a plant-powered prescription for inflammation

Sharon Palmer, RD
editor, *Environmental Nutrition*

Anti-inflammatory diets are hot

- 1.3 million Google hits
- 574 books on Amazon
- Recommended by top diet gurus, from Weil to Sears
- Identified as a top diet trend, according to the Food Channel

Recommended to treat a range of diseases

- Parkinson's
- MS
- Arthritis
- Injuries

My Plant-Powered Family

Sources range from the credible…

Keri Glassman, RD on CBS Health Watch speaking on anti-inflammatory foods

My Plant-Powered Family

…To the not so credible.

Juicing For Acne Cleanse: The anti-inflammatory diet

Consensus on Inflammation and Health

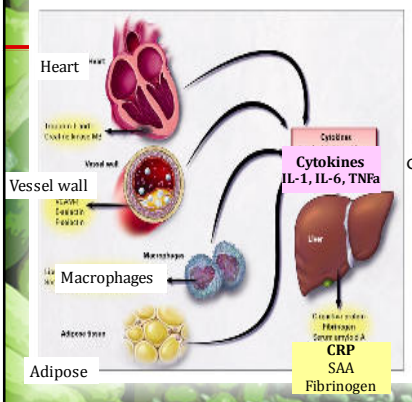
American Heart Association.

"Although it is not proven that inflammation causes cardiovascular disease, inflammation is common for heart disease and stroke patients and is thought to be a sign of atherogenic response."

AMERICAN INSTITUTE FOR CANCER RESEARCH

"Findings from laboratory studies have shown that phytochemicals have the potential to… reduce the kind of inflammation that makes cancer growth more likely."

Clinical Biomarkers of Inflammation (CRP)



C-Reactive protein (CRP) is an acute-phase protein produced by the liver in response to cytokine production during illness, infection, tissue injury or general inflammation.

NEJM 2000

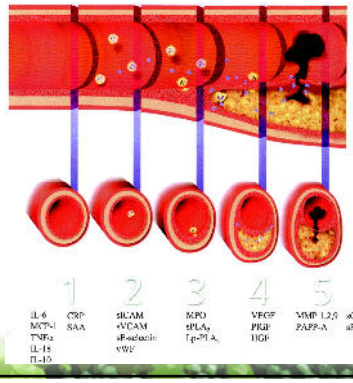
Acute inflammation is good.

- The body's natural immune response in reaction to an injury or assault.
- Cascade of events occur to fight infection and invading foreign substances.

Chronic inflammation is not.

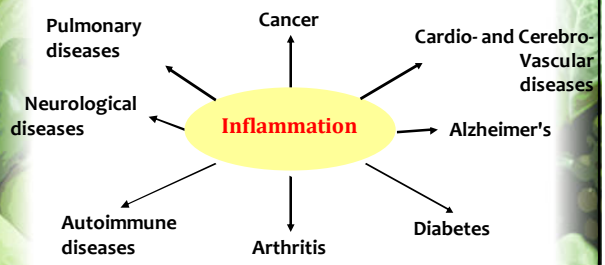
- When the inflammatory response is triggered with no real cause, for days, weeks, months.

Pathophysiological Sequence of Inflammatory Biomarkers in ACS



Circulation. 2001

Inflammation: Root in Diseases



Cardiovascular Disease, Stroke and Inflammation

- Inflammatory biomarkers predict risk of stroke. *(J Stroke Cerebrovasc Dis 2008)*
- In adolescents, CVD risk associated with adiponectin, TNFα, CRP and IL-6. (Horm Res Paediatr, 2012)
- Risk of Hypertension increased with elevated plasma CRP and IL-6. *(JHH, 2010)*
- Oxidative stress promotes inflammation *(Oxidative Medicine and Cellular Longevity, 2013)*

