

Metabolic Syndrome and Functional Foods

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What Is Our Responsibility?

- “It is our responsibility to educate and empower our patients with the information necessary to live the chiropractic lifestyle.”
- “This lifestyle-based care is easy, effective, and what today’s consumer is clamoring for....They are looking for a health and wellness coach...Teach them about the power that made the body heals the body. Teach them how to take better care of themselves and to take responsibility for their health.”
- Bob Hoffman, DC, President of *The Masters Circle*.

Chiropractic Wellness Model

- “Chiropractic Wellness Model is the recognition by the chiropractic profession that the greatest need in health care today is promotion of health and wellness.”
- *The ACA Wellness Model Consensus Document from Core Committee.*

Chiropractic Wellness Model

- Physical inactivity and unhealthy eating often lead to obesity and several chronic diseases including cardiovascular disease, type II diabetes, and even cancer.
- *Chiropractic Practice: Public Health Issues and Wellness, Michael Haneline, DC, MPH, Assoc. Professor, Palmer College West*

Healthy Lifestyle Characteristics

- Few American adults meet the study criteria for an overall healthy lifestyle, underscoring the “health promotion crisis”, w/ very low rates of compliance with recommendations for body weight, diet, and exercise and a continued high rate of smoking.
- Reeves MJ, Rafferty AP: Healthy Lifestyle Characteristics Among Adults in the US < 2000. Arch Intern med. 2005;165:854-857

Lifestyle vs. Medicine

- One Doc's Drug Complaint, J Abrahamson, Clinical Instructor Primary Care, Harvard Medical School.
- *“About 70% of our health has to do with how we live our lives. Doctors are not keeping up.”*
- *“The truth us that lifestyle is much more important than cholesterol levels.”*
- Discover Magazine, 11/05, p 16-18.

What is Metabolic Syndrome?

- American Heart Association/National Heart, Lung, and Blood Institute Scientific Statement :
- *The metabolic syndrome has received increased attention in the past few years. It consists of multiple, interrelated risk factors of metabolic origin that appear to directly promote the development of atherosclerotic cardiovascular disease (ASCVD).*
- First developed by V. Dilman in 1968 and later and more famously by Reaven as **Syndrome X**

MS:Prevalence and Risk

- Estimated 50,000,000, or 1 in 6 Americans! Some say 1 in 5!*
- Increases the risk of coronary heart disease, stroke and peripheral vascular diseases such as dementia, intermittent claudication, and erectile dysfunctions, and type 2 diabetes.
- International Diabetes Association

What Characterizes Metabolic Syndrome?

A group of metabolic risk factors in one person. They include:

- **Abdominal obesity** (excessive fat tissue in and around the abdomen)
- **Atherogenic dyslipidemia** (blood fat disorders — high triglycerides, low HDL cholesterol, and high LDL cholesterol)
- **Elevated blood pressure**
- **Insulin resistance** or glucose intolerance (the body can't properly use insulin or blood sugar)
- **Prothrombotic state** (e.g., high fibrinogen or plasminogen activator inhibitor-1 in the blood)
- **Proinflammatory state** (e.g., elevated C-reactive protein in the blood)

Additional Lab Testing

- In addition, research shows that other components not routinely measured commonly aggregate with the major components:
- elevated apolipoprotein B, small LDL particles, insulin resistance and hyper-insulinemia, impaired glucose tolerance (IGT), elevated C-reactive protein (CRP), and variation in coagulation factors (eg, plasminogen activator inhibitor [PAI]-1 and fibrinogen).
- Clinical Management of Metabolic Syndrome, Report of the American Heart Association/National Heart, Lung, and Blood Institute/American Diabetes Association Conference on Scientific Issues Related to Management

Pro-Inflammatory State

- This condition is characterized by elevated cytokines (e.g., tumor necrosis factor- and interleukin-6) as well as by elevations in acute-phase reactants (CRP and fibrinogen).
- Measurement of CRP is the most practical way to assess the presence of an inflammatory state. CRP levels tend to be higher than normal in patients with the metabolic syndrome.
- An elevated CRP (3 mg/L) is an emerging risk factor for CVD.

CRP vs. LDL for Predicting Cardiovascular Risk

- CRP may be better than LDL for predicting adverse CV events and that CRP adds predictive value.
- The precise role CRP plays in cardiovascular disease remains unclear: Is it really a risk factor?
- Statin therapy has been shown to be effective in reducing adverse event rates in people with elevated CRP as in people with elevated cholesterol.
- <http://cardiology.jwatch.org/cgi/content/full/2002/1213/1>

2005 Heart Disease and Stroke Statistics from AHA

- CHD is #1 cause of death, cutting 11.5 yrs from life expectancy.
 - This year about 1.2 million Americans will have a first or recurrent coronary attack. About 494,000 of these people will die.
 - About 7.1 million Americans age 20 and older have survived a heart attack (myocardial infarction).
 - About 6.4 million Americans have angina pectoris
- An American suffers a heart attack every 26 seconds, and every minute an American dies from one.
- 50% of men and 64 % of women suffering a deadly CHD attack had NO SX!

