Anti-Inflammatory Diets… Do they really work?

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Disclosures

- None

Objectives

- To understand the fundamentals of inflammation and its impact on human health
- To explore the concept of anti-inflammatory diets
- To provide practical suggestions for implementing an anti-inflammatory diet

Forbes HEALTH

Nutrition

The 30 Best Anti-Inflammatory Foods to Eat Daily

Plus, expert-backed ways to get them on your plate.

SPECIAL TIME EDITION

100 MOST HEALING FOODS

+20 DELICIOUS RECIPES

Chicago Tribune

Using food to battle inflammation

By Shara Yurkiewicz, Special to Tribune Newspapers
CHICAGO TRIBUNE

SEPTEMBER 20, 2009

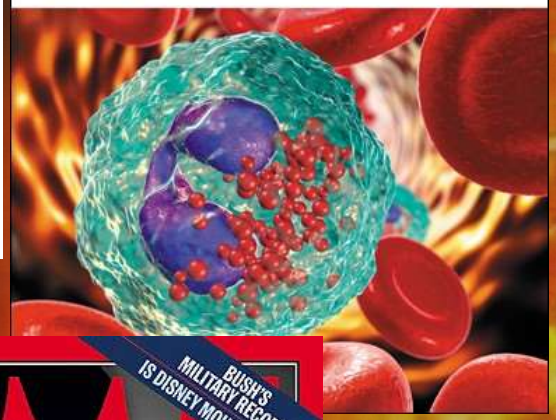
If you want to live longer -- and avoid heart disease, Alzheimer's disease and cancer -- then pick and choose your foods with care to quiet down parts of your immune system.

Special Health Report

HARVARD MEDICAL SCHOOL

Fighting Inflammation

How to stop the damage before it compromises your health



THE

14-DAY Anti-Inflammatory Diet

With 75 Quick & Easy Recipes!

Heal your gut, prevent disease and slow aging—one bite at a time!

BY MIKE ZUMMERMAN

Eat This, Not That!

MARKETS BUSINESS INVESTING TECH POLITICS CNBC TV INVESTING CLUB

MODERN MEDICINE

MODERN MEDICINE

Why women are adopting Tom Brady's antiinflammatory diet

PUBLISHED THU, JUN 21 2018-3:35 PM EDT | UPDATED FRI, JUN 22 2018-1:09 PM EDT

Sheryl Kraft, CNBC contributor

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TIME

BUSH'S MILITARY RECORDS IS DISNEY MOUSETRAPPED?

THE SECRET KILLER

- The surprising link between INFLAMMATION and HEART ATTACKS, CANCER, ALZHEIMER'S and other diseases
- What you can do to fight it

What is Inflammation?

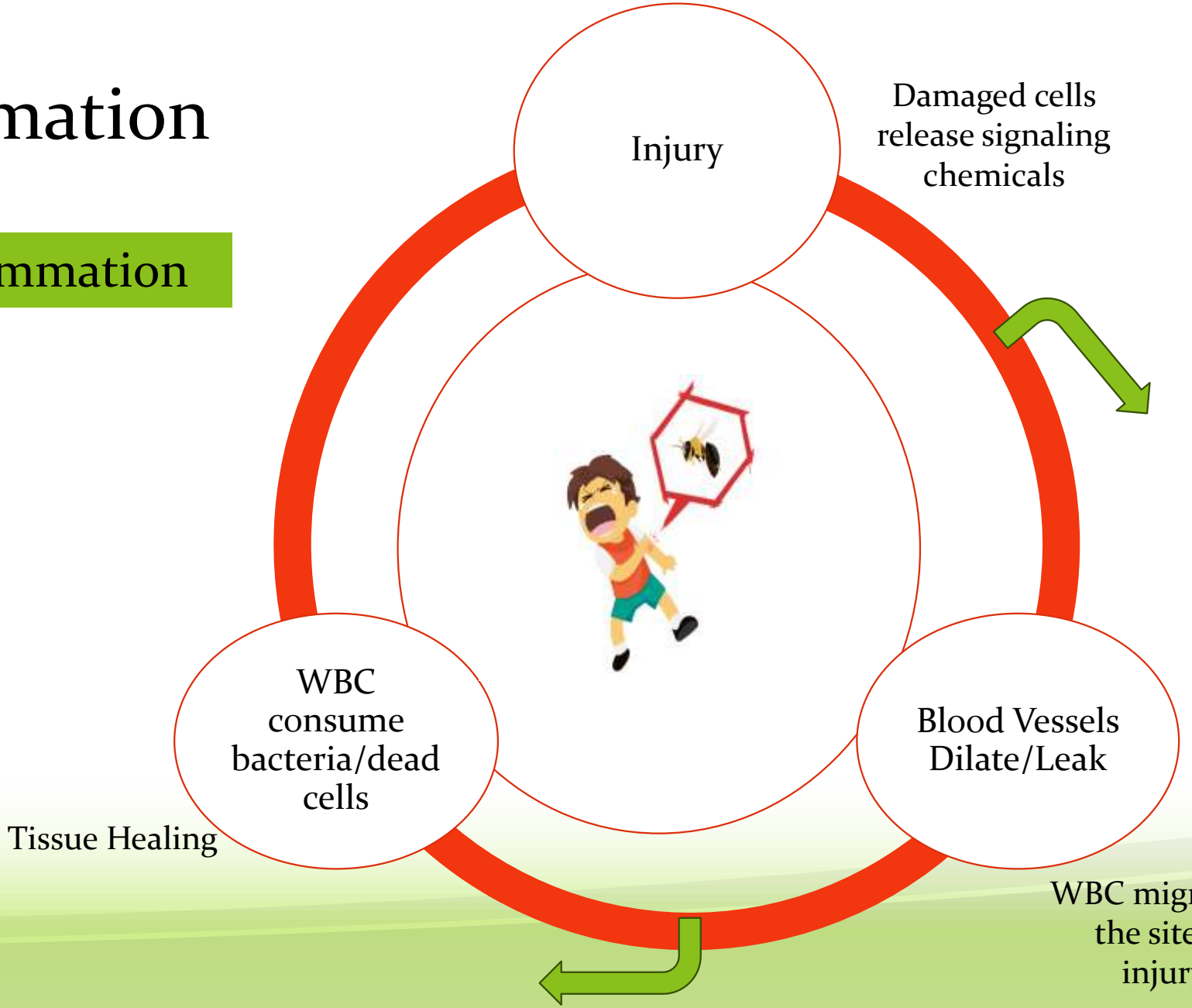
A complex biologic response triggered by injury, irritants, aimed at removing the pathogenic substance, promoting healing, and restoring normal structure and function

