



6. Nutrition: Fact and Fiction

Stephanie Seneff
Wise Traditions Workshop
Weston Price Foundation
Nov. 8, 2013



“Of all factors which make human health, the greatest single factor is perfectly constituted food.”

-- Sir Robert MacCarrison

The Cantor Lectures delivered before the Royal Society of Arts, 1936.

Outline

- Sulfur!
- Flavonoids
- Animal-based fats
- Shore-based foods
- Fermented foods
- What you can do!

Sulfur!

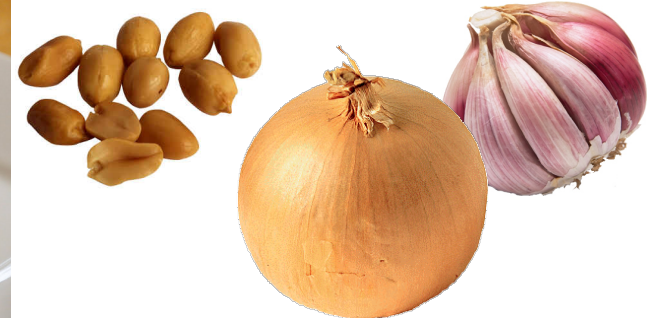
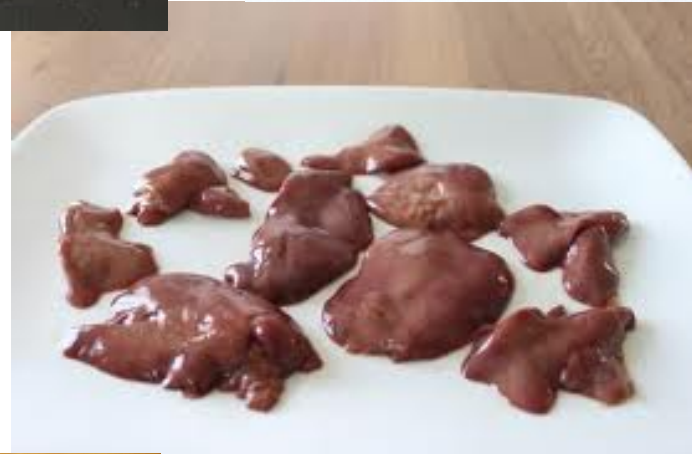
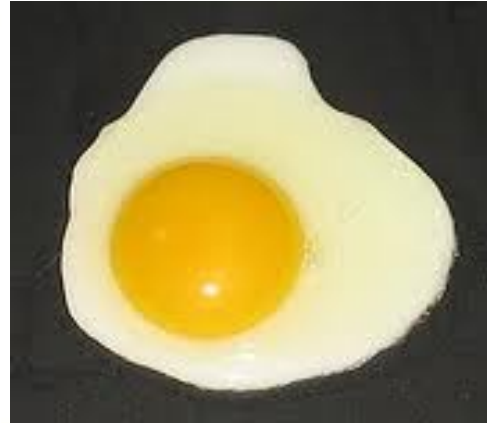


Sulfur: the Forgotten Nutrient*

“ ... the available knowledge on elemental *sulfur* in human nutrition looks like a *black hole*. Despite the fact that S8 follows H, C, O, N, Ca and P as the seventh most abundant element in mammalian tissues, it appears as a forgotten item. *Not the slightest attention is dedicated to S8* in the authoritative “*Present Knowledge in Nutrition*” series of monographs even though they go over most oligo- and trace-elements in minute detail.”

* p. 40, Y. Ingenbleek, The Open Clinical Chemistry Journal, 2011, 4, 34-44.

Foods Containing Sulfur



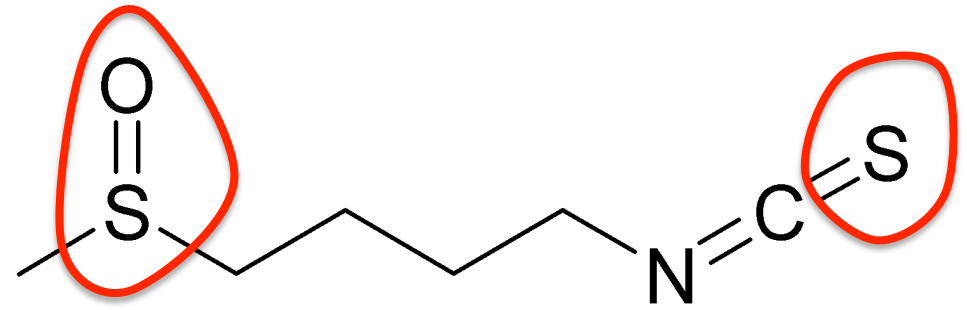
Cruciferous Vegetables!

The Really Healthy Vegetables



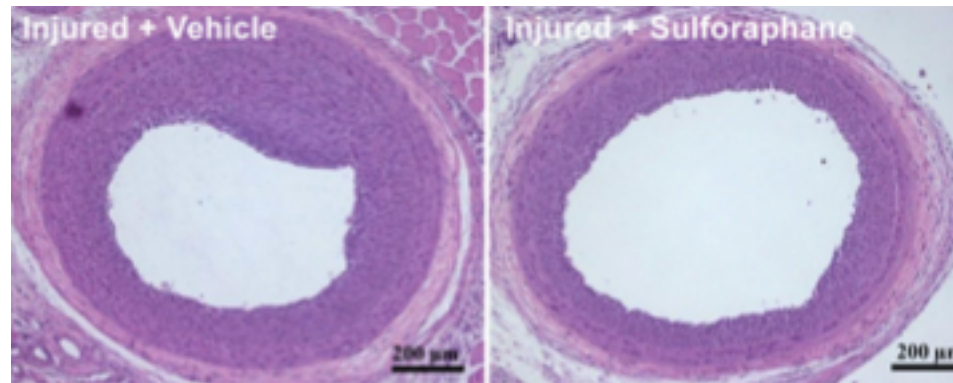
Sulforaphane!

Sulforaphane*



- Experiment conducted on rats subjected to carotid artery balloon injury
 - Half the rats were given sulforaphane as nasal gel
 - Treated rats had reductions in inflammatory markers

Artery wall 14 days after injury



+ sulforaphane

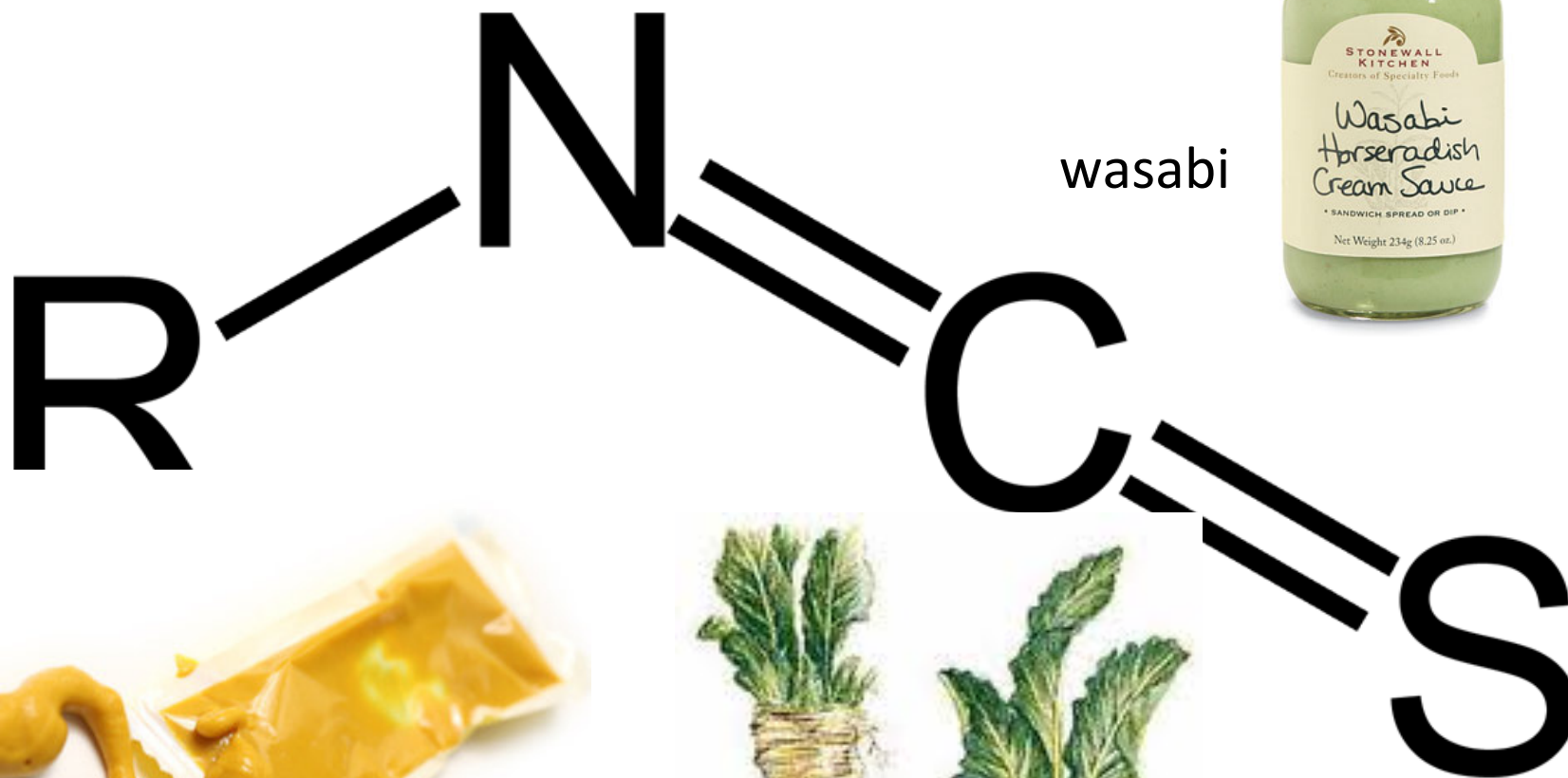
* J.-S. Kwon et al., *Atherosclerosis*, *In Press*

Cruciferous Vegetables and Pancreatic Cancer*

“In this large population-based *prospective* study of Swedish women and men, overall fruit and vegetable consumption was not associated with pancreatic cancer risk. However, we observed an inverse association between consumption of cruciferous vegetables, especially of *cabbage*, and risk of pancreatic cancer.”*

* Larsson et al., Cancer Epidemiol Biomarkers Prev 2006, 15:301-305.

