The Times They Are A-Changing

Modern Biomedicine

- **Acute disease** is what drove medicine in the 20th century.
- **Infectious disease and injuries** dominated the landscape.
- This reinforced view that being **healthy meant not being sick**.
- We assume most people can be treated in **exactly the same way**.
- While this works well for appendicitis, collapsed lung, or heart attack, it is woefully inadequate for the prevention and management of **chronic disease**.
- And it doesn’t even begin to address the concept of **health promotion**, a process of enabling people to **increase control over, and to improve, their health**.
• If the American public embraced a healthier lifestyle:
  • no smoking
  • no or moderate alcohol consumption
  • limited or no exposure to toxic chemicals
  • healthy nutrition
  • balance of exercise and rest
  • stress management
  • and healthy social networks

93% of diabetes, 81% of heart attacks, 50% of strokes, and 36% of all cancers could be prevented.


CDC shows <18% of adults consume the recommended amount of fruit and <14% consume the recommended amount of vegetables.
Caloric Restriction?

- 25 year study University of Wisconsin Madison: 76 rhesus monkeys who between ages 7-14 years, began eating a diet reduced in calories by 30%.
- Disease was 3 fold greater in control group. No evidence of diabetes in any caloric-restricted animal.
- National Institutes of Aging reported one monkey on 30% CR diet at age 16 years lived to be 43 years old, a longevity record for the species, and equivalent of a human living to 130.

CALERIE (Comprehensive Assessment of the Long-term Effects of Reducing Intake of Energy)

- National Institute of Aging sponsored controlled study: 218 non-obese individuals, randomized to maintain current diet or 25% caloric restriction for 2 years. (11.7% caloric restriction was actually maintained on average).
- Study found statistically significant reduction in cardiometabolic risk factors and inflammatory markers; weight loss, improved mood and sleep duration.
- Reduced bone mineral density noted in CR group. Exercise was recommended to offset loss of BMD. Higher incidence of anemia in CR group, some required iron supplementation but overall was very well tolerated.

CALERIE 2

- 2-year prospective, longitudinal follow-up study of 39 nonobese adults who went through the CALERIE trial (12 and 24 months post trial completion).
- After the CR intervention, a mean weight loss of 9.0 ± 0.6 kg was observed in the CR group, in which only 54% of the weight was regained 2 y later.
- Despite regain, weight, percentage of body fat, and fat mass remained significantly reduced from baseline throughout follow-up and remained significantly less than in the control group (P < 0.05).
- After a 2-y intensive CR intervention, ~50% of CR-induced weight loss was maintained 2 y later, which was probably the result of lasting effects on acquired behaviors and dietary restraint.
Fasting-Mimicking Diets (FMD)?

- USC study of 100 healthy participants randomized into 2 study arms and tested the effects of FMD done 5 consecutive days each month for 3 months.
- 1100 calorie first day, 700 calories for 4 days (plant based, multivitamin). Ate whatever they wanted rest of the month.
- Three FMD cycles reduced body weight and total body fat; lowered blood pressure, cholesterol, triglycerides and IGF-1. Lean muscle mass remained unchanged. Note: 25% drop-out rate
- Effects still noted 3 months AFTER study ended.


Promising and…..

- Much of initial research on yeast and rodent models. Research in rhesus monkeys is impressive.
- CALERIE study showed that even 11% reduction in calories can improve weight loss and certain biomarkers associated with aging. Most people could not sustain 25% reduction in cal.
- What is unclear: do these diets extend longevity in humans? The data suggest that they have a favorable impact on many metabolic parameters associated with better health.

Personalized Diets

- Personalized diets based on individual’s genome to optimize dietary intervention and reduce genetic cardiovascular disease (CVD) risk or to prevent or treat cancer is one of the challenges frequently discussed in scientific community.


Is it any wonder that people are confused?
Dietary Inflammatory Index

- Inflammation often driven by dietary patterns. An anti-inflammatory diet can reduce inflammation and improve health.
- The Dietary Inflammatory Index is based on measuring inflammation in the body in response to specific foods. You can take the test by downloading the app for Dietary Inflammatory Index (DII).

<table>
<thead>
<tr>
<th>FOOD</th>
<th>SERVING SIZE</th>
<th>SERVING SIZE (GRAMS)</th>
<th>IF RATING</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGAVE NECTAR</td>
<td>1 TBSP</td>
<td>21</td>
<td>-100</td>
</tr>
<tr>
<td>ALMOND BUTTER</td>
<td>¼ CUP</td>
<td>64</td>
<td>0</td>
</tr>
<tr>
<td>CHEESE, CHEDDAR</td>
<td>1OUNCE</td>
<td>28.35</td>
<td>-20</td>
</tr>
<tr>
<td>CHICKEN BREAST, RSTD</td>
<td>3 OUNCES</td>
<td>85</td>
<td>-10</td>
</tr>
<tr>
<td>MILK, WHOLE</td>
<td>1 CUP</td>
<td>246</td>
<td>-16</td>
</tr>
<tr>
<td>OLIVE OIL</td>
<td>1 TBSP</td>
<td>14</td>
<td>74</td>
</tr>
<tr>
<td>ONIONS, COOKED</td>
<td>½ CUP</td>
<td>105</td>
<td>240</td>
</tr>
<tr>
<td>RICE, WHITE</td>
<td>1 CUP</td>
<td>158</td>
<td>-153</td>
</tr>
<tr>
<td>SPINACH</td>
<td>1 CUP</td>
<td>30</td>
<td>75</td>
</tr>
<tr>
<td>SALMON, SOHO BAKED</td>
<td>3 OUNCES</td>
<td>85</td>
<td>450</td>
</tr>
<tr>
<td>TURMERIC</td>
<td>½ TSP</td>
<td>1.5</td>
<td>320</td>
</tr>
</tbody>
</table>