- **Acute:** Rapid onset, short lived (cuts, bee stings, trauma)
- **Chronic:** Persist long-term causing progressive damage (autoimmune diseases, CVD, cancer)

Acute Inflammation

Signs of Acute Inflammation

- Redness
- Swelling
- Pain
- Heat

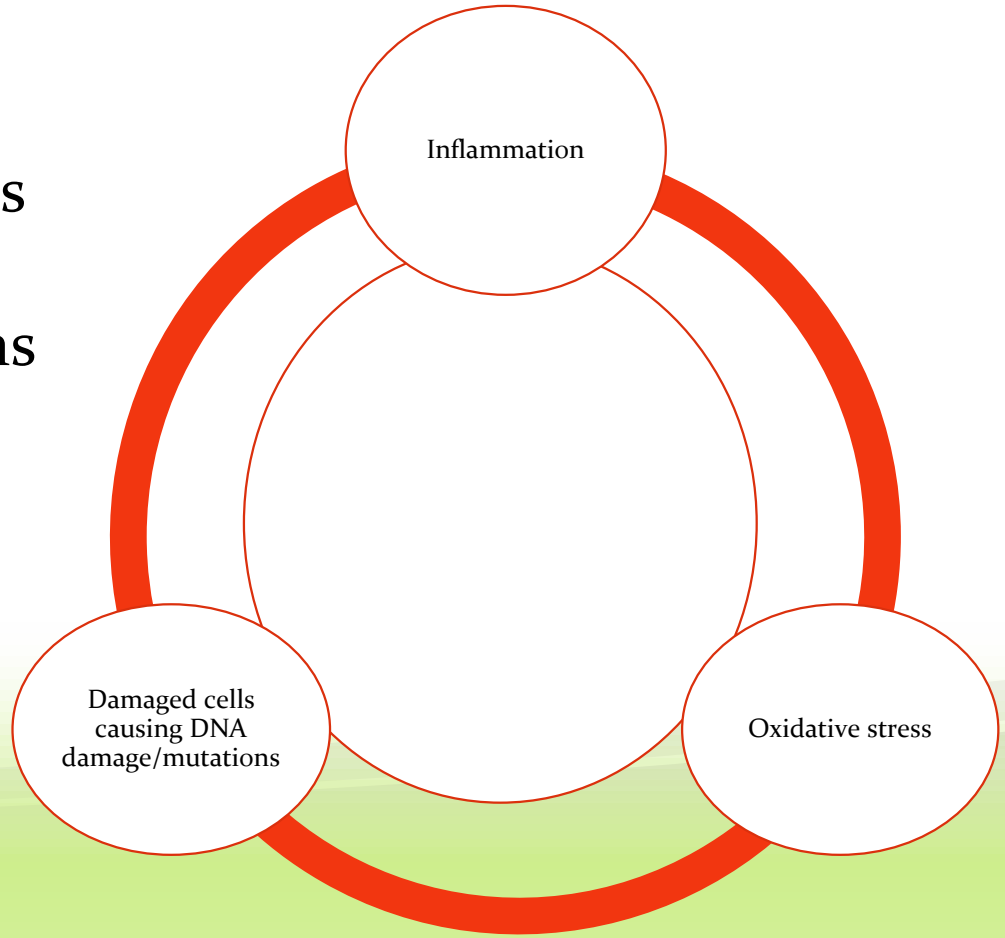


Chronic Inflammation

- Slow, long-term persistent immune system activation causing inflammation
  - Chronic, low-grade inflammation damaging tissue/cells, tissue never heals
  - “Smoldering disease” : Damage occurs for months to years to indefinitely

Signs of Chronic Inflammation

- Fatigue
- Insulin resistance
- Rashes/Skin issues
- Weight gain/loss
- Digestive problems
- Joint swelling