Allyl Isothiocyanate



wasabi



mustard



horseradish

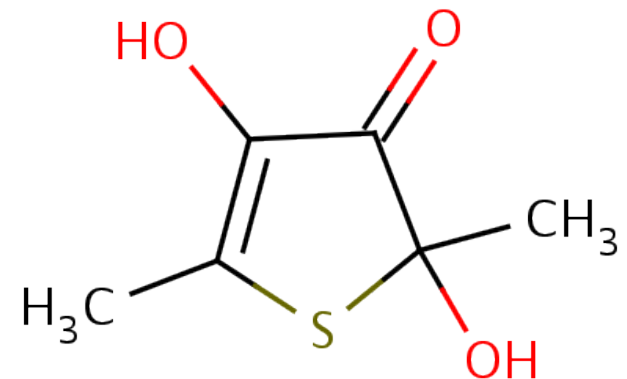
Isothiocyanates Inhibit Prostate Tumor Growth*

- Isothiocyanates protect laboratory animals from chemically induced tumors
- Expose human prostate tumor cells and normal prostate epithelial cells to isothiocyanates
 - Caused arrest of tumor cells in G2/M phase (aborted DNA duplication, arrested growth)
 - Non-toxic to normal cells

*D. Xiao *et al.*, *Carcinogenesis* 24(5), 891-897, 2003

Garlic!*

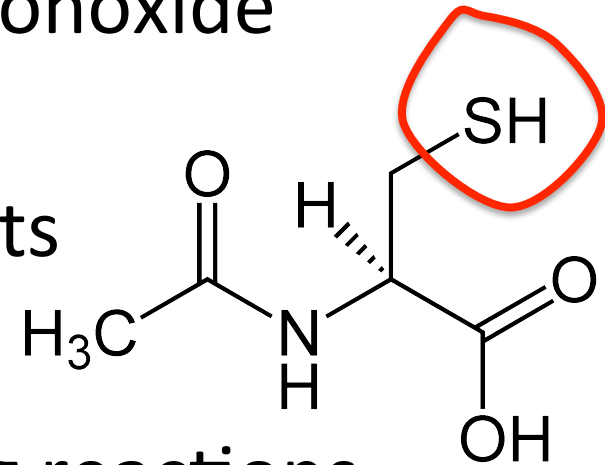
- Garlic has anti-cancer and anti-inflammatory effects
- Experiment: feed thiocresmonone (active sulfur compound in garlic) to genetically obese mice.
 - mice lost weight
 - triglyceride and glucose levels dropped
 - GLUT4 expression and glucose uptake were up-regulated.
 - fatty acid synthesis was suppressed in liver



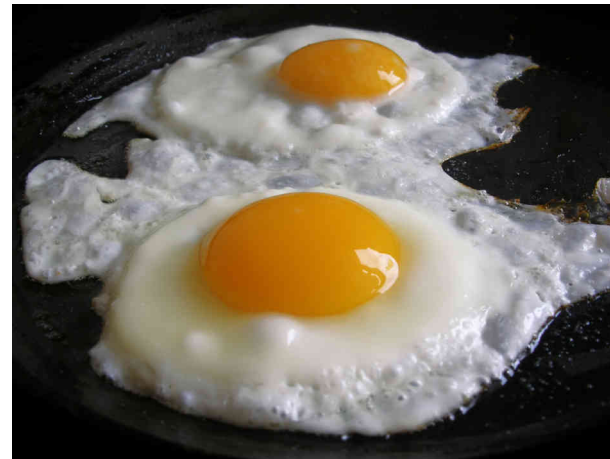
*J.O. Ban et al., Phytother Res. 2012 Sep;26(9):1265-71.

WebMD: Therapeutic Uses for N-acetyl cysteine (NAC)

- Counteracts Tylenol and carbon monoxide poisoning
- Repairs bile-duct blockage in infants
- Treats ALS and Alzheimer's
- Antidote to acute anti-seizure drug reactions
- Reduces Lp(a) levels and homocysteine levels
- Treats heart attack and stroke for those with severe kidney disease

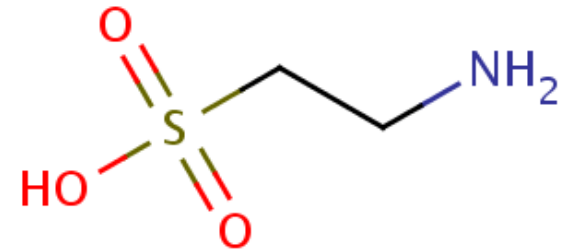


Food Sources of Taurine: The Only Sulfonated Amino Acid



Taurine has Many Known Roles*

- Maintains osmotic balance in cells
- Bile acid formation (digest fats)
- Roles in mitochondria
 - Helps them maintain their membrane potential
 - Suppresses superoxide synthesis (oxidation damage)
- Clinical observations
 - Maintains healthy skin
 - Protects against diabetes and heart disease
 - Protects against heart arrhythmias
 - Low taurine in blood associated with many cancers

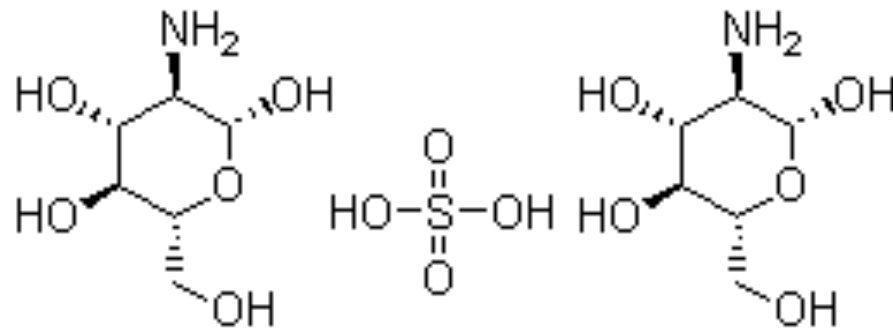
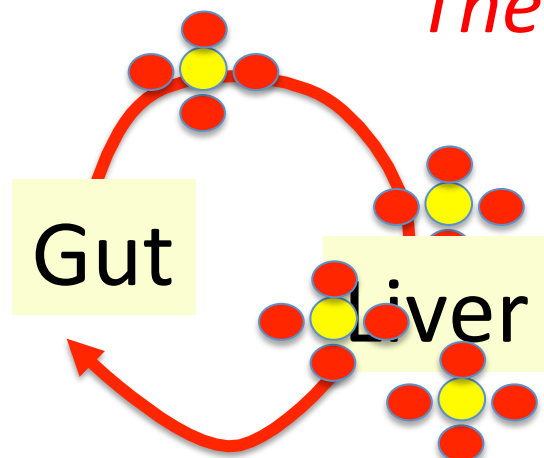


* Wesseling et al., Hypertension. 2009, 53, 909-911

Glucosamine **SULFATE***

- Glucosamine sulfate is the only formulation of glucosamine that's patented
 - It's also the only formulation that's been shown to have benefit in treating arthritis in clinical trials
- Studies on horses show that only 2% of the glucosamine actually gets into the blood stream

The sulfate is the benefit?



*S. Persiani et al., OsteoArthritis and Cartilage (2005) 13, 1041-1049

Recapitulation

- Sulfur is an incredibly important but highly neglected nutrient
- Cruciferous vegetables are an excellent source of sulfane sulfur, and protect from pancreatic cancer
- Isothiocyanate in mustard, wasabi and horseradish has antitumor properties
- Garlic has anti-inflammatory and antitumor effects
- Taurine is a sulfur-containing amino acid found only in animal-based foods

Flavonoids!



