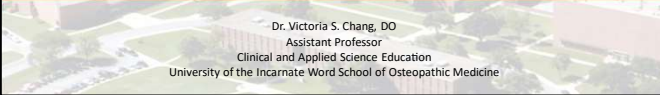


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Anti-inflammatory Diet



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Learning Objectives

1. Understand biochemical mechanisms underlying inflammation.
2. Recognize the relationship between diet and inflammation.
3. Describe the components of an anti-inflammatory diet.
4. Recommend the anti-inflammatory diet to specific patient populations.





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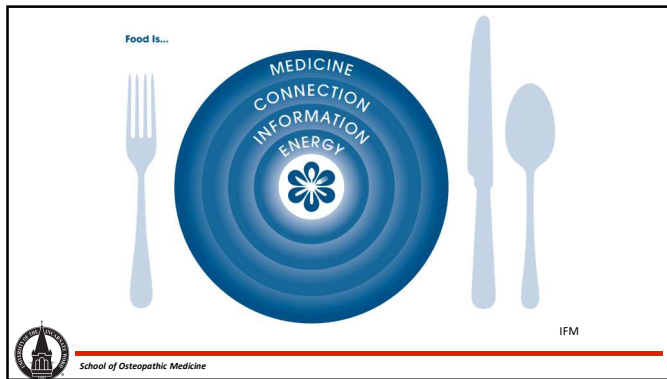
Man is what he eats

Anthelme Brillat-Savarin wrote, in *Physiologie du Gout, ou Meditations de Gastronomie Transcendante*, 1826:

"Dis-moi ce que tu manges, je te dirai ce que tu es." [Tell me what you eat and I will tell you what you are].

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What are we eating?

How many pounds of food do we eat per day?

- 5.5 pounds
- Large meta-analysis from 2010: Dietary factors are leading risk factor for death & disability in the US, 700,000 deaths & 15% of disability-adjusted life years in 2010!



Inflammation

Which of the following diseases are related to chronic inflammation?

- Alzheimer's Dementia
- Rheumatoid Arthritis
- Type II Diabetes Mellitus
- Osteoarthritis
- Depression



Inflammation

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- B. Rheumatoid Arthritis
- C. Type II Diabetes Mellitus
- D. Osteoarthritis
- E. Depression



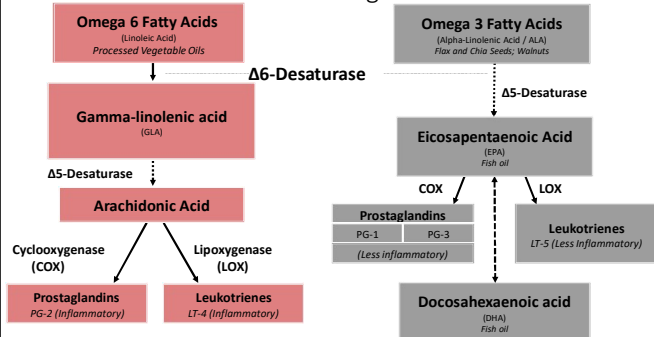
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Where does inflammation come from?



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Eicosanoids: Balancing Inflammation



Mechanisms of Inflammation

- Modulation of eicosanoid activity
- Pro- and antioxidant effects
- Insulin and glucose levels
- Genetic and intracellular expression of genes related to inflammation
- Modulation of endothelial function
- Gastrointestinal dysbiosis



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Measuring Inflammation

- CRP- most common
- High-sensitivity CRP (hs-CRP)- more sensitive measure of basal levels of CRP
- Other markers: TNF-alpha, IL-6, IL-1 beta, adhesion molecules and endothelial function tests



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Anti-inflammatory Diet

- Mediterranean diet is most well-researched example
- Large epidemiological studies and RCT that demonstrate a significant mortality benefit and reduction in chronic disease



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Evidence for Mediterranean Diet

- Increasing 2 components of the diet resulted in 25% reduction in overall mortality (NEJM 348:2599-2608 2003)
- Republished PREDIMED study: primary prevention study involving persons at high risk for cardiovascular events, those assigned to an energy-unrestricted Mediterranean diet, supplemented with EVOO or nuts had a lower rate of major cardiovascular events than those assigned to a low-fat diet (NEJM 378.25: e34(1)-e34(14) 2018)



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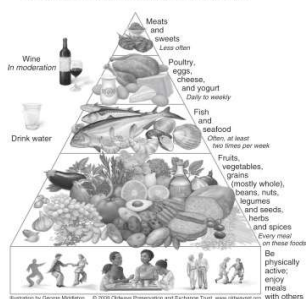
Mediterranean Diet

- Pattern of eating, not a collection of specific recipes
- Rich in vegetables, fruits and whole grains
- Nuts and olive oil as sources of fat
- Legumes, lean poultry and fish over red meat
- Discourages soda, sweets, refined baked goods, processed meats, butter or similar spreadable fats
- Wine in moderation



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MEDITERRANEAN DIET PYRAMID
A contemporary approach to delicious, healthy eating



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Components of an Anti-inflammatory Diet

- Fats
- Carbohydrates
 - Vegetables and Fruit
- Proteins
 - Fish
- Other Anti-inflammatory Foods, Spices, and Supplements



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Fats

- Mediterranean diet is 40-50% of calories from fat
- Choose high quality fats- fresh, natural, organic, unrefined
- Optimal ratio of omega-6 and omega-3 fatty acids



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Essential Fatty Acids

What is the ratio of omega-6 to omega-3 fatty acids in the standard American diet?

