated mental fatigue	Diarrhoea
Reduce drowsiness and improve brain function	Dizziness
Enhance memory	Headache
Increase short term memory	Nausea
Beneficial in stressful situation	Muscle Weakness

CONCLUSION

The review on several memory enhancing agents acting on dementia. The human brain is one of the most complex organ ever made. One of the most interesting aspects that the brain is its+ power to retain memory in majority of the studies the underlying mechanism was found to be anti acetylcholinestrase activity and free radical scavenging activity with the facilitation of the cholinergic transmission. Research were done on improvement of memory and finding that herb were as memory booster. The collection of herbal plant showing the nootropic activity this article has discussed about how medicine used as memory booster and their biochemical action.

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