Flavonoids!*

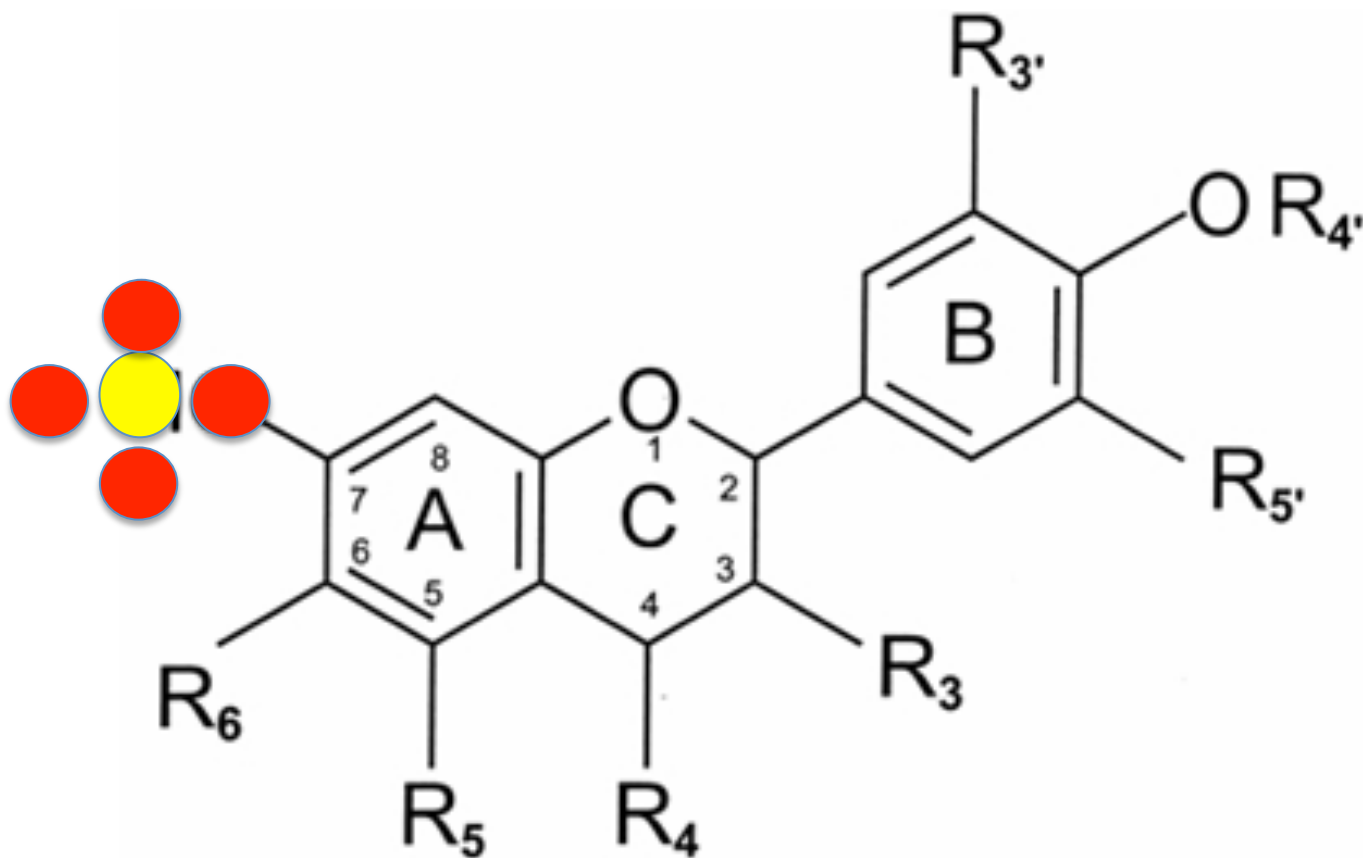


- Complex set of over 6,000 different substances
 - Impart color to fruits and vegetables
 - Also found in coffee, tea, wine, and beer
- Enhance the effect of vitamin C
- One of their potent effects may be through their ability to increase levels of glutathione

HOW DO THEY DO THIS??

*<http://www.whfoods.com/genpage.php?tname=nutrient&dbid=119>

Flavonoid Chemical Structure: Carbon Rings and a Place for Sulfate!



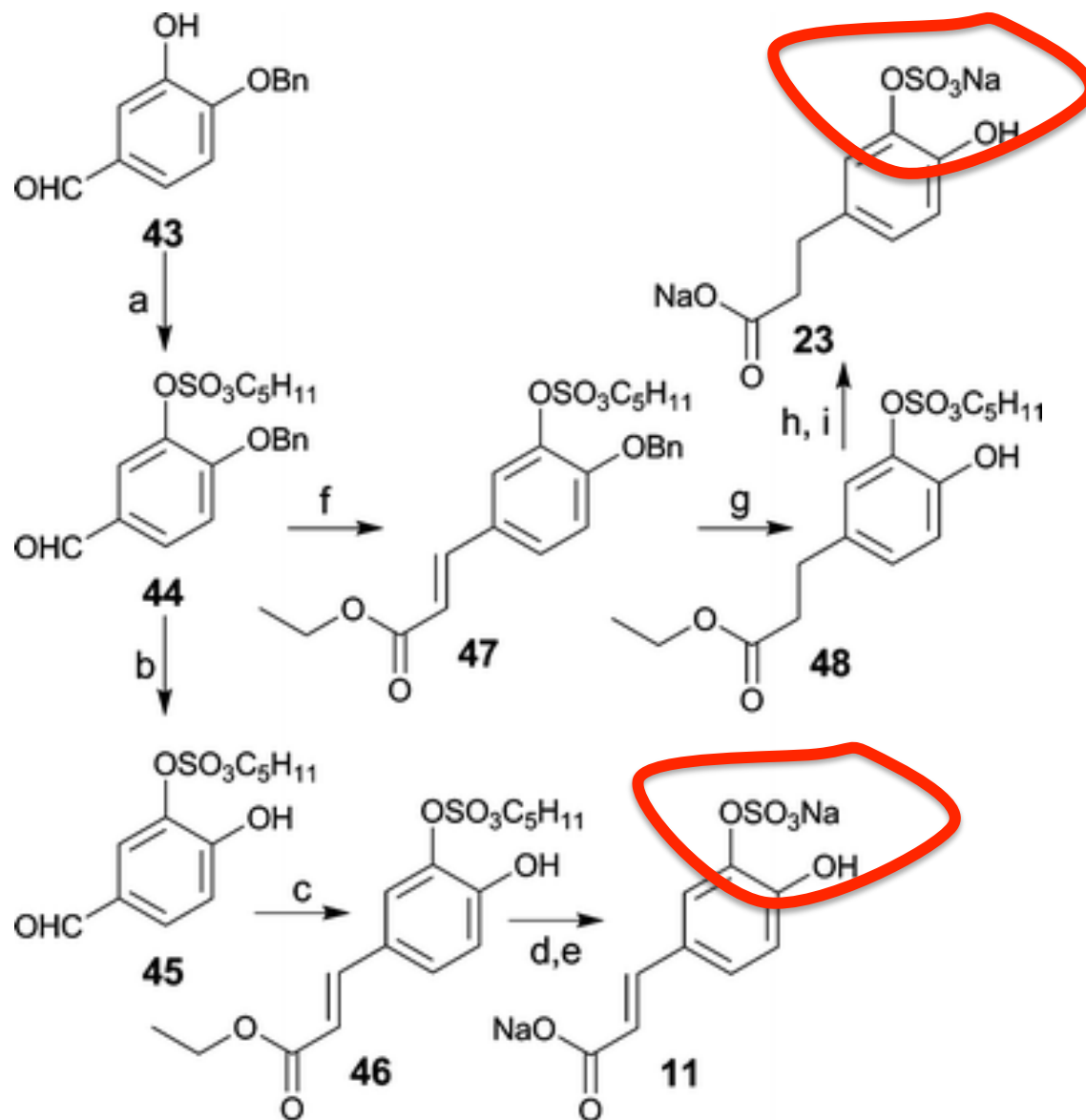
Polyphenols

- Tannin in tea
- Flavonoids in fruits
- Resveratrol in wine
- Curcumin in curries
- Polyphenols in coffee and chocolate



These compounds all have significant health benefits, but it's not clear why!

Coffee Chemistry*



*R. Fumeaux et al. *Org. Biomol. Chem.*, 2010,8, 5199-5211

Polyphenols in Coffee*

"Supplementation with CPP [Coffee Polyphenols] significantly reduced body weight gain, abdominal and liver fat accumulation, and infiltration of macrophages into adipose tissues."



* T. Murase et al., Am J Physiol Endocrinol Metab 300: E122–E133, 2011

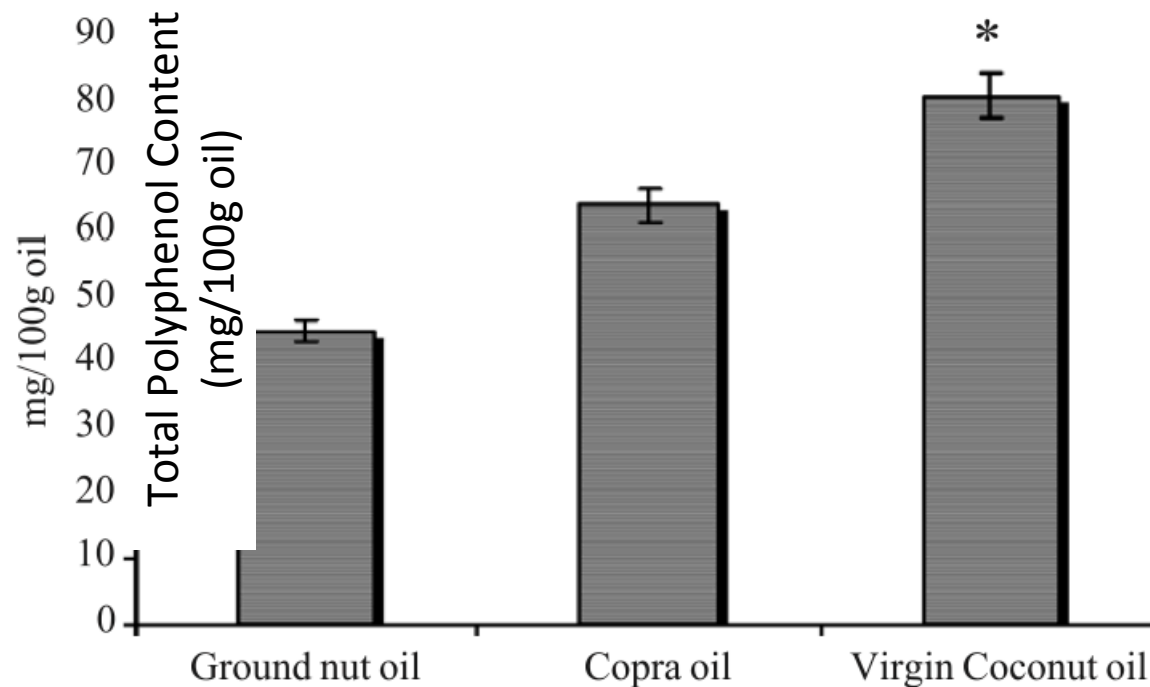
Cocoa Improves Lipid Measures!

“Regular consumption of cocoa powder with milk increases HDL cholesterol and reduces oxidized LDL levels in subjects at high-risk of cardiovascular disease” *



*N. Khan et al., Nutrition, Metabolism & Cardiovascular Diseases 22(12), 1046-1053, Dec. 2012.

Polyphenols in Coconut Oil*

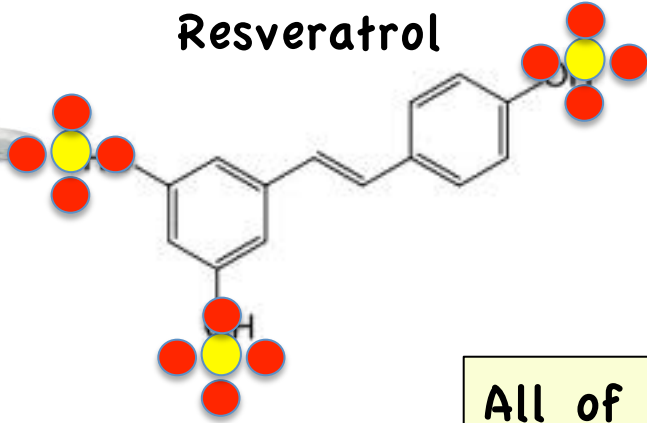


*Figure 2 in K.G. Nevin and T. Rajamohan, Clinical Biochemistry 2004, 37, 830–835.

