

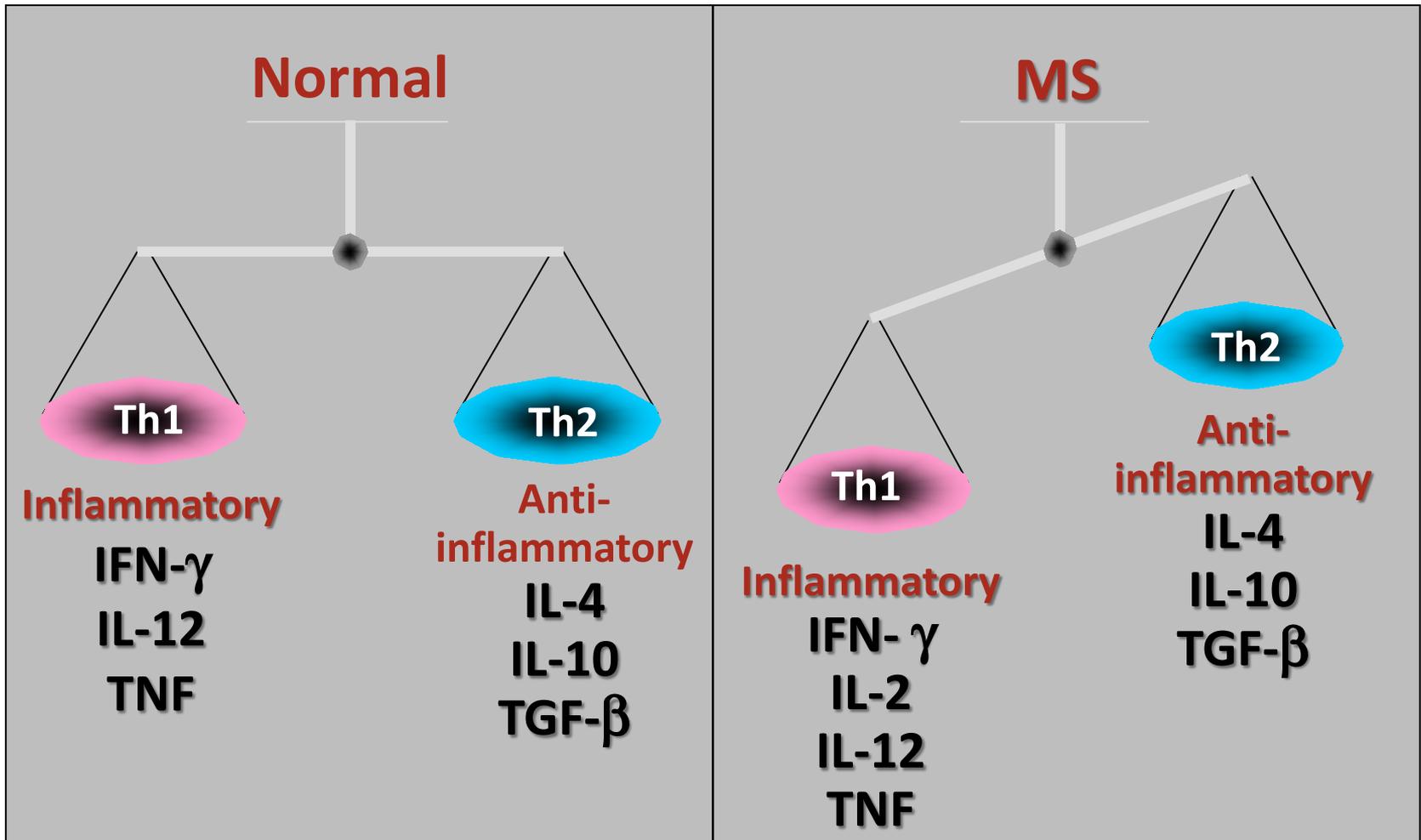
You are What You Eat? Myths and Facts of the MS Diet

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MS and the Immune System

- In MS the immune system actively damages myelin
- Most treatments aim to down regulate the immune system
- Immune system stimulation may be dangerous
- Immune system down-regulation may be beneficial
- Anything advertised to BOOST or IMPROVE your immune system may be the worst choice

Cytokines



Is it True....?

