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REVIEW ARTICLE

ENRICHMENT OF MEMORY BY USING HERBAL FORMULATIONS

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ABSTRACT:

Memory is the ability of an organism to store, retain, and subsequently recall information. Memory enhancers are the compounds which improve or enhance the memory. The compounds, enhance memory are called nootropics. Some physiological conditions such as stress, anxiety affect the memory. Memory loss may be age related and due to some disease condition like Alzheimer's disease, Parkinson's disease etc. There are several nootropics marketed such as torental, duxil but these products has side effects like vascular dementia related to lacunae or to multiple infarcts, or leucoaraiosis and drug related amnesia. So mostly people prefer herbal nootropics over synthetic nootropics because they have less side effects than others. Herbal nootrppics mainly act by different ways like by increasing and replenishing neurotransmitter at high concentration in brain, by anti-depression, adaptogenic and mood stabilization, by improved oxygen supply and brain energy, by improved concentration, stamina, and focus, by memory enhancement and learning improvement, by nerve growth stimulation and brain cell protection. Memory is the most imperative characteristic for effectual survival of human beings. It also differentiates humans from animals. Reminiscence is the ability of an personage to record the in sequence and recall it whenever needed. Traditionally herbal drugs have been used to augment cognitive functions. A figure of medicinal plants and medicines derived from these plants has shown memory enhancing properties by virtue of their medicinal constituents. There has been substantial pharmacological exploration into the memory enhancing activity of some compounds. Since allopathic system of medicine is yet to make available a radical cure, the usefulness of traditional medicines needs to be explored. This article reviews the memory enhancing properties of the most commonly employed herbal medicines and their identified active constituents. The herbs acting on the brain are called Nootropicherbs and their isolated constituents are referred to as smart drugs. These herbs enhance the memory as well as increase blood circulation in the brain.

Keywords: Memory enhancers, Nootopics, Adaptogemic

1. INTRODUCTION

Nootropics, popularly referred to as "smart drugs," are substances which boost human cognitive abilities (the functions and capacities of the brain. The word nootropic is derived from the Greek words noos or mind and tropos, a growth. Typically, nootropics work by increasing the brain's supply of neurochemicals (neurotransmitters, enzymes, and hormones), by improving the brain's oxygen supply, or by stimulating nerve growth. With a few notable exceptions, nootropics have very low or no toxicity, making overdose unlikely. [21]Most nootropics are nutrients or plant components (herbs, roots, beans, bark, etc.), available over the counter at health food and grocery stores, and are used as nutritional supplements. Some nootropics are drugs, used to treat retardation, neural degradation (Alzheimer's and Parkinson's), and for cases of oxygen deficit to prevent hypoxia. These drugs have a variety of human enhancement applications as well, are marketed heavily on the World Wide Web, and are used by many people in personal cognitive enhancement regimens. With some nootropics the effects are subtle and gradual, such as with most nerve growth inducers, and may take weeks or even months before any cognitive improvement is noticed. At the other end of the spectrum are nootropics which have effects that are immediate, profound, and obvious.[20]

2. EPIDIMIOLOGY:

Mental function often declines particularly under conditions of stress or fatigue. In addition, most people over the age of 40 experience some memory loss, technically known as Age-related Cognitive Decline (ARCD) or Age-associated Memory Impairment (AAMI). We don't know what causes this normal experience, and there is no conventional treatment available for it certain conditions can cause a far more serious loss of mental function.[7,8]

3. CLASSIFICATION [7-10]

First-generation compounds

- **Psychostimulants:**

  The psychostimulants reinforce behavioural activities and, in all likelihood, act as thymoleptics or as activators of attention-inducing processes. Eg. Caffiene, Nicotinnic acid.

- **Metabolic compounds:**
  It has been suggested that the so-called nootropic compounds, which act as neither stimulants nor sedatives, are likely to improve learning and memory. Such compounds are typically activators of cerebral metabolism. eg. Vinpocetine.
- Cerebro vascular compounds

These drugs have been used to improve cerebral blood flow and bioavailability of oxygen on an explanatory basis; this approach was subsequently shown to be flawed, since cerebral atherosclerosis was shown to be the initial causative pathophysiological anomaly in senile dementia. Eg. Ginkgo biloba, Vinpocetine

Second-generation compounds

- **Cholinergic drugs:**

The "cholinergic hypothesis" of age-related memory dysfunction has resulted in the clinical evaluation of three

types of cholinomimetics: acetylcholine (ACH) precursors, acetylcholinesterase (AChE) inhibitors and cholinergic receptor agonists. The use of choline (precursor of the synthesis of ACH) or of lecithin (the food source of choline) is warranted Their potential ability to increase the bioavailability of ACH in presynaptic egions. Recently, new, more selective muscarinic receptor agonists have been studied, particularly substances that stimulate the nicotinic cholinergic receptors. The discovery both in vitro and in animal models of stimulation of cholinergic receptors supports the notion of cell trophism, and opens up interesting new horizons in clinical practice in the vast domain of nerve-cell protection. This also applies to nicotinic receptors, nicotine and nicotinic agonists such as ABT-418 which exert a beneficial effect on mood, vigilance and memory although there is nevertheless a risk of addiction. eg. Huperzine-A, Vitamin B-5 (Huperzine-A is a potent Ach esterase inhibitor and Vit. B-5 is a cofactor in the conversion Choline in to neurotransmitter.)

