

# FOOD FOR THOUGHT

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



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# LIFESTYLE MEDICINE



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**

## CONCLUSION

What's good for the heart is  
good for the brain.

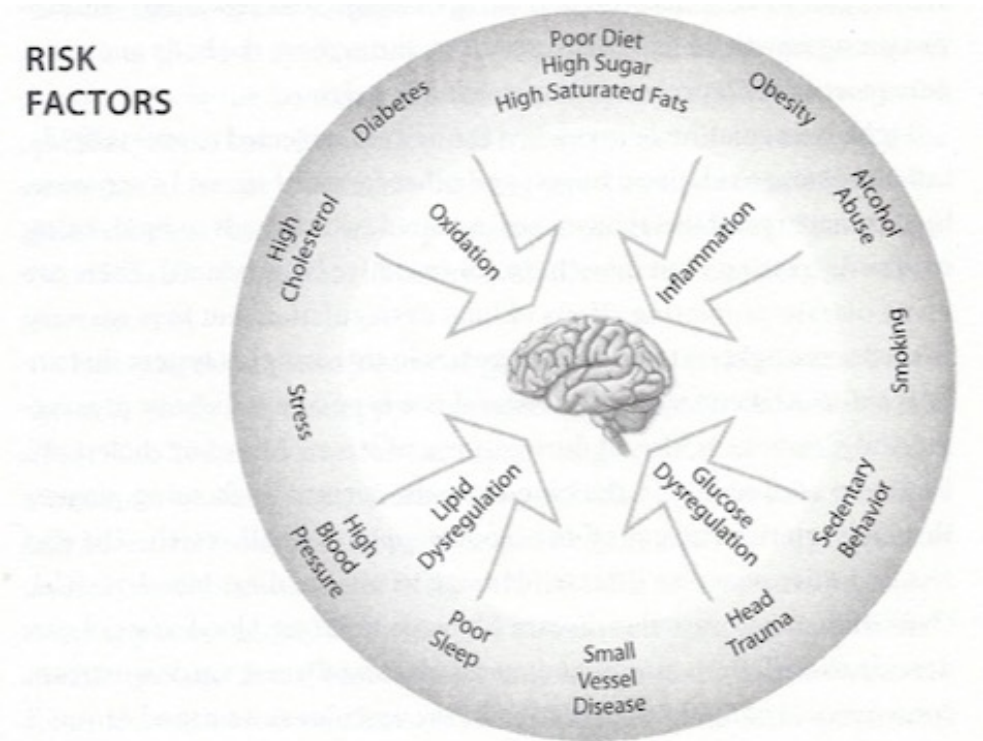
# IS ALZHEIMER'S A VASCULAR DISEASE?

- 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.