- A. 1:1
- B. 4:1
- C. 8:1
- D. 16:1



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Essential Fatty Acids

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- D. 16:1**



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Essential Fatty Acids Cont.

What is the optimal ratio of omega-6 to omega-3s?

- 1:1-4:1



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Omega-3 fatty acids

- Salmon
- Mackerel
- Anchovies
- Sardines
- Herring
- Chia seeds, flaxseeds, walnuts



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Oils high in Omega-6 fatty acids to AVOID

These oils are highly processed:

- Canola oil (rapeseed oil)
- Corn oil
- Cottonseed oil
- Grapeseed oil
- Safflower oil
- Soybean oil
- Sunflower oil
- Vegetable Shortening



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Omega-6 fatty acids

- Fast fact: The estimated annual per capita consumption of soybean oil increased by a jaw-dropping 116,300% between 1909 and 1999



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What does it all mean?

Refined	Oils that are extracted and treated with heat or chemicals in order to remove flaws. This process can also destroy the beneficial properties of oils. Refined oils are generally more stable than unrefined oils, so they are better choices for most high-heat cooking and baking. "Light" oils are examples of refined oils.
Unrefined	Oils that are made from cold-pressed source ingredients, and are never treated with chemicals or heat. These oils retain all of the minerals, enzymes, vitamins, and phytonutrients of the source ingredient. Virgin and extra-virgin oils fall under this category.
Extra-Virgin	Oils that are unrefined and cold-pressed, and are generally from the first pressing of the source ingredient. These oils can be fragile, so they should be reserved for dressing, drizzling, and dipping. Note that olive oils must meet specific requirements for acidity in order to be labeled as "extra-virgin."
Virgin	Oils that are unrefined and cold-pressed, and are generally from the second pressing of the source ingredient. These oils are also fragile and should be reserved for low-heat cooking, dressing, and drizzling. Virgin oils must pass standards for taste and quality, but the standards are not as strict as those for the "extra-virgin" qualification.
Pure	Oils that are a blend of refined and unrefined oils. All of the oil comes from a first pressing, but some of the batches of oil may be treated with chemicals or heat to remove impurities before bottling.
Cold-Pressed	Oils that are extracted from their source using pressure only. Chemicals and heat are not used in this process. This helps the oils retain all of the nutritional benefits of the source ingredient.



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Tips for buying & storing cooking fats & oils

DO	DO NOT
Purchase oils that are packaged in dark glass bottles.	Purchase oils that are packaged in plastic containers.
Purchase oils that are packaged in containers with a tight-fitting lid or seal.	Purchase oils that are packaged in containers with a loose-fitting lid or seal.
Store your fats and oils away from the stove and other heat sources.	Store your fats and oils next to the stove, oven, microwave, or other heat source.
Store your fats and oils in a dark place.	Store your fats and oils in a place that gets a lot of artificial or natural light.
Measure and separate cooking fats and oils from their containers before placing them in a hot pan.	Pour oils directly into the pan from the bottle or container. The heat or steam from the pan can damage the oil in the bottle.



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Olive Oil

- Rich in oleic acid
- Monounsaturated fatty acid
- Virgin and EVOO high in polyphenols which have potent antioxidative properties
- Improves lipid profiles
- Decreases BP in HTN
- Improves endothelial function in pts with atherosclerosis
- Reduces markers of inflammation



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Nuts

- Rich in monounsaturated and polyunsaturated fats, fiber, minerals
- Improves metabolic syndrome, CAD, total mortality in cancer and cardiovascular disease



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Coconut Oil

- Saturated fat but in the form of medium-chain fatty acids that are more easily metabolized than animal fats
- High in polyphenols



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Carbohydrates

- Whole grains contain fiber, lignans, Mg, Zn, B vitamins and Vitamin E that helps with inflammation
- Reduces inflammatory markers such as hs-CRP and IL-6
- Lower glycemic index
- More favorable for gut microbiome



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Vegetables and Fruit

- Highest concentrations of vitamins, minerals and other phytochemicals
- Lower caloric density
- Americans consume 1.6 servings of vegetables per day and only one fruit per day



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Proteins

- Plant-based proteins such as legumes are high in protein, fiber, iron, folic acid, and B vitamins
- Diets high in red and processed meats correlated with increases in inflammatory markers, markers of glucose dysregulation and dyslipidemia



