To Reduce Age Related Cognitive Decline
Introduction

- What is Age Related Cognitive Decline?
- How Common is Dementia?
- What causes dementia?
- What are the risk Factors for Dementia?
- What is DHA and how does it impact brain function and cognitive decline?
- What is PS and how does it impact brain function and cognitive decline?
- How do B12 and folic acid impact brain function and cognitive decline?
- What is Efalex Active 50+?
- What are the suggested dosages?
- Conclusion
What Is Age Related Cognitive Decline?

- Decreased ability to think quickly
- Decreased short term memory
- Adequate intellectual function but memory loss since early adulthood
- Memory loss is measurable in performance tests
- Coincides with age related changes in the brain
- Affects 45% of aged 50-59 yrs & increases in prevalence with age.
- Have greater risk of developing more severe forms of decline: “Dementia”
1. Look at the following faces and names.
2. Take a few seconds to study each one.
1. Make a list from 1 – 6
2. Write the name corresponding to each face.
1. Please check if your answer was correct.
2. Write down how many you got correct.
** HOW DID YOU DO? **

<table>
<thead>
<tr>
<th>AGE</th>
<th>Average Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>18-29</td>
<td>6</td>
</tr>
<tr>
<td>30-39</td>
<td>5</td>
</tr>
<tr>
<td>40-49</td>
<td>4</td>
</tr>
<tr>
<td>50-59</td>
<td>3</td>
</tr>
<tr>
<td>60-69</td>
<td>2-3</td>
</tr>
<tr>
<td>70+</td>
<td>1-2</td>
</tr>
</tbody>
</table>
How common is Dementia?

- **Occurs after age 65**
- **Affects**
  - Less than 2% of 65-69 year olds
  - 5% of 75-79 year olds
  - More than 20% of 85-89 year olds
  - Over 30% of 90 year olds
- **More than half of those with dementia suffer from Alzheimer’s disease**

The 2005 Delphi Consensus Study

- 24.3 m people with dementia
- 4.6 m new cases per year
- Countries with highest incidence in 2001
  - China 5 million
  - European Union 5 million
  - United States 2.9 million
  - India 1.5 million
  - Japan and Russia, both 1.1 million
  - Indonesia 1 million
- Expected to reach 81.1 m by 2040
- Highest increase to occur in India, China and south Asian & Pacific neighbours

Need for preventive therapies critical!
What causes dementia?

**Reversible (Treatable)**

- High fever
- Dehydration
- Vitamin deficiencies
- Poor nutrition
- Reactions to medications
- Thyroid gland problems
- Head injury

**Irreversible**

- Apolipoprotein E mutation causing amyloid β-peptide plaques in the brain
- Pick’s dementia
- Parkinson’s disease
- Alzheimer’s disease
- Multi infarct dementia (vascular dementia)
Alzheimer’s disease

Symptoms

• Begin slowly and become steadily worse
• Range from mild forgetfulness to serious impairment
• Impaired memory, language & abstract reasoning, & personality changes
• Eventually patients need total care.

Symptoms coincide with

• Appearance of amyloid β-peptide plaques & nerve fibre tangles
• Leads to oxidative or free radical damage to surrounding tissues
  – Docosahexaenoic acid (DHA) is particularly vulnerable to attack
  – Damages nuclear DNA
  – Exposes an important membrane phospholipid: Phosphatidylserine (PS)
• Leads to nerve cell death in parts of the brain controlling thought, memory and language.
• 20% of all dementias
• More common in men & those with high blood pressure
• Cause by stroke
• Location and severity impacts symptoms
• Begins abruptly & progresses with repeated strokes
• Treatment to prevent further stroke is essential.
What are the Risk Factors for Dementia?

Multi infarct dementia
- Atherosclerosis, type 2 diabetes and high blood pressure

Alzheimer’s Disease
- Advancing age
- Genetic predisposition
- Being female
- Lower standard of education
- Presence of defective apolipoprotein E4 allele
- **Low DHA status**
  “Age Related Cognitive Decline”

Reason for low DHA Status:
- Low dietary intake
- Free radical or oxidative degradation
- Impaired delivery of DHA from the liver to the brain
- Conversion of DHA into protective agents specific to the brain called “Neuroprotectins”
What is Docosahexaenoic Acid (DHA)?