# 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



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

- |   |  |
|---|--|
| 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 |  |

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

# MIND DIET

## Includes

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



## Limits

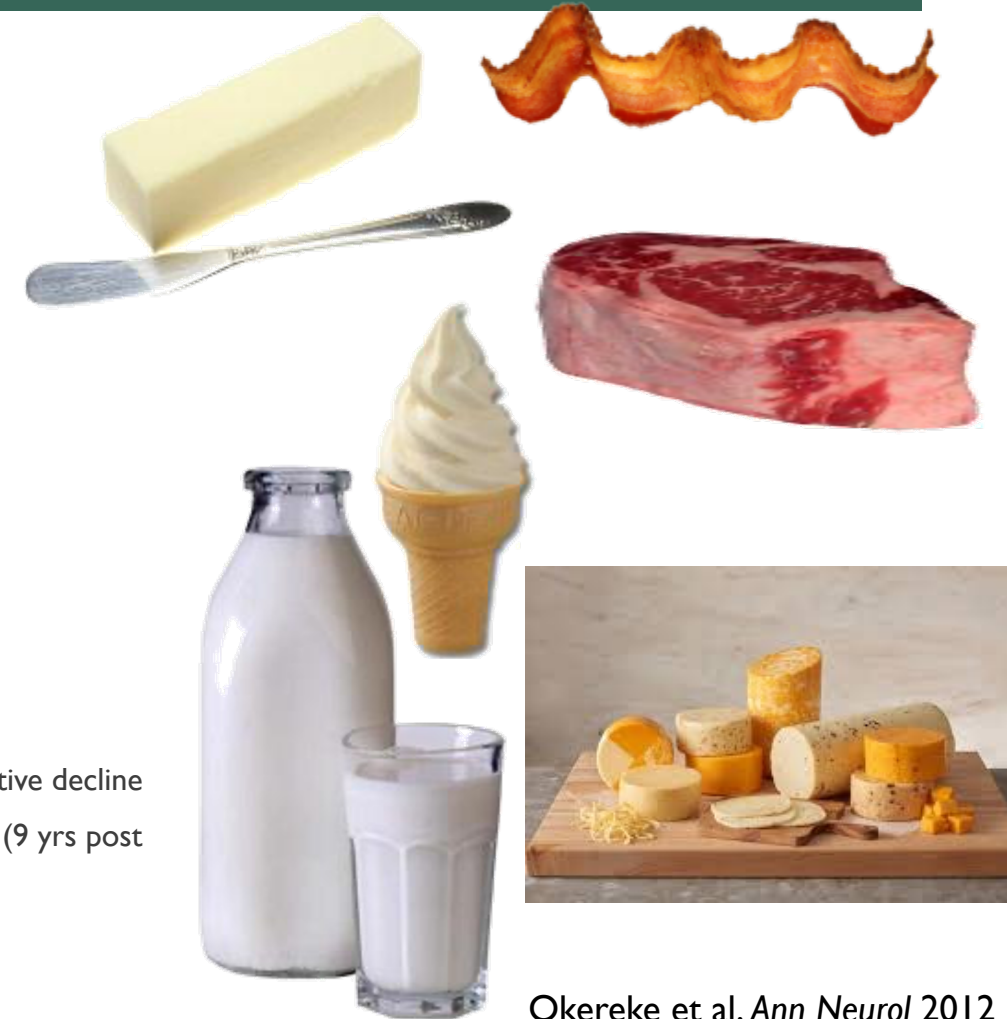
Red Meats  
Butter / Stick margarine  
Cheese  
Pastries / sweets  
Fried / fast food



# 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



Okereke et al. *Ann Neurol* 2012  
Morris et al. *Arch Neurol* 2003

# Add Up the Saturated Fat

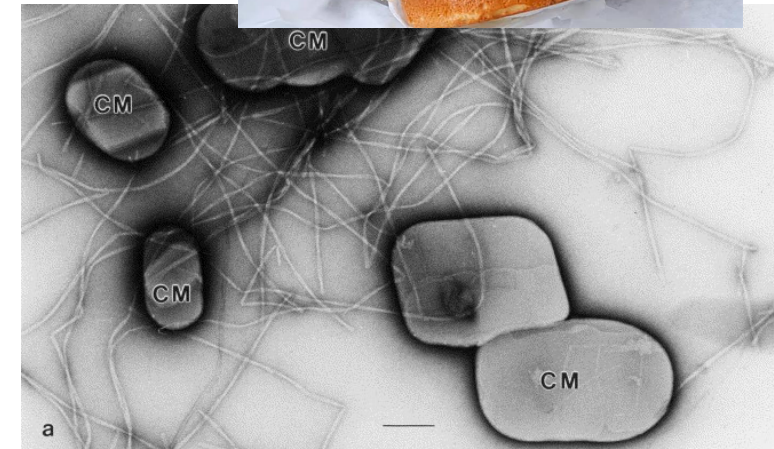


2 large eggs	3.2 g
1 slice bacon	1.0 g
Chicken thigh, skinless	4.7 g
Whole milk (1 cup)	4.6 g
DiGiorno Pizza for One	12.0 g

Total	25.5 g
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# 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 A $\beta$  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



