Hormones, Neurotransmitters & Nutraceuticals for Affective Disorders and Cognitive Enhancement

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Neurogenesis
An Enzymatic Cascade To Keep Your Brain Forever Young
2 Core Principles

1. All Health Care is **HEAD FIRST**:

   **Brain Dominoes**: One small change in the brain can affect the workings of the entire body

   **The Brain is the MOST IMPORTANT Organ**

   The Brain computer orchestrates all informational transfer in the body including sensory, motor, visceral, cognitive and hormonal levels controlled by complex electrical and chemical reactions in the body

   No nerve cell fires in the body without a quantum release of calcium
MCI

MCI is generally defined as a “Mild or moderate cognitive impairment that is a heterogeneous disorder”

- It affects different people in different ways
- Some cases of MCI turn into Alzheimer’s dementia, some remain mildly impaired for life, and others are reversed
- With the discovery of neurogenesis – regeneration of brain cells – we can now aim to recover full intellectual capacities as we age
- New vision of the future:
  
  Growing older could mean growing smarter, by increasing intellectual faculties
MCI and Poor Attention Span Can Kill

• In 2004, 112,012 Americans died due to attention-related accidental injuries
• That is more than 28 times the number of American deaths in Iraq!
• Loss of attention after age 30 is part of MCI
• Approximately 50% of all adults partially fail attention tests
• These attention and memory problems lead to deficits in IQs
• Since most of us think over a period of only 100 msec, a 20% loss of our processing speed is enormous

Early MCI

- Dementia takes 15 to 20 years to develop and begins with MCI
- Pre-MCI, asymptomatic milder form of cognitive impairment but may take another 15 to 20 years of development prior to the discovery of the first MCI symptoms
- MCI begins in the 30s-40s
- By 80-85, 50% of America is demented
- Dementia may be an accelerated form of brain aging

High and Low Voltage Dementia

- **Fetus to 5** is high voltage Dementia
- **After Age 30:** DEMENTIA BEGINS!
- **Age 70 and on** is low voltage dementia → no cell growth
- Cell growth is *inversely* related to Dementia
- Inability to retain memory
  - Memory was a wave and particle
General Trend of Cognitive and Physical Decline

- Loss of brain processing speed and voltage
- Loss of visual, verbal, and working memory
- Loss of complex attention
- Loss of cognition, abstract thinking ability, inductive reasoning, spatial orientation
- “Pause” of each gland and organ system – Anatomy begins to fail
Identifying aMCI in Primary Care

- Amnestic mild cognitive impairment (aMCI) is characterized by episodic memory impairment in the absence of clinical dementia.
- aMCI represents the transitional stage between normal aging and Alzheimer’s Disease (AD).
- Patients have fewer symptoms and function better than those with mild AD; therefore, they have more ability that can be preserved with appropriate therapy.
- It is not known how well non-expert primary-care physicians (PCPs) can differentiate individuals with no cognitive impairment (NCI), aMCI, and mild AD, in their own clinical settings.
- A study was designed to establish the feasibility of making an aMCI designation and identifying some likely sources of error.

aMCI Feasibility Study

- 14 experts assessed subjects with memory complaints, in terms of:
  1. laboratory results
  2. MRI findings
  3. scores on the MMSE
  4. adapted Clinical Dementia Rating Scale
  5. Alzheimer’s Disease Assessment Scale – cognitive subscale Delayed Word Recall
- Experts trained non-expert PCPs, using the same clinical information and utilizing the same assessment instruments
- The chance-corrected inter-rater (expert versus non-expert), based on binary outcome (aMCI/non-aMCI), was estimated
- 119 evaluable subjects were recruited (50 aMCI, 27 mild AD, and 42 NCI)

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### Table II. Analysis of inter-rater agreement – evaluable subjects (n=119; binary outcome)\(^a\)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Expert</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>aMCI(n=50)</td>
<td>not aMCI(^b)(n=69)</td>
</tr>
<tr>
<td>Non-expert (n)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| aMCI            | 31     | 14      | 45  
| not aMCI\(^b\)  | 19     | 55      | 74  
| Non-expert (n)  |        |         |  
| Agreement (%)   |        |         | 72.3  
| Sensitivity (%) |        |         | 62.0  
| Specificity (%) |        |         | 79.7  

\(^a\) The MCI, AD and NCI classifications were based on the expert designations.