- **Substances acting on neurotransmissionsystem:**

Disturbance of other neurotransmitter systems involved in learning and memory (noradrenaline, serotonin and probably dopamine) also occurs in AD). The improvements noted in cognitive function could be secondary to beneficial effects on attention, vigilance or psychomotor functions. This also applies to substances such as monoamine oxidase type-A (MAO-A) inhibitors. A subtype of glutamate receptor, the N-methyl-D-aspartate (NMDA) receptor, plays a key role in long-term potentiation (LTP), an elementary model of cellular memory . Substances designed to heighten the activity of NMDA receptors are currently under development. This mechanism is generally an indirect result of modulation of the receptor itself. eg.Vit.B-6, Vit-C, Yohimbe (Dopaminergics), theanine

- **Neuropeptides:**

The neuropeptides modify behaviour by their action within the central nervous system, either as true neurotransmitters, or as modulators of known neurotransmitters. Neuropeptides such as adrenocorticotropic hormone (ACTH) analogues and vasopressin have been shown to exert beneficial effects on learning and memory in animal models. Although analogues of ACTH (ACTH 4-10 and ACTH 4-9) improve attention, concentration and motivation in healthy young volunteers, no benefits have been shown either in normal elderly subjects or in AD patients. Similarly, vasopressin-type peptides induce non-specific central stimulation rather than direct improvement of memory in AD. Somatostatin, corticotrophin-releasing factor (CRF), neuropeptide Y and other neuropeptides are unquestionably decreased in the brain of AD patients, but unfortunately, for the moment, all therapeutic strategies based on supplements of these substances and all pharmaceutics research are faced with difficult technical problems.

Third-generation compounds

- **Neurotrophic factors:**

One of the most promising and interesting fields of research in neuroscience involves the use of growth factors, in particular Nerve Growth Factor (NGF), to reinforce the viability of neurones. Since a number of changes in the central nervous system related to physiological age or dementia are associated with loss of neurones, the use of growth factors to prevent or delay cell death could have a considerable impact on the preservation of memory and other cognitive functions. In animal models, NGF increases the viability and survival of cholinergic nuclei in the brain stem, as well as improving learning and memory in animals with experimentally induced lesions in this region. NGF crosses the blood-brain barrier only with difficulty and requires administration either by the intraventricular route or in combination with a carrier molecule (transporter).; novel compounds arising from chemical synthesis possess true neurotrophic properties and are currently undergoing clinical evaluation as potential neurocytoprotectants (certain MAO-B inhibitors, SR57746, etc.).

- **Abnormal proteins:**

Certain familial forms of AD involve excessive production of amyloid peptides. Amyloid accumulation is at the heart of senile plaques, the histopathological stigmata of AD. Research is currently being undertaken to produce methods of suppressing this abnormal overproduction, attempting for example to act upon the metabolic processes (secretases) resulting in the amyloid protein precursor (APP), or on recently-identified amyloid receptors. Variations in the apolipoprotein E gene (APOE) on chromosome 19 may constitute a risk factor for AD.

Fourth –generation compounds

The considerable increase in knowledge concerning the pathogenesis and origin of memory disorders in elderly subjects and in dementia, including AD, as well as the introduction of innovative therapies including biotechnology and molecular gene therapies, constitute the basis of effective treatments and preventive measures for disturbances of the central nervous system responsible for this cognitive dysfunction. Methods involving regulation of synthesis of abnormal proteins could hasten the development of fourth-generation medications.

4. GENERAL MECHANISM OF ACTION

4.1 General strategies:

Neurotransmitter support - supplying the body with the precursors and cofactors it needs to produce neurotransmitters. Keeping the brain's neurotransmitters at high levels improves concentration, mental focus, calculation ability, memory encoding, recall, neurotransmitters are acetylcholine, dopamine, norepinephrine and serotonin. Note that cardiovascular exercise performed on a regular basis also has nootropic effects, by increasing the body's capacity to supply brain cells with oxygen. Exercise is highly synergistic with nutritional supplementation, and a health regimen is incomplete without it.