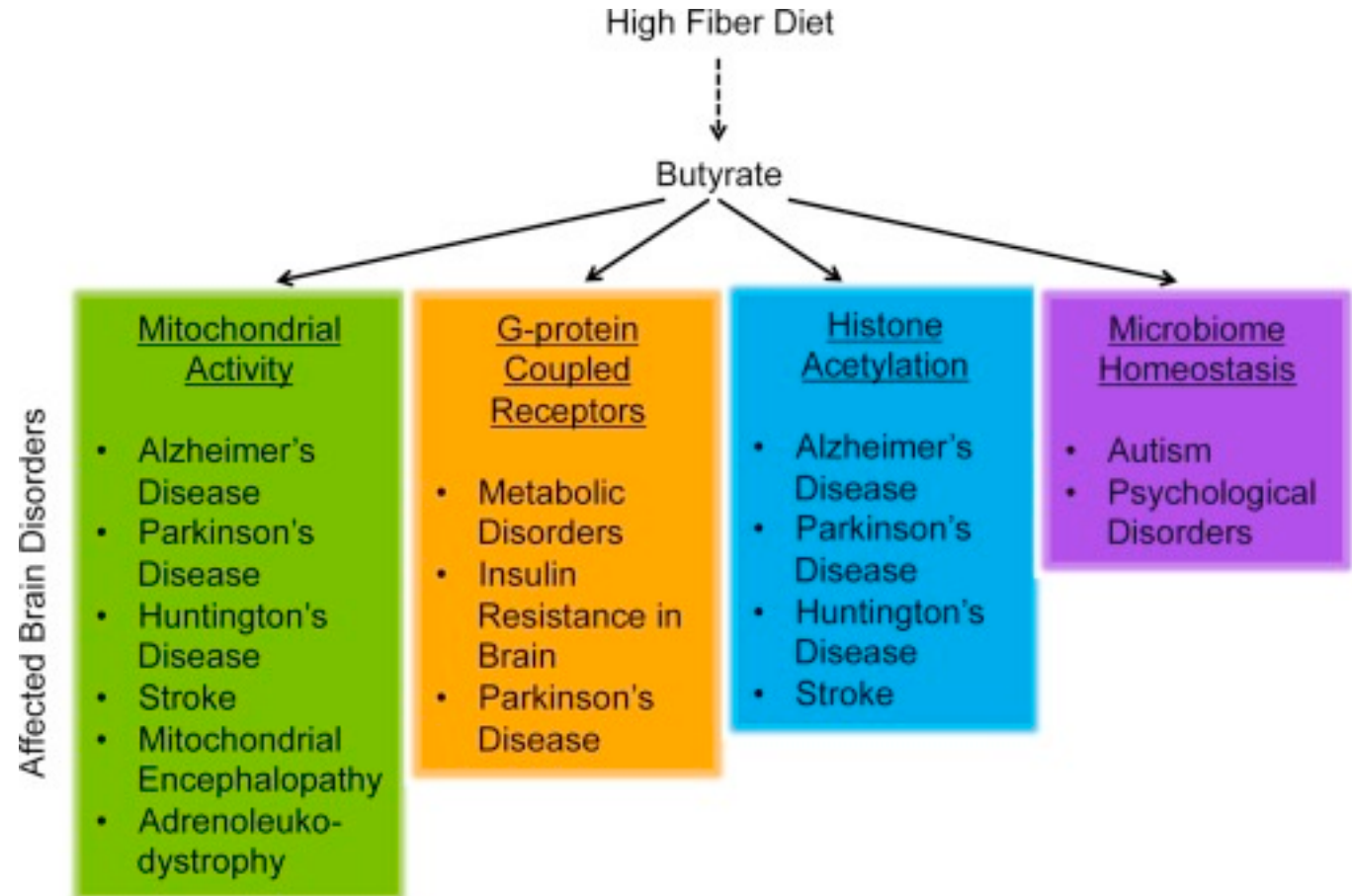
## ■ Cruciferous vegetables and leafy greens – folate, other antioxidants, omega-3 FAs

Dong et al. *Arch Gerontol Geriatr* 2016.  
Morris et al. *Neurology* 2006.  
Hughes et al. *Am J Geriatr Psychiatry*. 2010