- That a high salt diet causes MS
- That coconut oil is good for your brain
- That drugs for stomach acid cause Alzheimer's Dz.
- That fish oil is good for MS
- That a polyunsaturated fatty acid-enriched diet stops MS relapses
- Cranberry juice prevents UTI
- That antioxidants make MS worse
- That Ginkgo biloba helps cognition
- That B12 decreases fatigue
- That everyone with MS is vitamin D deficient
- ...and what is vitamin H

PPI and Dementia?

- A recent study (nearly 3000 subjects in Germany) confirmed an **association** between proton pump inhibitors and increased risk of dementia
- PPIs may change development of beta-amyloid plaques
- 70% of PPI prescriptions could be inappropriate
- PPI increases risk of B12 deficiency- low low levels impair brain function
- Keep in perspective the use of PPIs to treat severe reflux and prevent bleeding with NSAID use (Motrin, aleve)
- Studies are inconclusive; not verified in humans; more research is needed

Coconut Oil

- Coconut oil plus medium-chain triglyceride oil taken as a one ounce drink three times a day
- **Caprylidene**- proprietary medium chain triglycerides
 - Action: ketones provide alternative energy source to neurons with compromised glucose metabolism
 - Dose: one packet in 8 oz of liquid
 - Data limited to one clinical trial of 152 with mild to moderate AD
 - FAQs: www.about-axona.com/

Axona: Medical Food

- There is a differential effect by APOE4 status
 - E4+ decrease transport of ketones into brain?
 - E4+ decrease mitochondrial function and decrease ability to use ketones?
 - Decrease effect observed in insulin and TZD in clinical trials
- Safety/tolerance
 - Gastrointestinal effects: diarrhea, nausea, gas, bloat, dyspepsia
 - May increase affect kidney function
 - May increase triglycerides and uric acid (gout)
 - Risk for ketoacidosis (alcohol and diabetics)
 - Risk in metabolic syndrome and GI conditions
- Cost: \$120-140/month; \$350/90 days
- Coconut oil- poor man's caprylidene (20g/d or 2 tbs)

Vitamin D

- Hormone and vitamin
- Produced in the body by exposure to sun
- Works to promote calcium absorption
- Builds bone
- Epidemic of Vitamin D deficiency
- 1 billion deficient or 77%
- Contributing factors:
 - Age, obesity, diet



Sources of Vitamin D

- Obtained primarily from the sun
- 15 minutes, three times a week (depends on latitude, tilt, time of day, skin tone)
- Small quantities (fatty fish, mushrooms, egg yolk)
- Fortified milk products
- Supplements



Food- Vitamin D Content	IU/serving
Cod liver oil, 1 Tbs	1,360 U
Mushrooms 3 oz	400
Salmon cooked 3.5 oz	360
Mackerel, cooked 3.5 oz	345
Sardines, canned in oil, 1.75 oz	250
Tuna fish, canned in oil, 3 oz	200
OJ fortified with D, 1 cup	142
Milk 1 cup	98
Yogurt 6 oz	80
Margarine 1 Tbs	60
Ready to eat fortified cereals .75-1 cup	40
Liver, beef cooked 3.5 oz	15
Egg 1 whole (D in yolk)	20
Cheese, Swiss, 1 oz	12

Vitamin D : Deficiency

- Vitamin D levels: measure 25(OH)D
- deficiency 25(OH)D < **20 ng/ml**
- insufficiency 25(OH)D < **30ng/ml**

- United States: elderly, children and young adults, postmenopausal women, individuals with dark skin pigment-prevalence of deficiency well above 50%

- winter, the tilt of the earth's axis and angle of sun's light: less available UVB.
- northern latitudes in the morning and late afternoon.
- strict vegetarian and vegan diets

Vitamin D and Multiple Sclerosis

- Implicated in immune system regulation
- Evidence of sun exposure and latitude
- Exposure to Vitamin D may prevent MS
- Birth season and childhood sun predict risk
- Low Vitamin D exposure prior to MS onset associated with greater disability
 - Reduces MS disease severity (slows progression)
 - Decreases risk of attacks
 - Reduces severe disability
- Concern for bone- weakness, falls, fracture



Vitamin D Toxicity

Symptoms of toxicity: **drowsiness, increased urination, increased thirst, anorexia, nausea, vomiting, constipation, hypertension and ultimately coma**

Intoxication observed at 150 ng/ml, associated with oral supplementation of 50,000 IU/day

Up to 10,000 IU/day of D₃ has not been reported associated with toxicity

One size does not fit all...