Docosahexaenoic Acid (DHA)

- Beneficial to health
- Omega-3 Fatty Acid
- Found in Fish Oils
- Major membrane fatty acid in brain tissue
- Our intake only 100 mg/day
- Suggested intake 220 mg/day

ISSFAL – Minimum Daily Intake EPA+DHA 500 mg/d
ISSFAL - Minimum Intake 220 mg/d DHA

http://www.dhadepot.com/Omega3_Consumption.htm
BRAIN COMPOSITION

- 60% of dry weight is fat
- DHA is one of the main fatty acids comprising that fat
  20 – 50% DHA
**Lipid Bilayer**
- Barrier to water & ions that enables electrochemical gradient formation\(^1\)

**Receptor Function**
- The efficiency of cell signaling\(^1\)
- Second messengers – DHA & neuroprotectins
• Electrical impulse causes influx of calcium ions through ion channel
• Causes vessels containing neurotransmitters to be released
• Neurotransmitters bind to receptors which opens ion channels
• Creates an electrical charge allowing nerve impulse to continue
• Fatty Acid composition of cell membrane impacts ion channels and neurotransmitter receptors.
• If DHA is too low they don’t work right!
### Types of Neurotransmitters

<table>
<thead>
<tr>
<th>Small Molecular Neurotransmitter Substances</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetylcholine</td>
</tr>
<tr>
<td>Serotonin</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Amino Acids</th>
</tr>
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<tbody>
<tr>
<td>GABA</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Neuroactive Peptides – Partial List!</th>
</tr>
</thead>
<tbody>
<tr>
<td>bradylinin</td>
</tr>
<tr>
<td>cholecystokinin</td>
</tr>
<tr>
<td>gastrin</td>
</tr>
<tr>
<td>secretin</td>
</tr>
<tr>
<td>oxytocin</td>
</tr>
<tr>
<td>Sleep peptides</td>
</tr>
<tr>
<td>Gonadotropin releasing hormone</td>
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</tbody>
</table>

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<tr>
<th>Soluble Gases</th>
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</thead>
<tbody>
<tr>
<td>Nitric Oxide</td>
</tr>
</tbody>
</table>
Function of Dopamine

- Movement

- **Role in cognition and frontal cortex function**
  - Cognitive functions, especially memory, attention and problem-solving

- **Role in pleasure and motivation**

- **Role in psychosis**
Synaptic Architecture

- Essential for learning & memory
- Information is stored by
  - adjusting strength at synapses
  - formation of new synapses
  - elimination of old synapses
- Architecture is fundamental to information processing & storage
- Scaffold proteins
- DHA protects against loss of scaffold proteins and parts of certain enzymes.
- Critical to prevent AD
Second Messengers

- Carry messages from the receptor site to the interior of the cell.

- Created through a series of steps:
  - neurotransmitter attaches to receptor coupled with G protein
  - G protein turns on an enzyme that generates the second messenger

- DHA & Neuroprotectin are second messengers that carry a “Don’t Die” message to the nucleus.

- Shuts off amyloid beta peptide production
DHA Supplementation

In patients with defective apolipoprotein E4 allele
- Increases DHA levels in the brain
- Reduces formation of free radicals and lipid peroxides.

In normal aging populations
- Reduces brain lipid peroxide levels
- Low lipid peroxide levels prevent loss of reference & working memory

DHA protects against lipid peroxidation & sustains memory
Main structural fatty acid in brain cell membranes

- **Impacts on efficiency of cell signalling**
  - *Function of ion channels*
  - *Response to neurotransmitters*
  - *Formation of second messengers*
    - *Neuroprotectin – stops amyloid beta peptide formation and programmed cell death*
    - *Protects against loss of scaffold proteins*

- **Protects against lipid peroxidation**
**Blood levels of DHA are lower than normal**

- **Alzheimer’s disease** *(Corrigan et al. 1991)*
  - DHA was 65% of normal in RBC phospholipids

- **Alzheimer’s disease, other kinds of dementia, cognitive decline but not dementia** *(Conquer et al. 2000)*

- **Alzheimer’s disease rated as mild, moderate and severe** *(Tully et al. 2003)*
  - DHA progressively reduced with dementia severity
Low DHA Status & Development of Cognitive Decline

Direct correlation
- **Kyle et al. 1999**
  - 1188 volunteers followed for 10 years
  - Those with low DHA had 67% greater risk of developing Alzheimer’s disease
  - No relationship between EPA and dementia
- **Heude et al. 2003**
  - 246 participants followed for 4 years
  - Those with higher EPA & DHA had lower risk of cognitive decline

Inverse Correlation
- **Laurin et al. 2003**
  - Related EPA & DHA to development of cognitive impairment and dementia during 5 years.
  - Found high EPA in cognitive impairment and high DHA in dementia
  - Difference between groups were small and may be of little clinical significance
High Fish Intake & Reduced Incidence of Dementia

Rotterdam Study (Kalmijn et al. 1997)
- 5386 volunteers followed for 2.1 years
- Food questionnaire estimated FA intake
- High fish intake significantly related to decreased development of dementia, in particular Alzheimer’s disease.