\(^b\) AD and NCI subjects (pooled data).

**AD** = Alzheimer’s disease; **aMCI** = amnestic mild cognitive impairment; **NCI** = no cognitive impairment.

### Table III. Analysis of inter-rater agreement – evaluable subjects (n=119; three-category outcome)\(^a\)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Expert</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NCI(n=42)</td>
<td>aMCI(n=50)</td>
</tr>
<tr>
<td>Non-expert (n)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| NCI             | 37     | 15      | 4       | 56  
| aMCI            | 5      | 31      | 9       | 45  
| AD              | 0      | 4       | 14      | 18  
| Specific agreement (%) |    |         |         |  
| NCI             | 75.5   | 65.3    | 62.2    |  
| aMCI            | 88.1   | 62.0    | 51.9    |  
| AD              | 75.3   | 79.7    | 95.6    |  
| Weighted \(\kappa\)\(^b\) |        |         |         | 0.5698  
| Overall agreement (%) |        |         |         | 68.9  

\(^a\) The MCI, AD and NCI classifications were based on the expert designations.

\(^b\) Calculated using Cicchetti-Allison weights.[18]

**AD** = Alzheimer’s disease; **aMCI** = amnestic mild cognitive impairment; **NCI** = no cognitive impairment.
aMCI Feasibility Study Conclusions

- Non-expert PCPs under-rated the level of impairment compared with experts.
- When the expert designation was either aMCI or AD, the non-expert more commonly misdiagnosed the subjects as MCI or aMCI, respectively.
- Non-experts usually recognized MCI (88.1% sensitivity) and seldom labeled subjects as AD (specifically 95.6%).
- The results suggest that when drugs with clear benefit for aMCI patients are developed, community-based PCPs, with training, will be able to accurately identify those patients who should receive treatment.

Solve Problem to Close Performance Gap

- Brain, Mind, and Physical Performance Gaps begin in the early 40s
  - Increases to dangerous levels from age 50 to 70
- This mental and physical gap can be reversed by addressing brain electrochemistry (work output and processing speed)

Braverman ER, Blum K. “P300 (Latency) Event-Related Potential: An Accurate Predictor of Memory Impairment” Clinical Electroencephalography. 2003. 34(3); 124-139.
Conventional Method of Diagnosing Cognitive Impairment

• Petersen et al. advocates the combination of a skillful clinical interview, plus a judicious use of neuropsychological tests
• So far, there are no standardized tests for the evaluation of MCI

Brain Print DSM-IV Axes – Old/Traditional Method:

1. **Axis I**: Clinical Disorders - bipolar, schizophrenia, etc.

2. **Axis II**: Personality Disorders - histrionic, dependent, schizoid, avoidant

3. **Axis III**: General Medical Conditions

4. **Axis IV**: Psychosocial and Environmental Problems

5. **Axis V**: Global assessment of functioning scale
A Novel Approach to Detecting Mental and Physical Decline

- **Axis 0**: Anatomical - MRI, PET, CT, US.

- **Axis I**: Electrophysiological - speed, voltage, rhythm, synchrony (BEAM) qEEG, P300, AEP, VEP

- **Axis II**: Memory function (WMS III) & Attention function (TOVA and CNSVS)

- **Axis III**: Personality and psychiatric diagnoses, IQs (MILLON, MBTI, MMPI, psychiatric indices)

- **Axis IV**: Interfacing medical problems - endocrine, vascular, metabolic, immunologic, genetic etc.

