FOOD FOR THOUGHT
THE EMERGING ROLE OF WHOLE FOOD, PLANT BASED DIETS IN BRAIN HEALTH

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Lifestyle Medicine involves the use of evidence-based lifestyle therapeutic approaches, such as a predominantly whole food, plant-based diet, regular physical activity, adequate sleep, stress management, avoidance of risky substance use, and other non-drug modalities, to prevent, treat, and, oftentimes, reverse the lifestyle-related, chronic disease that's all too prevalent.

—American College of Lifestyle Medicine
CHRONIC DISEASE AMENDABLE TO LIFESTYLE MEDICINE

- Diabetes (remission / reversal)
- CAD (reversal on angiography)
- Autoimmune or inflammatory conditions (symptom control, disease remission): RA, MS, IBD
- Metabolic conditions: HTN, HLD, PCOS
- GI conditions: IBS, constipation
- Mood disorders
- Dementia
What’s good for the heart is good for the brain.
IS ALZHEIMER’S A VASCULAR DISEASE?

- **History**
  - 1901: Auguste Deter evaluated by Dr. Alois Alzheimer in Frankfurt, Germany
    - 50yo female: paranoid, delusional, emotional outbursts and confusion
  - 1906 autopsy revealed amyloid plaques and tau tangles
    - Overlooked in the report “The larger cerebral vessels show arteriosclerotic change.”

- Alzheimer’s patients have documented significant arterial stenosis (vascular plaques) in the vessels feeding the brain’s memory centers.
- Treating vascular risk factors (hyperlipidemia, diabetes, hypertension) improves AD symptoms or slows progression.
- Many experts have voiced support for reclassifying AD as a vascular disorder.

De la Torre, *Ann NY Acad Sci* 2002
Roher, et al *Alz Dement* 2011
BRAIN DAMAGE IN DEMENTIA

- **Four key processes** responsible for the majority of brain degeneration in AD
  - **Chronic inflammation** – even early in the disease course, higher levels of inflammatory cytokines and activated microglia are observed
  - **Oxidation** (natural) → free radical formation and surrounding tissue damage
  - **Glucose dysregulation, insulin resistance** → chronic inflammation and **tau protein** phosphorylation
  - **Lipid dysregulation** – excess lipids + inflammation → oxidized lipids (LDL) → vascular plaque formation and local hypoperfusion
    - Improper clearance and processing of excess cholesterol contributes to **amyloid plaque** formation

Drs. Dean and Ayesha Sherzai
Co-Directors of Alzheimer's Prevention Program at LLU
LIFESTYLE FACTORS AND DEMENTIA

- Rush Memory and Aging Project and Chicago Health and Aging Project data (n = 2,765, ~6yr follow-up)

- 5 factors
  - No smoking
  - ≥ 150 min/wk of moderate/vigorous activity
  - Moderate alcohol
  - Engagement in late-life cognitive activities (upper 40%)
  - MIND Diet* (upper 40% of adherence) – plant heavy, plant fats, low saturated fat, low sodium, minimal alcohol

Compared to 0-1 factors
- Having 2-3 healthy lifestyle factors \(\rightarrow\) 37% lower risk of AD (HR 0.63, 95% CI 0.47-0.84)
- Having 4-5 healthy lifestyle factors \(\rightarrow\) 60% lower risk of AD (HR 0.40, 95% CI 0.28-0.56)

*Mediterranean-DASH diet intervention for neurodegenerative delay

MIND DIET

**Includes**
- Green leafy vegetables
- Other vegetables
- Nuts
- Berries
- Beans / legumes
- Unprocessed (intact) grains
- Seafood
- Poultry
- Olive oil
- Red wine

**Limits**
- Red Meats
- Butter / Stick margarine
- Cheese
- Pastries / sweets
- Fried / fast food

Morris et al. Alzheimers Dement 2015
SPECIFIC DIETARY COMPONENTS

Saturated Fat

- Solid at room temperature, mainly found in animal products (butter, marbling in meat/chicken/fish, cheese / dairy; plants - coconut products and cashews)
- AHA recommends sat fat < 6% of calories or 13g/day on 2,000 calorie diet

- Chicago Healthy Aging Study (n = 815, > 65yo, 4 yr follow-up)
  - Consumption of 25g/day of saturated fat → 2.2x risk of AD dx compared to 13g/day

- Harvard Women’s Health Study (n = 6,183, 4yr time frame)
  - Higher saturated fat intake (from meats, dairy, processed foods) significantly associated with cognitive decline
  - Those in highest quintile of saturated fat intake had 60-70% chance of cognitive decline over time (9 yrs post diet assessment)
  - Women with lowest saturated fat intake had brain function of those ~6 years younger