4.2 Replenishing and increasing neurotransmitters:

Thinking is hard workIt involves the firing of neurons which requires plenty of neurotransmitters, and even though these are reuseable to some extent, they do get depleted. Depletion of neurotransmitters generally results in reduced mental performance, which may include difficulty concentrating, slowed reasoning, decreased learning efficiency, impaired recall, reduced coordination, lowered moods, inability to cope, increased response times, and mental fatigue. This also generally increases the likelihood of human error on tasks and activities

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performed. Stress causes neurotransmitters to be depleted even faster. The brain's neurotransmitters need to be replenished frequently, made by the body from substances ingested in the diet. Maintaining neurochemicals at optimal levels has a corresponding effect on brain performance supporting improved mental agility and stamina, even beyond the individual's normal limits. As the brain ages, its ability to produce and maintain youthful levels of neurotransmitters declines providing the brain with ample raw materials to make the neurotransmitters it needs can restore them to more youthful levels to help maintain cognitive function at vigorous youthful levels as well.[21]

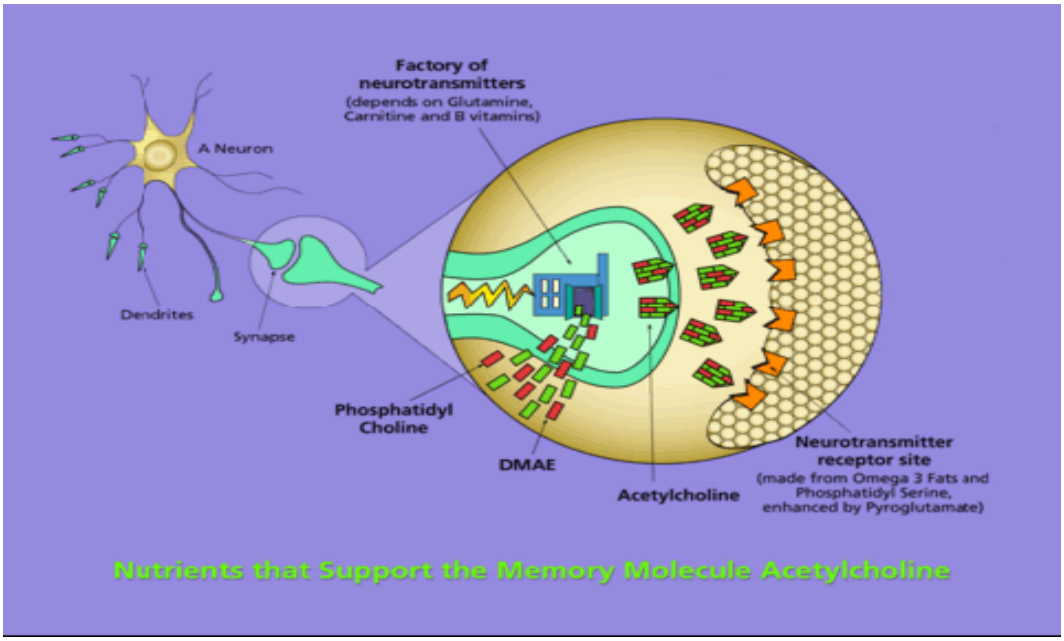

Figure 1: Pathway of action of nutrients on memory molecule acetylcholine

4.3 Recreational drugs with purported nootropic effects:

LSD - Schedule I / Class A drug. At minuscule doses (1 mcg) the drug has effects similar toHydergine. Overdose and side-effects: produces inebriating hallucinogenic and entheogenic effects at doses as low as 20–30 µg (micrograms), with the likelihood of having a bad trip increasing as dose is increased. May also cause cognitive shifts, synesthesia, and flashbacks. The drug sometimes spurs long-term or even permanent changes in a user's personality and life perspective, can cause Hallucinogen Persisting Perception Disorder, and post-LSD psychoses 4-methylaminorex.[25]

4.4 Anti-depression, adaptogenic and mood stabilization:

Depression and depressed mood negatively affect cognitive performance, Feelings of sadness, guilt, helplessness, hopelessness, anxiety, and fear caused by depression detract from productive thought while apathy (which is also induced by depression) is the lack of motivation and driving moods (like curiosity, interest, determination, etc.) Other symptoms include disturbed sleep patterns, mental fatigue and loss of energy, trouble concentrating or making decisions, and a generalized slowing and obtunding of cognition, including memory Obviously, removing these effects improves intelligence and mental performance and therefore, counteracting and preventing depression are effective nootropic strategies. There is a high correlation between depression and a reduction or depletion of neurotransmitters (dopamine, acetylcholine, and serotonin) in the brain therefore it is no surprise that increasing the brain's supply of neurotransmitters alleviates (or at least reduces the symptoms of) most depressions Stress is another major factor in neurotransmitter depletion, being both a cause and effect of it (creating a vicious downward cycle) therefore stress management and anti-stress substances are also very useful nootropic strategies.[24]All of the "nergics" listed above have been found to increase stress tolerance and alleviate depression (by replenishing or increasing the brain's supply of specific neurotransmitters), especially when used in precursor/co-factor combinations. Here are some more nootropics which affect mood and stress:

- Ashwagandha (Withania somnifera) - Root. Also known as Indian ginseng. Adaptogen used as a tonic to normalize body processes and reduce stress and anxiety.[19]
- Inositol- is a B-vitamin like substance with anti-anxiety effects. It is believed to produce its anti-anxiety effects by improving the binding of gabaergics to $GABA_A$ receptors Inositol is a sugar, and is therefore an alternative energy source for brain and muscle tissues. It produces a sugar high without a sugar low, making it especially suited for sweetening tea (instead of sugar). It is also a membrane stabilizer which can strengthen neurons.[22]
- Lemon balm (Melissa officinalis) – herb. Anti-depressant[21]
- *Rhodiola rosea*- herb. Adaptogen; elevates mood alleviates depression promotes mental energy and stamina reduces fatigue.
- St John's wort - herb. The active components: hypericin and hyperforin, are clinically indicated to be effective in cases of mild to medium depression.