Mediterranean Dietary Pattern and Memory

- Mediterranean and DASH diets have been associated with lower dementia risk. Researchers evaluated the inflammatory potential of these diets in relation to mild cognitive impairment/dementia risk using the DII during an average follow up of 9.7 years during Women's Health Initiative Memory Study.
- Higher inflammatory scores were significantly associated with greater cognitive decline and earlier onset of cognitive impairment.

Mediterranean Dietary Pattern

- 13 meta-analyses of observational studies and 16 meta-analyses of randomized controlled trials investigating association between adherence to Mediterranean diet and 37 different health outcomes, for a total population of over than 12,800,000 subjects, were reviewed.
- Robust evidence (P-value<0.001) and large simple sizes show that greater adherence to the Mediterranean diet is associated with reduced risk of overall mortality, cardiovascular disease, heart attack, overall cancer incidence, diabetes, neuro-degenerative diseases and lower inflammatory markers.


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**Sugars**

- Americans consume primarily: table sugar and high-fructose corn syrup.
- Table sugar (sucrose): bond between one glucose molecule and one fructose molecule.
- High fructose corn syrup: 55% fructose, 42% glucose and 3% other sugars.
- Every cell in our body readily converts glucose into energy. But liver cells are one of the few types of cells that can convert fructose to energy.
- A soda floods the liver with large amounts of free floating fructose. When you eat an apple, the fiber considerably slows down digestion, making the fructose slowly enter the liver.
- Large amounts of “free” fructose taxes the liver and increases fatty liver disease.
- Fructose also raises levels of the hormone ghrelin, which stimulates hunger, and suppresses leptin, the hormone that makes you feel full.
One of the most popular dietary trends in US is the “low carb” diet. Perhaps instead of focusing on LOW CARB, we could emphasize LOW GLYCEMIC LOAD CARBS.

Glycemic Index/Load

- International consensus conference concluded that diets low in GI and GL were relevant to the prevention and management of diabetes and coronary heart disease, and are particularly important in individuals with insulin resistance.
- “Given the high prevalence of diabetes and pre-diabetes worldwide and the consistency of the scientific evidence reviewed, the expert panel confirmed an urgent need to communicate information on GI and GL to the general public and health professionals, through channels such as national dietary guidelines, food composition tables and food labels.”


Diabetes Matters to Us All

- “There is strong evidence that people with periodontitis have elevated risk for dysglycemia and insulin resistance.”
- Periodontitis is also associated with an increased risk of type 2 diabetes.
- “The European Federation of Periodontology and the International Diabetes Federation report consensus guidelines for physicians, oral healthcare professionals and patients to improve early diagnosis, prevention and co-management of diabetes and periodontitis.”


Glycemic Load and Mood

- 82 healthy weight and healthy overweight or obese, adults enrolled in randomized, crossover controlled feeding study.
- Compared to a low GL diet, consumption of high GL diet resulted in:
  - 38% higher score for depressive symptoms (P = 0.002)
  - 55% higher score for total mood disorder (P = 0.05)
  - 26% higher score for fatigue/inertia (P = 0.04), compared to low GL diet.
**Glycemic Index & Glycemic Load Rating Chart**

<table>
<thead>
<tr>
<th>Glycemic Index (GI)</th>
<th>Low (&lt;=55)</th>
<th>Moderate (56-69)</th>
<th>High (&gt;=70)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glycemic Load (GL)</td>
<td>Low (&lt;=10)</td>
<td>11-19</td>
<td>High (&gt;=20)</td>
</tr>
</tbody>
</table>

**Which One Would You Choose?**

- **Banana**
  - Glycemic Index = 52
  - Available Carbs = 24 grams
  - Glycemic Load = 14

- **Watermelon**
  - Glycemic Index = 72
  - Available Carbs = 10 grams
  - Glycemic Load = 8

**Glycemic Load**

<table>
<thead>
<tr>
<th>Food</th>
<th>Individual Food Portion</th>
<th>Whole Day</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low (&lt;=10)</td>
<td>Moderate (11-19)</td>
</tr>
<tr>
<td></td>
<td>Low (&lt;=80)</td>
<td>Moderate (80-120)</td>
</tr>
</tbody>
</table>