Morris et al. Arch Neurol 2003
Add Up the Saturated Fat

<table>
<thead>
<tr>
<th>Item</th>
<th>Fat (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 large eggs</td>
<td>3.2</td>
</tr>
<tr>
<td>1 slice bacon</td>
<td>1.0</td>
</tr>
<tr>
<td>Chicken thigh, skinless</td>
<td>4.7</td>
</tr>
<tr>
<td>Whole milk (1 cup)</td>
<td>4.6</td>
</tr>
<tr>
<td>DiGiorno Pizza for One</td>
<td>12.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>25.5</strong></td>
</tr>
</tbody>
</table>
SPECIFIC DIETARY COMPONENTS

- **Cholesterol** – component of animal cell membranes (only found in animal products)
  - Autopsy studies: Alzheimer’s brains have significantly more total cholesterol vs controls (atherosclerosis AND extravascular tissue)
  - Cholesterol specifically appears to accumulate in AD plaques – it may actually promote the clumping of amyloid
    - Electron microscopy has revealed clustering of amyloid fibers on and around little microcrystals of cholesterol
  - Evidence that low-density (LDL) cholesterol may cross blood–brain barrier and damage the barrier itself
    - Once in the brain, cholesterol can auto-oxidize and create damaging free radicals
  - High total serum cholesterol over 250 mg/d → 3x times of AD diagnosis (OR 3.1, 95% CI 1.2 – 8.5)
    - 444 men, aged 70-89 years, who were survivors of the Finnish cohorts of the Seven Countries Study
  - Specific PET scanning of the brain has lead to the finding that serum LDL levels correlate with amyloid in the brain
    - Elevated cerebral Aβ level is associated with cholesterol fractions in a pattern analogous to that found in coronary artery disease

Harris et al Subcell Biochem 2010
Reed et al. JAMA Neurol 2014
Notkola et al. NueroEpi 1998
Corsinovi et al Mol Nutr Food Res 2011
PROTECTIVE DIETARY COMPONENTS

- **Fruits and vegetables**
  - 5+ portions of fruit and/or vegetables per day → 47% decreased prevalence of cognitive impairment (900 Chinese adults, 50+ yr old)
  - CHAS: Eating median 2.8-4.1 servings of vegetables / day associated with ~40% lower rate of cognitive decline
  - Self report in midlife of “medium/great” vs “no/small” portion of diet being made up of fruits and vegetables was associated with 27% lower odds of dementia and 40% lower odds of AD in fully-adjusted models, 30 years post diet questionnaire (n ~3,800, Swedish Twin Registry Study)

- **Berries**
  - Polyphenols - anthocyanidins, which are found in blue and purple pigmented fruits and berries
  - Harvard Nurses’ Health Study > 16,000 women: long-term consumption of strawberries and blueberries → significantly associated with slower rates of cognitive decline equivalent to cognitive differences in women up to two and a half years younger

- **Cruciferous vegetables and leafy greens** – folate, other antioxidants, omega-3 FAs

Hughes et al. Am J Geriatr Psychiatry. 2010
PROTECTIVE DIETARY COMPONENTS

- Legumes
  - Beans, lentils, peas, soy beans, peanuts
  - High in fiber and resistant starches which gut bacteria transform into SCFAs
  - Higher intake associated with larger parietal and occipital lobe cortical thickness

**PROTECTIVE DIETARY COMPONENTS**

- Whole grains
  - Intact grains: oats, wild rice, barley, quinoa
  - Higher intake associated with large temporal pole and superior temporal cortical thickness
  - Lower intake associated with higher inflammatory markers (IL-6) and accelerated cognitive decline

PROTECTIVE DIETARY COMPONENTS

- Nuts and seeds
  - Fiber, antioxidants (vitamin E), unsaturated fats (omega 3 FA – alpha lineolenic acid)
  - Harvard Nurses Study (70+yo): 5+ servings nuts/week lead to cognition scores equivalent to women 2 years younger
  - PREDIMED data: Mediterranean dietary pattern supplemented with nuts (walnuts, almonds, hazelnuts) improved plasma brain-derived neurotrophic factor (BDNF) concentrations. BDNF is associated with the prevention of memory loss and cognitive impairment.