# PROTECTIVE DIETARY COMPONENTS

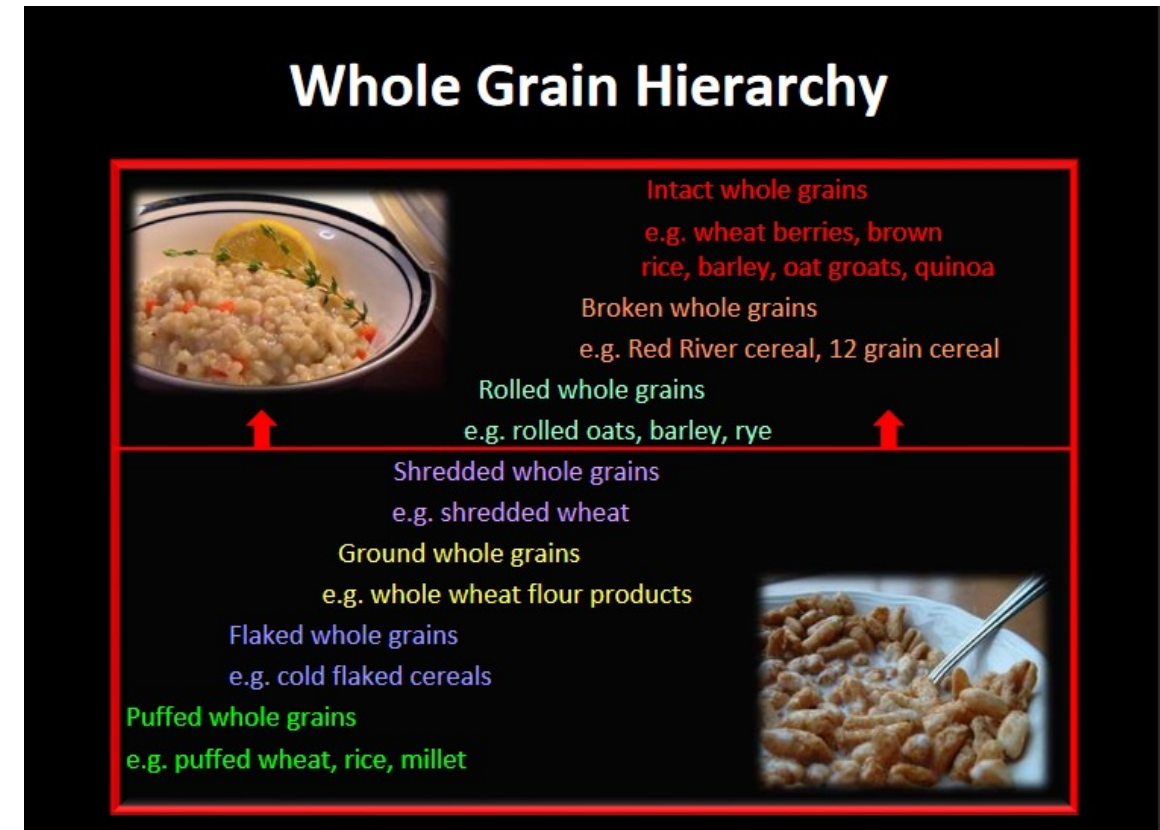
- Legumes
  - Beans, lentils, peas, soy beans, peanuts
  - High in fiber and resistant starches which gut bacteria transform into SCFAs
- Higher intake associated with larger parietal and occipital lobe cortical thickness



Bourassa et al. *Neurosci Letters* 2016.  
Staubo et al. *Alzheimers Dement* 2017.

# 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



Staubo et al. *Alzheimers Dement* 2017.  
Ozawa et al. *Clin Nut* 2017.

# PROTECTIVE DIETARY COMPONENTS

- Nuts and seeds
  - Fiber, antioxidants (vitamin E), unsaturated fats (omega 3 FA – alpha linolenic 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



Morris et al. *Am J Clin Nut* 2005.  
Sánchez-Villegas et al. *Nutr Neurosci* 2011.  
Pribis et al. *Am J Clin Nut* 2014.