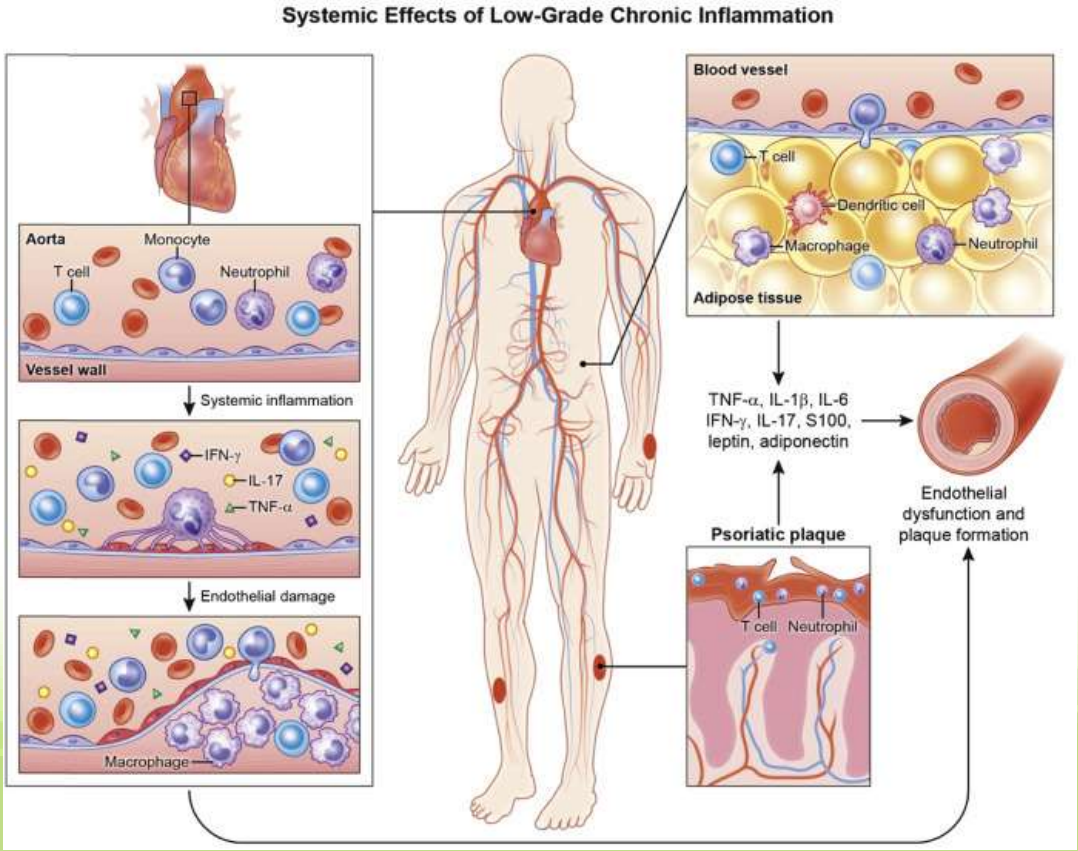


How is inflammation measured?

Certain biomarkers in blood, stool, tissue samples can indicate inflammation

High blood level of proteins made by the liver for defense against a pathogens

- CRP
- ESR
- Ferritin
- Complement C3
- Complement C4



Elevations of signaling molecules related to the inflammatory process

- Interleukins: IL-1, IL-6 and other cytokines
- TNF-alpha
- Nuclear Factor Kappa Beta
- Lipoxygenase-2 (LOX-2)
- Cyclooxygenase-2 (COX-2)

The Standard American Diet (SAD)

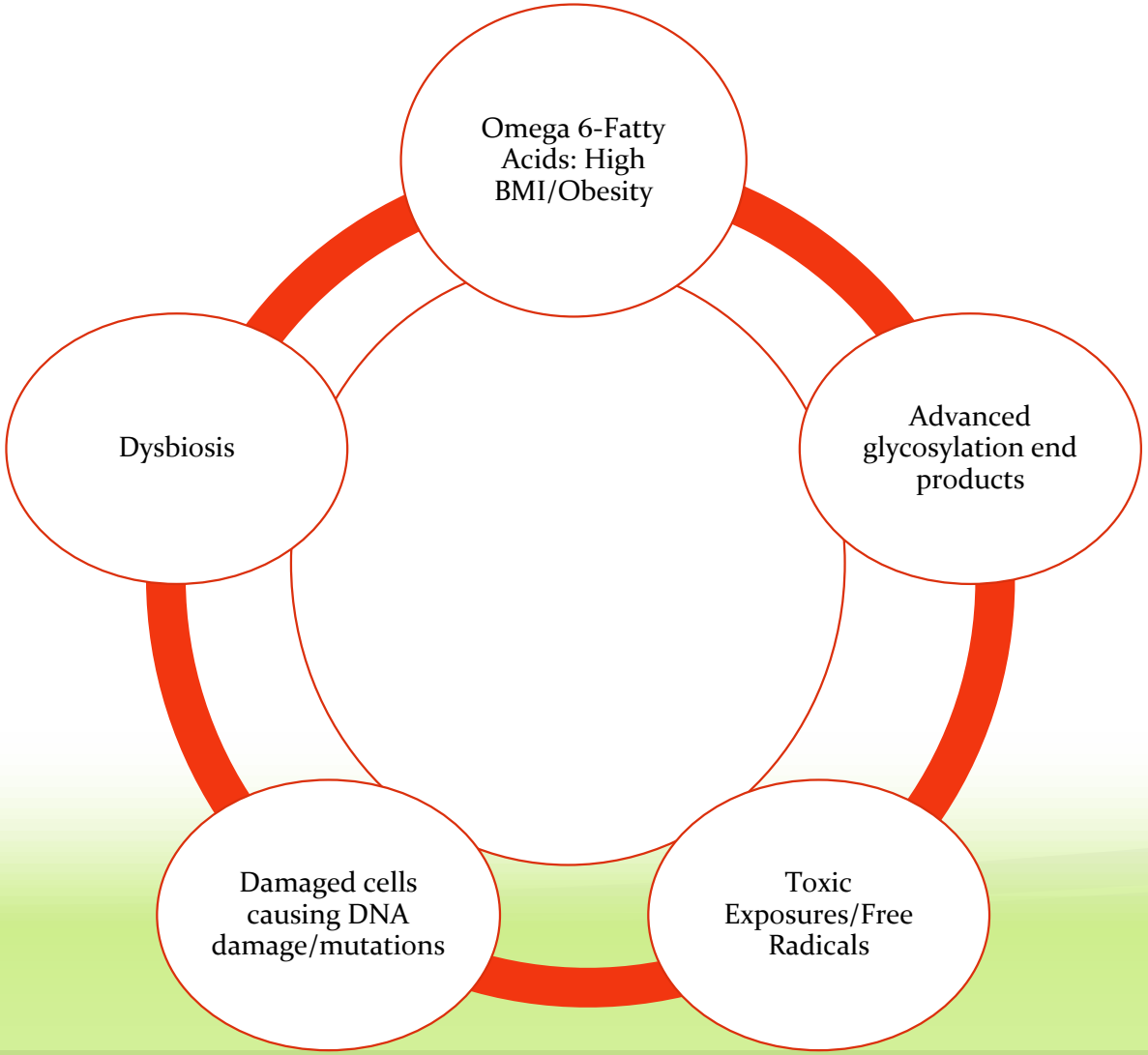
- High in:
  - Refined sugars
  - Processed foods
  - Sodium
  - Omega 6-Fatty Acids*
- Low in:
  - Fiber
  - Whole grains
  - Healthy Fats