- Ginseng, Siberian (Eleutherococcus senticosus) - root. Anti-anxiety adaptogen that normalizes physical stress and mental consequences.[19]
- Sutherlandia Frutescens – herb. Adaptogen, blood detoxifier
- Tea – herb contains theophylline and theanine. Increases alpha-wave based alert relaxation (relieves stress).[19]
- Theanine - amino acid. Found in tea. Increases serotonin and dopamine levels in the brain. Increases alpha- wave based alert relaxation.
- Vasopressin - drug. Memory hormone, produced by the pituitary gland, improves both memory encoding and recall rapidly counters chronic apathy syndrome and drug-induced depletion.
- Nicotinic acid (vitamin B3) - essential nutrient. Mild enhancer of concentration and memory vasodilator mood stabilizer, with a powerful anti-anxiety effect perhaps the best and most immediate stress reliever available (note that other forms of vitamin B3 do not have this effect.)

Side effects: gastric upset (which is easily prevented and relieved with antacids), reduced blood pressure and flushing of the skin (caused by vasodilation) and itchy sensation in the skin caused by histamine release.

4.5 Brain energy and improved oxygen supply:

- Chromium stabilizes blood sugar levels promoting concentration
- Coenzyme q-10- increases oxygen transport through the mitochondria of the cells. Appears to slow age related dementia.
- Creatine increases brain energy levels via ATP production.

4.6 Mental agility, Concentration, Stamina, And Focus:

- Caffeine improves concentration, idea production, but hinders memory encoding. Also produces the jitters caffeine is the most widely used psychoactive substances in the world.
- Coffee bean contains caffeine, brewed coffee is high in antioxidants
- Nicotine stimulus barriers (aids in concentration) stimulus barrier rebound effect(an unpleasant side effect)

4.7 Memory enhancement and learning improvement:

All of the "nergics" listed above improve memory (encoding and recall) So do all nootropics which improve general brain performance such as the brain energy and oxygen suppliers listed above and the nerve growth stimulants and protectants listed in their own section below. Other nootropics with specific effects on memory encoding and recall include:

- Bacopa monnieri (Brahmi) - Herb. Elevates curiosity, enhances memory and concentration
- Vasopressin - Hormone, prescription drug[24]

4.8 Nerve growth stimulation and brain cell protection:

- Bacopa monnieri (Brahmi) - Herb. Improves protein synthesis in brain cell repair and new dendritic growth. [1,19]Inositol - Membrane stabilizer. Strengthens neurons, making them less susceptible to damage.[21]
- Vitamin C - Membrane stabilizer, involved in collagen synthesis. Strengthens neurons {{fact}, making them less susceptible to damage {{fact}. Vitamin C is also a co-factor in the brain's production of dopamine, and therefore it also has general nootropic effects.[3]

4.9 Sleep enhancement or reduction:

- Modafinil (Provigil) - drug. Major sleep reducer, reduces symptoms of sleep deprivation, reduces sleepiness, improves concentration, increases mental stamina, and reduces ADD/ADHD. Produces relatively few side-effects, with no catch-up sleep required Has been reported to extend the period of normal wakefulness to 90 hours, without feelings of weirdness or the "jitters". Long term effects on health are unknown.
- Vitamin B12 - can greatly enhance the color of dreams. Stimulates brain neuron RNA synthesis.[3]

4.10 Recreational drugs with purported nootropic effects:

- LSD - Schedule I / Class A drug. At minuscule doses (1 mcg) the drug has effects similar to Hydergine. Overdose and side-effects: produces inebriating hallucinogenic and entheogenic effects at doses as low as 20–30 µg (micrograms), with the likelihood of having a bad trip increasing as dose is increased. May also cause cognitive shifts, synesthesia, and flashbacks. The drug sometimes spurs long-term or even permanent changes in a user's personality and life perspective, can cause Hallucinogen Persisting Perception Disorder, and post-LSD psychoses. 4-methylaminorex.[25]

5. STAGES IN PRODUCTION OF MEMORY RELATED SYNAPTIC CHANGES:

The Production of stable synaptic changes is typically divided into induction, expression and consolidation phases. These relate to steps in memory formation introduced into the psychological literature with the discovery that electroconvulsive shocks applied shortly after learning erase memory. Subsequent decades of work confirmed that memory encoding involves two distinct steps: an acquisition process requiring a few seconds, followed by a series of changes that consolidate the new information against disruption and decay, which requires hours or even days. The manifestation of memory in behavior (such as recognition) constitutes a third component emerging immediately after acquisition and in advance of consolidation. LTP, as summarized below, seems to pass through a similar sequence of stages, two of which are logical target for mechanism-based memory drugs.[12]

The consensus induction model involves the two classes of transmitter receptors co-localized at excitatory (glutamatergic) synapses. AMPA-type glutamate receptors generate depolarization needed to unblock voltage sensitive NMDA-type glutamate receptors, which then admit calcium into the dendritic side of the synapse.