# CURRENT RELEVANT RESEARCH

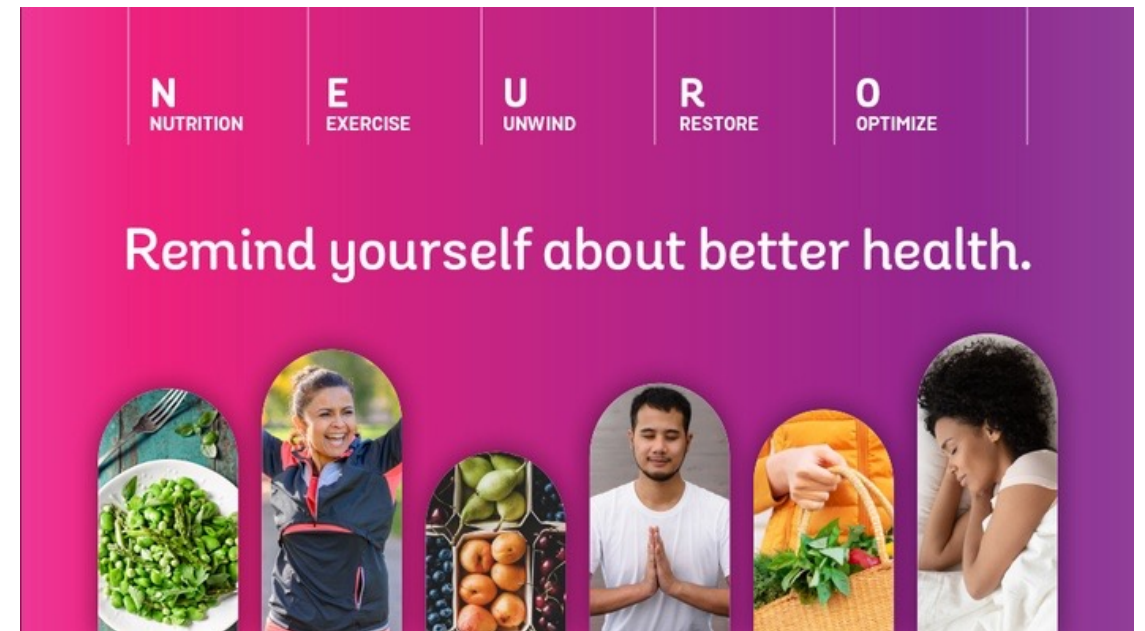
- Team Sherzai: Drs. Dean and Ayesha Sherzai
  - Neurologists
  - Co-direct Alzheimer's Prevention Program and Loma Linda University
  - **NEURO Plan**
  - Healthy Minds Initiative
    - AD and Environment Responsive Cognitive Diseases (ERCDS): diseases for which environment and lifestyle provide a strong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