- **Axis V**: Treatment - Neurotransmitter & Hormonal, Cranioelectrical and Nutritional Therapies
Progression to Cognitive Failure

*Brain*

Toxic exposure/TBI/Hypoxia
↓
Hyperlipidemia
↓
Hypertension
↓
Cerebrovascular Disease
↓
Cerebral Ischemia/Infarct or demyelination
↓
Neurodegenerative Cascade
↓
Mild Cognitive Impairment
↓
Dementia/Death
Progression to Dementia

Brain

Depression/Tremors/Attention (Dopamine)

Depression/Insomnia (Serotonin/Melatonin)

Depression/MCI (ACH)

Anxiety/Tremors (GABA)

Dementia (ALL)

* Evaluate through full brain and body MRI, PET, CT, EEG, ultrasound and blood chemistry
The Aging Brain

↓

Cellular DNA Damage to Telomeres

↓

Lamin A

↓

Nucleus Integrity

↓

DNA Replication

↓

Telomerase

↓

Metabolic Damage

↓

Atrophy

↓

Brain Death

* Evaluate through brain MRI, PET, CT, EEG, ultrasound, and blood chemistry
The Brain: Electrophysiological Diagnostic Evaluation

- **P300**: voltage (strength) and latency (delay in the wave echo)
- **Evoked potentials** (using visual and auditory provocations): numbers
  - Grade of abnormality: Grade 1 through 7
- **Spectral analysis**: including changes in frequency of the alpha wave
  - *Synchrony* (On/Off Switch) Mind - Body Relaxation
- **EEG** Electroencephalography
Brain Print Levels of Cognitive Impairment

Electrophysiology - Key to Brain Health:

1. **Speed**: Quickness
2. **Voltage**: Muscle Power
3. **Rhythm**: Endurance
4. **Synchrony**: Coordination
5. **Distraction Detector**: P300 catches the inattention, the blocking effect of loss of focus

Delayed P300 latency correlates with abnormal Test of Variables of Attention (TOVA) in adults and predicts early cognitive decline.
Brain Speed and Voltage Measured by P300 Wave

Here is a wave:
<table>
<thead>
<tr>
<th>Age (years)</th>
<th>P300 speed (msec)</th>
<th>P300 Voltage (mV)</th>
<th>Neurocognitive Changes in Relation to Health</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>380</td>
<td>15</td>
<td>Infantile Amnesia, Delayed Brain speed but High Voltage Energy</td>
</tr>
<tr>
<td>12</td>
<td>360</td>
<td>12</td>
<td>Surge of Hormones, Confusion</td>
</tr>
<tr>
<td>20</td>
<td>320</td>
<td>10</td>
<td>Maturing and Peak Vibrancy</td>
</tr>
<tr>
<td>30</td>
<td>330</td>
<td>9</td>
<td>Cognitive Decline</td>
</tr>
<tr>
<td>40</td>
<td>340</td>
<td>8</td>
<td>More Memory and Attention loss and Cognitive Decline</td>
</tr>
<tr>
<td>50</td>
<td>350</td>
<td>7</td>
<td>Ambush of Internal Silent Disease</td>
</tr>
<tr>
<td>60</td>
<td>360</td>
<td>6</td>
<td>Severe Chronic Illness, Massive Brain and Body Performance Gap</td>
</tr>
<tr>
<td>70</td>
<td>370</td>
<td>5</td>
<td>Critical Dementia, No Cell Growth</td>
</tr>
<tr>
<td>80</td>
<td>380</td>
<td>4</td>
<td>Increased Loss</td>
</tr>
</tbody>
</table>
Brain speed and reaction time deteriorates with aging

You only have 100 ms to lose in the course of your life

Most people lose 7ms per decade

Human Reaction Speed
Normal vs. Abnormal Evoked Potentials

- Two waves: One is control and other is that of a patient (delayed)
  - Beginning: Normal
  - At 200 ms: relative negativity
  - At 300 ms: relative positivity
  - At 450 ms: excess negative
- Wave 2 abnormalities result from delay of Evoked Potential
- The question is really: How your brain is out of rhythm in relation to normally functioning brains?