Increase dose in: obesity, use of anti-seizure drugs, post-menopausal females, malabsorption syndromes

Salt

- Several reports suggest that dietary salt can speed the development of an MS-like disease in mice
- Salt drives aggressive immune cells- pro-inflammatory T17 to induce immune system activity (increase MS severity; speed onset of MS)
- The role of salt needs further study
- Low salt is beneficial to heart and circulation
- Increased salt may trigger attacks
- Reduced salt may inhibit attacks and disease progression
- USDA dietary guidelines suggest consumption of less than 2,300mg (1 tsp)
- Those with hypertension, age >65 and black should consume no more than 1500mg /day
- Tomato juice, canned soups and frozen cheese pizza highest content

Antioxidants

- Antioxidants – these natural or manmade substances are found in many foods.
 - Vitamin A, C, E---**use in moderation**
 - Fruits, vegetables
 - Whole grains, nuts
 - seeds, herbs, spices

Free radical or oxidant (molecule with an unpaired electron)

- “Free radicals” are normal by-products of bodily processes, and may cause tissue injury and turn on immune attacks in MS.
- Antioxidants block the action of free radicals.
 - CoQ10 (Idebenone) decreases loss of brain volume
 - Green tea
 - Some antioxidants may be harmful: Vitamin C and E

B12

- Cobalamin, required for the production of red blood cells and proper function of the nervous system
- Found in eggs, meat, poultry, shellfish, and dairy
- People with MS may have lower levels of B12
- Those with normal levels there is no evidence that supplementation either improves neuro symptoms or favorably alters the course of disease
- There is no solid evidence that B12 injections help with fatigue or weight loss

Biotin

- Biotin is considered a form of vitamin B, and is a component of enzymes in the body that help break down certain substances in the body. Biotin, also known as vitamin H, is usually obtained from food.
- Research shows improvement in disability progression with high
- More research is needed to determine who might benefit from this approach.

Red Wine

- Previous research has suggested that resveratrol, a component of red wine, enhances the activity of a molecule (SIRT1) that might help to preserve nerve fibers
- Several studies show a decrease in the severity of MS-like disease in mice.
- One more recent report, however, suggests that resveratrol actually may worsen disease in mice, so additional research is needed.

Ginkgo

- Ginkgo - Extract from the Ginkgo biloba tree has been used for a variety of medicinal purposes, and small pilot studies hinted that it might be beneficial for cognitive impairment in MS.
- Results of a placebo-controlled, 12-week clinical trial showed that Ginkgo biloba failed to improve cognitive function in people with MS.

Dietary Fat

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graph TD; A[Dietary Fat] --> B[Saturated (solid)]; A --> C[Unsaturated (liquid)]; C --> D[Monounsaturated]; C --> E[Polyunsaturated]; E --> F[Omega 6]; E --> G[Omega 3];
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Saturated (solid)

Unsaturated (liquid)

Monounsaturated

Polyunsaturated

Omega 6

Omega 3

Polyunsaturated Fatty Acids



- Trends toward beneficial effects on MS outcomes
- PUFA: **omega-3** (alpha linoleic acid, ALA, eicosapentaenoic acid, EPA) **omega-6** (linoleic acid, LA and gamma-linoleic acid, GLA)
- **LA** found in sunflower oil, soybean oil, corn oil, walnut oil, wheat germ oil, grape seed oil, safflower oil
 - Contraindications: allergies to daisy plant
- **GLA** found in primrose oil, blackcurrant seed oil, borage oil, spirulina
 - Contraindications: increased risk of seizures, prolongs bleeding time

Polyunsaturated Fatty Acids

- **ALA** found in flaxseed oil, canola oil, walnut oil
 - Contraindications in diabetes and bleeding disorders
- **EPA** and **DHA** found in fish oils (salmon, Atlantic herring, mackerel, Bluefin tuna, sardines, cod liver)
 - Contraindications: bleeding disorders, diabetes, aspirin sensitivity, bipolar depression

Polyunsaturated Fatty Acids

- Omega-3 - Polyunsaturated fats
- A recent Norwegian study showed that omega-3 fatty acid supplements were safe in 92 people with relapsing-remitting MS, but failed to show benefit in any clinical (MRI, relapse or disease progression) or quality of life measures.