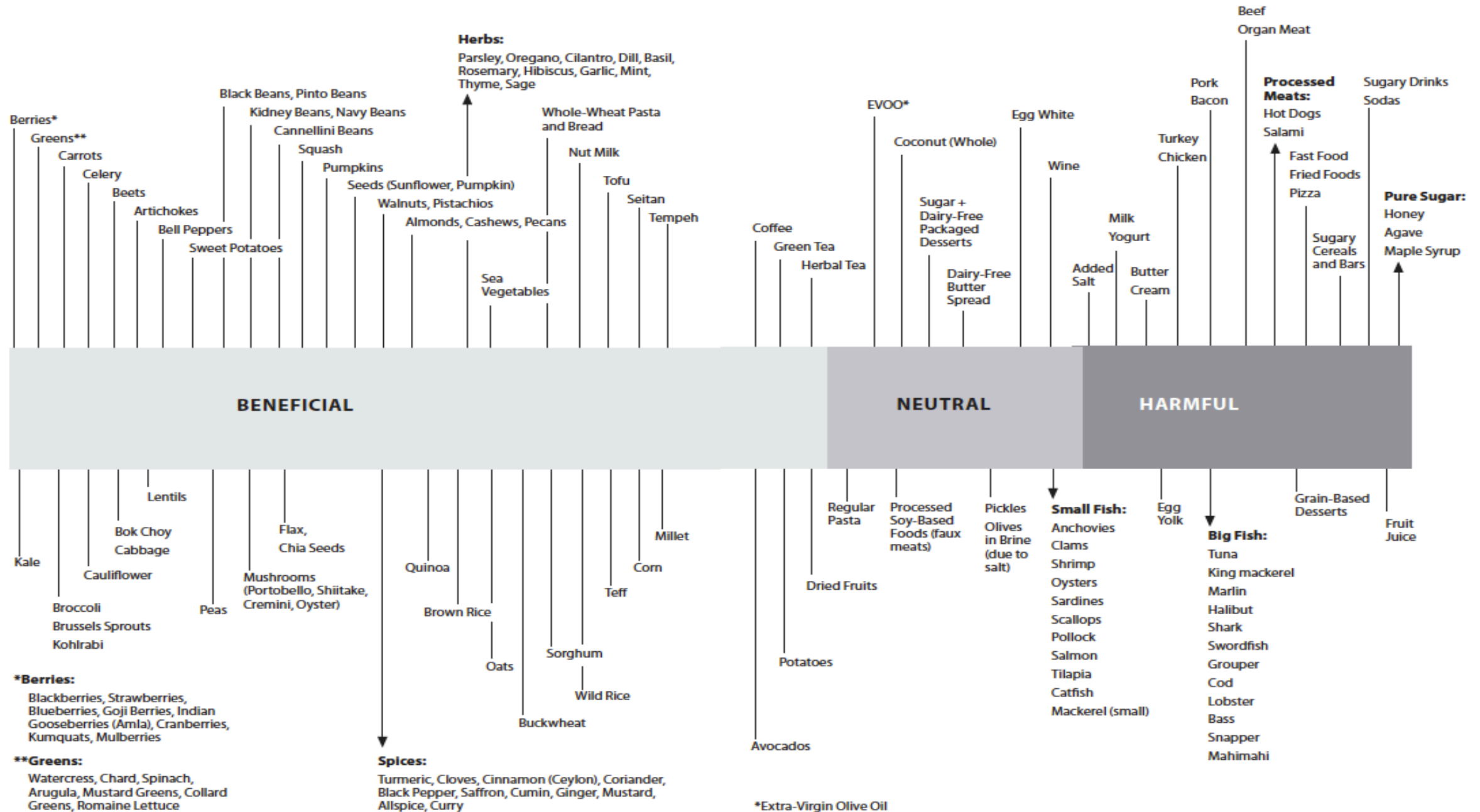


# NEURO PLAN

- **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



# Team Sherzai's NEURO Plan Nutrition Spectrum



# 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



## Saturated fat 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)

- 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

Mazereeuw et al. *Neurobio Aging* 2012.

Cooper et al. *J Psychopharm* 2015.

Zhang et al. *Aging Clin Exp Res* 2016.

# TOP PLANT-BASED SOURCES OF: OMEGA 3 FATTY ACIDS



1

FLAXSEEDS  
133% 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 4oz



6

BRUSSELS SPROUTS  
11% AI per cup



7

CAULIFLOWER  
9% AI\* per cup



8

BROCCOLI  
8% AI\* per cup



9

WINTER SQUASH  
8% AI\* per cup

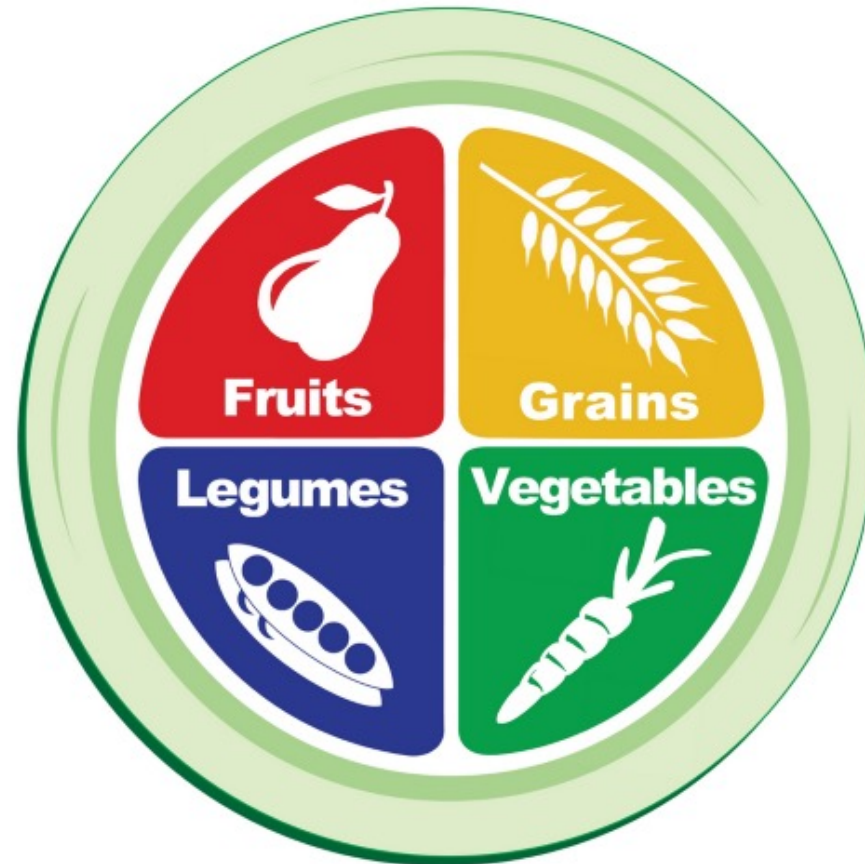
# What's good for the heart is good for the brain.

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



Physicians Committee for  
Responsible Medicine

## DR DEAN ORNISH



- 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>
  - 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>
  - Book: *The Alzheimer's Solution*
  - Healthy Minds Initiative: <https://www.healthymindsinitiative.org>
  - NEURO Plan Academy (with app): <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)