**Food**

<table>
<thead>
<tr>
<th>Food</th>
<th>Serving Size</th>
<th>Glycemic Load</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grapefruit</td>
<td>½ large</td>
<td>3</td>
</tr>
<tr>
<td>Apple</td>
<td>1 medium</td>
<td>6</td>
</tr>
<tr>
<td>Banana</td>
<td>1 large</td>
<td>14</td>
</tr>
<tr>
<td>Avocado</td>
<td>1 small box</td>
<td>20</td>
</tr>
<tr>
<td>Watermelon</td>
<td>1 cup</td>
<td>8</td>
</tr>
<tr>
<td>Carrots</td>
<td>1 large</td>
<td>5</td>
</tr>
<tr>
<td>Orange</td>
<td>1 medium</td>
<td>6</td>
</tr>
<tr>
<td>Sweet potato</td>
<td>1 cup</td>
<td>17</td>
</tr>
<tr>
<td>Baked potato</td>
<td>1 medium</td>
<td>28</td>
</tr>
<tr>
<td>French fries</td>
<td>1 medium serving</td>
<td>24</td>
</tr>
<tr>
<td>Nuts</td>
<td>1 oz</td>
<td>10</td>
</tr>
<tr>
<td>Donut</td>
<td>1 mini</td>
<td>2</td>
</tr>
<tr>
<td>White bread</td>
<td>5 ounces</td>
<td>1</td>
</tr>
<tr>
<td>Red beet wine</td>
<td>5 ounces</td>
<td>1</td>
</tr>
<tr>
<td>Grape juice</td>
<td>6 ounces</td>
<td>12</td>
</tr>
</tbody>
</table>

- **Food**

<table>
<thead>
<tr>
<th>Food</th>
<th>Serving Size</th>
<th>Glycemic Load</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asparagus</td>
<td>½ cap</td>
<td>2</td>
</tr>
<tr>
<td>Broccoli</td>
<td>1 cup</td>
<td>4</td>
</tr>
<tr>
<td>Green beans</td>
<td>1 cup</td>
<td>3</td>
</tr>
<tr>
<td>Tomato</td>
<td>1 medium</td>
<td>2</td>
</tr>
<tr>
<td>Subway sandwich</td>
<td>6 inch</td>
<td>17</td>
</tr>
<tr>
<td>Turkey breast</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Buttermilk ice cream</td>
<td>5.5 ounces</td>
<td>22</td>
</tr>
<tr>
<td>Vanilla ice cream cone</td>
<td>4.5 ounces</td>
<td>18</td>
</tr>
<tr>
<td>Potato chips, fat free</td>
<td>1 bag (8 ounces)</td>
<td>48</td>
</tr>
<tr>
<td>Tortilla strips, white corn</td>
<td>3.5 ounces</td>
<td>38</td>
</tr>
<tr>
<td>Egg omelet omelet</td>
<td>1 serving</td>
<td>13</td>
</tr>
<tr>
<td>Maple syrup</td>
<td>4 Tbsp</td>
<td>28</td>
</tr>
<tr>
<td>Egg, hard boiled</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Apple juice</td>
<td>8 oz</td>
<td>6</td>
</tr>
<tr>
<td>Food</td>
<td>Serving Size</td>
<td>Glycemic Load</td>
</tr>
<tr>
<td>--------------------</td>
<td>--------------</td>
<td>---------------</td>
</tr>
<tr>
<td>Spaghetti</td>
<td>1 cup</td>
<td>38</td>
</tr>
<tr>
<td>Brown rice</td>
<td>1 cup</td>
<td>23</td>
</tr>
<tr>
<td>White rice</td>
<td>1 cup</td>
<td>33</td>
</tr>
<tr>
<td>White bread</td>
<td>1 slice</td>
<td>10</td>
</tr>
<tr>
<td>Whole grain bread</td>
<td>1 slice</td>
<td>5</td>
</tr>
<tr>
<td>Bagel, cinnamon raisin</td>
<td>1 slice, 3-5 inch</td>
<td>28</td>
</tr>
<tr>
<td>Pumpernickel bread</td>
<td>1 slice</td>
<td>6</td>
</tr>
<tr>
<td>Macaroni and cheese</td>
<td>1 cup prepared</td>
<td>31</td>
</tr>
<tr>
<td>Chocolate doughnut</td>
<td>1 doughnut (80 g)</td>
<td>25</td>
</tr>
<tr>
<td>Glazed doughnut</td>
<td>1 doughnut (80 g)</td>
<td>12</td>
</tr>
<tr>
<td>Kellogg’s Frosted Flakes</td>
<td>¾ cup</td>
<td>20</td>
</tr>
<tr>
<td>Kellogg’s Special K</td>
<td>1 cup</td>
<td>14</td>
</tr>
<tr>
<td>Post Bran Flakes</td>
<td>¾ cup</td>
<td>12</td>
</tr>
<tr>
<td>Post Raisin Bran</td>
<td>1 cup</td>
<td>25</td>
</tr>
</tbody>
</table>

**Low/High GI Meals**

<table>
<thead>
<tr>
<th>GI</th>
<th>GL</th>
</tr>
</thead>
<tbody>
<tr>
<td>80</td>
<td>32</td>
</tr>
<tr>
<td>61</td>
<td>12</td>
</tr>
</tbody>
</table>

**Resources**

- **The 150 Healthiest 15-Minute Recipes on Earth**
- **Low GI Diet Tracker**

Get an App $3.99
Tips on Whole Grains

• 100% Whole Wheat (first ingredient!)
• Oats (skip the instant)
• Brown Rice (white has bran/germ removed, LOW in nutrients)
• Whole Rye (four times the fiber of whole wheat, most nutritious)
• Whole Grain Barley (not pearled: bran and germ have been removed)
• Buckwheat (loaded in magnesium, gluten-free)
• Quinoa (not a grain, it’s a seed loaded in protein and omega 3)
• Whole Wheat Couscous (delicious and high in fiber)
• Corn (organic, non-GMO – increases healthy gut flora)

