The Anti-Inflammatory Diet
No Disclosures
This Presentation

- Inflammation.
- Pro-Inflammatory foods. What makes them so?
- Anti-inflammatory foods. What makes them so?
- Bioavailability and the microbiome
- General anti-inflammatory diet
- Cases and individualizing the diet
- Resources
Inflammation. It’s how the body heals.

Inflammation is an intrinsically beneficial event that leads to removal of offending factors and restoration of tissue structure and physiologic function.
Inflammatory response in a nutshell

1) Increased vasodilation and capillary permeability in the area (Calor, Rubor, Tumor, Dolor)

2) Margination and migration of phagocytes to the site of infection.

3) Phagocytes consume pathogens/debris.

4) Inflammation resolves.
https://www.youtube.com/watch?v=GIJK3dwCWCw
maybe watch 2.5 min of this 5:15-7:30?
But inflammation doesn’t always resolve.
Reasons inflammation may become persistent/chronic

- Persistent infections
- Hypersensitivity disease/immune mediated inflammatory disease
- Prolonged exposure to toxic agents
- Obesity
- Recurrent attacks of acute inflammation
- No exercise, poor sleep, stress in general
- Poor diet
FOODS THAT FIGHT INFLAMMATION

Chronic inflammation has been linked to cancer, heart disease, diabetes, arthritis, depression, and Alzheimer's. Fight inflammation with a healthy diet.

ANTI-INFLAMMATION FOODS

- **Tomatoes**
- **Fruits**
  - Strawberries, blueberries, oranges, and cherries.
- **Nuts**
  - Almonds, walnuts, and other nuts.
- **Olive oil**
- **Leafy greens**
  - Spinach, kale, collards, and more.
- **Fatty fish**
  - Salmon, mackerel, tuna, and sardines.

INFLAMMATION FOODS

- Fried foods
- Sodas
- Refined carbs
- Lard
- Processed meats
Pro-inflammatory foods.
What makes them so?
- Sugar
- Hydrogenated fats
- Additives
- Refined grains

- Omega 6 Fatty acids?
- Saturated Fatty acids?
- Dairy?
- Red Meat?
- Nightshades?
Sugar

Oxidative damage via AGE’s giving rise to chronic disease

Damage to endothelial cell walls giving rise to heart disease

Obesity, leading to more inflammation

Insulin resistance and diabetes
Hydrogenated fats

Partially hydrogenated fats or trans fats raise LDL’s and lower HDL’s leading to overall increased risk of CVD. We see inflammatory markers increased, specifically TNF alpha, CRP, and IL-6. We don’t fully understand the specific mechanism but we do know that they decrease prostacyclin (PGI2) a prostaglandin that supports normal endothelial function and is heart protective.


Note: Know that trans fats are found in most any processed food even if the label says fat free. FDA allows the labeling “fat free” if the ‘food’ contains < .5g/serving.
Additives

Emulsifiers

In mice, relatively low concentrations of two commonly used emulsifiers, namely carboxymethylcellulose and polysorbate-80, induced low-grade inflammation and obesity/metabolic syndrome in wild-type hosts and promoted robust colitis in mice predisposed to this disorder.

Nature. 2015 Mar 5;519(7541):92-6
More on additives

Artificial sweeteners

Artificial sweeteners induced glucose intolerance by altering the microbiota in the gut. The question arises, do diseases of gut dysbiosis like Crohn’s, IBD and UC increase when Splenda is introduced into the food system?


http://nutritionfacts.org/video/effect-of-sucralose-splenda-on-the-microbiome/
Refined grains
Omega 6 fatty acids

Higher nut consumption is associated with a lower risk of all-cause mortality, total CVD, and CVD mortality. Interestingly, most nuts are much higher in omega 6 than omega 3. Is it something else in the nuts?