It's not the Vertical Shift in the Sine Curve, it's the Horizontal Shift!
Memory Loss Early On: Predictor of Future MCI

**Pre-Cognitive Decline:**
1. Verbal memory – 64%
2. Visual memory – 97%
3. Visual motor speed – 79%
4. Reaction time – 39%
5. <.05

**Post-Cognitive Decline:**
1. Verbal memory – 42%*
2. Visual memory – 85%
3. Visual motor speed – 70%
4. Reaction time – 18%*

- **A patient asks, “Why am I in the neurosurgery department?”**
  - The visualization of head trauma, head injury and its impact on several brain problems is best identified through software developed by the neurosurgical department at the University of Pittsburgh, Dr. Joe Maroon, Vice Chairman of the Department of Neurological Surgery.
Appreciation for a tool that objectively measures cognitive state:
- reaction time relay
- reduced psychomotor speed

Each of us has a different brain print:
- Unfortunately, we do not know our brain print now
- So, when we are injured, it is hard to pick up subtle abnormalities
- However, each of us has a scattergram of performance cues

CNS Vital Signs Clinical Report

<table>
<thead>
<tr>
<th>Domain Scores</th>
<th>Percentile Range</th>
<th>Test Date: September 17 2009 15:17:56</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Subject Score</td>
<td>Standard Score</td>
</tr>
<tr>
<td>Neurocognition Index (NCI)</td>
<td>NA</td>
<td>53</td>
</tr>
<tr>
<td>Memory</td>
<td>82</td>
<td>69</td>
</tr>
<tr>
<td>Verbal Memory</td>
<td>47</td>
<td>82</td>
</tr>
<tr>
<td>Visual Memory</td>
<td>35</td>
<td>67</td>
</tr>
<tr>
<td>Processing Speed</td>
<td>47</td>
<td>89</td>
</tr>
<tr>
<td>Executive Functioning</td>
<td>-1</td>
<td>42</td>
</tr>
<tr>
<td>Psychomotor Speed</td>
<td>155</td>
<td>86</td>
</tr>
<tr>
<td>Reaction Time*</td>
<td>687</td>
<td>92</td>
</tr>
<tr>
<td>Complex Attention*</td>
<td>49</td>
<td>-21</td>
</tr>
<tr>
<td>Cognitive Flexibility</td>
<td>-4</td>
<td>40</td>
</tr>
</tbody>
</table>

Above average domain scores indicate a standard score in that domain of greater than 109. Average is 90-109. Low Average is 80-89. Below Average is 70-79. Very Low is less than 70. Reaction times are in milliseconds. An * denotes that "lower is better", otherwise higher scores are better.

Total Test Time (min:secs): 28:37
Total time taken to complete the tests shown.

http://www.cnsvs.com
Brain Levels of Attention Impairment

These are the causes of accidents, such as friendly fire, etc:

Various forms of Attention that can be impaired:

• TOVA
• Omissions- Missed Stop Signs
• Commissions- Jump the gun!
• Response Time- Slow
• Response Variability- Inconsistent
• Complex Attention- Cannot pull it together
Millon Clinical Multiaxial Inventory -III

- Schizoid (91)
- Dependant
- Avoidant (84)
- Histrionic
- Narcissistic (75)
- Antisocial (81)
- Aggressive/Sadistic (67)
- Compulsive
- Passive-Aggressive
- Self defeating

- Schizotypal (76)
- Borderline (84)
- Paranoid (90)
- Anxiety Disorder (94)
- PTSD (105)
- Dysthymic (99)
- Alcohol Dependence (67)
- Drug Dependence (65)
- Thought Disorder (75)
- Major Depression (87)
- Delusional Disorder (95)
Increase in Age-Related Disease Parallels Cognitive Decline

Taking off of disease begins in early 40s and explodes in mid 50s

While disease is increasing, the brain is traumatized by additional injuries, for example from sports and combat.
All Medical Illnesses Affect Brain Electrophysiology: Brain Speed Damage by Aging
Impact of Breakdown on Brain Voltage

We look at the voltage of the P300 wave. Whereas normal expectations are 10 mV (microvolts), deviations indicate abnormal brain wave function:
Hormonal Decline Predicts Performance Gap That Can Be Repaired, Otherwise Memory And Attention Deficits Will Occur

Age 30 → HGH, IGF-1,3 deficiency
Age 40 → Testosterone, Estrogen deficiency
Age 50 → DHEA, Thyroid deficiency
Age 60 → Progesterone, Parathyroid deficiency
Age 70 → Calcitonin, Erythropoietin deficiency

No hormones hence no brain juice for neuronal and synaptic plasticity
And no fire to maintain resilience
Loss of Neurotransmitters and Hormones due to Aging Leads to Widespread Breakdown