Diet ***is not*** the only contributor for inflammation

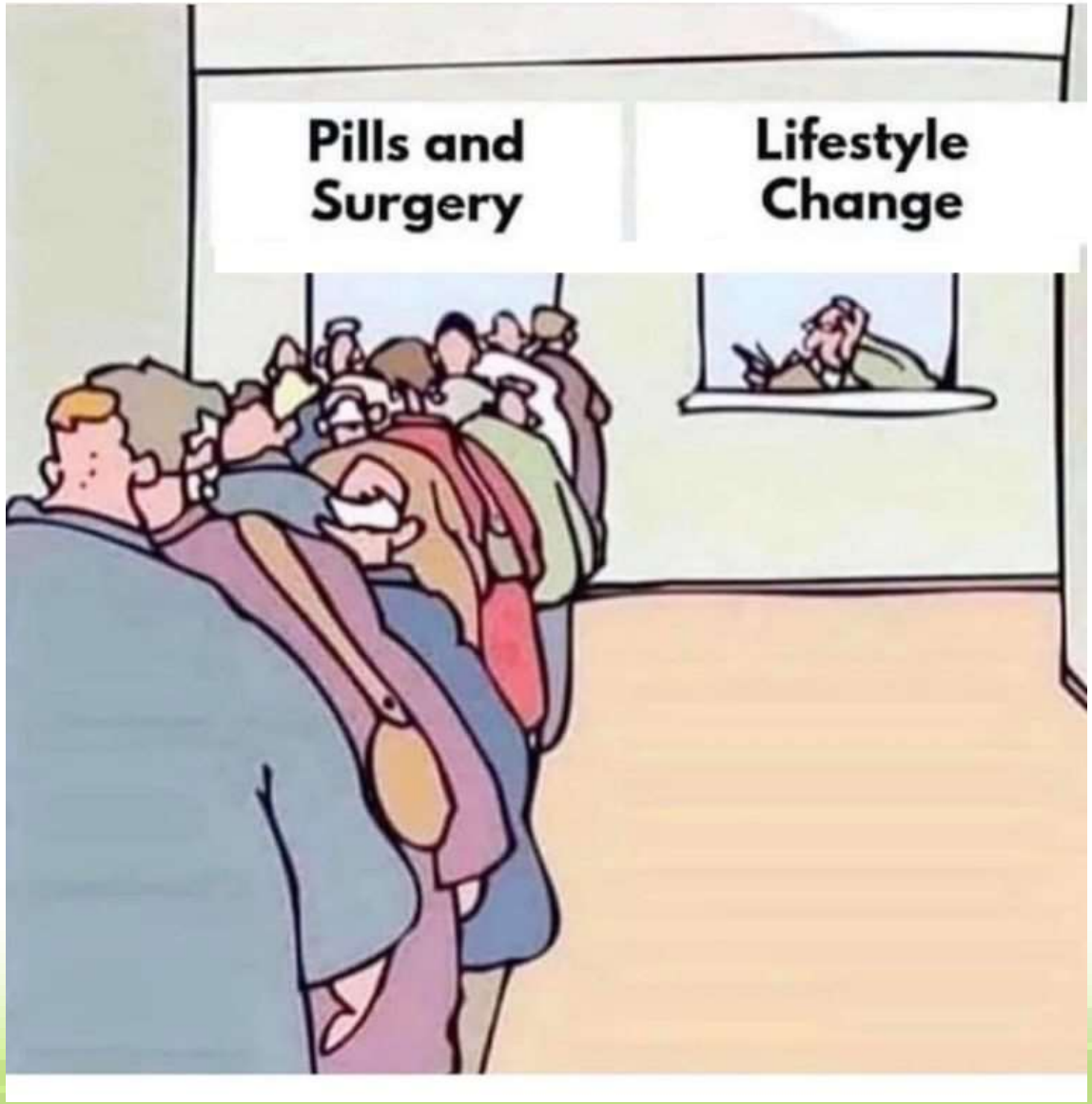
Other factors:

- **Smoking**
- **Obesity/High Body Fat Index**
- **Exposure to dust/chemicals**
- **Periodontal disease**
- **Chronic Stress**

The many ways foods can cause inflammation



Anti-inflammatory Diet

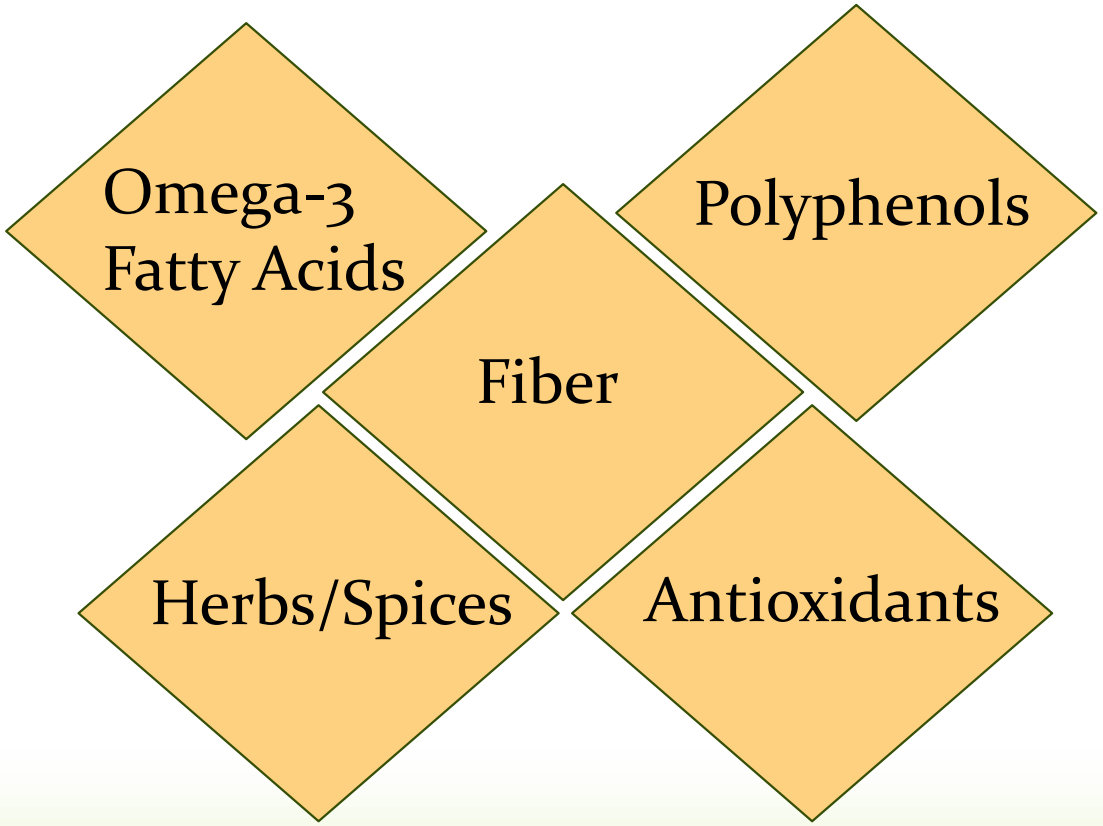

Pills and Surgery
Lifestyle Change

Diet Inflammatory Index (DII)