PAQUID Study (Barberger-Gateau et al 2002, Larrieu et al. 2004)
- 1416 participants followed for 7 years to assess meat and fish intake
- One fish meal/week reduced dementia by one third

Zutphen Elderly Study (Kalmijn 2000)
- 476 volunteers
- Related fish consumption to cognitive impairment and decline
High Fish Intake & Reduced Incidence of Dementia

CHAP (Morris et al. 2005)

- 3718 residents
- Followed for 6 years
- Rate of cognitive decline
  - 10 % slower with one fish meal/week
  - 13 % slower with two or more fish meals/week
**High DHA Intake & Reduced Dementia Incidence**

**Kalmijn et al. 2004**
- 1613 subjects assessed for memory, psychomotor speed, cognitive flexibility & overall cognition during 5 yrs while monitoring Fatty Acid intake
- High EPA & DHA was associated with low risk of impaired cognitive function and speed

**Morris et al. 2003**
- 815 subjects followed for 7 years
- 60 % less risk of Alzheimer’s disease in those eating fish 1/week
- No link between low EPA & the disease; but direct link for DHA

**Whalley et al. 2004**
- 64 year old fish oil supplement users compared to non-users
- High RBC total omega-3 FAs & DHA in the fish oil supplement group was associated with better cognitive function later in life.
Terano et al. 1994

- 20 patients with moderately severe multi infarct dementia
- Treated with 0.72 g of DHA/day or placebo for 12 months
- At baseline and after 3, 6 and 12 months tests
  - Mini-Mental State Examination (MMSE)
  - Hasegawa’s Dementia Rating (HDS-R)
  - Clinical evaluation
  - Blood fatty acid profile
- No significant differences between groups at baseline
- DHA and EPA was higher in active group by month 3
- Correlated with significant improvements in dementia scores (MMSE and HDS-R) while placebo group continued to deteriorate
Fontani et al. 2005

- Double-blind, placebo-controlled study
- 49 healthy men & women aged 22-51 years
- Fish oil – 1.6 g EPA & 0.8 g DHA per day
- Improved anger control, repressed unsuitable responses
- Reduced anxiety, fatigue and depression
- Increased vigour
- Improvements correlated with increased blood omega-3 content
- No improvements in the placebo group
**Summary of Support Evidence for DHA**

**Epidemiological Studies**

- Blood DHA levels are below normal in mild moderate & severe AD, other kinds of dementia & cognitive decline but not dementia
- Low DHA status correlated with development of cognitive decline in most studies
- High fish intake correlates with reduced development of cognitive decline
- High DHA intake (but not EPA) correlated with reduced incidence of decline

**Clinical Intervention Studies with DHA**

- Improves dementia scores in severe multi infarct dementia
- Improves emotional and behavioural responses in normal healthy adults
What is Phosphatidylserine (PS)

- Naturally occurring phospholipid
- Part of our diet and our cell membranes
- Greatest concentration in brain
- Unique ionic charge anchors proteins in membranes
- Minor membrane component but essential for electrical transmission

BRAIN SPECIFIC NUTRIENT
Occurrence and daily consumption of PS

Changes in our daily diet (low fat, low cholesterol, less meat) have resulted in reduced PS intake in recent years.