Stroke

- Each year about 700,000 people suffer a new or recurrent stroke in the United States.
- Nearly 163,000 of these people die, making stroke the third leading cause of death.
- About 5.4 million U.S. stroke survivors are alive today, many of them with permanent stroke-related disabilities.
- Women account for more than 6 in 10 stroke deaths.
- African Americans are more likely than Caucasians to have high blood pressure, and have strokes earlier in life, with more severe results.

High Blood Pressure

- The estimated prevalence of high blood pressure in adults age 20 and older in the U.S. is 65,000,000.
- Of all people with high blood pressure, 30 percent are unaware of it, and only 34 percent are on medication and have it controlled. 25 percent are on medication but don't have it under control.
- Up to 95 percent of high blood pressure cases stem from unknown causes (?), but the condition is easily detectable and most cases can be controlled with proper treatment.
- Normal blood pressure in adults is below 120/80 mm Hg.
- High blood pressure is 140/90 mm Hg or higher. (Now 135/85!)

Cholesterol

- About 38 million American adults have cholesterol levels of 240 mg/dl or higher — the point at which it becomes a major risk factor for coronary heart disease and stroke. Your total cholesterol should be below 200 mg/dL, and your HDL (good) cholesterol should be 40 mg/dl or higher.
- New guidelines are 160 w/ LDL below 130!

Obesity

- BMI > 24 = overweight
- BMI > 30 = obesity. 300 million in the world are obese!
- BMI > 40 = morbid obesity
- In US, 31% of adults are obese, a doubling in 20 years!
- 42% of hi-schoolers in AK and MS are obese, quadrupling in 30 years!
- Runestad T., Lawlor S., The Latest Gains on the Weight Front, Functional Foods and Nutraceuticals, Sept . 2005, pp 42-46

Overweight and Obesity

- About 65 percent of Americans age 20 and older are overweight or obese
- Abdominal, AKA Central Obesity, is a greater risk factor. (Apple shape)
- Waist size is $> 90\%$ of hip size (Europe)
- $> 40''$ in M, $> 38''$ in F (USA)
- Hard, deep abdominal fat is greatest risk factor. (Beer Belly)

China Stats

- 18,000,000 obese
- 137 million overweight
- 64 million have metabolic syndrome!

Calories / Day in the USA

- 1970 > 2,234; 1980 > 2,270
- 1990 > 2,500; 1995 > 2599
- 2000 > 2,795; 2003 , 2,757
- Takes 3,500 calories to gain one pound.
- $2757 - 2,234 = 523$ calories/ day difference, all other things being equal comes to 1 pound gain per week!
- USDA Food Supply Data

Fat, Facts, and Fictions

- Some one million adult New Yorkers (1 in 5) are obese.
- Obesity is generally considered to be a BMI of $> 30\%$.
- Only 39% obese NYer' s described themselves as “very over weight”
- 16% said “just right”, 42% “slightly over-weight” *and 2% said underweight!*

More Fat, Facts, and Fictions

- Only 44% of adult NYC citizens have a “healthy weight”.
- 75% do not have *any* regular physical activity
- 5’10” man weighing 175 have a BMI of 25.1
- 5’10” man weighing 210 has a BMI of 30.1
- Still NYC obesity rate in 1993 12%, 20% in 2004, and New Yorkers are thinner than average US citizen! (23% obesity in 2004)

Early Prevention

- Obesity epidemic effects *16% of children.*
- Teenage girls who have a large waist circumference and high levels of triglycerides run a greater risk of developing MS in later life.
- Early Interventions at managing pre teen obesity could reduce risk of developing the (metabolic) syndrome.
- Dr John Morrison, Cincinnati Children's Hospital.

The Diabetes Time Bomb

- 15 million Americans are diagnosed with diabetes. 3 million need daily insulin injections.
- 194 million on the planet have diabetes, doubling in the last 25 years.
- Yearly, in the US, 40,000 get diabetic nephritis, 24,000 go blind, 82,000 amputations.
- Diabetes linked to Alzheimer's, dementia and depression
- Diabetes cuts 15-20 years of life expectancy
- Pre-diabetic insulin resistance is estimated at MUCH higher incidence!
- *Duncan, D.E., The Covert Plague, Discover, 2005, pp 60 -66

Diabetes Mellitus

- From two-thirds to three-fourths of people with diabetes die of some form of heart or blood vessel disease.
- For more information about heart disease and stroke or about the statistics in this publication, contact your nearest American Heart Association or call 1-800-AHA-USA1 (1-800-242-8721), or visit americanheart.org.

Medicinal Approaches to Diabetes

- Insulin and Pancreatic stimulants = more insulin
 - Rx to Lower IR
 - Rx to Increase insulin use intra-cellularly
 - Starch blockers
 - None cure anything, only slow down the progressions
 - *“No medicine is as effective for treating diabetes as exercising 7 days a week and following a healthy diet.”*
Osmam Hardy, Diabetes Prevention Program
-
- Duncan, D.E., The Covert Plague, Discover, 2005, pp 60 -66

Diabetics Combine Complementary and Conventional Medicine

- Many diabetics combine some form of alternative therapy, including acupuncture, massage or herbal supplements, with conventional medicine.
- Researchers at the Medical University of South Carolina at Charleston found that 48 % of the 2,474 adult diabetics used some form of CAM. The study, published in Diabetes Care, found that the use of CAM did not prevent diabetics from seeking out conventional therapy as well.
- To learn more please visit www.naturalstandard.com.