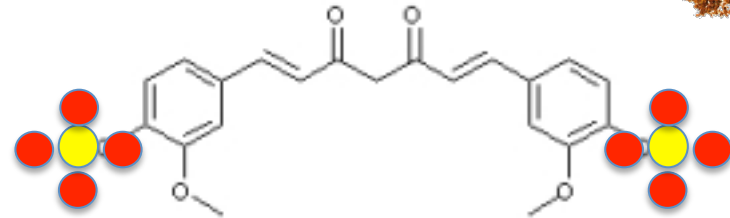
Four Related Molecules



Resveratrol

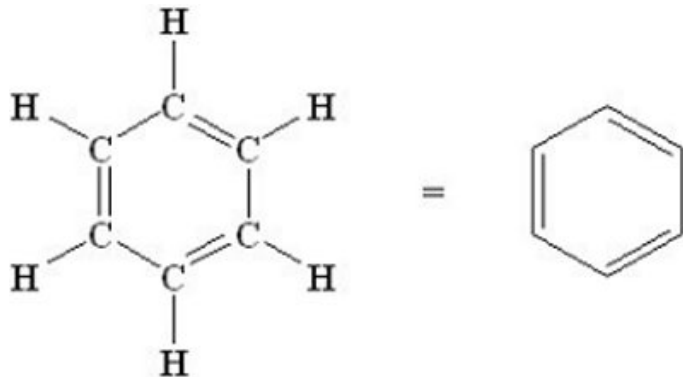


Curcumin

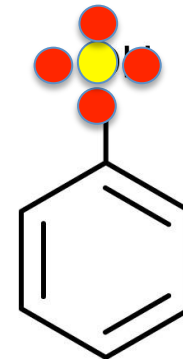


All of the OH groups
can become sulfates

Benzene



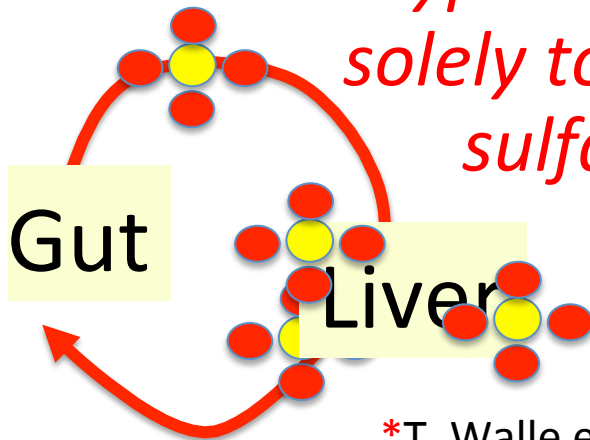
Phenol



“High Absorption but Very Low Bioavailability of Oral Resveratrol in Humans”*

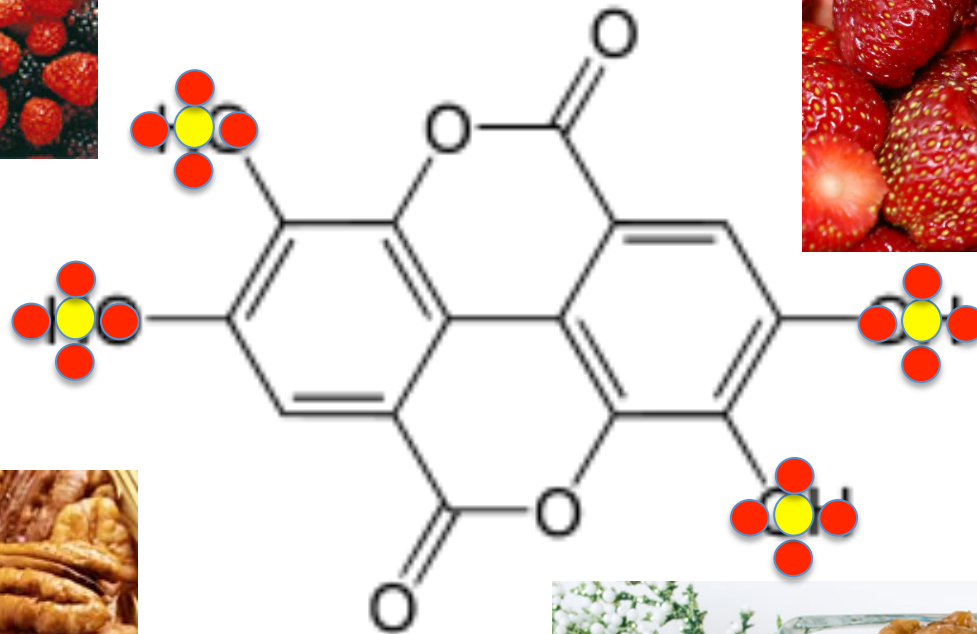
- Researchers studied absorption of resveratrol
- Wanted to understand its role in biology
- Found that it was sulfated in the gut, went into the bloodstream and promptly disappeared

I hypothesize that its health benefit has solely to do with its ability to transport sulfate from the gut to the liver



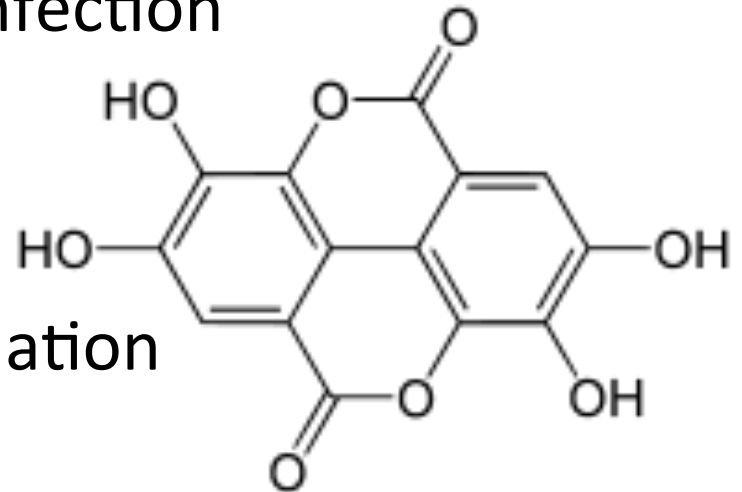
*T. Walle et al., Drug Metabolism and Disposition, 32(12), 1377-1382, 2004

Ellagic Acid



Polyphenols protect from AIDS*

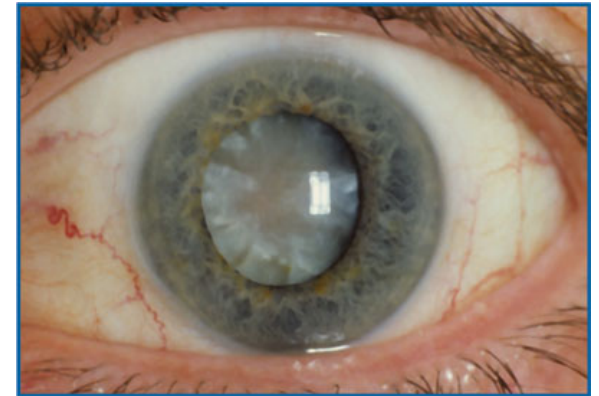
- In-vitro experiment on human T-cell lymphotropic virus type-I-carrying MT-4 cells
 - Extremely susceptible to HIV infection
- Sulfated plant polyphenols:
 - Inhibited HIV infection
 - Protected from giant cell formation
 - Protected from cell death
 - Prevented antigen formation



*T. Mizuno et al., *Planta Med* 1992; 58(6): 535-539.

Cataracts and their Treatment*

- Premature cataract development is one of the earliest secondary complications of diabetes.
 - Huge and growing problem in Western world
 - Due to protein misfolding following oxidation and glycation damage
- Natural remedies that have been shown to be beneficial include:
 - Broccoli, garlic, turmeric, caffeine