Herbs and MS

- An herb is a plant with properties that may improve and maintain health
- **Six herbs that may help MS symptoms**



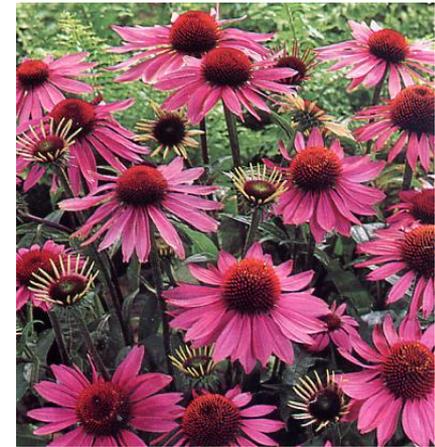
Herbs That May Help MS

- **Psyllium** for constipation
- **Coffee** for fatigue, poor attention
- **Valerian** for calm, anxiety, sleep, spasticity
- **Cranberry** to prevent UTI
- **St. John's Wort** for depression
- **Ginkgo biloba** for improved thinking, fatigue



Herbs to Avoid in MS

- All supplements should be considered in light of their potential effects on the immune system
- In MS immune stimulation may be dangerous
 - **Echinacea**
 - **Asian ginseng**
 - **Garlic**
 - **Alfalfa**
 - **Astragalus**



Probably Should Avoid These...

- Fatigue is worsened by: **chamomile, Asian and Siberian ginseng, barberry**
- **Hormones melatonin and DHEA** activate the immune system
- **Steroid** side effects are worsened by: **aloe, bayberry, Asian ginseng, licorice**
- Herbs with serious side effects: **yohimbe, chaparral, lobelia, comfrey**

Supplements: Vitamins

- **Vitamin D**
- **Antioxidants:** Vitamin A, Vitamin C, Vitamin E
- **Vitamin B1/Thiamine:** possible treatment for fatigue
- **Vitamin B6:** may decrease effect of DMA
- **B9/folate:** may decrease toxicity to methotrexate
- **Vitamin B12:** no evidence for use unless deficiency
- **Vitamin C:** possible UTI prevention
 - High doses will boost immune system and may contribute to kidney stones

Supplements: Minerals

- Selenium (liver, fish, turkey)
- Calcium (yogurt, sardines, milk, cheese, green leafy vegetables)
- Zinc (beef, sesame seeds, yogurt, turkey, shrimp)
- Magnesium (pumpkin seeds, spinach, salmon, beans)
- Iron (red meat, seafood, beans, whole grains, leafy greens)



Calcium

- Best way to get calcium is from food: **milk, yogurt, cheese, dark green leafy vegetables, bones in canned sardines, salmon, calcium fortified foods**
- Absorption depends on Vitamin D
- Absorption decreased with dietary fiber, laxatives, tannins in tea, medications (corticosteroids and anti-convulsants, iron, some antibiotics)
 - Should increase calcium dose but not exceed 2,500 mg/day
 - More than 2,500 mg/day can cause toxicity
- Improve absorption by taking 500 mg increments separated by 4-6 hrs

Calcium... More

- Calcium tab must contain 90-110% of elemental calcium and must dissolve in 30-40 minutes
- Adding one tablespoon of reduced fat milk to caffeinated coffee and tea to negate calcium losses in urine
- Can cause constipation and kidney stones
- Do not take with other medications

Forms of Calcium



- As Citrate (Citracal, Solgar): 21% elemental calcium; best absorbed; can be taken on an empty or full stomach
- As Carbonate (Tums, Caltrate): 40% elemental calcium; take with food- needs acid to absorb
- Calcium phosphate, calcium gluconate, calcium lactate contain very little elemental calcium
- Dolomite, Oyster shell, bone meal - naturally occurring calcium carbonate and **contain lead**

The MS Diet

- Although various diets have been promoted to cure or control MS, no diet has been proven to modify the course of MS. MS specialists recommend that people follow the same high fiber, low fat diet that is recommended for all adults.
- There is some evidence that a diet low in saturated fats and supplemented by omega-3 (fatty fish, cod-liver oil, or flaxseed) and omega-6 (fatty acids from sunflower seeds and Evening Primrose oil) may have some benefit for people with MS