Insulin and Atherosclerosis

- Atherosclerosis involves the oxidation of low density lipoproteins (lipid peroxidation) in circulation.
- Insulin resistance is associated w/ $>$ free radical production and thus atherogenesis.

IR + Smoking = CVD

- Tobacco smoke is a a major source of oxidants
- An estimated 26 million men and 21 million women put themselves at increased risk of heart attack and stroke by smoking cigarettes.
- Each day about 4,000 people become regular smokers, more than 2,000 of them under age 18.
- (1-4 cigarettes a day triples cancer risk!)

Physical Inactivity

- Data released by the Centers for Disease Control and Prevention show that more than 59 percent of American adults do not engage in periods of vigorous leisure-time physical activity lasting at least 10 minutes per week.
- Approximately 70% of the US public can be classified as being sedentary!
- AHA/NHLBI/ADA Conference Proceedings

Insulin Resistance

- The dominant underlying risk factors for this syndrome appear to be abdominal obesity and insulin resistance.
- Insulin resistance is a generalized metabolic disorder, in which the body can't use insulin efficiently.
- Indeed metabolic syndrome is also called the **insulin resistance syndrome**.
- *In advanced stages an 80 year old insulin resistant person may produce 400% normal insulin.*

Genetic and Acquired Factors

- Acquired factors, such as age, hormonal imbalance, excess body fat, abdominal obesity, and limited physical inactivity elicit insulin resistance and the metabolic syndrome in people.
- The biologic mechanisms at the molecular level between insulin resistance and metabolic risk factors aren't fully understood and appear to be complex.
- Some people are genetically predisposed to insulin resistance..

Pathogenesis of Metabolic Syndrome

3 potential etiologic categories:

1. insulin resistance
2. obesity and disorders of adipose tissue
3. a constellation of independent factors (e.g., molecules of hepatic, vascular, and immunologic origin) that mediate specific components of the syndrome.

Hi insulin causes obesity

- Hi insulin and blood sugar cause lipogenesis and triglyceride synthesis, and inhibits lipolysis.
- Hi insulin may trigger hypothalamus to send hunger signals.
- *Randle Effect*: fats burn in the flame of carbs, carbs do not burn in the flame of fats. So fatty acids are burned and glucose is stored as fat.

Patho-physiology

- Glucose released in blood triggers insulin, which attaches to cell wall *receptors*, which send proteins into the cell.
- Some of these proteins prompt glucose *transport* into the cell, some prompt the manufacture of more transporters.
- Glucose is transported to the mitochondria for energy
- IR interrupts communication between insulin receptors and glucose transporters. The beta cells of the pancreas compensate by overproducing insulin, *hyper-insulinemia*.
- Beta Cells eventually burn out, leading to *hyperglycemia*.
- Alpha cells overproduce glucagon, causing *glycogenolysis*.
- Excess glucose create toxic advanced glycation end-products (AGEs) which effect nerve cells and the intima of capillaries leading to *neuropathies, retinopathies, and nephropathies*.

Diabetes = End Stage IR

- Reactive hypoglycemia, (low blood sugar), hyperinsulinemia, hyperglycemia (pre-diabetes) and type II diabetes may all be different stages of IR!
- Type II diabetes has been called advanced, extreme or end stage IR.
- Type II diabetics may produce massive amounts of insulin!
- Nonetheless, the elevated blood glucose penetrate the non-glucose dependent tissues (the eye, arteries and nerves.)

Advanced Glycation End Products

- Elevated circulating glucose reacts non-enzymatically w/ proteins and nucleic acids to form AGEs
- AGEs promote cross-linking of proteins
- AGEs diminish tissue flexibility, functionality.

Diabetes and Osteoporitic Fx

- Although diabetes is associated with HIGHER BMD, it is also associated with higher risk for fractures!
- Apparently diabetics suffer a decrease in bone strength not currently measurable.
- Possible non-enzymatic changes in protein matrix.

Metabolic Syndrome as a Rx Side Effect

The metabolic syndrome increasingly is being recognized as a side effect of several commonly used drugs, mainly because some of these drugs (e.g., corticosteroids, antidepressants, anti-psychotics, antihistamines) can produce weight gain, which predisposes to 2 of the features of the metabolic syndrome: obesity and glucose intolerance.

- Protease inhibitors used in the treatment of HIV very often induce a metabolic syndrome secondary to lipo-dystrophy and insulin resistance.

How is the metabolic syndrome diagnosed?

- There are no universally accepted criteria for diagnosing the metabolic syndrome.
- The criteria proposed by the *National Cholesterol Education Program (NCEP) Adult Treatment Panel III (ATP III)*, with minor modifications, are currently recommended and widely used.