<table>
<thead>
<tr>
<th>Delerium/Confusion-Dopamine ↓</th>
<th>Dementia-Acetylcholine ↓</th>
<th>Depression-Serotonin ↓</th>
<th>Anxiety/Panic-GABA deficiency ↓</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypo/Hyperglycemia</td>
<td>Hypothyroidism</td>
<td>Hyperthyroid</td>
<td>Hyperthyroidism</td>
</tr>
<tr>
<td>Hypothyroidism</td>
<td>Vitamin B12 Def.</td>
<td>Adrenal Insuff.</td>
<td>Hypopituitarism</td>
</tr>
<tr>
<td>Hypopituitarism</td>
<td>Diabetes Mellitus</td>
<td>Hypopituitarism</td>
<td>Hyperthyroidism</td>
</tr>
<tr>
<td>Vitamin B Defic.</td>
<td>Hypopituitarism</td>
<td>Diabetes Mellitus</td>
<td>Hypopituitarism</td>
</tr>
<tr>
<td>Hypercalcemia</td>
<td>↓ Leptin</td>
<td>Hypercalcemia</td>
<td>↑ Leptin</td>
</tr>
</tbody>
</table>
Hormones Imbalances That May Contribute to Cognitive Decline:

- Androstenedione
- Calcitonin
- Dehydroepiandrosterone (DHEA)
- DHEA-Sulfate (DHEA-S)
- Erythropoietin
- Estriol
- Estrone
- Human growth hormone (HGH)
- Hydroxycortisol/aldosterone
- Insulin-like growth factor (IGF)
- Incretin (at least 50% bioidentical)
- Insulin
- Melatonin
- Parathyroid Hormone
- Pregnenolone
- Progesterone
- Testosterone
- Thyroid: T3, T4
- Vitamins D2, D3
- Oxytocin
- DDAVP
Brain or the Mind

• Which came first: The neuronal or the psychiatric deterioration?

**Answer:** The *gene!* Neurological and psychiatric decline occur *concomitantly.*
Genetic Factors & Phenotypes

• People with certain **DRD2 gene polymorphisms** may have psychiatric conditions such as:

1. Aggression
2. antisocial personality
3. conduct disorder
4. social alienation/schizoid personality
5. social phobia/avoidant personality
6. ADHD
7. Binging
8. stress reactions
9. abnormal visual evoked response
10. abnormal P300 amplitudes and latency
The Brain is Your Most Important Organ: It Affects the Functioning of the Entire Body

One critical system is **NOT** under our control: Autonomic Nervous System

- Regulated **ONLY** by neurotransmitters & hormones
Balancing all neurotransmitters results in quantum neurologic enhancement.

Neurotransmitter Integration

- Dopamine
- Acetylcholine
- Energy/Powerr/Voltage
- Youth/Memory/Speed
- Serotonin
- GABA
- Sleep/Rest/Symmetry
- Calm/Level/Rhythm
Breakdown Starts in the Chemical Loss of Neurotransmitters

• **Chemical loss of catecholamines (DOPA)** → results in decreased voltage (brain power), depression, fatigue, PTSD, Parkinson’s Disease, addiction and burnout.

• **Chemical loss of acetylcholine** → significantly decreases brain speed and memory can cause Alzheimer’s Disease. Multiple endocrine deficiencies occur in TBI.

• **Chemical loss of GABA** → causes intermittent headaches, palpitations, seizures, addiction, anxiety, insomnia, depression and manic behavior

• **Chemical loss of serotonin** → results in sleep disorders, mood disorders, irritable bowel syndrome, PTSD, and burnout.
## Brain and Body Repair Mechanisms