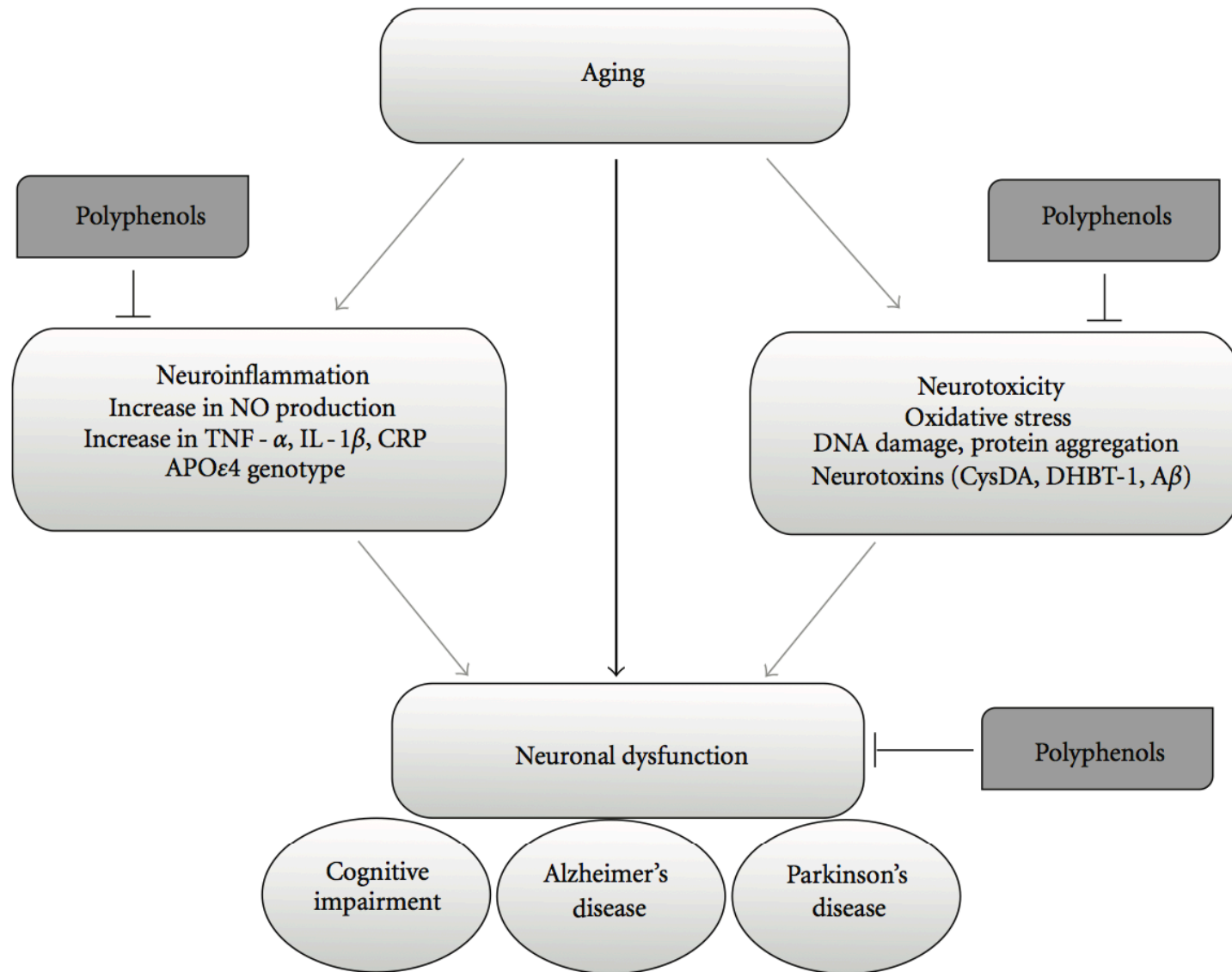


*Statin drugs increase risk to cataracts***

*K.L. Moreau and J.A. King, Trends Mol Med. 2012 May ; 18(5): 273–282.

** C.M. Machan et al, Optom Vis Sci. 2012 Aug;89(8):1165-71.

Polyphenols Protect the Brain*



*D. Vauzour, Oxidative Medicine and Cellular Longevity Volume 2012, Article ID 914273,

Curcumin!*



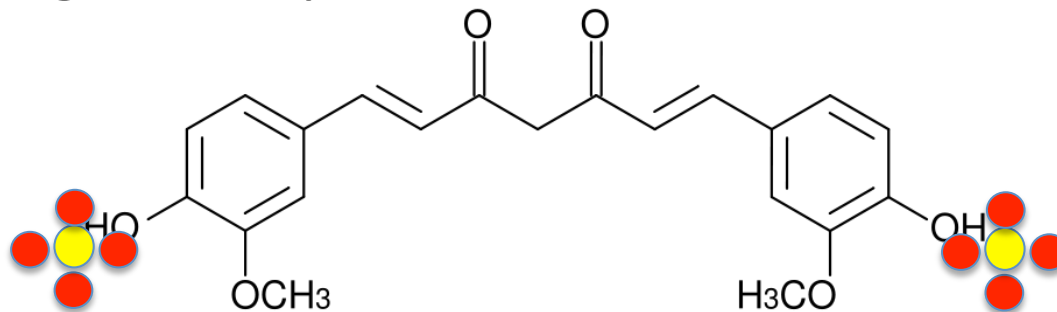
NaturalNews.com

- Atharvaveda (ca. 6000 yr B.P.) referred to turmeric as medicinal aid to "charm away jaundice."
- Turmeric is widely valued as a medicinal herb in South Asia, since ancient times
- Heals wounds, treats stomach ache, flatulence, poison, etc.
- Curcumin oils have broad-spectrum anti-fungal activity (propose as topical skin treatment)

*Fanai Lalsangluai et al., Sci Vis 13(2), 49-57, April-June 2013

Curcumin's Health Benefit: Sulfation??*

- Curcumin has anticancer properties but absorption is thought to be limited
 - Curcumin suppresses carcinogenesis in skin, stomach, colon, breast, and liver
- Curcumin is absorbed after oral dosing in humans and can be detected as glucuronide and sulfate conjugates in plasma.



*S.K. Vareed et al., *Cancer Epidemiol Biomarkers Prev* June 2008 17; 1411

Going Nuts about Nuts!



- 7,216 men and women 55-80 years old, randomized to 3 interventions*
 - Mediterranean diet + nuts
 - Mediterranean diet + olive oil
 - Control
- Nut consumption was associated with significantly reduced all-cause mortality (39% lower mortality risk)
- Nuts contain carotenoids, phytosterols, resveratrol, stilbenes, flavonoids and phenols**
 - These all transport sulfate!

* S. Rohrmann and D. Faeh, BMC Medicine 2013, 11:165

**CY Chen and JB Blumberg, Asia Pac J Clin Nutr. 2008;17 Suppl 1:329-32.

Recapitulation

- A variety of “healthy” compounds in foods have the interesting property that they can be sulfated
- These include polyphenols in coffee and tea, resveratrol (wine and nuts), flavonoids in berries and other fruits, and curcumin in curries
- I maintain that the health benefits of these foods are mainly due to their ability to transport sulfate in the blood stream

Animal-based Fats

The Saturated Fatty Acid (SFA) and Carbohydrate Debate

“Fifteen years ago, this debate would have been considered impossible because it was believed that SFA intake was the primary determinant of the high rates of CVD in Western countries. However, in recent years, that question has been reexamined, or, *more accurately, seriously examined* for the first time. In truth, *there was not very good epidemiological evidence for this relationship from the beginning.*”

-- Walter C. Willett, MD, PhD (2012)

Harvard School of Public Health, Boston, MA, USA

Saturated Fats and Heart Disease: Europe, 1998 *

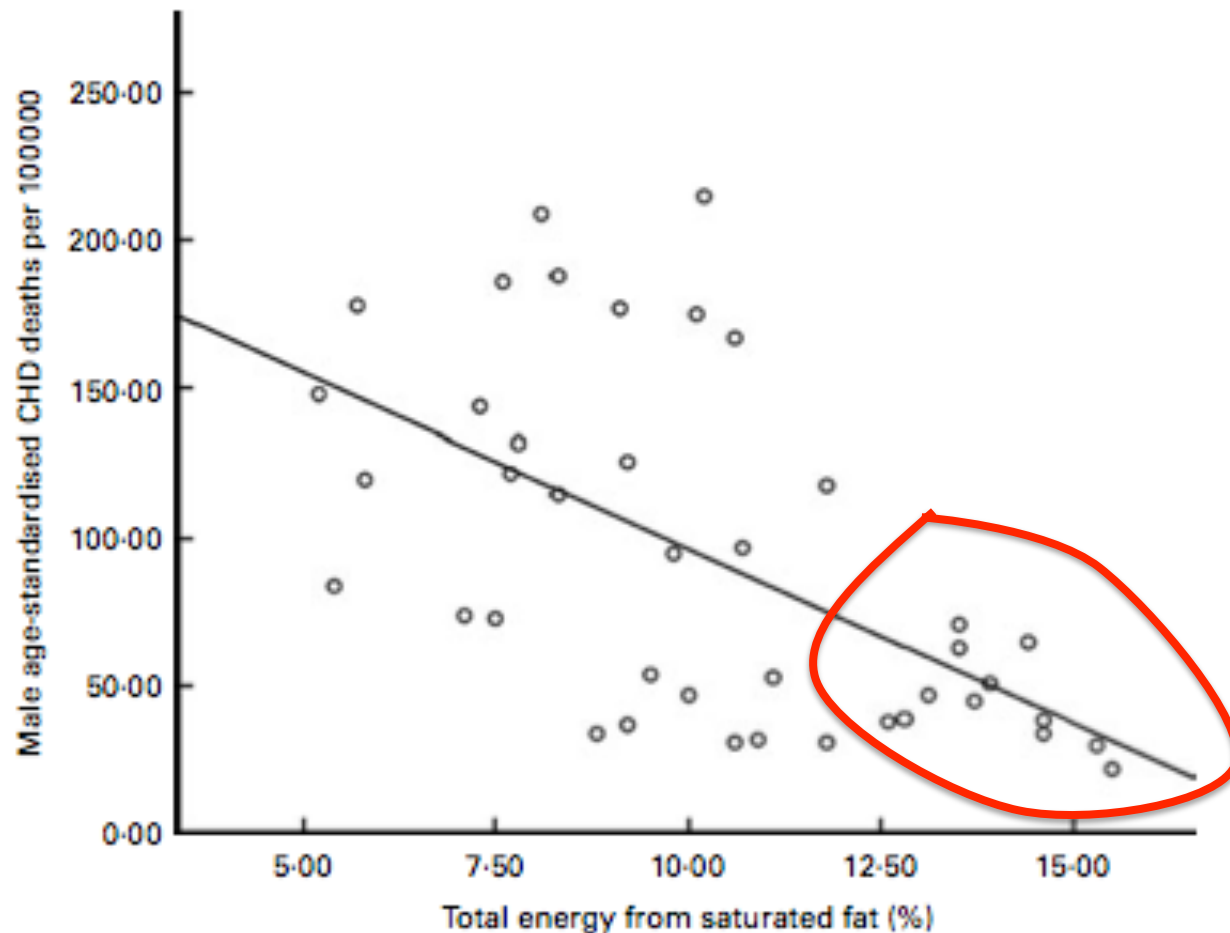


Fig. 1. Saturated fat intake and CHD mortality in Europe (1998). R^2 linear = 0.339.

* Hoenselaar, R. British Journal of Nutrition (2012), 108, 939-942.