Inflammation and Cancer

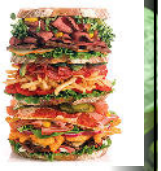
- Epi evidence connects inflammation and cancer.
- One-fifth of worldwide cancer incidence associated with microbial infection (NCI, 2009)
- Chronic irritation and inflammation predispose to cancer, such as cigarette smoke, asbestos, and silica. (Yale J Biol Med. 2006)

Diabetes and Inflammation

- Type 2 diabetes: 35% of adults ≥20 years of age in the US
- Diabetes = inflammatory disease, sharing many outcomes as cardiovascular disease (J Nutr Metab, 2012)
- Insulin resistance in obesity accompanied with inflammation (Arch Immunol Ther Exp. 2013)
- Pro-inflammatory cytokines increased in adipose tissue, linked to systemic inflammation, insulin resistance. (Arch Immunol Ther Exp. 2013)

Inflammation and Cancer

- Inflammatory mediators stimulate tumor cell growth
- Tumors progress with inflammatory diseases (*Adv Exp Med Biol* 2014)
- "Injury-inflammation-cancer" pathway: Recurrent injuries due to genetic susceptibility, smoking, unhealthy diet, and alcohol abuse induces a pro-inflammatory milieu (Minerva Gastroenerol Dietol, 2012)

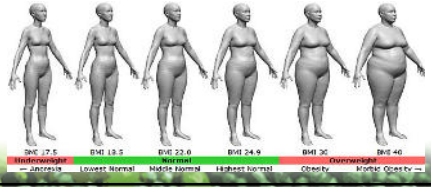


Alzheimer's and Inflammation

- Inflammation in vulnerable regions of AD brain
- Degenerating tissue classical stimulants of inflammation
- Damaged neurons, neurites, amyloid beta peptide, neurofibrillary tangles stimulate inflammation
- Present from early preclinical to terminal stages
- Over many years, inflammation exacerbates the very pathogenic processes that gave rise to it
- Several avenues linking AD inflammation to pathogenesis : autopsy; in vivo (PD imaging), epi data, and biochemical/histologic testing of patients (*Clin Neurosci Res*, 2006)

Weight and Inflammation

- BMI/adiposity linked with elevated CRP
- Related to metabolic syndrome factors (Diabetes, 2006)
- Fat cells secrete chemokines activating immune cells in adipose tissue (Vascul Pharmacol, 2013)
- Weight loss improves systemic inflammation (Arch Immunol Ther Exp, 2013)



Enter Diet

Diets high in refined starches, sugars, saturated fats, and trans fats and low in fruits, vegetables, whole grains, and omega-3 fatty acids appear to turn on the inflammatory response. (JACC, 2006)

But a diet rich in whole foods, including healthful carbohydrates and fat and protein sources, along with regular exercise and not smoking, seems to cool down inflammation. (JACC, 2006)

Eat food.

Not too much.

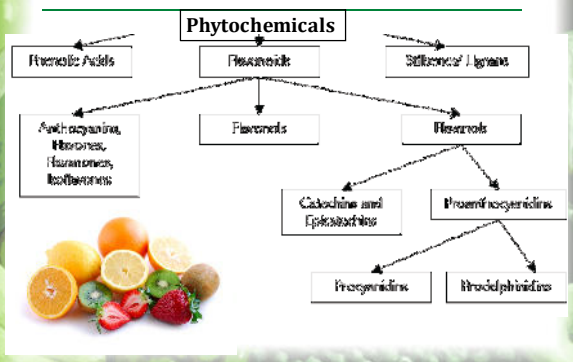
Mostly plants.

Michael Pollan
In Defense of Food

Why is Anti-Inflammatory Eating Important?