<table>
<thead>
<tr>
<th>System</th>
<th>Natural</th>
<th>Pharmaceutical</th>
<th>Hormonal</th>
<th>Electrical Treatments &amp; Lifestyle Changes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dopamine</strong></td>
<td>Caffeine</td>
<td>Wellbutrin</td>
<td>Testosterone/Estrogen</td>
<td>Weight bearing exercise</td>
</tr>
<tr>
<td>“Energy, Power &amp; Voltage”</td>
<td>Rhodiola Rosea</td>
<td>Tenuate</td>
<td>DHEA</td>
<td>Teas</td>
</tr>
<tr>
<td></td>
<td>Folic acid</td>
<td>Provigil</td>
<td>Thyroid</td>
<td>Spices: Cumin, etc</td>
</tr>
<tr>
<td></td>
<td>Tyrosine</td>
<td>Cymbalta</td>
<td></td>
<td></td>
</tr>
<tr>
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<td><strong>Pharmaceutical</strong></td>
<td><strong>Hormonal</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Serotonin</strong></td>
<td>Fish Oils</td>
<td>SSRI's</td>
<td>Progesterone</td>
<td>CES/TENS</td>
</tr>
<tr>
<td>“Sleep, Rest &amp; Symmetry”</td>
<td>Tryptophan</td>
<td>SNP's</td>
<td>Pregnenolone</td>
<td>Sleep</td>
</tr>
<tr>
<td></td>
<td>Magnesium</td>
<td></td>
<td></td>
<td>Complex Carbs</td>
</tr>
<tr>
<td></td>
<td>Resveratrol</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Acetylcholine</strong></td>
<td>Fish oils</td>
<td>Aricept</td>
<td>Estrogen</td>
<td>Aerobics</td>
</tr>
<tr>
<td>“Youth, Memory &amp; Speed”</td>
<td>Choline</td>
<td>Exelon</td>
<td>Parathyroid</td>
<td>Spices: Sage</td>
</tr>
<tr>
<td></td>
<td>Lipoic Acid</td>
<td>Statin drugs</td>
<td></td>
<td>Eggs, etc</td>
</tr>
<tr>
<td></td>
<td><strong>Natural</strong></td>
<td><strong>Pharmaceutical</strong></td>
<td><strong>Hormonal</strong></td>
<td></td>
</tr>
<tr>
<td><strong>GABA</strong></td>
<td>Inositol</td>
<td>Depakote</td>
<td>Progesterone</td>
<td>CES</td>
</tr>
<tr>
<td>“Calm, Constancy &amp; Rhythm”</td>
<td>CoQ</td>
<td>Topamax</td>
<td>Human Growth Hormone</td>
<td>Spices: Cinnamon</td>
</tr>
<tr>
<td></td>
<td>Theanine</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Other Recommended Changes**
- Weight bearing exercise
- Sleep
- Spices: Sage, Eggs, etc
- CES
- Spices: Cinnamon
The Binary Neuro-Electrochemical System: The Order

Dopaminergic (catecholamines) > +
Cholinergic

GABAergic > -
Serotonergic

Endorphins – “spare tires”

Clark Randt showed that adrenaline helps with memory

\[ E=MC^2 \]

*Cognitive Energy=Brain Speed x (Voltage)^2*

Brain cyclic AMP and memory in mice Randt CT et al *Pharmacol Biochem Behav.* 1982 Oct; 17(4):677-80
How do Hormones Enhance Brain Speed?

• Many of the same hormones associated with increases in processing speed are also associated with neurogenesis, or growing new brain cells (Hgh, Pregnenolone)

• These hormones may make it possible to grow smarter as we grow older!

• Antidepressants are known stimulants of neurogenesis
  – Improve P300 latency in depressed patients
  – Improve Brain Atrophy (especially in hippocampus)
Parathyroid Hormone/Thyroid Hormone Therapy

- Parathyroid hormone levels increase with age and have shown a positive correlation with P300 latency
- Control of PTH levels may be an important factor in protecting against age-induced dementia
- Hyperparathyroidism and osteoporosis can lead to calcifications in brain and body
- Thyroid hormones have been shown to modulate adult hippocampal neurogenesis in studies on rats
- Hypothyroidism is associated with poor concentration, memory disturbances, depression, and decreased cognitive function, and is linked to increased P300 latency


Subclinical hyperparathyroidism, an age dependent phenomenon, is an antecedent of both osteoporosis (OP) and dementia.” Braverman E, Arcuri V, Blum K Alzheimer’s and Dementia Vol 3, issue 3, p S133-S134
Estrogen Replacement Therapy/ Testosterone Therapy

• Estrogen replacement therapy in menopausal women has led to a significant improvement in information processing as indexed by a significant shortening of P300 latency

• Estrogen pretreatment attenuated the anticholinergic drug-induced impairments on attention tests

• Serum testosterone levels positively correlate with brain speed, and have been shown to enhance adult hippocampal neurogenesis

• Androgen therapy may thus be used to prevent Alzheimer’s dementia and other forms of cognitive decline.