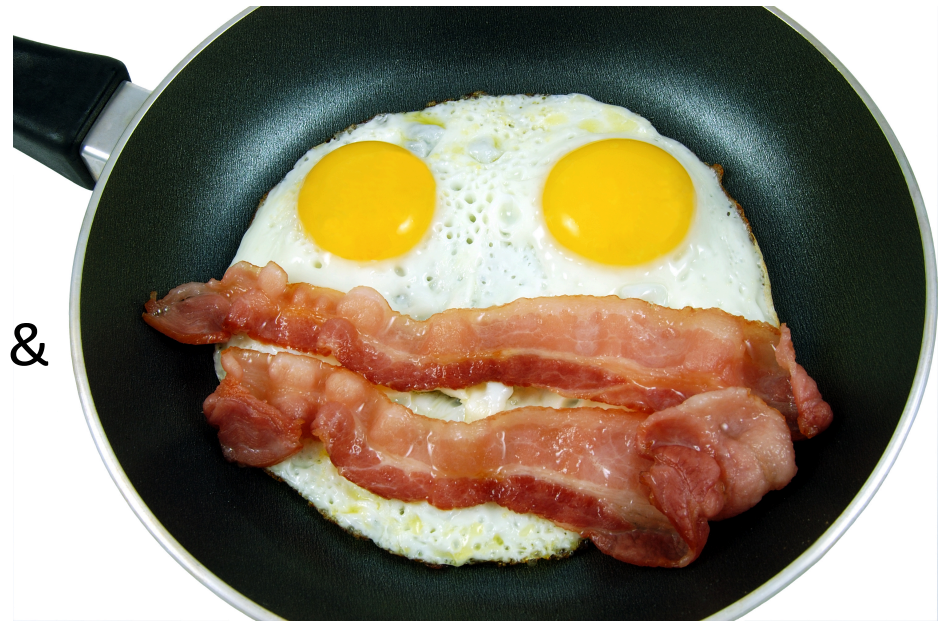
Milk Fat Protects from Asthma*

- Nearly 3000 3-year-old children studied
- Those who ate butter daily had less than 1/3 the incidence of asthma compared to those who didn't
- No associations were observed with the consumption of fruits, vegetables, margarine, and fish.

*A Wijga et al., Thorax. 2003 July; 58(7): 567–572.

The Benefits Of Eggs, Even For Those At Cardiovascular Risk*

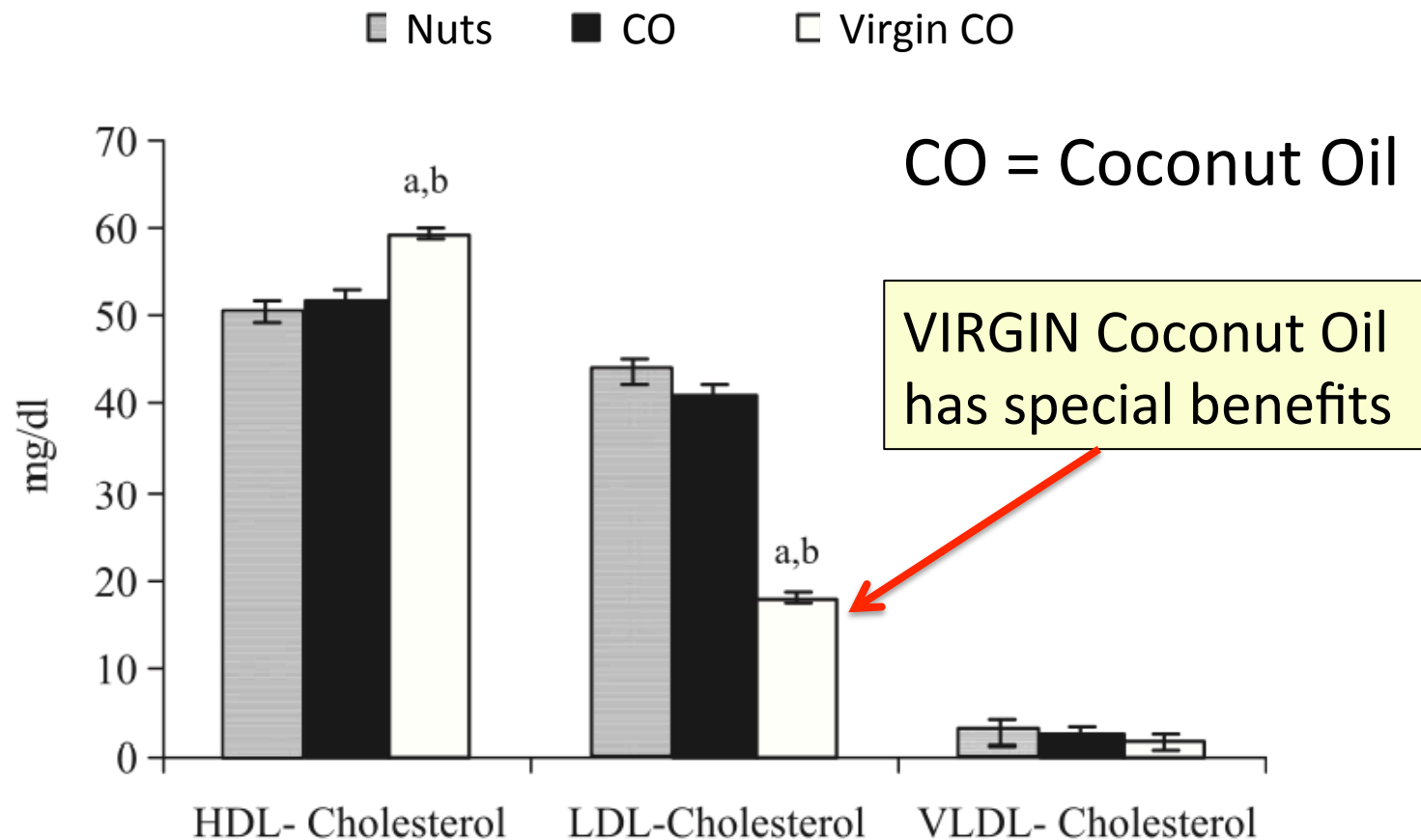
- Experimental Biology conference, 2013
- Research at Yale showed whole eggs are a healthy part of your diet, even if you have *heart disease*
- U. Conn research showed eggs benefit HDL cholesterol in adults with *metabolic syndrome*
- U. Missouri research showed eggs & pork breakfast is beneficial for *overweight* adolescents



*Medical News Today, Apr. 25, 2013

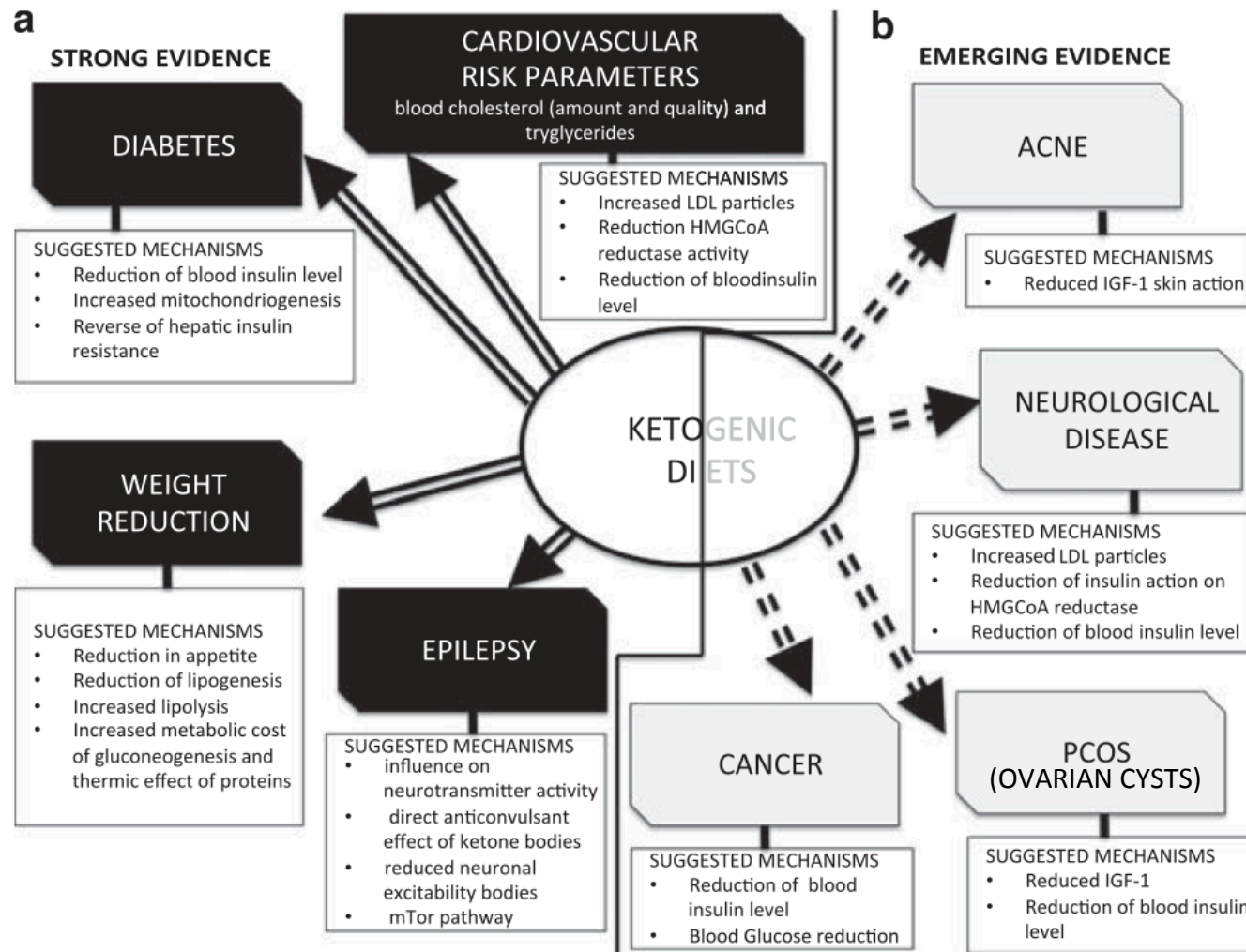
www.medilexicon.com/medicalnews.php?newsid=259565

Effects of Dietary Choice on Lipids*



*Figure 1 in K.G. Nevin and T. Rajamohan, Clinical Biochemistry 2004, 37, 830–835.