- Evidence-based, validated tool
- 1,900 studies reviewed to determine relationship between food parameters and the 6 inflammatory biomarkers in the body
  - IL-1, IL-4, IL-6, IL-10, TNF-alpha, and CRP
- Each food was based on quality and quantity of study:
  - + = pro-inflammatory
  - 0 = neutral
  - - = anti-inflammatory

Shivappa N, Steck SE, Hurley TG, Hussey JR, Hebert JR. Designing and developing a literature-derived, population-based dietary inflammatory index. *Public Health Nutr.*

Key Components



Dietary ***patterns*** can prevent inflammation

Fiber

- Slows the digestion of carbohydrates, regulating blood sugar, keeping you full longer
- American Heart Association Eating Plan: 25-30 grams /day from FOOD

Fruits and Vegetables

Legumes

Nuts and Seeds

Whole Grains

Omega-3 Fatty Acids

- National Institute of Health: 1.1 1.6 grams/day
- American Heart Association: 3 grams/day

Alpha Linolenic Acid (ALA)

Chai seeds, Flax seeds, Walnuts

Docosahexanenoic Acid (DHA)

Salmon

Mackerel

Tuna

Eicosapentaenoic Acid (EPA)

Rainbow Trout

Shrimp

Polyphenols

- A broad category of chemical compounds that naturally occur in plants
- Interfere with pro-inflammatory cytokine synthesis
  - Inactive NF-KB
  - Inhibit certain enzymes involved in reactive oxidative species : Cyclooxygenase (COX), Lipooxygenase (LOX) → decrease in Prostaglandins and Leukotrienes

Flavanoids



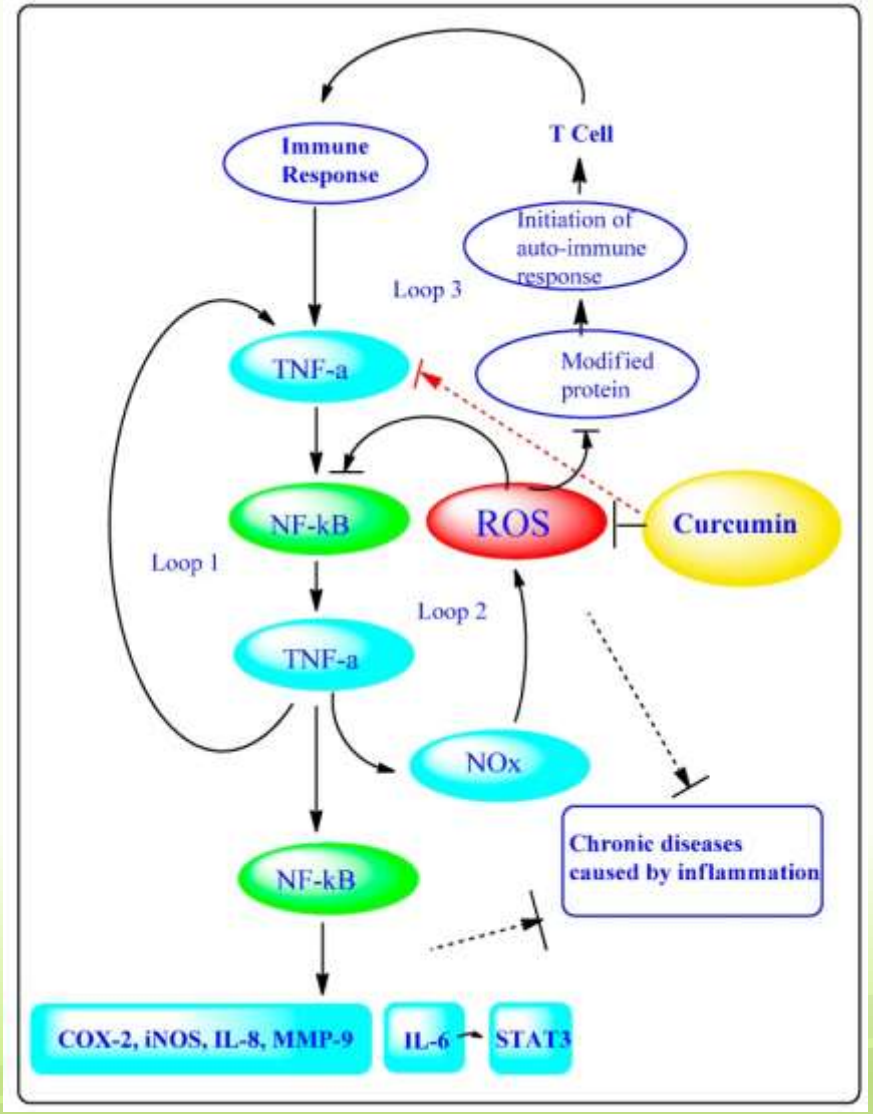

Capsaicinoids

Resveratrol and Stillbenes


Herbs/Spices

Turmeric : “Golden Spice”

- Curcumin comprises approximately 2%-5% of the total composition of turmeric,
- Acts as a natural free-radical scavenger via the COX-2 and NF-kB pathway
- Highest Diet Inflammatory Index (DII)