- Reducing inflammation critical to disease risk reduction
- Diet plays a significant role in reducing inflammation
- Plant foods linked with a number of health benefits; anti-inflammation may be one reason

Phytochemicals: Protective Plant Compounds



Diet Patterns and Inflammation

- Recent study comparing three breakfasts: Western, Med Diet (olive oil or walnut), Western highest inflammatory response (*Atherosclerosis*, 2009)
- Review: Mediterranean and DASH diets associated with lower inflammation (*J Nutr Metab*, 2012)
- Vegetarian diets linked with lower CRP levels (*Nutrition*, 2004)

Phytochemicals in Plants

Benefits to plant:

- Act as a natural defense system: UV protection, anti-bacterial, -fungal, natural pesticide
- Attract pollinating or other seed dispersing insects

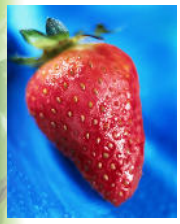
Benefits to humans:

- Antioxidants
- Anti-inflammatory agents
- Enhance cell-to-cell communication
- Alter estrogen metabolism
- Cause cancer cells to die
- Repair DNA damage
- Detoxify carcinogens

Antioxidant-Rich Foods

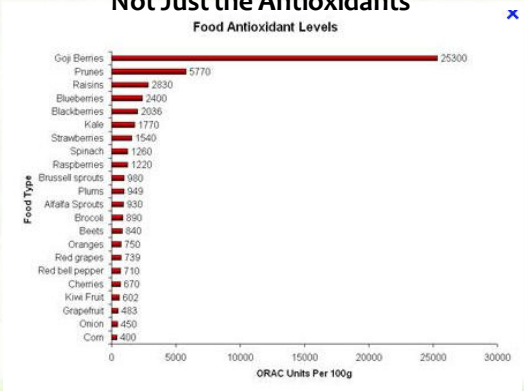
- "Antioxidants are like sponges, which mop up free radicals in the bloodstream and help quiet the immune system."
- Eat the rainbow (including white)!
  - Fruits & vegetables with rich hues, such as berries, broccoli, and dark leafy greens
  - less-than-colorful garlic and onions, too!
- Extra virgin olive oil and nuts

Plant Foods Linked to Lower Inflammation



- Fruit and vegetable intake linked with lower CRP (*J Nutr*, 2004)
- Whole grains lower inflammation (*Curr Opin Lipidol*, 2007)
- Soy foods linked to lower inflammation (*J Acad Nutr Diet*, 2012)
- Effects seen even at one meal; Strawberry reduces inflammatory response after high-fat meal (*JACN, 2010*)

Not Just the Antioxidants



Powerful Plants: Soy and CVD

- Epi data: soy intake and lower CVD rate
- FDA: Health claim 25 g/d soy protein may reduce risk of heart disease.
- Isoflavones anti-inflammatory effects:
  - Inhibit cell adhesion molecule expression
  - Act as antioxidant
  - Possible estrogen-like effects inhibit pro-inflammatory cytokines

- Study: European women, isoflavone-enriched bars for 8 wks, beneficial effects on CRP. (*AJCN*, 2005)

A Portrait of an Anti-Inflammatory Diet




Variety of foods	Healthful fats
Low in refined, low-nutrient foods	Includes omega-3 fatty acids
High in Fruits and vegetables	Rich in antioxidant spices and herbs
Balanced in calories to promote optimal weight	Tea consumption
Healthful carbohydrates	Moderate consumption of red wine (if alcohol is consumed)
Low in animal proteins (except for fish)	Small amounts of dark chocolate (at least 70% cocoa) as a treat
Includes plant proteins such as legumes, soy foods, and nuts	





Powerful Plants: Soy and Cancer

- Soy Story: Populations with high soy intake, low breast and prostate cancer rates
- Soy contains several anticarcinogenic compounds : isoflavones (genistein), saponins and protease inhibitors
- Soy protein and isoflavones:
  - Acts as antioxidant
  - Regulates immune function
  - Cancer suppressive activity

- Whole food approach:
  - Very high levels had stimulatory effect on tumors
  - Soy extract better results than soy isoflavones (*Exp Biol Med* 2010)