DHEA-S

- In women, DHEA-S levels have been shown to be associated with better cognitive function.
- Higher endogenous DHEA-S levels are independently and favorably associated with executive function, concentration and working memory.
- DHEA helps to mediate adult neurogenesis.
- Dehydroepiandrosterone (DHEA) levels naturally decline as people age and these lowered level are associated with memory loss and decreased cognitive function.

Growth Hormone Therapy

- In patients with growth hormone (GH) deficiency, GH replacement therapy decreased P300 latency after 6 months
- Low IGF-1 correlates to delayed processing speed, a loss of 10-20 msec

### Nutritional Therapies that Enhance Cognitive Function

<table>
<thead>
<tr>
<th>Vitamin and Mineral Antidotes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coriander, Garlic, Calcium, Magnesium, Kelp, Gingko Biloba, Green tea, Peppermint, Cysteine, Cystine, Methionine, Taurine, Melatonin, Iodine, Selenium, Folic Acid, Vitamin E, Spirulina, Ashwagandha, Methionine, Alginates, Iron, Selenium, Zinc, Vitamins A, B1, C, Pectin, Copper</td>
</tr>
</tbody>
</table>
N-Acetyl L-cysteine and Radiation

A Model for Nutrient Therapeutics:

- Inhibit irreversible photobinding
- Improve radiation tolerance
- Inhibit potassium channel activation by gamma radiation
- Decreases C-JUN MRNA (also H2O2 induced)
- Increases clonogenic survival
- Decreases accumulation of P53
- Increases total nonprotein-bound thiols
N-Acetyl L-cysteine and Radiation

A Model for Nutrient Therapeutics:

- UVA and UVB rays (reduce oxygen intermediate species)
- Lymphocytes
- Inhibit NF Kappa B
- Ethyl ester form
- Topical application

- Decreases EGF (epidermal) tyrosine phosphorylation
- Decreases PGE2 synthesis
- Increases epidermal phospholipases
- Increases GSH content
- Decreases DNA breaks (parents, deletions, dicentrics)
Neurogenesis: The New Treatment For Aging Brains

**REPLENISH damaged brain cells with fresh ones:**
- Natural antidepressants and neuro-endocrine therapy can enhance brain cell growth and thus improve cognitive function
- Removal of toxicity through chelation and vitamization
- Cranial Electrical Stimulation
- Enhancement of dopamine, acetylcholine, GABA, and serotonin
- Genetic fate mapping causes median eminence **tanycytes to generate newborn neurons**

**REVERSE age-related dementia (between ages 50 and 80):**
- Coordination of using medicine, hormones, herbs, vitamins, and lifestyle choices

**RECOVER Brain Function & Optimize Performance:**
- More resilient, disciplined, focused, and confident leader

Neurogenesis Repairs Brain Function and Performance

- Improves rapid visual information processing
- Enhances paired associate learning
- Regains spatial recognition
- Reverses executive problems and low IQ
- Reverses memory decline
  - Visual
  - Auditory
  - Working
  - Immediate

C. H. Salmond¹, D. A. Chatfield², D. K. Menon¹, J. D. Pickard¹,³ and B. J. Sahakian

Cognitive sequelae of head injury: involvement of basal forebrain and associated structures
Brain Advance Access originally published online on November 7, 2004
Brain 2005 128(1):189-200; doi:10.1093/brain/awh352

Conclusion

• You can reverse and delay the impact of mental and physical decline by up to 15 years through brain chemistry optimization

• Brain chemistry deficiencies and imbalances can be identified through proper brain and body testing

• Deficiencies can be addressed through a combination of brain and body repair mechanisms

End result: A smarter, faster more optimally performing brain and body