Diets

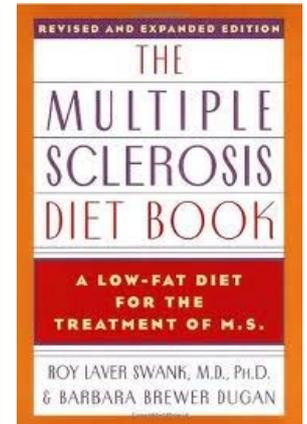
- **Paleo:** eat natural foods; avoid highly processed foods- no dairy, eggs, gluten grains
 - study in SPMS showed improved fatigue;
 - improved cardiovascular risk
 - Deficiencies in folic acid, thiamine, B6, calcium and vitamin D
- **Mediterranean diet (MD)** -high intake of whole grains, vegetables, fruits, legumes, olive oil, fish, red wine; low in saturated fats, red meat, poultry, dairy
 - No data for role of MD in MS
 - Research shows benefit on markers of inflammation
 - Evidence for a role in nonautoimmune disorders (cancer, DM, cardio)

Diets

- **McDougal diet:** low fat, high carb, vegan; refined flour and white rice excluded; oils excluded
 - No evidence for use in MS
 - Research studies show reduction in weight, BP, cholesterol levels
 - Nutritional deficiencies: iron, B12, Vit D, calcium and fatty acids
- **Gluten free diet:** wheat, barley, rye
 - No evidence for a role in MS
 - No evidence for a role in non-autoimmune disorders
 - Nutritional deficiencies expected
- **Swank diet:** low saturated and unsaturated fat

Swank Diet

- No randomized controlled trials
- Anecdotal evidence that Swank diet reduces exacerbation and slows disease progression
- Saturated fat should not exceed 15 G/day
- Unsaturated fats should be kept to 20-50 G/day
- No red meat for the first year
 - After first year, 3 oz of red meat is allowed/week
- Dairy must contain 1% or less butterfat
- No processed foods containing saturated fats allowed
- Cod liver oil (1 tsp), Vitamin, mineral supplements daily



Plant-based Diet

- Plant-based diet - A one-year study tested a low-fat, plant-based diet on measures of disease activity, mobility, fatigue, cholesterol, body weight
- Results show no significant changes in MRI scans, EDSS, or mobility.
- Fatigue scores improved significantly.
- Participants showed good compliance, and were able to lose weight and reduce cholesterol levels.

Low Saturated Fat Diet

- Population studies have linked a high saturated fat diet with increased risk of MS
- Long-term uncontrolled studies show a decrease in disability and death in MS patients using this diet (n=144)
- One randomized placebo controlled pilot study (n=31 RRMS) show a significant improvement in physical and mental well-being compared to placebo

Terry Wahls MD

- Dx.with MS in 2000 and began to research causes
- Decided MS was due to mitochondrial failure
- Claimed her diet slowed disease progression
- Wahls combined extensive rehabilitation and neurostimulation with a mitochondrial diet
- One case cannot become evidence

Wahls Diet

- Three cups of green leafy vegetables
- Three cups of sulfur rich vegetables (cabbage, broccoli, kale)
- Three cups of brightly colored foods, mostly fruit (flavonoids, polyphenols, antioxidants)
- Grass fed meat and seaweed
- PUFA (salmon, herring)
- Eliminates dairy and white flour; allows a limited intake of meat

MS Diet

- What's the evidence?
- No evidence to recommended a specific MS diet; evidence of effect very limited.
 - Wahl's diet
 - Swank diet
 - McDougal diet
 - Gluten free
- Probably ineffective against MS disability, depression, fatigue
- What do you tell the patient?

have not been subjected to rigorous, controlled studies, and the few that have been evaluated have produced mixed results.

A Healthy Diet for MS

- Low on saturated fat
- Uses oils from vegetables, seeds and fish
- Eat fish: salmon, herring, mackerel, tuna, sardines, trout
- Eat skinless chicken and turkey, lean meats trimmed of visible fat or go meatless with vegetable proteins from beans, lentils, soy and nuts
- Consume at least 5 servings of fruits and vegetables a day, choosing the brightly colored, fiber rich variety
- Eat 3-4 servings of whole grain products daily
- Be cautious with caffeine and alcohol
- High salt diet may trigger MS; obesity, high cholesterol may worsen MS