Three or More Components

- The American Heart Association and the National Heart, Lung, and Blood Institute recommend that the metabolic syndrome be identified as the presence of three or more of these components:
- Elevated waist circumference:
 - Men — Equal to or greater than 40 inches (102 cm)
 - Women — Equal to or greater than 35 inches (88 cm)

Components Continued

- Elevated triglycerides:
Equal to or greater than 150 mg/dL
- Reduced HDL (“good”) cholesterol:
Men — Less than 40 mg/dL
Women — Less than 50 mg/dL
- Elevated Blood pressure:
Equal to or greater than 130/85 mm Hg
- Elevated fasting glucose:
Equal to or greater than 100 mg/dL

Hyperinsulinaemia

- Routine GTT
- Measure insulin along with glucose each draw.
- IR may show normal glucose pattern, but insulin stays abnormally high.
- **Hyperinsulinism:** A state in which too much insulin is present in the blood thus causing blood glucose levels to become too low, which may then result in insulin shock.

Prolonged QT Intervals

- The EKG (ECG) duration of the QT interval increase by 5% is a arrhythmia characteristic of type 2 diabetes.
- It may be a side effect of drugs.
- It is also associated with obesity
- QT wave increased intervals is a predictor of the risk of stroke, death by heart attack and from mortality from all causes.
- Chromium shortens prolonged QT's

Differential Dx

- Hyper-androgenemia has been associated with insulin resistance in women with polycystic ovary disease. Lowering IR lowers T.
- Furthermore, mild hyper-corticoidism has been implicated in development of abdominal obesity. (Moon face, abdominal fat, thin extremities, upper dorsal fat, weakness, fatigue, backache, headache, increased thirst, increased urination, impotence, mental status changes and muscle atrophy.)

PCOS: Signs and Sx

- PCOS affects 6% of young women in the US.
- irregular vaginal bleeding and obesity.
- excess facial or body hair and acne.
- do not ovulate or menstruate regularly.
- Women with PCOS disease have male finger pattern and even “male” baldness hair loss.
- ovarian cysts, darkening of the skin folds, acne and elevated lipid levels, infertility.
- The long-term hypertension, heart disease, gestational diabetes, diabetes and uterine ca.

PCOS-IR Connection

- PCOS is caused by IR, leading to hyperglycemia, eventually causing glucose intolerance, along with many of the problems we commonly see in adult-onset diabetes.
- In fact, PCOS may be a very early type of adult-onset diabetes.
- It is the excess insulin that is apparently responsible for directly stimulating the ovaries to produce an excess of male hormones, throwing the entire system out of balance.
- <http://www.dreamababy.com/pcos-insulin.htm>

Early Intervention.

- **PCOS**, also known as **Polycystic Ovarian Syndrome**, is reported to be a growing problem with adolescent girls.
- Early intervention in hi-risk groups of 9-11 year olds greatly lowered full IR and obesity in later teenage years.

Increased Risk for ASCVD

- Prospective population studies show that the **metabolic syndrome** confers an 2-fold increase in relative risk for **ASCVD** events,
- and in individuals without established type 2 diabetes mellitus, 5-fold increase in risk for developing **diabetes** as compared with people without the syndrome.
- *This finding implies that the metabolic syndrome imparts a relatively high long-term risk for both ASCVD and diabetes.*
- *An American Heart Association/National Heart, Lung, and Blood Institute Scientific Statement*

AHA Recommendation for Management

- The primary goal of clinical management of the metabolic syndrome is to reduce the risk for cardiovascular disease and type 2 diabetes
- May include medications to control blood pressure, blood lipids (LDL), and blood sugar, and increase insulin sensitivity, and lessen inflammation and blood coagulation.

Risk Factor Reduction

- For management of long-term as well as short-term risk, lifestyle therapies are the first-line interventions to reduce the metabolic risk factors. These lifestyle interventions include:
 - Immediate cessation of smoking

Risk Factor Reduction, cont.

- Weight loss to achieve a desirable weight (BMI less than 25 kg/m²)
- Increased physical activity, with a goal of at least 30 minutes of moderate-intensity activity on most days of the week
- Healthy food habits that include reduced intake of saturated fat, trans fat and cholesterol (*and hi glycemc loads*)

Exercise

- Minimum for patients with diabetes, CVD, and Metabolic Syndrome I is 30 minutes a day.
- 10 minutes, 3 times a day may be OK.
- Real weight loss takes 60 -90 minutes a day.
- Successful weight maintenance after loss may require 60 minutes
- **Interval training** may be best. Weight training of big muscles, 15 reps, perhaps in a circuit , followed by a minutes rest and a repeat set or two, for 15 minutes, followed by 15 minutes of wind sprints or high intensity interval cycling.
- See www.isisfitness.com

Weight Loss Diets

- The first rule is that "crash diets" and "extreme diets" are seldom effective in producing long-term weight reduction. Such diets include very low-calorie diets and high-fat/low-carbohydrate diets.
- More effective and healthful for long-term weight loss are reduced-energy diets, consisting of a modest 500- to 1000-calorie/day reduction. A realistic goal for weight reduction is to reduce body weight by 7% to 10% over a period of 6 to 12 months.

Weight Loss

- Long-term maintenance of weight loss is then best achieved when regular exercise is included in the weight-reduction regimen.
- The emphasis in behavioral change should include improvements in eating habits such as setting goals, planning meals, reading labels, eating regular meals, reducing portion sizes, self-monitoring, avoiding eating binges.
- Eating small regular, low glycemic load meals, starting w/ breakfast.