Gluten

• Autoimmune condition celiac disease, where immune system interacts negatively with gluten, a storage protein in cereal grains. ONLY treatment is complete avoidance of gluten. Note: In children, celiac disease is associated with both enamel defects and aphthous stomatitis.*
• Celiac symptom checklist: (celiac.org/celiac-disease/resources/checklist/)
• Other individuals may be allergic to wheat, not all grains. Symptoms can include GI (indigestion, cramps, diarrhea, nausea), respiratory (stuffy/runny nose) and/or skin (hives or rash). Necessary to AVOID wheat.
• And still others appear to have a gluten sensitivity, where “symptoms” improve when they eliminate gluten from their diet. This is less clear.....

Non Celiac Gluten Sensitivity

- Multicenter study of 1,114 children (negative for celiac and wheat allergy) with chronic functional GI symptoms associated with gluten ingestion using a double-blind placebo controlled gluten challenge and crossover.
- Patients were randomized to gluten (10 g/daily) and placebo (rice starch) for 2 weeks each, separated by a washout week. Out of 1,114 children, 96.7% did not exhibit any correlation with gluten ingestion.
- Eleven of 36 children who did react tested positive for gluten challenge.


Fructans or Gluten?

- Non-celiac gluten sensitivity is characterized by symptom improvement after gluten withdrawal in absence of celiac disease. Foods with gluten often contain fructans, a type of fermentable oligo-, di-, monosaccharides and polyols.
- Double-blind crossover challenge of 59 individuals on a self-instituted gluten-free diet, for whom celiac disease had been excluded. Participants were randomly assigned to groups placed on diets containing gluten (5.7 g), fructans (2.1 g), or placebo, concealed in muesli bars, for 7 days.
- Symptoms were measured by Gastrointestinal Symptom Rating Scale Irritable Bowel Syndrome
- 13 participants had the highest overall score after consuming gluten, 24 had the highest score after consuming fructan, and 22 had the highest score after consuming placebo.

Saturated Fat Debate

- Three large meta analyses (21 studies, 12 studies, and 76 studies) have all failed to show any significant evidence that saturated fat increases the risk for heart disease.
- It also has failed to find any significant evidence that increasing polyunsaturated fats and decreasing saturated fats lowers your heart risk.
- Include a variety of fats in your diet!


Grass fed and finished beef higher in conjugated linoleic acid, stearic acid, vitamins A and E.
- Organic pastured dairy and meats are up to ~50% higher in omega 3 fatty acids and were only given organic feed and no growth hormones or antibiotics.

Red Meat and Cancer

- Poultry/turkey and fish neutral or beneficial effects regarding cancer/health.
- The American Institute for Cancer Research has made the following recommendations regarding red meats (beef, lamb, pork) based upon the data that links them to an increased risk of colon cancer:
  - Limit red meats to < 18 ounces per week.
  - Avoid processed red meats (e.g., bologna, salami, hot dogs, corned beef)

Fish and Seafood

- Fish and seafood are excellent source of protein high in omega 3 fatty acids. They also provide vitamin D and contribute valuable mineral nutrients to the diet such as selenium, iodine, magnesium, iron and copper.
  - Beneficial for helping to prevent atherosclerosis and maintaining healthy blood pressure and blood flow.
  - Promote brain health and may help reduce the risk of depression.
  - Necessary for the health of the eyes. Can help reduce dry eye syndrome.
  - Crucial for health pregnancy and childhood development.
  - Help quell inflammation, which has been linked to many chronic disorders.
Choose Your Seafood Wisely

Coconut Oil (*Cocos nucifera*)

- Extensively used in tropics/subtropics. Rich in medium chain saturated fatty acids (e.g., lauric acid), MAY be less likely stored as adipose tissue and may be less likely to promote insulin resistance and inflammation. Raises both LDL and HDL.
- Possesses antibacterial and antifungal activity (great for topical use). Study of 60 patients found oil-pulling (10 minutes, 2 tsp) equivalent to chlorhexidine in reducing *S. mutans*.
- If using refined coconut oil use ORGANIC only: no chemical solvents. Smoke point: 450 F.
- "Virgin" coconut oil obtained from fresh mature kernel of coconut by mechanical or natural means with or without the application of heat.

Olive Oil

- Cornerstone of Mediterranean diet.
- Rich in monounsaturated fat oleic acid (73%), antioxidants, and modest levels of vitamin E and K.
- Oleocanthal mimics ibuprofen in reducing inflammation.
- Protects against heart disease and stroke; lowers total blood cholesterol, LDL-C, triglycerides; improves HDL, has a mild blood pressure lowering effect.
- May offer additional protection against Alzheimer's disease, diabetes and cancer as part of a healthy diet.
- Keep refrigerated for optimal shelf life.
- To find top olive oils that meet rigorous quality and taste standards: [www.bestoliveoils.com](http://www.bestoliveoils.com)

Full or Low Fat Dairy?