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Fish

- Highly contaminated with heavy metals and polychlorinated biphenyls (PCBs) which are proinflammatory and impair metabolic function
- Avoid large fish highest in methylmercury- shark, swordfish, golden bass, king mackerel



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Anti-Inflammatory Foods, Spices, and Supplements

- Turmeric (curcumin)- inhibits phosphorylation of PLA(2), COX-2/LOX
- Wine- polyphenols serve as antioxidants
- Ginger- inhibits COX-2 and some types of PLA(2)
- Chili pepper
- Oregano
- Basil
- Thyme
- Rosemary
- Cocoa- dark (at least 70%)



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Resources for Patients

•Oldways Preservation Trust. Has the original Mediterranean diet pyramid, and also features culturally inclusive Asian, Latino, and African heritage pyramids.

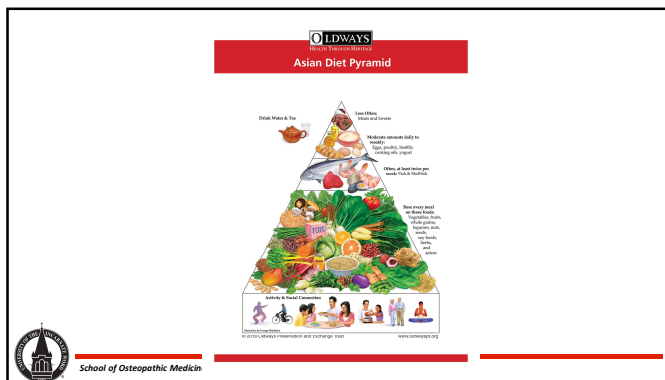
•<http://oldwayspt.org>

•Anti-Inflammatory Food Pyramid. Dr. Andrew Weil has published a patient-friendly and illustrative antiinflammatory food pyramid. This plan also features berries, Asian mushrooms, soy, tea, and dark chocolate

•<http://www.drweil.com> and search for "food pyramid."



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Resources for Patients Cont.

*For data on mercury levels in fish, check out the U.S. Environmental Protection Agency.

<http://www.fda.gov/uhwt/idm/oclc.org/food/foodborne/contaminants/metals/ucm115644.htm>

*A good website with healthy Mediterranean-style recipes

http://www.eatingwell.com/recipes_menus/collectons/healthy_mediterranean_recipes



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Eating on a budget: Before you shop...

- Figure out your weekly schedule and budget. Plan ahead if you know you will be eating out or making a meal for others.
- Look through your pantry, fridge, cupboards, and freezers. Make a list of the food you already have that you can use for the coming week.
- Look through your sales ads and weekly flyers to learn what foods are on sale at different grocery stores in your area. Keep an eye out for sales on specialty products like organic meats and dairy, which can be consumed during the week or frozen for later use.
- Plan all of your meals for the week, using the information above as a starting point. Look for recipes that utilize ingredients you already have on hand, or ingredients you know are on sale.
- Make a grocery list with any additional ingredients you will need for the recipes you've chosen. Be sure to include food for breakfasts and lunches, plus any used pantry ingredients you need to replace.
- If you receive benefits from the Supplemental Nutrition Assistance Program (SNAP), make sure your grocery store and/or farmers market accepts benefits. Some will match your dollars spent on produce up to \$10, allowing you to buy twice as much.
- Consult the Environmental Working Group's Clean 15 and Dirty Dozen lists. Use these lists to prioritize which foods you will buy organic vs. conventional. Clean 15 foods have little pesticide residue when raised conventionally and are safe to consume. Dirty Dozen foods have the most pesticide residue when raised conventionally, so they should be purchased organic when possible.
- Have a snack. Going to the grocery store while you're hungry makes impulse purchases more likely.



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Eating on a budget: In the store...

- Only buy foods that are on your grocery list.
- Buy generic or store brand items when possible.
- When buying shelf-stable goods, look on the bottom shelves for less expensive options. Stores tend to stock the most expensive options at eye level.
- Avoid packaged and processed foods when possible. Premium packaging often contributes to the higher cost of these items.
- Buy fruits and vegetables while they are in season. Seasonal produce is usually more flavorful and less expensive. In-season produce is often priced to sell before it goes bad.
- Buy frozen produce as an alternative to fresh. Produce is frozen at the height of freshness, and most of the nutrient content remains intact. When possible, stock up on affordable frozen produce and save it for weeks when money is tighter.
- Buy in bulk. Spices and dry goods (rice, beans, grains, nuts, flours, etc.) are significantly cheaper in the bulk section. You can buy as much or as little as you need, depending on your storage space and budget.
- Skip the interior aisles stocked with chips, snacks, candy, and soda. These items are expensive, provide little to no nutrition, and will not fill you up for long. Instead, do most of your shopping on the perimeter of the store, where produce, meats, and dairy products are located.



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Questions?



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- Functional Medicine- Patient Handouts



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