- Vitamin E
  - CHA study (65+ yo, n = 1041, 4yr AD incidence): every 5mg/d (whole food vit E) reduced AD risk by 26% (RR 0.74, 95% CI: 0.62, 0.88)
    - Just 7.6mg/day provided neuro protection
  - RDA (adults) 15mg/day
  - Sources: green vegetables, many seeds, many nuts, avocado, mango
  - 1 oz nuts/seeds (palmful) = 5mg vit E

Current Relevant Research

- Team Sherzai: Drs. Dean and Ayesha Sherzai
  - Neurologists
  - Co-direct Alzheimer's Prevention Program and Loma Linda University
- **NEURO Plan**
- Healthy Minds Initiative
  - AD and Environment Responsive Cognitive Diseases (ERCDs): diseases for which environment and lifestyle provide a strong risk
    - Other dementias (vascular, Lewy body, Parkinson’s, fronto-temporal), stroke, depression / anxiety / PTSD, ADHD
NEURO PLAN

- **N – nutrition** (“food is the single greatest tool we have in the fight against AD….it is by far the most important lifestyle factor”)

- **E – exercise**

- **U – unwind** (stress reduction, stress management)

- **R – restore** (restorative sleep)

- **O – optimize** brain stimulation, cognitive capacity
WHAT ABOUT FISH? “GOOD FATS?”

- 3 important forms of omega-3 FA: alpha-linolenic acid (ALA), EPA and DHA
- Omega-3 intake controversially and inconsistently associated with cognitive health
  - 2012: “Results suggest an effect of n-3 FAs within specific cognitive domains in CIND, but not in healthy or AD subjects”
  - 2015: “There is marginal evidence that n-3 PUFA supplementation effects cognition in those who are n-3 PUFA deficient. However, there is no evidence of an effect in the general population or those with neurodevelopmental disorders.”
  - 2016: “Our meta-analysis indicated that omega-3 fatty acids may help to prevent cognitive decline in the elderly”
- Depending on species – only 15-30% of fat in fish is omega-3
- Fish contain cholesterol. Some shellfish have more cholesterol than beef.
- Mercury and environmental pollutants → neurotoxins

Solution
- Plant based omega-3 (ALA): walnuts, flax seeds, chia seeds, whole soy, leafy greens
- Omega 3 supplement (plant based algal) with 250mg/day DHA

Saturation in 3.5oz of salmon
- Fish, salmon, chinook, cooked, dry heat: 3.214g (16%RDA)
- Fish, salmon, Atlantic, farmed, raw: 3.05g (15%RDA)
- Fish, salmon, coho, wild, cooked, moist heat: 1.595g (8%RDA)

TOP PLANT-BASED SOURCES OF:

OMEGA 3 FATTY ACIDS

1. FLAXSEEDS
   183% AI* per 2 Tbsp

2. WALNUTS
   113% AI* per 1/4 CUP

3. CHIA SEEDS
   45% AI* per 2 Tbsp

4. SOYBEANS
   43% AI* per cup

5. TOFU
   26% AI* per 4 oz

6. BRUSSELS SPROUTS
   13% AI per cup

7. CAULIFLOWER
   9% AI* per cup

8. BROCCOLI
   8% AI* per cup

9. WINTER SQUASH
   8% AI* per cup
What’s good for the heart is good for the brain.

A diet high in (or made up exclusively of) unprocessed plant foods, that also limits saturated fat, is the strongest intervention we have to prevent or halt the progression of dementia.
YOUR NEW BRAIN POWER PLATE
His research as far back as 1990 provided evidence that intensive lifestyle changes (including a low fat plant-based diet) could REVERSE coronary artery disease.

Current work is focused on memory.

“We are at a state with AD similar to where we were over 40 years ago with heart disease: if moderate changes can prevent it, can more intensive changes reverse it?”
RESOURCES

- Physician's Committee for Responsible Medicine
  - Alzheimer's Disease: [https://www.pcrm.org/health-topics/alzheimers](https://www.pcrm.org/health-topics/alzheimers)
  - Book: *Power Foods for the Brain* by Dr. Neal Barnard
    - Tedx talk: [https://www.youtube.com/watch?v=v_ONFix_e4k](https://www.youtube.com/watch?v=v_ONFix_e4k)

- NutritionCME.org – 2 CME lectures on brain health

- Team Sherzai: [https://teamsherzai.com](https://teamsherzai.com)
  - Book: *The Alzheimer's Solution*
  - Healthy Minds Initiative: [https://www.healthymindsinitiative.org](https://www.healthymindsinitiative.org)
  - NEURO Plan Academy (with app): [https://www.theneuroplan.com](https://www.theneuroplan.com)

- [www.nutritionfacts.org](http://www.nutritionfacts.org)
  - Various evidence-based clips and articles covering food and dementia risk
  - Book: *How Not to Die* by Dr. Michael Greger (dementia chapter)