- Full fat dairy products MAY help protect against type 2 diabetes. Fat slows absorption of milk sugar, causing slower rise in blood sugar, and lower/slower release of insulin. No evidence full fat dairy increases risk of heart disease.
- Full fat dairy recommended for women trying to get pregnant as it reduces anovulatory infertility.
- Full fat dairy improves acne, low fat dairy aggravates it.
- Full fat dairy lower in lactose, better tolerated by lactose intolerant individuals.
- Only 30% of global population able to produce enough lactase to digest and absorb lactose throughout adult life (highest in Scandinavian and northern Europeans).

- **Choose Your Seafood Wisely**
  - The Seafood Watch App
  - Available for iOS and Android

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What About Eggs, Shrimp and Dietary Cholesterol?

- Provide essential fatty acids, proteins, choline, vitamins A and B12; selenium, and other critical nutrients at levels above or comparable to those found in other animal-sourced foods.
- Egg consumption not associated with an increased risk of heart disease in the general population.
- Past guidelines set 300-mg daily limit for dietary cholesterol. This was removed in new guidelines (e.g., eggs, shrimp).

Protein

- From the Greek word protos, “first.”
- Used to build new cells, maintain tissues (e.g., muscles, inner bone, hair, nails), create enzymes, make hemoglobin to carry oxygen, lipoproteins to transport cholesterol; present in inner and outer membrane of every living cell.
- Sources include meat, poultry, seafood, eggs, soy products, nuts, nut butters, beans, peas, and seeds. You need ~8 grams protein per 20 pounds body weight for adults.
- Choose seafood two times weekly (low in mercury, high in omega 3s, sustainable)
- Include beans and peas often in your diet, as a side or main dish
- Avoid processed red meats, include modest amounts of other meats

Protein and Fracture Risk

- Framingham Osteoporosis Study found higher protein intakes (60.83g/d versus 46g/d) in elder men and women (mean 75 years) were associated with a 37% decreased risk of hip fracture.
- Women's Health Initiative found 20% increase in protein intake (15-18% of energy intake) improved bone mineral density maintenance and marginally lowered forearm fracture risk.
- Systematic review of 29 studies found that protein intakes above the current RDA have a beneficial role in preventing hip fractures and BMD loss. No differences between animal or plant proteins, although data in this area were scarce.


**Real State of Our Nutrition**

- 90 million Americans are vitamin D deficient (using the Endocrine Society guidelines < 20ng/mL)
- 30 million are deficient in vitamin B6
- 18 million people have B12 deficiency
- ~16 million have very low serum vitamin C
- 13% of Latinas and 16% of African American women (ages 12-49) are iron deficient
- Women 25-39 overall have borderline iodine insufficiency

CDC. 2nd National Report on the Biochemical Indicators of Diet and Nutrition in the U.S. population

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**Serotonin and Melatonin Pathways**

Vitamin B3 (Niacin) helps convert tryptophan to 5HTP which converts tryptophan to serotonin.

Zinc, Vitamin B6, B1 and B2 are needed to make stomach acid.

Vitamin B6, vitamin C, zinc and magnesium are needed to convert tryptophan to serotonin.

Vitamin B6 and folic acid are needed to convert serotonin to melatonin.

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**Position on Nutrient Supplementation by the Academy of Nutrition and Dietetics**

- Among the groups most vulnerable to inadequacy of one or more nutrients are:
  - Older adults
  - Pregnant women
  - People who are food insecure
  - Alcohol-dependent individuals
  - Strict vegetarians and vegans
  - Those with increased needs due to a health condition or the chronic use of a medication that decrease nutrient absorption/increase metabolism or excretion.

Position on Nutrient Supplementation by the Academy of Nutrition and Dietetics

- Nutrient supplementation can be used to help meet a nutrient requirement for those:
  - Restricting energy intake for weight loss control
  - Not consuming an adequate amount of food to meet energy requirements as a result of poor appetite or illness
  - Eliminating one or more food groups from their diet on a regular basis
  - Consuming a diet low in nutrient rich foods despite adequate or excessive energy intakes.

Marra and Boyar. J Am Diet Assoc 2009

Vitamin D

- Vitamin D deficiency can cause osteomalacia (lower bone mineralization), leading to musculoskeletal pain, usually in the pelvis, shoulders, low back, and proximal muscles.
- Deficiency is common worldwide but often more severe in elders due to environmental and biological factors.
- Impaired mobility can limit time spent outdoors and decreased synthesis of vitamin D in skin makes it difficult to maintain adequate levels even with sun exposure.
- As aging advances, intestinal resistance to 1,25(OH)2D impairs the uptake of calcium and a decline in renal function reduces activation of vitamin D.


Fragility Fractures

- Fragility fractures associated with decreased quality of life, increased disability, more frequent hospital admission and increased risk of mortality.
- While a multimodal approach is important, vitamin D supplementation alone, or in combination with calcium, has been shown to significantly reduce the risk of falling in elders.


Calcium and Vitamin D: Fracture

- Osteoporosis responsible more than 8.9 million fractures annually worldwide.
- Meta-analysis by National Osteoporosis Foundation: eight studies (n= 30,970 participants) found that all studies showed calcium plus vitamin D supplementation produced a statistically significant 15% reduced risk of total fractures and 30% reduced risk of hip fractures.