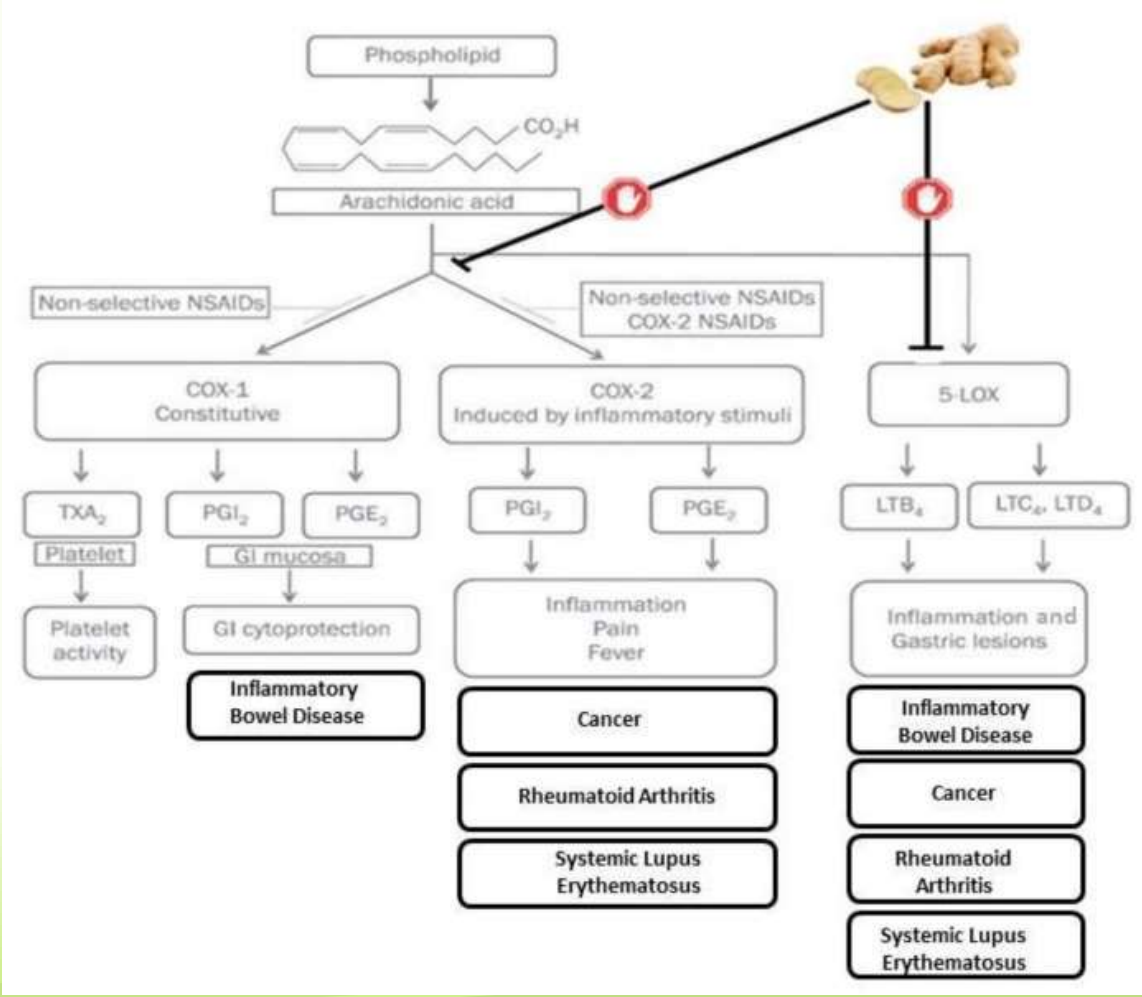


Zhou, X.; Afzal, S.; Wohlmuth, H.; Münch, G.; Leach, D.; Low, M.; Li, C.G. Synergistic Anti-Inflammatory Activity of Ginger and Turmeric Extracts in Inhibiting Lipopolysaccharide and Interferon-γ-Induced Proinflammatory Mediators. *Molecules* **2022**,

Herbs/Spices

Ginger

- 6-Shogaol has exhibited the most potent antioxidant and anti-inflammatory properties in ginger
- In the recent study of Aryeian et al., it was observed that the effect of supplementation with 1.5 g/day of ginger in 63 patients with RA obtained a significant reduction in IL-1B and hs-CRP, and TNF-α was observed in the ginger group



Mashhadi NS, Ghiasvand R, Askari G, Hariri M, Darvishi L, Mofid MR. Anti-oxidative and anti-inflammatory effects of ginger in health and physical activity: review of current evidence. Int J Prev Med. 2013 Apr;4(Suppl 1):S36-42.

Table 1. Anti-inflammatory activity, synergistic interaction, therapeutic index and cytotoxicity parameters of ginger extract (G), turmeric extract (T) and G-T combinations in inhibiting LPS-induced NO, IL-6 and TNF productions in RAW 264.7 cells ($n > 3$ of experiments).

Extracts and Combinations	Cell Viability LC_{50} (µg/mL) (Mean ± STD)	NO			IL-6			TNF		
		IC_{50} (µg/mL) (Mean ± STD)	CI Value at IC_{50}	Therapeutic Index	IC_{50} (µg/mL) (Mean ± STD)	CI Value at IC_{50}	Therapeutic Index	IC_{50} (µg/mL) (Mean ± STD)	CI Value at IC_{50}	Therapeutic Index
G	104.3 ± 5.63 *	11.78 ± 1.58	N/A	8.85	32.91 ± 9.06	N/A	3.17	163.40 ± 3.94 *	N/A	0.64
T	83.90 ± 7.19	6.51 ± 1.28	N/A	12.88	16.10 ± 3.09	N/A	5.21	14.63 ± 2.19	N/A	5.73
G-T 1:9	72.29 ± 4.77 Δ	13.08 ± 0.97	1.91	5.52	25.46 ± 4.28	1.50	2.84	22.20 ± 6.13 Δ	1.86	3.26
G-T 2:8	76.93 ± 6.72 Δ	10.08 ± 0.96	1.41	7.63	18.33 ± 3.68 Δ	1.01	4.20	19.02 ± 3.09 Δ	1.10	4.04
G-T 3:7	82.15 ± 3.00 Δ	7.93 ± 0.81 Δ	1.05	10.36	13.98 ± 2.00 Δ	0.70	5.88	20.51 ± 5.17 Δ	0.40	4.01
G-T 4:6	81.00 ± 2.86 Δ	6.52 ± 0.70 Δ	0.83	12.42	11.52 ± 2.33 Δ	0.52	7.03	18.30 ± 2.64 Δ	0.73	4.43
G-T 5:5	102.70 ± 2.10	5.72 ± 0.62 Δ	0.69	17.95	14.47 ± 3.04 Δ	0.59	7.10	12.40 ± 2.16 Δ	0.31	8.53
G-T 6:4	115.80 ± 18.44 &	4.72 ± 0.48 Δ	0.54	24.53	12.40 ± 2.02 Δ	0.45	9.34	22.81 ± 5.38 Δ	0.57	5.08
G-T 7:3	93.29 ± 5.04	5.02 ± 0.23 Δ	0.53	18.58	16.94 ± 2.36 Δ	0.53	5.51	24.79 ± 4.58 Δ	0.62	3.76
G-T 5:2	115.80 ± 11.4 &	5.83 ± 0.81 Δ	0.61	19.86	9.07 ± 1.47 Δ	0.23	12.76	20.07 ± 3.33 Δ	0.28	5.77
G-T 8:2	104.80 ± 6.23 &	5.92 ± 1.18 Δ	0.59	17.70	16.53 ± 3.79 Δ	0.43	6.34	29.92 ± 6.24 Δ	0.49	3.50
G-T 9:1	107.40 ± 8.67 &	6.11 ± 0.96 Δ	0.57	17.58	29.87 ± 7.66	1.00	3.60	31.91 ± 6.16 Δ	0.41	3.37