Nutritional Counseling

- Although knowledge and education are critical, they are often insufficient, and thus nutrition counseling is often very helpful.
- Detailed advice for weight reduction can be obtained from obesity guidelines at <http://www.nhlbi.nih.gov> and <http://www.americanheart.org>.

Dietary Modification

- ATP III recommendations for diet composition for patients with metabolic syndrome are consistent with general dietary recommendations.
- low intake of saturated fats, *trans* fats, and cholesterol;
- higher intake of unsaturated fats
- reduced consumption of simple sugars; and
- increased intakes of fruits, vegetables (legumes), and whole grains.

Killer Fat Facts

- Scientific evidence shows that consumption of saturated fat, *trans* fat, and dietary cholesterol raises low-density lipoprotein (LDL), or "bad" cholesterol, levels, which increases the risk of CHD.
- Basically, *trans* fat is made when manufacturers add hydrogen to vegetable oil--a process called hydrogenation. Hydrogenation turns liquid oils into solid fats, like shortening and hard margarine, and increases the shelf life and flavor stability of foods containing these fats.
- http://www.fda.gov/fdac/features/2003/503_fats.html

Trans Fats

- *Trans* fat can be found in vegetable shortenings, some margarines, crackers, cookies, snack foods, and other foods made with or fried in partially hydrogenated oils.
- A small amount of *trans* fat is found naturally, primarily in dairy products, some meat, and other animal-based foods.

Proteins and Satiety*

- Protein creates more satiety than fat or carbohydrate.
- Protein intake 150% of the RDA appears to increase fat loss and reduce loss of lean body mass.
- Fast digesting proteins, like whey, are more satiating than slow digesting proteins, like casein.
- Functional Foods and Nutraceuticals, 09/05, p43-45

Proteins and Fat Burning

- Maastricht U, Netherlands study finds proteins increases satiety by enhancing *thermogenesis*, and positively enhancing LBM
- University of Wisconsin, Madison finds proteins increase satiety in hypo-caloric diets.
- Natural Products Insider, 11/07/05, p. 72

Lean Proteins- minimal “bad” fats

- Lean proteins- whey, soy, rice
- Whey-complete, helps build lean body mass, protects the heart
- Soy- lowers cholesterol
- Rice- hypo-allergic, most lysine rich grain

Dairy and MS

- the more dairy products you consume, the less likely your chances of metabolic syndrome.
- People in the highest quartile were 1/3 less likely to have a large waist size, and almost 30% less likely to have HBP...MS was 29% less common in those with hi dairy intake.
- Odds ratio becomes weaker when total calcium intake is considered.
- Yogurt increases calcium uptake, which increases abdominal fat loss over iso-caloric milk protein.
- Amer Jour Clin Nut, vol 82, no 3 , pp523-530
- Natural Products Insider, 11/07/05, p. 72

Whey

- The consumption of milk products has been shown “positively modulate the primary lipid indexes associated with cardiovascular disease”. The mechanism of action surrounding this observation has been attributed to the serum bovine immunoglobulin protein fraction
- Whey is much higher in these protein fractions than milk.
- Content of denatured SBA varies greatly in whey products
- <http://www.ajcn.org/cgi/content/abstract/81/4/792>

Whey and Appetite

- Whey is also rich in tryptophan which is a precursor to *serotonin*, a neurotransmitter that lessens appetite and carbohydrate craves.
- Studies showed that **GMP** induced secretion of cholecystokinin (CCK), a group of neuropeptides known to regulate short-term control of food intake by acting as a satiety signal.
- 1.) Pearson, D, Shaw S., Fat and Happy? Tryptophan Concentrations Reduced in Obesity, *Life Extension News*, Vol. 7 No. 1, Feb 2004

Soy Meal vs. Milk Meal

- University of Kentucky, Lexington
- Both showed equal weight loss
- Soy showed > reductions of triglycerides, TC, LDL.

Soy

- "There is increasing evidence that consumption of soy protein may help lower blood cholesterol levels in some people with elevated cholesterol levels, and it may provide other cardiovascular benefits*,"
 - FDA Approved Claim, "25 gm of **soy** protein a day, as part of a diet low in saturated fat and **cholesterol**, may reduce the risk of **heart** disease."
 - Soy appears to promote weight loss, preserve lean body mass, and glycemic control.**
- John Erdman, a University of Illinois professor of nutrition advisor for the American Heart Association Nutrition Committee.
 - (Deibert et al., 2004, Allison et al., 2003; Fontaine et al., 2003, Goodman-Gruen and Kritz-Silverstein, 2003)

Rice

- Our findings suggest that replacing carbohydrates with protein may be associated with a lower risk of ischemic heart disease.*
 - Rice is a hypo-allergic, easily digested form of protein
 - Of the major grains, it is highest in lysine.
-
- <http://www.ajcn.org/cgi/reprint/70/2/221.pdf>

Good Fats

- Omega-6 and omega-3 fatty acids are 'essential' because they cannot be synthesized by the human body and must be obtained from the diet.
- The first members of the omega-3 and omega-6 fatty acid families, namely linoleic acid (LA) and alpha-linolenic acid (ALA),

Good Fat Functions

- Fatty acids serve functionally as substrates for the synthesis of hormone-like signaling molecules collectively called *eicosanoids*. These consist of prostacyclins, prostaglandins, thromboxanes, and leukotrienes.
- Investigations all over the world have shown the potentially beneficial effects of omega-3 fatty acids in inflammatory diseases, and reducing blood pressure (by promoting dilation of blood vessels), and blood coagulation.