<table>
<thead>
<tr>
<th>Food</th>
<th>PS-Content in mg / 100 g</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Meat</strong></td>
<td></td>
</tr>
<tr>
<td>Bovine Brain</td>
<td>713</td>
</tr>
<tr>
<td>Innards (average value)</td>
<td>305</td>
</tr>
<tr>
<td>Spleen (Pig)</td>
<td>239</td>
</tr>
<tr>
<td>Kidney (Pig)</td>
<td>218</td>
</tr>
<tr>
<td>Poultry (Leg)</td>
<td>134</td>
</tr>
<tr>
<td>Poultry (average value)</td>
<td>110</td>
</tr>
<tr>
<td>Poultry (Breast)</td>
<td>85</td>
</tr>
<tr>
<td>Beef</td>
<td>69</td>
</tr>
<tr>
<td>Pork</td>
<td>57</td>
</tr>
<tr>
<td>Liver (Pig)</td>
<td>50</td>
</tr>
<tr>
<td><strong>Fish</strong></td>
<td></td>
</tr>
<tr>
<td>Mackerel</td>
<td>480</td>
</tr>
<tr>
<td>Herring</td>
<td>360</td>
</tr>
<tr>
<td>Eel</td>
<td>335</td>
</tr>
<tr>
<td>Tuna</td>
<td>194</td>
</tr>
<tr>
<td>Crayfish</td>
<td>40</td>
</tr>
<tr>
<td>Cod</td>
<td>28</td>
</tr>
<tr>
<td><strong>Dairy</strong></td>
<td></td>
</tr>
<tr>
<td>Milk (3.5% Fat)</td>
<td>1</td>
</tr>
<tr>
<td>Milk (1.5% Fat)</td>
<td>0.5</td>
</tr>
<tr>
<td><strong>Others</strong></td>
<td></td>
</tr>
<tr>
<td>Beans</td>
<td>107</td>
</tr>
<tr>
<td>Whole Grain</td>
<td>20</td>
</tr>
<tr>
<td>Rice (unpolished)</td>
<td>3</td>
</tr>
</tbody>
</table>

Daily PS Intake

<table>
<thead>
<tr>
<th>Daily PS Intake</th>
<th>Daily PS Intake</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980ies</td>
<td>today</td>
</tr>
<tr>
<td>diet rich in meat</td>
<td></td>
</tr>
<tr>
<td>250 mg</td>
<td>180 mg</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Daily PS Intake</td>
<td>Daily PS Intake</td>
</tr>
<tr>
<td>today</td>
<td>today</td>
</tr>
<tr>
<td>reduced fat diet</td>
<td>Vegetarians</td>
</tr>
<tr>
<td>100 mg</td>
<td>&lt; 50 mg</td>
</tr>
</tbody>
</table>
How does PS impact Brain Function?

- Ion channel function
- Release of neurotransmitters
- Signal transduction
- Gene expression – Protein kinase C
- Cell growth and renewal
  - Growth factor - promotes synthesis & release
    - prevents receptor decline
- Cell Recycling – Amino-PL translocases
<table>
<thead>
<tr>
<th>Investigator</th>
<th>Patients</th>
<th>Dosage/day</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delwaide et al. 1986</td>
<td>42 Hospitalized demented</td>
<td>300 mg</td>
<td>42 days</td>
</tr>
<tr>
<td>Engel et al. 1992</td>
<td>33 Mild dementia</td>
<td>300 mg</td>
<td>56 days</td>
</tr>
<tr>
<td>Palmieri et al. 1987</td>
<td>90 Moderate cognitive decline</td>
<td>300 mg</td>
<td>60 days</td>
</tr>
<tr>
<td>Villardita et al. 1987</td>
<td>170 Mild to moderate age related cognitive decline</td>
<td>300 mg</td>
<td>90 days</td>
</tr>
<tr>
<td>Heiss et al. 1993</td>
<td>40 Probable Alzheimer’s</td>
<td>300 mg</td>
<td>180 days</td>
</tr>
<tr>
<td>Heiss et al. 1994</td>
<td>70 Probable Alzheimer’s</td>
<td>300 mg</td>
<td>182 days</td>
</tr>
<tr>
<td>Crook et al. 1991</td>
<td>149 Normally aging adults</td>
<td>300 mg</td>
<td>84 days</td>
</tr>
<tr>
<td>Crook et al. 1992</td>
<td>51 Probable Alzheimer’s</td>
<td>300 mg</td>
<td>84 days</td>
</tr>
<tr>
<td>Cenacchi et al. 1993</td>
<td>425 Moderate to severe cognitive decline</td>
<td>300 mg</td>
<td>180 days</td>
</tr>
</tbody>
</table>
Delwaide et al. 1986

- 35 hospitalized Alzheimer’s disease patients
- 300 mg/day PS or placebo
- Six weeks
- Measured daily living parameters before and after treatment
  - Toilet
  - Dressing
  - Eating
  - Bowel control
  - Bladder control
  - Ability to go to the toilet unaided
  - Interpersonal relationships
  - Relationship with the environment
  - Behavioural problems in the unit
  - Verbal expression