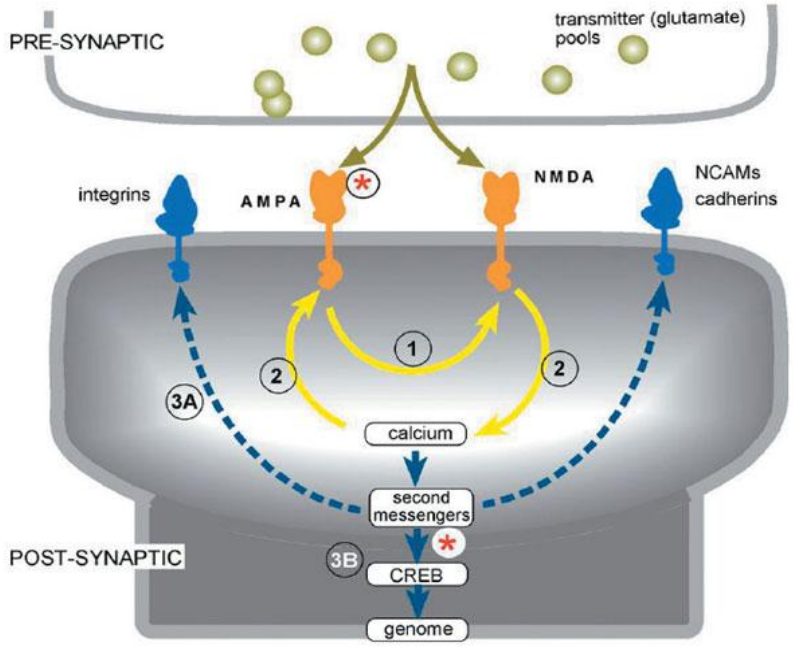

Figure 2: Targets for the development of memory-enhancing drugs

The production of memory-related synaptic changes occurs in three stages[12].

Step 1: induction. Released transmitter binds to AMPA-type glutamate receptors, which then depolarize the postsynaptic region and unblock NMDA-type receptors.

Step 2: expression. NMDA receptors admit calcium and thereby modify AMPA receptors so as to increase the size of subsequent excitatory currents.

Step 3: consolidation. NMDA receptors also trigger changes that stabilize the modifications to the AMPA receptors. A rapidly developing aspect of this (3A) involves adhesion receptors, whereas a more delayed component requires genomic events (3B). Current strategies for drug development (red asterisks) target the AMPA receptor component of induction or the gene-signaling component of consolidation.

Today most researchers hold that the enhanced postsynaptic currents that define LTP expression are caused by changes in AMPA receptors, but there is disagreement about how they are changed. Simply adding new receptors to the synaps would increase the response to a given amount of transmitter; one variant of this idea posits that recycling is co-opted so as to alter receptor number. The alternative is that extant receptors are modified so as to enhance their operation. The leading candidate for this process is serine phosphorylation of two sites on the

cytoplasmic domain of the receptor. An important advance in consolidation came with the discovery that LTP is easily erased immediately after its induction but not after delays of 30-60 minutes. As with memory, the progressive resistance of LTP to disruption (consolidation) seems to have multiple phases. Adhesion proteins are implicated in steps beginning within minutes of induction, whereas protein synthesis is needed for phases occurring an hour or more later.

The current search for memory drugs begins with the assumption that steps in memory formation correspond to steps in synaptic modification. This is not to argue that the behavioral phenomena can be reduced to plasticity: for example, the critical questions of memory organization and retrieval are barely addressed by current biological models. However, to the degree that initial encoding and later consolidation of memory depend upon the induction and stabilization of LTP,then drugs that enhance these cellular effects are expected to promote their behavioural reflections.[13]

5.1 Drugs that facilitate induction:

Repetitive release of transmitter over a period of 30−50 milliseconds allows AMPA receptors to generate sufficient depolarization to unblock NMDA receptors and thereby induce LTP (Figure 2). Increasing the amount of glutamate released during stimulation or enhancing the effects of the transmitter on AMPA receptors can reduce this requirement. Work on the latter approach—positive modulation of AMPA receptors—is now well advanced and has resulted in competing families of drugs.[15]

Ampakines were the first allosteric modulators of AMPA receptors to augment excitatory transmission in brain. They have no detectable agonist or antagonist actions but instead modify two aspects of receptor biophysics—desensitization and deactivation—that terminate the synaptic current. By slowing these two processes, ampakines enhance and prolong the synaptic currents generated by release of glutamate from axon terminals.