Omega 3 Fats

- The three most common omega-3s have long names, but can be remembered with their abbreviations: ALA for alpha-linolenic acid, EPA for eicosapentaenoic acid and DHA for docosahexaenoic acid.
- EPA and DHA have a stronger influence on health than ALA and that although ALA can be converted to EPA and DHA, the rate is somewhat limiting. Persons wanting to get the most omega-3 influence are advised to consume some sources of EPA or DHA in addition to ALA.

Omega 3 Sources

- ALA: Nuts and seeds: Walnuts, flax seed, chia seed, pumpkin seed, berry seeds, rape seed (canola), Omega 3 Milk
- EPA/DHA: Fish*, (salmon, sardines, flounder, rock fish, crab, herring, halibut, bluefin tuna, trout, tile fish, striped bass, whiting, oysters, polluck) wild game
- EPA/DHA Eggs,
- Avocado
- *<http://www.oznet.ksu.edu/humannutrition/Choosing%20Fish.pdf>

Something Fishy Here!

- Unfortunately, fish can harbor mercury, dioxins, pesticides, and polychlorinated biphenyls (PCBs).
- FDA advises that women who may become pregnant, pregnant and nursing women, and young children not eat fish that may contain high levels of mercury, particularly shark, swordfish, king mackerel, striped bass, and blue crab, also oysters, rockfish, tuna and tilefish (also called golden bass or golden snapper), as well as limit their total consumption of all other fish to no more than an average of 12 ounces (cooked) per week; that includes canned tuna fish.
- Some 8% of women who become pregnant have elevated blood levels of mercury apparently due largely to their frequent fish consumption.
- Men, older children, and women who are not pregnant or lactating should probably eat no more than one meal per week of high-mercury fish but can eat the others as desired.
- While salmon is low in mercury it is high in PCB's dioxins and pesticides. Wild Atlantic is best.

EPA/DHA Supplementation

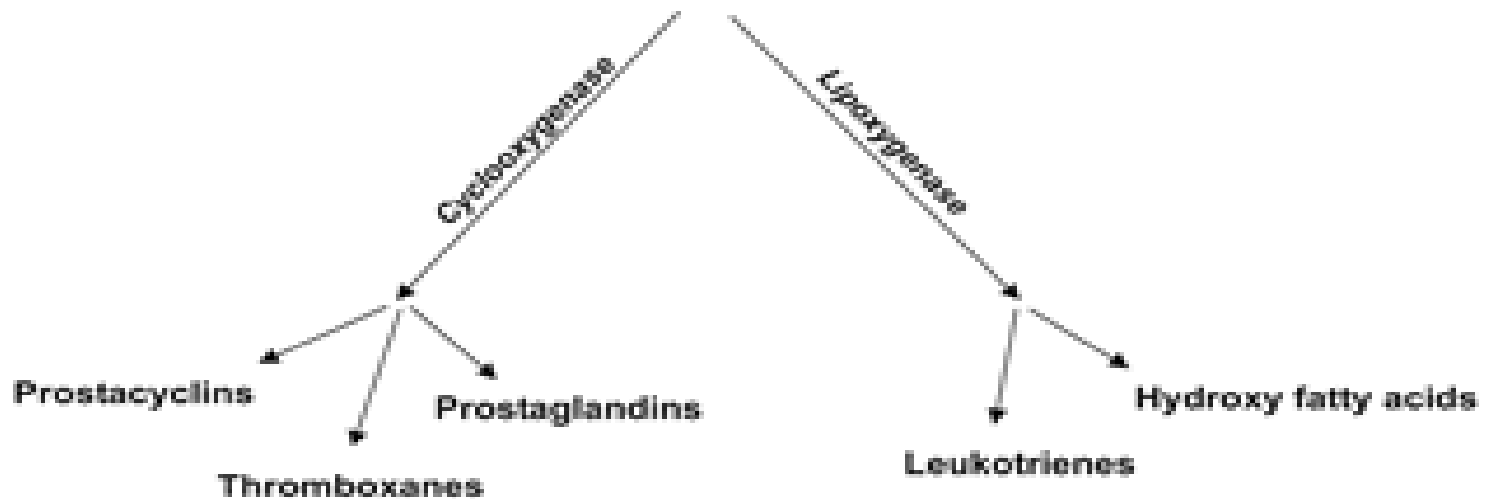
- Because of the good news/ bad news in fish, supplementation is recommended.
Look for:
- molecular distillation to minimize poisons
- Peroxide levels to check for rancidity
- Triglyceride forms more absorbable
- Consider liposome delivery to enhance bioavailability

Fats- Inflammation

- high levels of the one fatty acid family can prevent the synthesis of eicosanoids from the other family.