Vitamin D and Respiratory Infection

• Acute respiratory infection kills ~2.65 million people/year.
• 25 eligible randomized controlled trials (n=10,933, aged 0-95 years).
• Vitamin D supplementation reduced risk of acute respiratory infection among all participants (NNT=33) and those who were vitamin D deficient experienced the most benefit (NNT=4), as did those who were receiving daily or weekly vitamin D and not receiving vitamin D boluses (NNT=20).


Endocrine Society Guidelines

• Serum 25(OH)D level is used to determine vitamin D status
  • Sufficiency is 30 ng/mL (75 nmol/L) and above
  • Insufficiency defined as 21-29 ng/mL
  • Deficiency defined as <20 ng/mL

• 66.8 million Americans 1 year and older had levels between 12-20 ng/ml
• 23 million Americans 1 year and older had levels less than 12 ng/ml

• WHY isn’t there more routine screening in high risk individuals?

CDC 2nd National Report on Biochemical Indicators of Diet and Nutrition in the U.S. Population

Prescription Meds and Nutrients: Just a Glimpse

• Widespread use of prescription drugs for management of chronic health conditions can make it difficult to maintain adequate levels of specific nutrients.
• PPI drugs are one of the most commonly prescribed medications and are also available over-the-counter in the United States. Long-term use can increase the risk of fracture, cause magnesium levels to plummet, and interfere with B12 absorption, as well as increasing the risk of C. difficile infection.
• With increasing prevalence of type-2 diabetes, we will continue to see increase in metformin use, a drug known to deplete vitamin B12.


Conzade R, et al. Prevalence and Predictors of Subclinical Micronutrient Deficiency in German Older Adults: Results from the Population-Based KORA-Age Study. Nutrition 2017; doi: 10.1016/j.nut.2017.05.005

Vitamin B12 Deficiency

• Risk for vitamin B12 deficiency increases with age. Using NHANES data, 6.9% ages 51–70 years and 15% >70 years are B12 deficient.
• In Germany, 27.3% of people aged 65-93 have deficient serum B12 levels.
• Risks include: inadequate intake, vegan, malabsorption, medications (PPI, metformin), obesity, and aging.
• Decline in gastric acid secretion occurs with advancing age can make it difficult to absorb food-bound B12, supplementation is recommended.
Vitamin B12

• A 2015 meta-analysis found an 80% increased risk of B12 deficiency after ten months of regular PPI use.
• Metformin, a medication commonly prescribed for the treatment of type-2 diabetes, reduces serum B12 levels and worsens diabetic neuropathy.
• B12 deficiency can lead to difficulty walking, tingling/numbness in hands and feet, fatigue, shortness of breath, loss of appetite, joint pain, depression, loss of taste and smell, cognitive impairment, and dementia.
• YET, vitamin B12 levels are not commonly monitored with these drugs.


Magnesium

• Low magnesium intakes and serum levels associated with type 2 diabetes, metabolic syndrome, chronic inflammation, high blood pressure, atherosclerotic vascular disease, sudden cardiac death, osteoporosis, migraine headache, asthma, and colon cancer.
• 48% of US population consume less than RDI of magnesium; down from 56% in 2001-2002
• FDA requires warning that proton pump inhibitors can cause dangerously low magnesium levels.


Magnesium and Diabetes

• Insulin resistance repeatedly shown to decrease magnesium levels and diabetics with low magnesium show a more rapid disease progression and an increased risk for diabetes-related complications.
• A vicious forward feeding cycle is created. Magnesium supplementation has been shown to improve glucose metabolism and insulin sensitivity in those with type-2 diabetes.


Magnesium and Heart Disease

• 2013 meta-analysis of 16 studies with more than 313,000 participants found:
  • Higher blood levels associated with a 30% lower risk of cardiovascular disease.
  • Dietary magnesium (per 200-mg/d increment) associated with a 22% lower risk of fatal ischemic heart disease.
• Magnesium important in maintaining blood pressure and supplementation (365 to 450 mg/d) shown to significantly lower blood pressure in those with insulin resistance, prediabetes, and other chronic diseases.

Magnesium Deficiency

- People with magnesium deficiency can present with insulin resistance, menstrual cramps, leg cramps, migraines, fatigue, anxiety and mild elevations in blood pressure.
- In more severe cases of deficiency, seizures, tingling and numbness in the arms and legs, bizarre muscle movements (especially of the eyes and face), personality changes, and coronary spasms can occur.
- Many medications can deplete magnesium (e.g., diuretics, PPIs, OCPs, gout medication, B2-agonists, steroids, etc.).

The Need is Real and Urgent

- Clinicians must have more training in how to identify potential nutrient deficiencies and what testing is most appropriate for determining the status of specific nutrients.
- We urgently need more research to determine the “optimal” reference range for key micronutrients in specific populations, as well as making nutrient testing more widely available, more economical, and reimbursed by insurance and government programs.
- Given that even marginal micronutrient status can adversely affect muscle, joint, and eye health, as well as the immune, cardiovascular and neurological systems, there is an urgent need for better education and communication with public health officials, medical professionals and the public.

Eating alone will not keep a man well. He must also take exercise.