Δ $p < 0.05$ compared with G; & $p < 0.05$ compared with T as analysed by one-way ANOVA test. * estimated LC_{50} or IC_{50} value based on the trend of the dose-response curve.

Mashhadi NS, Ghiasvand R, Askari G, Hariri M, Darvishi L, Mofid MR. Anti-oxidative and anti-inflammatory effects of ginger in health and physical activity: review of current evidence. Int J Prev Med. 2013 Apr;4(Suppl 1):S36-42.

Other Antioxidant Vitamins

Vitamin C

Fruits & Cruciferous vegetables

- Red Pepper, Broccoli
- Kiwi, Strawberry, Grapefruit, Guava
- Potato, Cauliflower, Brussel Sprouts

Vitamin E

Nuts &Oils

- Seed/Vegetable Oils
- Nuts and Seeds
- Spinach, Broccoli, Tomatoes, Squash
- Peanut Butter

B-Carotene

Orange fruits/veggies & Leafy greens

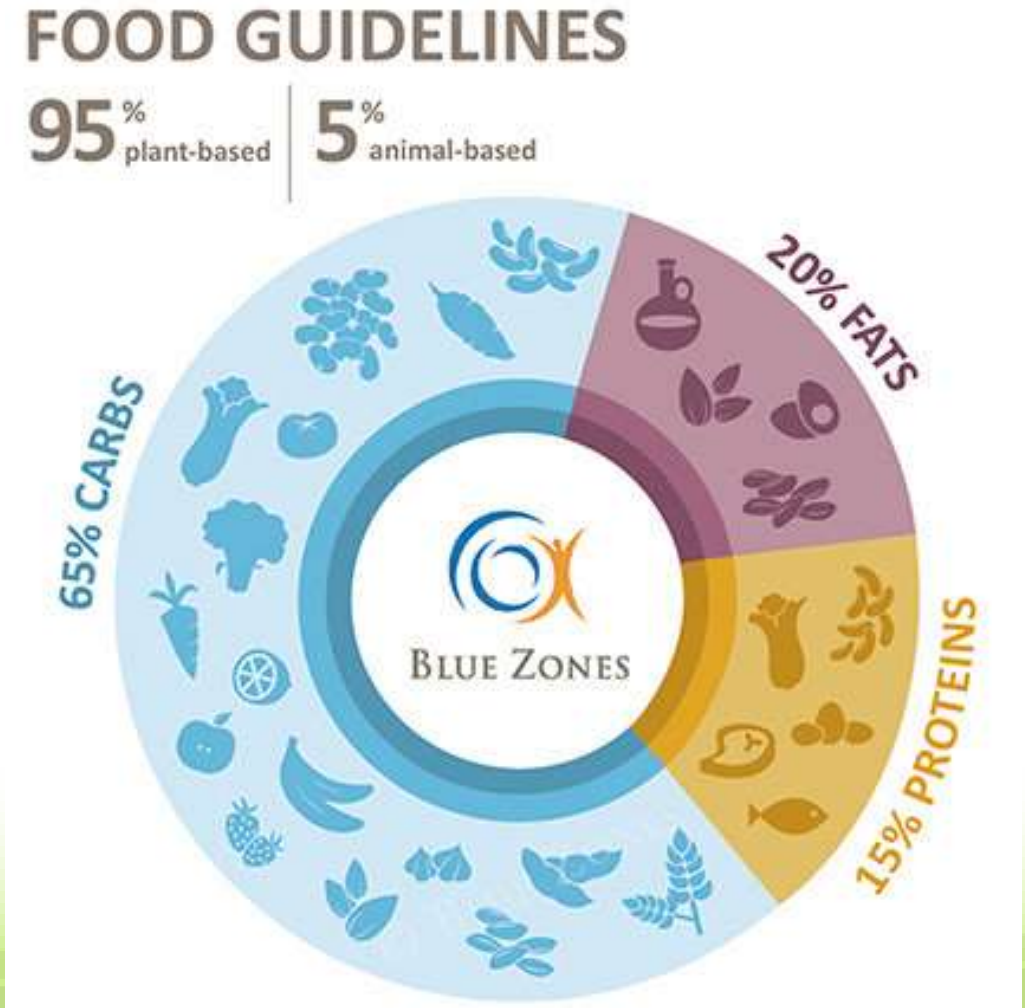
- Carrots, Pumpkin, Squash
- Peppers, Onions
- Apricot , Cantaloupes, Mangoes, Peach