Benefits of Ketogenic Diet*



*Figure 1, A. Paoli et al., European Journal of Clinical Nutrition (2013) 789 – 796

Results of Low-Carb Diet from 17 Trials*

- Significantly decreased body weight, BMI, and abdominal circumference
- Lower blood pressure
- Lower plasma triglycerides
- Lower fasting plasma glucose
- Reduced glycated hemoglobin
- Reduced plasma C-reactive protein (an inflammatory marker)
- Increased HDL-C (the “good” lipoprotein)



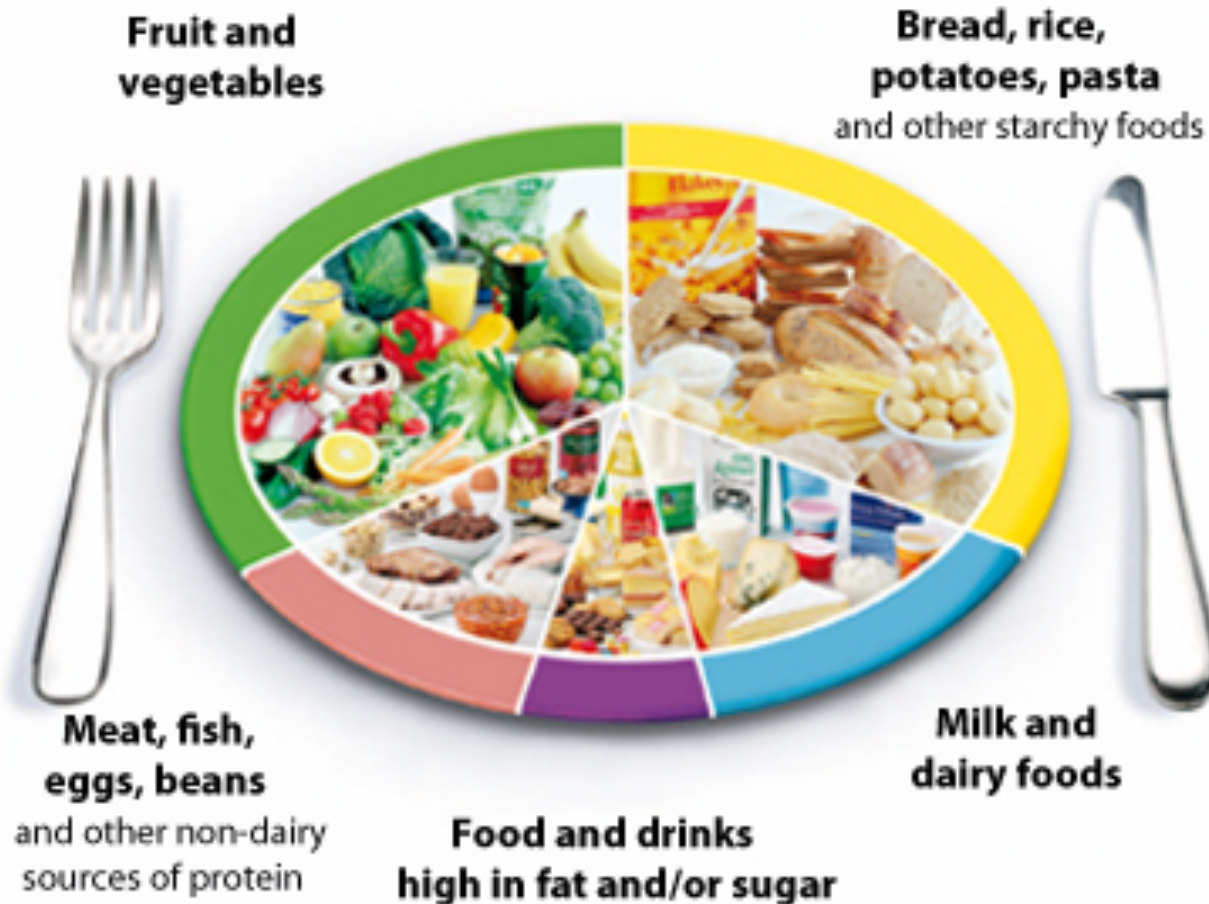
* F.L. Santos et al., Obesity Reviews, July 2012

Recapitulation

- Contrary to popular belief, saturated fat is protective against heart disease
- Milk fat is protective against asthma
- Eggs and bacon are a good breakfast choice
- Virgin coconut oil raises HDL and lowers LDL
- Ketogenic diet has many benefits
- 17 trials show that low-carb diet is beneficial for many metrics

Shore-based Foods

The “Eatwell” Plate



* <http://www.nhs.uk/Livewell/Goodfood/Pages/eatwell-plate.aspx>

The “Eatwell” Plate

Fruit and
vegetables

Bread, rice,
potatoes, pasta

Where are the Shore-based Foods?



* <http://www.nhs.uk/Livewell/Goodfood/Pages/eatwell-plate.aspx>



zinc

selenium



Copper

SULFUR



iron



iodine

Elaine Morgan and the Aquatic Theory

Proposed that we evolved to be human on ancient seashores, surviving the drought by eating seafood



- The Descent of Woman
- The Aquatic Ape
- The Scars of Evolution
- Descent of the Child
- Aquatic Ape Hypothesis



Survival of the Fattest*

“The prediction is that a functional deficit in brain development will occur if human infants consume inadequate amounts of shore-based foods”

* S.C. Cunnane, Survival of the Fattest, World Scientific Publishing Company, June 2005

Survival of the Fattest: The Key to Human Brain Evolution*

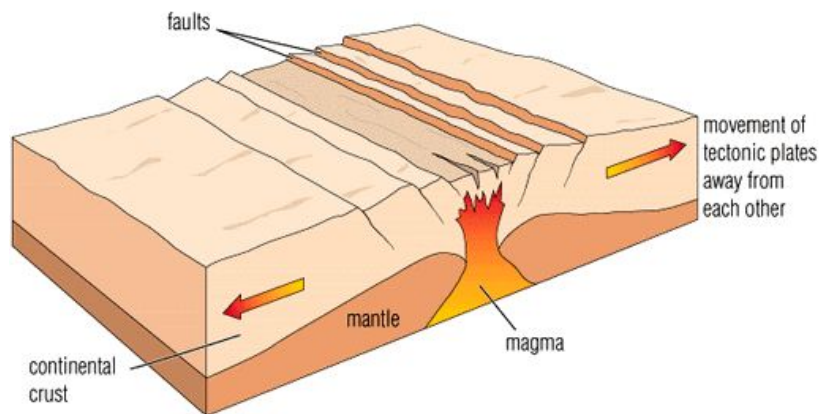
- Iron, iodine, selenium, zinc, copper, and the long-chain polyunsaturated fatty acid, docosahexaenoic acid, are needed to support our large and complex brain
- Maritime foods are among the best sources of these nutrients
- The shore-based diet hypothesis proposes that human “encephalization” was triggered by adaptation to life at the shoreline.

* S.C. Cunnane, Survival of the Fattest, World Scientific Publishing Company, June 2005

Selenium and Selenoproteins

"Of all volcanic rocks selenium is highest in volcanogenic rocks especially the *basalts*."*

- Selenoproteins protect pancreas and thyroid from oxidative damage



*EP Malisa, Environmental Geochemistry and Health 05/2001; 23(2):137-158.

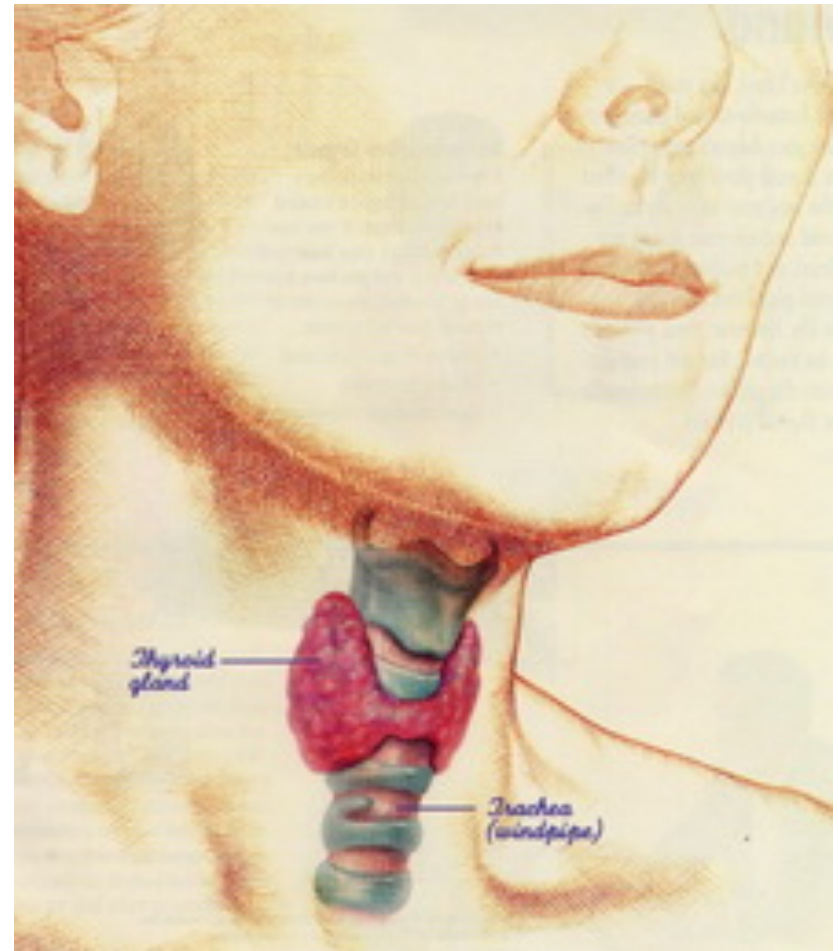
Zinc Deficiency*

- It has recently been estimated that 1 out of 5 people in the world might not be consuming or absorbing enough zinc from their diet
- Impaired immunity:
 - Not only are total lymphocyte numbers reduced, but their ability to respond to antigens is also compromised
- Zinc supplementation reduces the rates of diarrhea, pneumonia, malaria and mortality in children

*H.J. Blewett and C.G. Taylor, Nutrients 2012, 4, 449-466.