Hippocrates

- Higher risk for heart disease, type 2 diabetes, certain cancers, Alzheimer's disease and increase lower back pain, depression and anxiety.
- Half of baby boomers in the US report having NO exercise.
- 80 million Americans over the age of 6 years of age are entirely inactive.
Movement: *Sound Body = Sound Mind*

- Known since ancient times, exercise and physical activity are keys to a long and healthy life. Reducing risk of diabetes, heart disease, osteoporosis.
- Movement increases blood flow to the brain, promoting growth of new blood vessels, stimulating release of endorphins that diminish pain, as well as compounds that elevate mood and reduce tension.
- More than 400 studies show exercise can reduce risk depression/anxiety.
- Regular exercise increases energy levels and eases fatigue. Just 20 minutes 3 x per week of moderate exercise can improve energy levels in just 4 weeks!
- Fatigue, low energy, pain and depressed mood all impact our emotional wellbeing. Make movement a habit!

Motivation

- Use a fitness tracker – assess your baseline (normal activity 3 days) and see where you can improve.
- Use an app, join a class, grab a friend.
- Make it a habit. Just do it.
- Do something you enjoy.
- Focus on the immediate benefits you will feel once you start exercising regularly.

Lack of Sleep

- Tremendous amount of research shows that chronic sleep problems can lead to weight gain, obesity, diabetes (33% increased risk type 2 diabetes) and heart disease.
- CDC reports that 1 in 3 Americans do not get sufficient sleep.
- Studies show as our time asleep declines, it impairs working memory, processing speed and executive function. Interestingly, caffeine can temporarily counteract all but executive function.
- Women report more sleep disruption than men (pregnancy, childrearing, menopause), though men have more sleep apnea.
- Depression and anxiety are higher in people with chronic pain and are also strongly correlated with self-reporting of insufficient sleep. A vicious forward feeding circle.


The Biological Clock

- The most important regulator of the sleep wake cycle is our biological clock.
- Responsible for the 24 hour fluctuations in hormone secretion, body temperature and other bodily functions.
- Deepest sleep is generally around 2 AM
- Lowest body temp around 4:30 AM
- High alertness 10 AM
- Highest blood pressure ~6:30 PM
- Highest body temperature ~7 PM
- Melatonin secretion starts ~8-9 PM.
Sleep Stages

- **Stage 1**: Lasts a few minutes, the first stage of sleep is light and easy to wake from. Muscle twitching common.
- **Stage 2**: Light sleep, ~20 minutes brain waves begin to slow, blood pressure and body temperature decrease.
- **Stages 3 and 4**: Move into deeper sleep that’s harder to wake from. This is when body repairs itself and boosts immune function. Also known as “delta” sleep.
- **Rapid eye movement (REM)**: Final stage in sleep cycle, brain becomes more active and dreams occur. Brain is processing information and storing long-term memories. Heart rate and breathing increases. Gets longer and longer through the night - can last up to one hour.
- **REM suppressors**: alcohol, nicotine, blood pressure and anti-depressant meds

The cycle repeats ~90 minutes. As sleep progresses, REM cycles increase in length.

Days Can Make For Better Nights!

- Wake at same time everyday and make your bed! Exercise early.
- Start morning with exposure to sunlight or consider using a dawn simulating device that slowly increases intensity of light for 30 minutes before awakening.
- Landmark study in 1989 found that when participants with seasonal affective disorder were exposed to either simulated sunrise or both simulated sunset and sunrise for several days that their depression either resolved or was greatly reduced. The circadian rise and fall of melatonin production occurred earlier with sunrise simulation or with sunset plus sunrise simulation.
- Very good for those who have a hard time falling asleep (e.g. teenagers!)
- Pricey – Philips Wake-Up Light with Colored Sunrise Simulation is top rated.

The Bedroom

- No alarm clocks with display lights. Make sure there is no blue light emitting from the television or computers, or consider amber blue blocking glasses. Work WITH your body’s normal production of melatonin, not against it.
- Turn down your thermostat to 65-68 F. Wear socks to bed if feet get cold.
- Use black out blinds or curtains to eliminate external light.
- Replace mattress every 10 years and pillows every 2 years.
- Have pets sleep in their own beds.
- Make it a sanctuary. Nice bed linens, peaceful, a lamp and good book by the bed.
- Journaling can help if your mind is often preoccupied at night with “to do” lists. Gratitude journaling can also be a great way to ease into sleep.
- Consider melatonin 3 mg 2 hours before bed if you have “delayed sleep”

Current Recommendations……

- **Controlled-release melatonin** and doxepin are recommended as first-line agents in older adults; the so-called z-drugs (zolpidem, eszopiclone, and zaleplon) should be reserved for use if the first-line agents are ineffective.
- Dose generally 3-5 mg melatonin.