Food parameter	Weighted number of articles	Raw inflammatory effect score*	Overall inflammatory effect score†	Global daily mean intake‡ (units/d)	SD‡
Alcohol (g)	417	−0·278	−0·278	13·98	3·72
Vitamin B_{12} (μg)	122	0·205	0·106	5·15	2·70
Vitamin B_6 (mg)	227	−0·379	−0·365	1·47	0·74
β-Carotene (μg)	401	−0·584	−0·584	3718	1720
Caffeine (g)	209	−0·124	−0·110	8·05	6·67
Carbohydrate (g)	211	0·109	0·097	272·2	40·0
Cholesterol (mg)	75	0·347	0·110	279·4	51·2
Energy (kcal)	245	0·180	0·180	2056	338
Eugenol (mg)	38	−0·868	−0·140	0·01	0·08
Total fat (g)	443	0·298	0·298	71·4	19·4
Fibre (g)	261	−0·663	−0·663	18·8	4·9
Folic acid (μg)	217	−0·207	−0·190	273·0	70·7
Garlic (g)	277	−0·412	−0·412	4·35	2·90
Ginger (g)	182	−0·588	−0·453	59·0	63·2
Fe (mg)	619	0·032	0·032	13·35	3·71
Mg (mg)	351	−0·484	−0·484	310·1	139·4
MUFA (g)	106	−0·019	−0·009	27·0	6·1
Niacin (mg)	58	−1·000	−0·246	25·90	11·77
n-3 Fatty acids (g)	2588	−0·436	−0·436	1·06	1·06
n-6 Fatty acids (g)	924	−0·159	−0·159	10·80	7·50
Onion (g)	145	−0·490	−0·301	35·9	18·4
Protein (g)	102	0·049	0·021	79·4	13·9
PUFA (g)	4002	−0·337	−0·337	13·88	3·76
Riboflavin (mg)	22	−0·727	−0·068	1·70	0·79
Saffron (g)	33	−1·000	−0·140	0·37	1·78
Saturated fat (g)	205	0·429	0·373	28·6	8·0
Se (μg)	372	−0·191	−0·191	67·0	25·1
Thiamin (mg)	65	−0·354	−0·098	1·70	0·66
Trans fat (g)	125	0·432	0·229	3·15	3·75
Turmeric (mg)	814	−0·785	−0·785	533·6	754·3
Vitamin A (RE)	663	−0·401	−0·401	983·9	518·6
Vitamin C (mg)	733	−0·424	−0·424	118·2	43·46
Vitamin D (μg)	996	−0·446	−0·446	6·26	2·21
Vitamin E (mg)	1495	−0·419	−0·419	8·73	1·49
Zn (mg)	1036	−0·313	−0·313	9·84	2·19
Green/black tea (g)	735	−0·536	−0·536	1·69	1·53
Flavan-3-ol (mg)	521	−0·415	−0·415	95·8	85·9
Flavones (mg)	318	−0·616	−0·616	1·55	0·07
Flavonols (mg)	887	−0·467	−0·467	17·70	6·79
Flavonones (mg)	65	−0·908	−0·250	11·70	3·82
Anthocyanidins (mg)	69	−0·449	−0·131	18·05	21·14
Isoflavones (mg)	484	−0·593	−0·593	1·20	0·20
Pepper (g)	78	−0·397	−0·131	10·00	7·07
Thyme/oregano (mg)	24	−1·000	−0·102	0·33	0·99
Rosemary (mg)	9	−0·333	−0·013	1·00	15·00

How do I Implement this Information?

Focus on patterns, not individual foods

There is more than ONE anti-inflammatory diet



The Blue Zones Solution, Dan Buettner 2015

Dr. Andrew Wiel, Anti-Inflammatory Diet &Pyramid

Diet Patterns that are Universal

- Rich in beans/legumes, vegetables, and fruits
- Low in refined sugars
- Low in ultra-processed foods (simple carbs)
- High in fiber
- Low in saturated fats

Not all diets are healthy

- The main issue with fad diets isn't even their often poor, generalized science behind their recommendations: it's their emphasis on weight loss over health

	Keto	Whole30	Paleo	Plant Paradox
Reduces	• Carbs: Legumes • Fruits (except berries) • Grains • Starchy Veggies	• Carbs: Legumes • Red Wine • Peanuts	• Grains • Legumes, Soy • Veggies in "nightshade" • ALL nuts/seeds • Red Wine • Spices	• Grains • Legumes, Soy • Veggies in "nightshade" • ALL nuts/seeds • Nuts/Seeds
Promotes	• Red meats • High fat dairy	• Carbs: Legumes • Fruits • Grains • Starchy Veggies	• Red / Organ Meats • Coconut Oils	• Butter/Ghee • Heavy Creams • Red Meat (4oz) • Cheeses (goat/sheep)

Energy-Adjusted Dietary Inflammatory Index in pregnancy and maternal cardiometabolic health: findings from the ROLO study

Amy Gainfort [1], Anna Delahunt [1], Sarah Louise Killeen [1], Sharleen L O'Reilly [1 2], James R Hébert [3], Nitin Shivappa [3], Fionnuala M McAuliffe [1]

Association between dietary inflammatory index and Parkinson's disease from National Health and Nutrition Examination Survey (2003–2018): a cross-sectional study

Energy-Adjusted Dietary Inflammatory Index and Diabetes Risk in Postmenopausal Hispanic Women

Dietary inflammatory index and neuropsychiatric disorders

Mahsa Golshani Nasab, Arash Heidari, Mohammadreza Sedighi, Narges Shakerian, Mona Mirbeyk, Amene Saghazadeh and Nima Rezaei

From the journal Reviews in the Neurosciences

The Association between Dietary Inflammatory Index and Aging Biomarkers/Conditions: A Systematic Review and Dose-response Meta-analysis

C Jalili [1], S Talebi, R Bagheri, M Ghanavati, D M Camera, P Amirian, M Zarpoosh, M K Dizaji, M A H Kermani, S Moradi

Take Home Points

- There is A LOT of information out there
- Take each patient profile uniquely
- Eating individual foods does not cause acute inflammation (unless allergy)
- Eating individual foods does not make your diet “anti-inflammatory”
  - Dietary PATTERNS are essential for combating inflammation
- There is no ONE anti-inflammatory diet
- Be weary of FAD diets which promote “health” / Strict elimination diets
  - Contribute to an altered gut microbiome – negatively

Questions?