The Eicosanoid Cascade

Dihommo- γ -linolenic acid (omega-6)
Arachidonic acid (omega-6)
Eicosapentaenoic acid (omega-3)



Omega-6/ Omega-3 Ratio

- Studies suggest that humans evolved on a diet containing an omega-6/omega-3 fatty acid ratio of approximately 1:1.
- A typical Western diet has a high omega-6 to omega-3 ratio of 20:1 to 50:1. This largely happened due to the recommendation to replace saturated animal fat with vegetable oils (high in omega-6 fatty acid content) to reduce serum cholesterol levels in the battle against cardiovascular disease.
- <http://www.mrc.ac.za/mrcnews/des2002/goodfats.htm>

Fats-Coagulation

- LA is necessary for synthesis of prostaglandins in the E1 and E2 series; ALA is the precursor of the E3 series and other omega-3 fatty acids.
- Prostaglandins, hormone like substances, have various effects on smooth muscle and inflammatory processes.
- The E3 (PGE3) series seems to reduce cholesterol levels as well as platelet aggregation and thrombosis and are generally anti-inflammatory.
- Prostaglandin E2, related to arachidonic acid, tends to promote platelet aggregation.
- <http://www.healthy.net/scr/article.asp?PageType=article&ID=2099>

Long Chain FA and Satiety

- **Long Chain Fatty Acids enhance CCK and are satiating**
- Long Chain *Omega 6, DGLA and AA Fatty Acids*: Eggs, Dairy, Meats, Poultry
- Long Chain *Omega-3 (EPA, DPA, DHA)*: Salmon, Herring, Mackerel, Sardines
- DGLA= dihomo-gamma-linolenic acid;
- AA = arachidonic acid;
- EPA = eicosapentaenoic acid;
- DPA = docosapentaenoic acid;
- DHA = docosahexaenoic acid

MCT

- Medium Chain fats, like coconut oil, though saturated, are a good source of energy, and are believed to accelerate fat loss.
- MCTs bypass the digestion process that longer chain fats go through.
- MCT's provide *quick energy* for the body and are thus less likely to be stored in the fat cells.
- When a meal includes MCT there is a significant *thermogenic* effect.
- According to Dr. Laurie Cullen at the Women's Institute

L-Carnitine

- L-carnitine helps deliver fats into the mitochondria to be used as energy
- In diabetics, 1 mg/ kilogram to patients = lower blood lipids and triglycerides (255 and 39% respective)
- May also help repair diabetic neuropathy
- Nutritional Considerations for patients w/ Non-Insulin Dependent Diabetes or Pre-diabetic State, J. Meschino, Dyn. Chirp, Sept 27, pp37-38

Fiber

- Basically, the term fiber refers to carbohydrates that cannot be digested.
- Soluble (gums, pectins, hemi-cellulose) : oatmeal, nuts and seeds, legumes, fruits
- Insoluble (cellulose, hemi-cellulose, lignans): grains, brans, vegetables, seeds
- Current recommendations: adults > 20-35 grams of dietary fiber per day.* Children over age 2 > their age plus 5 grams per day.
- Average American eats 14-15 grams of dietary fiber a day.
- National Academy of Sciences Food and Nutrition Board recommends 40 a day!

Fiber and Metabolic Syndrome

- High intake of dietary fiber has been linked to a lower risk of heart disease and lower BMI*
- Fiber intake has also been linked with the metabolic syndrome. Several studies suggest that higher intake of fiber may somehow ward off this increasingly common syndrome.**
- *Glucomannan* from Konjac root is a common soluble fiber supplement, as is oat beta glucan.

• Bagnulo, J, Cutting Through the Carbohydrate Confusin, Alternative Therapies, Sept/ Oct 2005, Vol 11, No. 5

• <http://www.hsph.harvard.edu/nutritionsource/fiber.html>

Soluble and Insoluble

- Insoluble fiber, like wheat bran, adds roughage and alimentary speeds transit time
- Soluble fiber, like oat bran, slow digestion, thereby lowering the glycemic index, and bind bile, thereby lowering cholesterol.
- BTW, wheat bran contains IP6 and oat bran contains oat beta glucan, immune enhancing phytonutrients.

Whole Grains and MS

- US Agricultural Research Service (ARS) in 2004 said 3 or more servings a day of whole grains could reduce the chances of developing metabolic syndrome.

Glycemic Index (GI)

- GI compares the rise in blood sugar caused by a fixed amount of any given food as compared to the rise caused by a fixed measure gm of sucrose.
- Sucrose is given a rating of 100
- *Glycemic load* takes into account the amount of food eaten
- The total glycemic response of a meal is the glycemic load
- Hi glycemic loads create strong insulin spikes, presuming beta cell function.
- Large meals of any type tend to induce insulin response

GI vs. GL

- the glycemic index measures how fast and how far blood sugar rises after you eat a food that contains carbohydrates
- The glycemic load of a food is calculated by multiplying the glycemic index by the amount of carbohydrate in grams provided by a food and dividing the total by 100.

Carbohydrates ranked by GI

- **Sugars:** *Monsaccharides* (glucose, fructose, galactose) as in honey, powdered fructose*; *Disaccharides* (glucose, fructose, lactose) as in table sugar, milk, barley malt; *oligosaccharides* (maltodextrin) as energy gels and sports supplements.
- **Simple Starches** (*hydrolyzed amylopectin*) as in white flour, white rice, cooked potatoes, peas, cooked carrots.
- **Resistant Starches** (*need amylase*) as in beans, whole grains, sweet potatoes, non starchy vegetables.
- **Fiber:** soluble and insoluble fibers are indigestible by definition and does not contribute calories
- *Fructose is 70% bioavailable but becomes 90+% w/ simultaneous glucose intake. Fructose may also lower insulin and leptin, increasing appetite.