Br J Nutr, 2016 Jan 28;115(2):212-25
<table>
<thead>
<tr>
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<th>Omega 6 : Omega 3 Ratio</th>
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<tr>
<td>Walnuts</td>
<td>4 : 1</td>
<td>Flax</td>
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<td>Macadamia</td>
<td>6 : 1</td>
<td>Chia</td>
<td>1 : 3</td>
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<td>Pecans</td>
<td>20 : 1</td>
<td>Hemp</td>
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<td>Hazelnut</td>
<td>90 : 1</td>
<td>Sesame</td>
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<td>Brazil nut</td>
<td>1100 : 1</td>
<td>Sunflower</td>
<td>300 : 1</td>
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<tr>
<td>Almond</td>
<td>2000 : 1</td>
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</tbody>
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More on Omega 6 and 3

Depression

Possible mechanisms could include an increased production of pro-inflammatory cytokines, which can activate the HPA axis and a changed membrane fluidity, which potentially affects membrane bound enzymes, ion channels, receptor activity and neurotransmitter binding.

Medicina (Kaunas). 2016;52(3):139-47.
More omega 6 and 3

IV therapy

In the last few years, alternative intravenous lipid emulsions with lower soybean oil content have been associated with important improvements in clinical outcomes, such as mortality, mechanical ventilation days and ICU length of stay. Olive oil and fish oil IVLEs have been reported to reduce the incidence of infections with no clear benefits in other clinical outcomes.

Dairy

There is growing evidence that SFAs in the context of dairy foods, particularly fermented dairy products, have neutral or inverse associations with CVD.

Annu Rev Nutr. 2015;35:517-43
More on Dairy

It is concluded that a policy to lower SFA intake by reducing dairy food consumption to reduce cardiometabolic disease risk is likely to have limited or possibly negative effects.

Saturated fats

The findings of this updated review are suggestive of a small but potentially important reduction in cardiovascular risk on reduction of saturated fat intake. Replacing the energy from saturated fat with polyunsaturated fat appears to be a useful strategy and replacement with carbohydrate appears less useful. The ideal type of unsaturated fat is unclear.

Cochrane Database syst Rev. 2015 Jun 10;(6).
Red Meat

Eating lean red meat has no effect on production of the inflammatory markers, thromboxanenes or prostacyclins, and is a good source of protein and other nutrients.

Asia Pac J Clin Nutr, 2005;14(2):113-9
More on red meat

Consumption of meats characteristic of range-fed ruminants or wild ungulates supports reduced PGE2 and greater PGI2 synthesis, indicating potentially greater immune health and lower blood clotting potential than meat from grain-finished cattle or bison in this model system.

Nutr Res. 2011 Dec;31(12):907-14
Nightshades

Lycopene anti-inflammatory?


Atabine anti-inflammatory?

Clin Med Insights Arthritis Musculoskelet Disord. 2013Oct21;6:73-84

Withania reduced the production of pro-inflammatory cytokines in vitro.

Anti-inflammatory foods
What makes them so?
- Polyphenols
- Carotenoids
- Vitamins
- Minerals
Polyphenols

Phenolic acids-protect against oxidative damage. Found in tea, coffee, berries, plums, cherries, apples.

Flavonoids-work as antioxidants and anti-inflammatory agents. Flavones, flavanones, isoflavones, anthocyanins, flavonols and flavanols.

Stilbenes- anti-oxidant and anti-inflammatory agent; resveratrol is the most common, found in grape skins, blueberries and cranberries.

Lignans-decrease inflammatory markers and are phytoestrogens. Found in flax, sesame; and small amounts in algae, grains, legumes and some vegetables and fruits.
Quercetin, most abundant flavonoid subgroup, flavonol

Quercetin is known for its antioxidant activity in radical scavenging. It can also offer a host of anti-inflammatory benefits including inhibiting histamine release, decreasing leukotriene creation and suppressing cytokine IL-4.

Molecules. 2016 May 12;21(5).
More flavonoids, subgroup flavanone, naringenin

This review of both in vitro and in vivo studies found naringenin has anti-inflammatory and antioxidant benefits.

More Flavonoids

Polyphenols (likely subgroup anthocyanins) in azuki bean shown to attenuate vascular oxidative stress and inflammation during the progression of hypertension.