- Improvements faded when treated with PS was stopped
Palmieri et al. 1987

- 87 subjects with moderate cognitive decline
- 300 mg/day PS or placebo
- 60 days treatment + 30 day follow up
- Measured daily living parameters before and after treatment
  - 5 word acquisition and recall tests - Attention, concentration & short-term memory
  - Daily living skills
- Significant improvements in
  - Word acquisition & recall
  - Self-sufficiency, sleep disturbances, disadapative behaviour, initiative & overall behavioural deficit
- PS affects
  - Concentration & short-term memory
  - Behavioural aspects
  - Ultimately improves quality of life & ensures continued bond with family and friends.
Cenacchi et al. 1993

- 425 subjects with moderate to severe cognitive decline
- 300 mg/day PS or placebo for 6 months
- At baseline, 3 and 6 months measured:
  - Plutchik Geriatric Rating Scale
    - Activities of daily living
    - Withdrawal and apathy
  - Buschke Selective Reminding Test
    - Recall
    - Long term storage
    - Long term retrieval
    - Long term retrieval consistent
- Significant improvements in
  - Withdrawal and apathy
  - Memory and learning – word-list recall
  - Clinical evaluations and lab tests showed PS was well tolerated
Cenacchi et al. 1993

Clinical Intervention Studies - PS
Crook et al. 1991

- 149 Normally aging adults with age-associated cognitive decline
- People with dementia, AD & other forms of cognitive decline were excluded
- 300 mg/day PS or placebo for 12 weeks and follow up after 4 weeks
- At baseline and 3, 6, 9, 12 and 16 weeks:
  - Clinical global rating scale
  - Non-computerized neuropsychological tests
  - Computerized psychometric tests
- Improvements in
  - Comp & non-computerized performance tests related to learning memory.
  - A subgroup of 57 severely impaired had significantly improved:
    - Name-face acquisition
    - Name-face delayed recall
    - Facial recognition
    - Telephone number recall
    - Misplaced object recall
- **PS is effective to PREVENT cognitive decline in normal healthy adults**
- **Benefits are more pronounced in those with greater impairment**
Clinical Intervention Studies - PS

Crook et al. 1991
• 51 probable Alzheimer’s disease patients
• People with dementia, AD & other forms of cognitive decline were excluded
• 300 mg/day PS or placebo for 12 weeks and follow up after 4 weeks
• At baseline and 3, 6, 9, 12 and 16 weeks:
  – 12 item clinical global scale
  – 25 item psychiatric rating scale focusing on
    • Cognition  Anxiety
    • Agitation  Depression
  – Behavioural rating – Memory assessment clinics-family rating scale
  – Abbreviated computerized psychometric tests

• Significant Improvements in
  – 2 of 12 clinical global rating scale
    • Remembering names of familiar people
    • Ability to recall location of misplaced object
  – 3 of 25 psychiatric rating scale
    • Difficulty recalling names
    • Difficulty recalling events of the past day
    • Difficulty recalling events of the past week
  – At weeks 6 & 9, but not at week 12 for Behavioural rating
  – Abbreviated computerized psychometric tests
    • First-Last name test – week 12
    • Name-Face Association - week 9
    • Facial recognition – week 6
    • Verbal selective reminding – week 6

• Those with greatest impairment were least likely to improve.

Prevention should be started before development of more severe forms of dementia which respond less favourably.
Heiss et al. 1994

- 70 patients with probable AD
- 400 mg PS/day for 6 months
- PET Scans completed before and after treatment
- Yellow and red areas indicate activity
- Changes in brain activity correlate with clinical improvements.

**EEG and PET Brain Scans**

*Before Treatment*

*After Treatment*
Summary of Support Evidence for PS

• PS intake is lower today than 20 years ago

• Numerous Clinical Intervention Studies

  Significant Improvements in:
  – Alzheimer’s disease that benefit daily living
  – Moderate to severe cognitive decline
  – Normally aging adults with age related cognitive decline

  Treatment should be started early in life to prevent development of more severe forms of dementia which respond less favourably.
How do B12 & Folic Acid impact Brain Function?