Slow-Digesting Carbs

- Low-glycemic foods may reduce inflammation i.e. legumes, berries
- Overwt men & women who ate a low-glycemic diet for 1 month reduced CRP by 22% compared to those on a high-glycemic diet *(Journal of Nutrition, 2012)*

Whole Grains

- Designed as natured intended , with bran outer covering and inner germ intact
- Hundreds of studies have found that eating a diet rich in whole grains can reduce your risk of stroke, type 2 diabetes, heart disease, asthma, colorectal cancer, obesity and gum disease

Legumes

- "ideal protein package"
- **American Diabetes Association,** the **American Heart Association** and the **American Cancer Society** all recommend legumes as one of the most important food groups for disease prevention and optimal health

Fruits and Vegetables

- Anthocyanin-rich **purple sweet potatoes** appear to protect against colorectal cancer *(Molecular Nutrition 2013)*
- Eating tomato products with a high-fat meal significantly reduces LDL ("bad cholesterol") oxidation and inflammatory markers in the blood *(Molecular Nutrition 2013)*

Omega-3 Fats

- Fats are converted to prostaglandins → these increase or decrease inflammation
- Omega-3s decrease inflammatory prostagladins
- Walnuts, flaxseeds, chia seeds

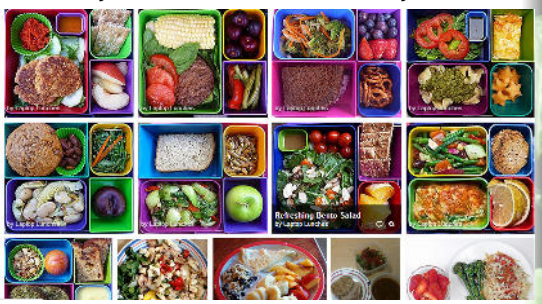
Anthocyanin-Rich Plant Foods

Plant Color	Plant Foods
Black	Blackberries, black beans, carrots (black), currants (black), Mission figs
Blue/Purple	Blueberries, eggplant, grapes (purple), plums, potato (purple), sweet potato (purple), raisins
Red	Apples (red), beets, blood oranges, cabbage (red), cherries, cranberries, grapes (red), kidney beans, peaches, pears (red), onions (red) radicchio, raspberries (red), rhubarb, strawberries, pomegranates, potatoes (red), radishes

Probiotic Foods & Supplements

- Probiotics can reduce inflammation in the gut, and other parts of the body *(Gut Microbes, 2013)*
- Can help with inflammatory diseases, including psoriasis, chronic fatigue syndrome, and ulcerative colitis
- Fermented foods i.e. yogurt, kefir, kombucha
- Prebiotics i.e. garlic, onions, asparagus

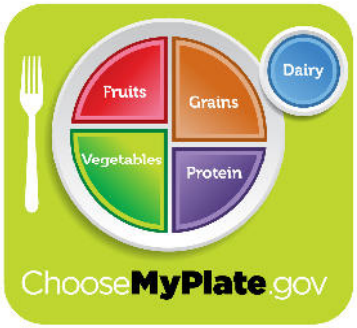
MyPlate—An Anti-Inflammatory Diet



Spices & Herbs

- Rosemary, sage, and thyme retain anti-inflammatory activity after heating & digestion *(Oxidative Medicine, 2012)*
- Cayenne pepper, cinnamon, clove, ginger, nutmeg, oregano, turmeric, and others

MyPlate



3/4 plate filled with plant foods

Cheers to Your Health!

- Drink tea
- Drink moderate amounts of red wine (if alcohol is consumed)
- Allow for small amounts of antioxidant-rich dark chocolate (at least 70% cocoa) as a treat

Physicians should consider recommending a plant-based diet to all their patients, especially those with high blood pressure, diabetes, cardiovascular disease, or obesity."

Special Report, Nutritional Update for Physicians: Plant-Based Diets
Perm J 2013 Spring;17(2):61-66

Thank You

Sharon Palmer, RD
The Plant-Powered Dietitian™
info@sharonpalmer.com