Carotenoids

Alpha carotene, beta carotene, lycopene, astaxanthin, lutein and zeaxanthin.

Suppress activation of NF kappa beta

Decrease CRP
Vitamins

Adequate intake of antioxidant vitamin C and E decreases pro-inflammatory effects of free radicals.

In addition vitamin E inhibits protein kinase C and cyclooxygenase 2. CRP decreases with adequate vitamin E.

Vitamin D has anti-inflammatory effects in the gastrointestinal tract and elsewhere.
Magnesium

American adults who consume less than the RDA of magnesium are 1.6 times more likely to have an elevated CRP.

Bioavailability and the Microbiome
Bioavailability

Environmental factors—storage, culinary preparation, industrialized processing

Intestinal absorption—stomach acid, enzyme production, hepatic metabolism, biliary and urinary excretion

Am J Clin Nutr May 2004 vol. 79 no. 5 727-747

All polyphenols are not absorbed equally. The below review of 97 bioavailability studies showed gallic acid a phenolic acid, and isoflavones are the most well-absorbed. Proanthocyanidins and anthocyanins are the least well-absorbed.

Processing of foods for best bioavailability

Stewing

Eating with olive oil

Raw or lightly steamed brassicas

Drink the water in which you steam your vegetables

Meats processed with dry heat have the highest AGE’s

http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4586566/
Olive oil

Flavor

Harvest date

Dark glass

Single source
Gut microbiota

Choline is metabolized by gut bacteria to TMAO (tri-methylamine N-oxide) which contributes to platelet over-activity and thrombosis potential.


Different bacterial species induce distinct immune cell populations that can play pro- and anti-inflammatory roles.

Annu Rev Immunol. 2015;33:227-56
More on gut microbiota

The percentage of Japanese men who convert isoflavones to its active metabolite equol is double compared to caucasian conversion. It’s the bacteria in the bowel that do the conversion.

More on gut microbiota

It has become clear that the gut microbiota not only plays a major role in priming and regulating mucosal and systemic immunity, but that the immune system also contributes to host control over microbiota composition.

Microbiol Spectr. 2015 Jun;3(3).
Microbiome: ways to enhance and maintain it

- Eat fermented foods- Kombucha, yogurt, kefir, miso, tempeh, ferment your own
- Live with others, socialize
- Garden
- Eat dirt
- Eat an anti-inflammatory diet rich in phytonutrients and fiber.

The Anti-Inflammatory Diet
Eat food, not too much, mostly plants.
General anti-inflammatory diet

**Legumes**: black, pinto, navy, adzuki, kidney, garbanzo, mung, lentil, split pea, fermented soy

**Vegetables**: carrots, celery, cucumber, kale, spinach, arugula, beets, winter squash, yams, broccoli, cauliflower, parsley, cilantro, collards, mushrooms, radish, bok choy, onions, garlic, tomato, peppers.

**Fruits**: berries, apples, peaches, pears, grapes, plums, cherries, persimmons, figs, dates, avocados, olives, citrus

**Grains**: millet, rice, quinoa, buckwheat, amaranth, oats, barley, rye, wheat

**Meats**: cold water fish, grass-fed lamb and beef, pastured poultry and eggs

**Nuts and Seeds**: almonds, walnuts, pecans, brazil nuts, hazelnuts, sunflower, flax, pumpkin, chia, sesame

**Spices**: turmeric, ginger, pepper, saffron, black cumin (nigella)

**Dairy**: yogurt, kefir, artisanal cheeses

**Other**: green tea, coffee, chocolate
Cases
Case 1

55yo female % fecal incontinence. She noticed episodes happened more often when she had dairy but now it was becoming less predictable. In addition she was experiencing more bloating and gas but could not always relate it to a specific food. She eats an omnivorous diet, drinks 2 12oz coffees, takes probiotics regularly.
She decided she wanted to do an elimination/anti-inflammatory diet instead of any testing. She avoided dairy, wheat, citrus (except for lemon), peanuts, soy, caffeine and sugar. She ate mostly vegetables, fruits, some grains, meats, fish and poultry. After one month she had already connected garlic and onions to her fecal incontinence. After 3 months, she found soy, chocolate, raw carrots cause bloating and gas; citrus and caffeine promote urinary urgency. Now she knows what to avoid and when she has a diet error she’ll take some enzymes to help digest the provoking food. Her eczema which she forgot to tell me about has rarely been a problem!
Case 2