Iodine and Hypothyroidism*

- In the U.S. population, there was a 50% reduction in urinary iodine excretion between 1970 and 1990.
 - Bromine exposure
 - Declining consumption of iodized salt, eggs, fish, and seaweed
 - Soil depletion
(*Glyphosate*)



<http://articles.mercola.com/sites/articles/archive/2009/09/05/another-poison-hiding-in-your-environment.aspx>

Iodine Deficiency*

- Iodine is essential for proper thyroid function
 - Thyroid hormones control metabolism
 - Development of fetal skeleton and nervous system
- In animal studies, iodine normalized stress-related elevation in cortisol
- Iodine deficiency is the most preventable cause of mental retardation
- Most of the earth's available iodine is in the sea
 - Seaweed is the best natural source
 - Shrimp, fish, eggs, other seafood



* L. Patrick, Alternative Medicine Review 13(2), 116-127, 2008

Iodine and Breast Cancer*

- Breast cancer rates in Japan are 6.6 per 10,000, v.s. 22 in U.S. and 27 in U.K.
 - 25-fold higher intake of iodine in Japan
- Iodine supplements shrink breast tumors in animal models
- Perchlorate is a toxicant that inhibits iodine uptake
 - Perchlorate contamination of food and water is growing problem in U.S.
 - Present in nitrate fertilizers and in pharmaceuticals

* L. Patrick, Alternative Medicine Review 13(2), 116-127, 2008

Sea Salt!



Soup: The Forgotten Food

- Bone marrow is a rich source of electrolytes, minerals, and fat-soluble vitamins
- Bone-based soups are extremely nutritious!



Recapitulation

- Aquatic theory of human origins proposes that we became human on the seashore
- Shore-based foods provide zinc, iron, sulfur, selenium, iodine, copper, and long-chain essential fatty acids
 - Deficiencies in these key minerals are widespread
 - This explains many modern diseases and conditions
- Shore-based foods are sorely lacking in the modern American diet
- Sea salt is far superior to table salt
- Bone marrow-derived soup contains many vital minerals
- Anticipate deficit in brain function in infants deprived of shore-based foods

Fermented Foods

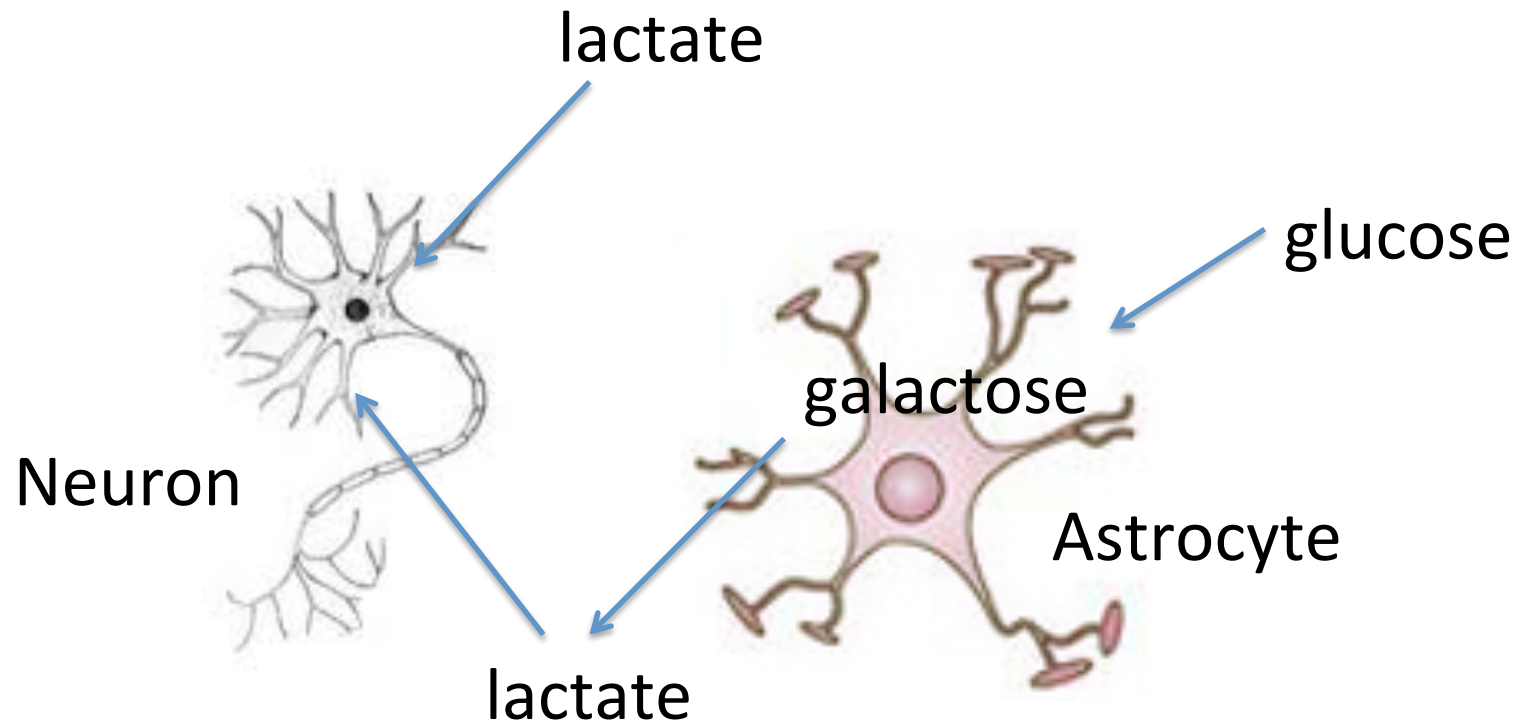


Lactate: The Perfect Food

- Doesn't generate AGEs like sugar and starch
- Doesn't generate oxidative damage like unsaturated fats
- Carries a negative charge: helps fight acidosis
- Heart, liver, and brain get first dibs
- These foods also contain vitamin K



Lactate in the Brain*



- Neuron requires lactate to be able to form long-term memories
- Astrocyte can supply it (by conversion from glucose) or it can come directly from the medium (diet)

* Suzuki et al., Cell 144, 810–823, 2011

“Probiotic lactobacilli: An innovative tool to correct the malabsorption syndrome of vegetarians?”*

- Lactobacilli produce phytase which breaks down phytates
- Phytates chelate important minerals

Glyphosate is an antibiotic that preferentially kills lactobacillus

*G. Famularo et al. Medical Hypotheses 65(6), 1132-1135, 2005.

Wine Improves Lipid Measures*

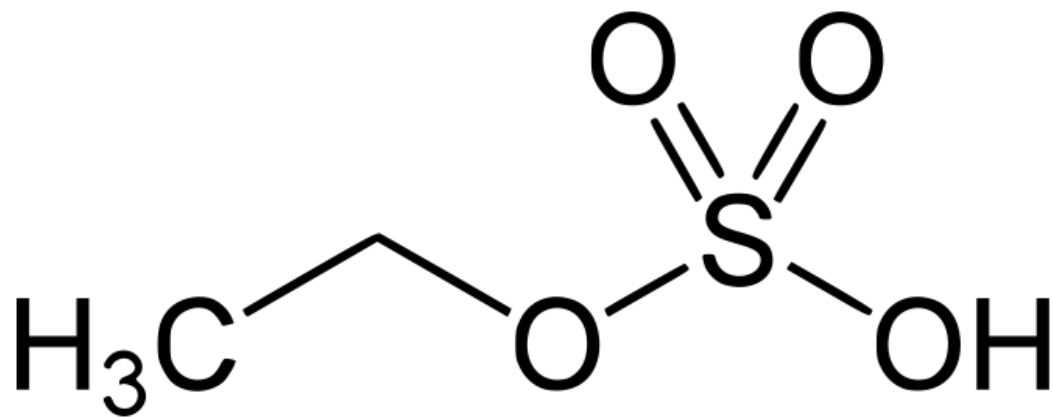
“A significant inverse relationship was found between ox-LDL-antibody titre and daily wine intake, which persisted after adjusting for possible confounders”



*M. Di Bari et al., Ann Epidemiol 2003;13:189–195.

Ethyl Sulfate:

A biomarker of Ethanol Consumption!*



Ethyl Sulfate

Ethanol is converted to ethyl sulfate and this allows transport of sulfate from the gut to the liver??

Remains detectable in urine for several days after intoxication

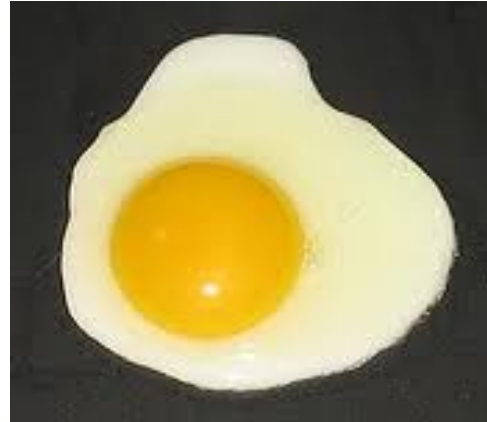
*F.M. Wurst et al., Addiction. 2006 Feb;101(2):204-11.

Recapitulation

- Fermentation is a way to turn unhealthy food into healthy food
- Lactate is "the perfect fuel" because it is negatively charged and does not glycate blood proteins
- Lactobacillus can protect from chelation by phytase
- Wine reduces serum levels of oxidized LDL
- Ethanol can be converted to ethyl sulfate → it's a sulfate transporter!

What You Can Do!

Eat Foods Containing Sulfur!



Go Organic!



How Much Does it Cost?

Food	Organic	Conventional
celery	2.99	1.99
cauliflower	4.99	2.99
Bartlett pears	2.69	1.99
orange juice	3.99	2.99
eggs	5.69	3.99
milk	4.69	2.99
cereal	4.56	3.91
TOTAL	29.60	20.85

increase bill by ~40%

Probiotics!



Escape to a sunny place in winter!



If you Live in Canada, Use a Sunlamp!



Epsom Salts!

Magnesium Sulfate in hot bath water is a cheap and easy way to get sulfate supply to the skin
Infrared heat also beneficial!





Don'ts!



We are Too Comfortable with Aluminum!



Conclusions

- We are headed for an enormous crisis in our food supply due to industrialized farming methods
 - Depletion of nutrients; exposure to toxins
- The crisis is made worse by misguided “expert” nutritional advice – low fat/low cholesterol/high carbohydrate diets
- We pay for it in major health problems like diabetes, obesity, heart disease, autism, Alzheimer’s, etc.
- Healthy choices:
 - Seafood is loaded with micronutrients
 - Fermented foods provide lactate and probiotics
 - Vegetables containing sulfur have many health benefits
 - Saturated fat is probably the healthiest fat
 - *Think ORGANIC!!*

**Thank you
for Listening!**