- **Vitamin B12 deficiency causes dementia.**
- **Combined Vit B12 and folic acid - Through their effects on cardiovascular function**
- **Folic Acid and Vitamin B12 reduce blood homocysteine**
- **Homocysteine**
  - *is elevated in cardiovascular disease*
  - *An independent risk factor for hardening of the arteries in*
    - Heart
    - Peripheral blood vessels
    - Brain

May be underlying factor in cognitive impairment with age Vascular dementia accounts for 20% of all
Duthie et al. 2002

• Brain aging, nutrition and heath study
• Included 331 people aged ~ 55 and 70 years old
• Subjected to a range of memory & concentration tests
• Measured blood levels of Vit B12, folic acid & homocysteine

Results

– High homocysteine was associated with
  • Low vitamin B12 and folic acid
  • Low cognitive performance
– High Vitamin B12 and Folic acid was associated with
  • Low homocysteine
  • High cognitive performance

Vitamin B12 and folic acid maintain cognitive performance by keeping homocysteine levels low
Clarke et al. 1998

• Effects of Vit B12 and Folic Acid on Homocysteine levels
• Meta-analysis of 14 clinical trials involving 1114 subjects
• 240-3000 ug Folic Acid, 20-1000 ug Vit B12
• 25% reduction by Folic Acid
• Additional 7% reduction by Vit B12

Bryan et al. 2002

• Effects of Vit B12 and Folic Acid on Cognitive Function
• 221 women aged 20 – 92 years
• 450 ug folic acid, 15 ug B12 & 75 mg B6 or placebo for 35 days
• Tested for cognitive processing, memory, executive function, verbal ability and self assessed mood
• Improved immediate recall & delayed word recognition – most notable in aged
• Younger women with deficiency also improved
How does Gingko biloba impact brain function?

- Widely promoted for memory & learning enhancement, prevention & treatment of age related cognitive decline and dementia.
- Preclinical studies provide strong support
- Most useful as a long term preventative for dementia
- Multiple mechanisms of action proposed, none proven
1998 Alzheimer’s disease – small but significant effect of 120-140 mg per day on objective measures of cognitive function.

1999 Alzheimer’s disease, multi-infarct dementia or mixed dementia – more effective than placebo to delay clinical deterioration and can improve symptoms.

2002 Healthy people – no marked or consistent positive effects except for in the longest trial – highlights need for long studies to assess preventive capacity.

• Andrieu et al. 2003
  – 1462 community-dwelling elderly women followed for 7 years
  – Those taking Gingko biloba for at least 2 years had lower risk of developing Alzheimer’s disease.

• NIH is funding a £15 million randomized, double-blind, placebo-controlled clinical trial
  – Includes 3000 normal elderly people
  – Supplementing with 240 mg/day Gingko biloba for 5 years
  – To assess prevention of dementia and/or ARCD
  – Recruitment completed and baseline data has been published
A supplement combining DHA-rich fish oil with key nutrients known for their beneficial role in maintaining healthy brain function.

Provides daily dose of:

- 500 mg DHA
- 62 mg PS
- 500 ug folic acid
- 10 ug Vitamin B12
- 10 mg vitamin E
- 120 mg Gingko biloba extract
DHA (500 mg/day)
- Satisfies ISSFAL
  - Minimum Daily Intake 220 mg DHA
  - Minimum Daily Intake 500 mg DHA + EPA
- Protection against age related cognitive decline – 225 mg/day
- Protection against Alzheimer’s Disease – 60 mg/day
- Enhance cognitive function & mood in healthy people – 800 mg
- Improve moderate to severe multi infarct dementia – 720 mg/day

PS (60 mg)
- Reduces risk of cognitive decline – 50-500 mg/day
- Severe mental deterioration – 300 mg/day

Vitamin B12 (10 ug)
- Lowers homocysteine levels – 20ug
- Improves memory – 15 ug

Folic Acid (800 ug)
- Lowers homocysteine levels – 240 ug
- Improves memory – 450 ug
Efalex Active 50+

Provides effective doses of nutrients clinically proven to:

**DHA**
- Improve dementia scores in severe multi infarct dementia
- Improve emotional & behavioural responses in normal healthy adults

**PS**
- Improve Alzheimer’s disease sufficient to benefit daily living
- Improve moderate to severe cognitive decline
- Improve memory in normally aging adults with age related cognitive decline

**Vitamin B12 and Folic Acid**
- Lowers homocystiene levels (risk factor in vascular disease - impacts brain function)
- Improves memory in normal aging women and younger ones with deficiency