59yo female PTC with hx of asthma and eczema which has become worse in the past 3 mos while she deals with her mother who has dementia and is moving into a local assisted living facility. She has identified foods (wheat, dairy, honey, chicken skin and egg yolks) that make her asthma and eczema worse, but doesn’t always avoid them. She takes singulair and probiotics and uses an inhaler sometimes 3 times daily. Through physical exam I assess her liver, gb and stomach are irritated. Lungs are clear but breathing is shallow. I hear no wheezes but she does cough if she tries to breathe deeply.

Tx: Herbal digestive tonic/stimulant. Herbal respiratory antispasmodic and bronchodilator. No wheat or dairy. Stress management skill building.
2wks later...wheezing less, using inhaler less. Plan: continue with herbal formula.

2wks later...wheezing no longer present but cough is dry and more often; stomach feels tight and bloated. Plan: trial of omeprazole

2days later...75% improvement in stomach pressure.

Fast forward...much time passed, didn’t see her for awhile; started a job, busy w/Mom care. Came back to see me, still struggling w/GERD, been taking prilosec, trying to avoid wheat and dairy but not really getting better. Seems to be having more “allergic” reactions, (daughter made dish w/tomatoes, chilies) and she experienced upper gi bloating, belching, constipation and general abdominal discomfort. Tried lactaid and doesn’t help with dairy sensitivity. Plan: food sensitivity test, endoscopy.
Endoscopy showed esophagitis and small hiatal hernia. Biopsies showed no pathologic diagnosis. Electrodermal test showed many foods: pork, beef, crustaceans and bivalves, soy, cow dairy, gluten, quinoa, nightshades, sugar, honey, barley malt, coffee, decaf coffee, plum, pineapple, apricot, banana, strawberry, citrus, mango, peanuts, alcohol, artificial sweeteners. Plan: gut healing, food elimination x8wks.

Latest (6mos later): Almost weaned off prilosec. Has added in and tolerates citrus and quinoa. Hasn’t had singulair or inhaler for many months. Is blood type A and will likely do well on that diet.
Individualize the diet for your patient

Food testing options

Gut healing
Food testing options

Proven tests:

● Skin prick testing
● IgE (RAST)
● Physician supervised oral challenge (gold standard)
Unproven methods

- ALCAT or ELISA
- Cytotoxic assay test
- Electrodermal
- IgG
- Patch test
- Kinesiology
- Pulse test

- Diet diary
- Elimination diet
- Blood type diet
Gut healing

- Herbal demulcents: ulmus, plantago, glycyrrhiza, althea, flax seeds, chia seeds, aloe
- Glutamine
- NAG (N-acetyl glucosamine)
- Broth
- Probiotics
- Anti-inflammatory diet
Resources

Nourishing Meals by Alisa Segersten

The Elimination Diet by Alisa Segersten and Tom Malterre


Fermented Foods available in Portland: Oregon Brineworks, Blue Bus, Moon Brine, Pickled Planet, Choi’s, King’s, Firefly, Wildbrine, Olykraut, Bubbies, It’s Alive Food (all at New Season’s).
Resources continued


https://www.ewg.org/foodnews/dirty_dozen_list.php


Benessere Olive oils and vinegars 1428 NE Broadway

Oregon Olive Mill at Red Ridge Farm in Dayton, OR

http://www.nature.com/ejcn/journal/v64/n3s/fig_tab/ejcn2010221t1.html

polyphenol list
Summary

Reviewed the inflammatory response

What in foods makes them pro- and anti-inflammatory

What constitutes an anti-inflammatory diet

How to individualize the diet to suit your patient.

Resource list
Contact Information

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