The drugs freely enter the brain, where they increase both glutamatergic transmission and the aggregate activity of cortical neurons controlling complex behaviors. As described in an extensive literature, these effects are accompanied by substantial improvements in retention scores on diverse tests that sample memories lasting for minutes, hours or weeks. Positive results are reported for tasks dependent upon different brain structures, types of rewards and training regimens. They also hold across species (rats, rabbits, monkeys). In all, positive modulation

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of AMPA receptors reduces the requirements for the encoding of memory, whether the memory is of a type that normally persists for only a few minutes or instead normally lasts for an indefinite period.[14]

Being modulators, ampakines affect only those AMPA receptors activated by endogenously released transmitter and thus only those networks engaged by the brain's present activity. This feature, coupled with the absence of targets outside the central nervous system, presumably accounts for their positive effects on memory at dosages well below those that produce notable side-effects. (Seizures are the most severe risk factor.)[16]Additional modulators with chemical structures distinct from those of the ampakines have been discovered, beginning with the benzothiadiazides. Similar to the ampakines, one set of derivatives is reported to enhance excitatory transmission, promote the formation of LTP, and improve object recognition memory. Another series of biarylpropylsulfonamide variants is notable for its potency, with some members of the group being effective in the low nanomolar range. The diversity of these chemical structures points to the conclusion now supported with experimental evidence, that AMPA receptors have multiple modulatory sites. Linking chemical structures and modulatory sites with particular physiological, and thus presumably behavioral, effects constitutes one of the more.

5.2 Drugs that improve consolidation:[17]

This represents a logical alternative (or complementary) approach to improved encoding as a route for developing memory-enhancing drugs. Most efforts at promoting consolidation deal with the late, protein synthesis−dependent phase rather than the adhesion phase that develops too quickly to be a consequence of gene activation. The CREB family of transcription factors has received particular attention in this regard. CREB is phosphorylated and activated by the cyclic AMP-dependent protein kinase and then binds to the cyclic AMP response the maintenance of the later stages of LTP. As expected from these physiological results, several studies have documented a role for CREB in long-term memory in Drosophila and mice. Other behavioral work implicates CREB in late-stage consolidation (not early stage), and shows that enhancing CREB functioning does indeed enhance the stable encoding of long-term memory, which is of crucial importance for drug development.

Multiple efforts are now underway to develop drugs that facilitate CREB's contributions to long-term memory. Under some conditions, inhibitors of the phosphodiesterase isozyme PDE-IV, which is responsible for hydrolysis of cAMP, increase CREB phosphorylation, CREB binding to DNA, and memory scores in rats. Although the clinical use of current PDE IV inhibitors is restricted by unacceptable side effects, more potent, and perhaps selective, compounds are under development. Given the ubiquitous distribution of CREB, target selectivity (brain/forebrain) will be a critical requirement for drugs acting upon it to produce cognitive effects. At least two biotechnology companies (Memory Pharmaceuticals, Helicon) are pursuing CREB-based strategies.

5.3 Applications: [18]

An FDA advisory panel recently decided that Mild Cognitive Impairment (MCI) is an acceptable category for clinical treatment. Persons with MCI have memory impairments relative to their age and education, but have significant preservation of everyday activities. Several studies have shown that subjects diagnosed as having MCI progress to Alzheimer's disease at a much higher rate (~ 10−15% per year) than age-matched controls. MCI is targeted along with Alzheimer's by most memory drug programs. These are enormous markets, involving perhaps as many as 10 million people in the US alone. Application beyond these well-characterized disorders depends on unresolved public policy issues. A substantial literature shows that deterioration in memory functioning is part of brain aging in mammals, including humans. Assuming the new mechanism-based memory drugs have minimal side effects, then the question could arise as to whether they are appropriate for treating conditions that, although disturbing, are part of the normal course of life. The answer to this question will determine the size of the market for memory drugs.

Finally, the new pharmacology could be used to produce chronic improvements in MCI and early-stage Alzheimer's by inducing increased neurotrophic support. Regional changes in neuronal activity and trophic support are widely cited as potential causes for the neuronal atrophy found in the aged brain. Glutamatergic transmission regulates neurotrophin expression, raising the possibility that positive modulators of glutamate receptors will increase trophic factor levels and thereby offset age-related declines. These positive modulators increase transcription of brain-derived neurotrophic factor (BDNF) in cortex and hippocampus of adult rodents. Whether comparable effects are obtained in aged animals, and whether the increases are associated with reduced cortical atrophy, remains to be seen.

6. HERBAL MEMORY ENHANCER DRUGS:

GINSENG

Synonyms:ninjin, pannag, panax

Biological source: Ginseng is the dried root of various species of panax, like *p.ginseng* (Korean ginseng), *p. japonica* (Japanese ginseng), family- araliaceae.

Mechanism of action: depression and depressed mood negativity affect conginitive performance. It enhance memory by acting as anti anxiety and antistress like.[26]

Chemical constituents: it contains a mixture of several saponin glycosides, belonging to triterpenoid group. They are grouped as follows: [19]

(1.) Ginsenoside;

(2.) Panaxosides; and

(3.) Chikusetsusaponin

Ginsenosides contain aglycone dammarol while panaxosides have oleanolic acid as aglycone.

BRAHMI

Synonym: Mandukparni.