Dietary Considerations

- Watch the caffeine, you might be sensitive to its effects. Drink plenty of water and/or herbal teas in the afternoon that have a calming, relaxing effect.
- While one serving of alcohol isn’t generally a problem – cut back or eliminate if you are having trouble sleeping. 3-4 drinks can disrupt melatonin secretion and REM sleep. Alcohol may also increase excitatory neurotransmitters.
- Increase magnesium and tryptophan foods (e.g., poultry, eggs, milk, dark green leafy vegetables, pumpkin seeds).
- Consider magnesium supplements (100-300 mg per day at night)

Apps for Sleep

- Sleep Cycle sits under your pillow and gathers data to wake you up when you’ll feel the least groggy. Easy-to-read graphs show your sleep patterns. Free.
- Deep Sleep provides step-by-step instructions to guide you into state of deep relaxation. Andrew Johnson is awesome and his CDs are truly amazing. $2.99

Cognitive Behavioral Therapy

- CBT has emerged as a recommended first-line therapy for insomnia. Digital CBT has been shown to be effective for improving sleep, as well as mental health and well-being.
- CBT-I typically consists of:
  - Psychoeducation about sleep and insomnia
  - Stimulus control
  - Sleep restriction
  - Sleep hygiene
  - Relaxation training
  - Cognitive therapy

Sleep Evaluation

- There are numerous medications that can impair sleep (e.g., beta blockers, antidepressants, steroids, ADHD meds, possibly statins, etc.) Do some online research and/or talk to your pharmacist. If you are taking medication that disrupts sleep, talk to your health care provider.
- Restless leg syndrome impacts many people. Talk to your provider, it could be due to low iron, vitamin D or meds you are taking – though the cause is really not known.
- Sleep apnea is a condition where breathing is interrupted during the night. A sleep study can be ordered and treatments are available (e.g., CPAP, dental appliances which reposition lower jaw and tongue)
High cortisol levels are linked to high blood pressure, high cholesterol, high blood sugar, insulin resistance, insomnia, weight gain, headaches, mood swings, depression, and increased risk of infections.

Scientists believe that prolonged elevation of stress hormones may shorten our lifespan by 15 years.

Emotional Health

- A conscious mental reaction (such as anger or fear) subjectively experienced as strong feeling usually directed toward a specific object and typically accompanied by physiological and behavioral changes in the body.

Merriam Webster Dictionary

What is Your Body Telling You?
Mindfulness Meditation

- Meditation is excellent for reducing stress perception and pain intensity, while elevating mood.
- Quiets the stream of thoughts that rage in our mind.
- Long-time meditators have greater activation of areas responsible for sustaining attention, processing empathy, integrating emotion and cognition.
- Review of 47 trials found that meditation improves:
  - Anxiety
  - Depression
  - Pain


Meditation Resources

- Guided Mindfulness Meditation: A Complete Guided Mindfulness Meditation Program from Jon Kabat-Zinn
- Insight Timer – ~4,000 guided meditations from more than 1,000 teachers (self-compassion, nature, stress, podcasts and more). More than 750 meditation music tracks. Free.
- Headspace – very good for beginners with 10 minute meditations. Free.
- The Mindfulness App – nice 5 days guided meditation program to get you started. Can be personalized and integrated into other health apps. Free.
- Aura – multiple teachers, from 3-10 minute daily meditations. Customizable. #1 new app on Apple in 2017. $29 for 6 months.

Guided Imagery: Imagine Yourself……..

- An immersive, deeply relaxing intervention that uses calming words, soothing music and positive images to structure a healing experience.
- Like meditation, it focuses attention and calms the mind, working on those parts of the brain where the emotional self dwells.
- Imagery has been shown in clinical trials to reduce stress, anxiety, and depression; help with sleep; lower blood pressure, and help with posttraumatic stress.
- I have found guided imagery a fabulous tool for myself, kids and patients. Very helpful for those with ADHD, anxiety, depression, pain, insomnia.

Belleruth Naparstek

- Love, love, love her. Something for everyone.
- She has Guided Imagery Meditations for:
  - Anxiety and Panic
  - Anger and Forgiveness
  - Depression
  - Healing Trauma
  - Ease Grief
  - Relieving Stress
  - Undergoing Surgery
  - Chemotherapy and Radiation
Loneliness, Social Isolation & Your Health

• 148 studies on the effects of social isolation on health found it is:
  • As bad as smoking 15 cigarettes a day.
  • As dangerous as being an alcoholic.
  • As harmful as never exercising.
  • Twice as dangerous as obesity.


Stress, Poor Social Networks and Heart Disease

• Psychosocial stress assessed by questionnaire in 14,577 patients (median age 65 years; 81.6% males) with stable coronary heart disease on optimal secondary preventive therapy in the prospective randomized STABILITY clinical trial.
• Psychosocial stress (depressive symptoms, loss of interest, living alone financial stress) associated with an increased CV mortality. Being married was protective, living alone increased risk.
• Meta-analysis of 11 coronary heart disease studies and 8 stroke studies. Poor social relationships associated with 29% increase in risk of incident CHD and 32% increased risk of stroke. No differences by gender.

Meaning and Purpose

- What truly gives a person a sense of meaning and purpose in life?
- How can one live from a "deep place" despite her pain?
- How does one feel the oneness, find the holy and sacred in the mundane?

“There are voices which we hear in solitude ... but they grow faint and inaudible as we enter into the world.”

— Ralph Waldo Emerson

Letting Go.....

“Healing may not so much be about getting better, but about letting go, of all the expectations, all of the beliefs, and becoming who you are.”

— Rachel Naomi Remen, M.D.
Be patient with yourself. And yourself; it under, it's just awkward.
There's a place in it for me.

Stephen Covey