Biological source: It is the herb of *Centella asiatica*, belonging to family umbelliferae (apiaceae).[19]

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Mechanism of action: it enhances memory by improving protein synthesis in brain cells and repairs new dendritic growth. It also elevates curiosity.

Chemical constituents: it mainly contains saponins in the form of α- amyrin derivatives called asiaticoside and madecassoside. They yield Asiatic acid and madecassic acid (triterpene acid) on hydrolysis respectively.

Asiaticoside —Hydrolysis→ Asiatic acid +2 Glucose+Rhamnose

Madecassoside —Hydrolysis→ Madecassic acid+2 Glucose+Rhamnose

SHANKHPUSHPI

Synonyms: shankhvel, shankhin

Biological source: this consists of the aerial parts of the plant known as *Canscora decussata*, family gentianaceas.[19]

Mechanism of action: it is used as a brain tonic; it acts as a psycostimulant and tranquiliser. Psycostimulant reinforce behavioral activity.

Chemical constituents: Drug is found to contain bitter substance and an oleo-resin. Tow crystalline compounds have been isolated from the aqueous and alcoholic extracts of the plant. Shankhpushpi is found to contain triterpenes, alkaloids and xanthones.[25]

AMLA

Synonyms: Emblica, Indian goose berry.

Biological source: It consists of dried, as well as fresh fruit of plant *Emblica officinalis* belonging to family- Euphorbiaceae.[19]

Mechanism of action: The main constituents of plant is VIT.C which is membrane stabilizer, involved in collagen synthesis, strengthen neurons makin them less susceptible to damage. It is also a co-factor in the brain production of dopamine.[3,25]

Chemical constituents: It is a natural rich source of VIT.C. Fruit also contain fat, phyllembin and tanin

GINGKO

Synonym: Maiden hair tree, Kew tree

Biological source: the dried leaves of *Gingko biloba*, family Gingkoaceae

Mechanism of Action: it improve cerebral circulation, it works by increasing blood flow throughout the body, so increase the efficiency of brain.[4]

Chemical constituents: Medicinally active ingredients of Gingko leaf are flavanoid glycoside, and ginkolide.[19]

HYPERICUM

Synonym: St. John's Wort, Goat weed

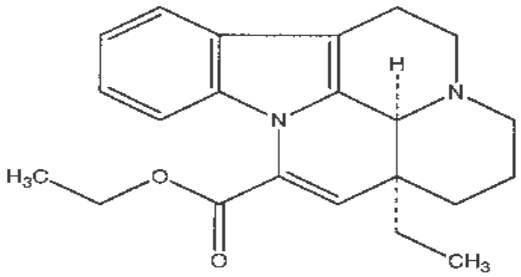
Biological source: It consists of dried aerial parts of the plant known as *Hypericum perforatum*, family hypericaceae.

Mechanism of action:It works by boosting level of serotonin neurotransmitter, it also act as cognitive enhancer.

Chemical constituents: Hypericum naphthoianthrones(anthraquinone derivative) hypericin and pseudo hypericin, hyperocide and flavonoids. Hypericins(0.06-0.75%) include hypericin red fluoeoscent pigment, pseudohypericin and hyperforin.[25]

VINPOCETINE

Trade name: Intelectol (Memory Secret, Inc.)[24]



Vinpocetine

Mechanism of action:

Several mechanisms have been proposed for the possible actions of vinpocetine. Vinpocetine has been reported to have calcium-channel blocking activity, as well as voltage-gated sodium channel blocking activity. It has also been reported to inhibit the acetylcholine release evoked by excitatory amino acids and to protect neurons against excitotoxicity. In addition, vinpocetine has been shown to inhibit a cyclic GMP phosphodiesterase, and it is speculated that this inhibition enhances cyclic GMP levels in the vascular smooth muscle, leading to reduced resistance of cerebral vessels and increase of cerebral flow. In some studies, vinpocetine has demonstrated antioxidant activity equivalent to that of vitamin E.

LEMON BALM

Synonyms: Balm.

Biological source: It is obtained from the leaves of *Melissa officinalis* belonging to family- Lamiaceae.

Chemical constituents: It contains eugenol, tannin, terpenes (eg. Citronellal and caryophyllene.) [21]

Mechanism of action: Depression and depressed mood negativity affect conginitive and mental performance. This herb act as a anti depressant so it improve the mental performance.

HUPEZINE-A

Scientific Name: Huperzine-A

Huperzine A and huperzine B are two of the chemicals that have been separated from Chinese club moss. Huperzine B is also an acetylcholinesterase inhibitor, but because its effects are much weaker than those of huperzine A, most research has focused on huperzine A. Synthetic forms of huperzine A have been made

in chemical laboratories and they appear to be as effective as natural huperzine A in studies. Huperzine A has also been combined or "hybridized" with the prescription drug tacrine (Cognex), an acetylcholinesterase inhibitor approved by the U.S. Food and Drug Administration for treating Alzheimer's disease.

The resulting "huprine" combination seems to be more effective at limiting acetylcholinesterase activity than either agent alone. Much more study needs to be done on the possible effects of huperzine A, huperzine B, huprine, and other chemicals derived from Chinese club moss.

ASHWAGANDHA

Synonyms: Withania root, Asgandh, Winter cherry.

Biological source: It consists of dried roots and stem bases of *Withania somnifera* belonging to family Solonaceae.[19]

Geographical source: The plant grows wildly in all parts and subtropical india'.

Mechanism of action: Depression and depressed mood negativity affect conginitive performance and memory also. Ashwagandha remove these problems means it reduce stress and anxiety condition and improve intelligence and mental performance.[24]

Chemical constituents: The main constituents of ashwagandha are alkaloids and steroidal lactone. Among various alkaloids, withanine is the main constituents. The leaves contain steroidal lactones, which are commonly called as "withanolides". Withanolides have c-28 steroidal nucleus with c-9 side chain, having 6- membered lactone ring. The various withanolides are withaferin and withaferine-A.

TEA

Synonyms: Camellia thea

Biological source: IT contains the prepared leaves and leaf buds of *Thea sinensis*

Belonging to family Theaceae.[19]

Mechanism of action: It improves concentration and idea production. It contains caffeine, theanine and theophylline which act as a C.N.S. stimulant and also reduce stress and anxiety condition.

Chemical constituents: Tea leaves are considered as arich source of caffeine (1-3%). It also contain theanine and theophylline.[19]

7. PROPOSED NATURAL TREATMENTS:

A single study suggests that the supplement NADH might help improve temporary mental impairment caused by jet lag.

Evidence conflicts on whether multivitamin/multimineral tablets may improve cognitive function in people of various age groups.

Note: Serious allegations of fraud have been raised regarding the work of one of the scientists involved in this research.

Isoflavones in soy or red clover have inconsistently shown beneficial effects on mental function in women.

Huperzine A is a potent chemical derived from a particular type of club moss (Huperzia serrata). This substance is really more a drug than an herb, but it is sold over the counter as a dietary supplement for memory loss and mental impairment. Some evidence indicates that it may be helpful for Alzheimer's disease and related conditions; very weak evidence suggests benefit for healthy people. Much the same can also be said about the substance vinpocetine.

Other treatments proposed for enhancing mental function in healthy people and having at least slight supporting evidence from preliminary double-blind trials include creatine (particularly after sleep deprivation), sage, and vitamin B_1.

Mild vitamin B deficiency may impair mental function. Because such deficiency is relatively common in the elderly, it has been suggested that vitamin B_{12} supplements may be appropriate in this age group. However, in the two studies that tried it, no benefits were seen. [3]

Seniors are also commonly deficient in vitamin B_6, but a review of the literature failed to find meaningful evidence that B_6 offers any benefits. [3]

Preliminary double-blind trials suggest that the amino acid tyrosine may improve memory and mental function under conditions of sleep deprivation or other forms of stress. Other double-blind trials suggest that the herb *Rhodiola rosacea* may offer a similar benefit.

Whey protein contains alpha-lactalbumin, a protein that in turn contains high levels of the amino acid tryptophan. Tryptophan is the body's precursor for serotonin, and is thought to affect mental function. In a small double-blind study, use of alpha-lactalbumin in the evening improved morning alertness perhaps by enhancing sleep quality. Another small double-blind study found weak evidence that alpha-lactalbumin improved mental function in people sensitive to stress. A third study failed to find that alpha-lactalbumin significantly improved memory in women experiencing premenstrual symptoms.

Herbs that contain caffeine would be expected to enhance mental function in health people, at least temporarily. These include green tea, black tea, mate and guarana.

Some reports suggested that declining levels of the hormone DHEA cause impaired mental function in the elderly. On this basis, DHEA has been promoted as a brain-boosting supplement. However, large studies have failed to find any correlation between DHEA levels and mental function, and there is no direct evidence that DHEA supplements provide any benefit in seniors. One study did find potential benefits in younger people.

Other herbs and supplements proposed for enhancing memory and mental function, but that lack meaningful

supporting evidence, includes rosemary, saffron, *Muira puama*, *Sageand lobelia*.

One study failed to find folate helpful for enhancing mental function in seniors; another failed to find benefit with folate plus vitamin $B_{12.}$

8. CONCLUSION:

From this cram, it is comprehensible that the herbals engage in recreationadjacent to poor memory. An assortment of herbal plants and plants extracts has considerable memory improving activity in animal models. They have anti-acetylcholinesterase property and may be valuable as a nootropic agent in delaying the onset and reducing the severity of Alzheimer's disease when compared with that of reference drugs. The memory improving activity is probably due to the presence of flavonoids in almost all these plants. A variety of botanical products have been reported to possess memory improving activity; in conclusion, it should be noted that substances such as flavonoids, and tannins that own memory improving activity are of particular therapeutic importance. The consequences of this study indicate that extracts of leaves and plants extracts of some medicinal plant have good impending for use in poor memory. It has been ascribed with a overabundance of physiological effects that could potentially benefit cognitive performance or mood.

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