Sugar Substitutes

- **Stevia**, a South American herb called *Rebaudiana Bertoni*, estimated to be some 150 to 400 times sweeter than sugar, and has no calories.
- **Xylitol**, from wood, is low glycemic, having 2.4 carbs / gm. It's taste is cooling and it is hydroscopic.
- **Lo Han Kuo** Extracts, AKA Mogroside 80%, are produced from both dried and fresh fruit. The extract is easily soluble in water without any sediment, and is 300 times sweeter than cane sugar, yet low in calories. It is a stable, non-fermentable extract which is useful for diabetics.

Carbs linked to Cataracts

- A high intake of carbs may lead to cataract formation from exposing the proteins in the eye to too much sugar.
- Carb quantity, but not quality, was associated with early cortical changes,
- 200- 268 gm a day = 250% increase over 101-185 gm a day.

• Amer Jour of CI Nut 81, no. 6, June 2005:1411-1416

Fruits and Vegetables

- The epidemiologic evidence strongly supports the inverse association between the intake of fruits and vegetables and ASCVD.
- Unfortunately, fewer than 25% of Americans eat 5 or more daily servings of these 2 food groups combined. Thus, following the recommendations of both the AHA and ACS we tell patients with metabolic syndrome to make sure that they eat *5 servings of fruits and vegetables every day.*

A D.A.S.H more fruits, please!

- Investigators for the Dietary Approaches to Stop Hypertension (DASH) trial found that diets including 8 to 10 servings of fruits and vegetables (4 of each) per day were effective in lowering systolic BP by 3 to 6 mm Hg.
- Thus, increasing fruit and vegetable intake will address both the *ASCVD* and *BP* abnormalities in patients with the metabolic syndrome.
- <http://www.patientcareonline.com/patcare/article/articleDetail.jsp?id=117120>

Nutraceuticals and Phytonutrients

- The term *phytochemical* refers to a classification system of botanical chemicals.
- *Phytonutrient*, within the context of natural health and nutrition, has come to refer to bio-active plant chemicals that humans eat and have or may well have significant positive effects on human metabolism.
- *Phytochemicals* that are concentrated or prepared in such a dosage as to have likely therapeutic effects are generally becoming referred to as *nutraceuticals*.
- *Phytonutrients* are not essential for life, but they appear to be essential for optimal health and longevity. They therefore may properly be classified as micro-nutrients, along with vitamins and minerals. The technical classification of the major groups of phytonutrients found in our diets includes: *terpenes, amines, organosulfurs, phenols, polysaccharides, organic acids, and lipids*. One food can contain several classifications of phytonutrients. For example, an orange contains terpenes (*carotenoids and limonoids*) and phenols (*bioflavonoids*).

Nutraceuticals

- We evaluated the insulin potentiating activity of aqueous extracts of several herbs, spices and medicinal plants and found that cinnamon was the most active
- The insulin potentiating activity was due to polyphenols.
- http://www.ars.usda.gov/research/publications/publications.htm?seq_no_115=176887

Cinnamon and Diabetes

- Cinnamon, 1- 6 gm a day, reduces serum glucose, triglycerides, LDL
- Increases HDL
- Diabetes Care 2003;25(12):3215-8

Water Soluble Cinnamon Extract

- Strongly insulin-mimetic
- Procyanidins type A polymers
- MHCP (methylhydroxychalcone polymer)
- Oil soluble cinnamon compound, coumarin, is anti-coagulant, potentially harmful in large quantities.

Cinnulintm: water soluble extract of cinnamon

- Results of a human trial last year showed that pre-diabetics taking the supplement experienced significant decreases in fasting blood glucose levels, increases in lean body mass and reduction in overall body fat.
- A new trial beginning this month with the US Department of Agriculture and the University of Hawaii will study the effects of Cinnulin in type 2 diabetics.
- <http://www.foodnavigator.com/news/ng.asp?n=64869&m=1niy104&c=nkusdzgahpgtkst>

Goat's Rue

- *Galega Officinalis*
- Rich in the amino acid guanidine,
- Improves Insulin sensitivity
- Lowers Blood Sugar
- Used as a natural substitute for **Metformin**

White Mulberry

- *Alpha-glucosidases* are gut enzymes whose function it is to break disaccharides (sucrose, maltose, lactose) into monosaccharides (glucose, fructose ,galactose)
- Mulberry, AKA *Morus Alba*, inhibits alpha-glucosidases
- Also rich in the flavonoids isoquercitin and astragalin
- 3 gm a day controlled blood glucose compared to glibenclamide, while lowering LDL and TC to boot, and raising HDL
- Also reduced oxidative stress on RBC membranes.

- Life Enhancement, Nov 2004, pp 4-8.

Bitter Melon

- Bitter melon has long been used in India for diabetes.
- AKA *Karela* or *Momordica Charantia*
- Bitter Melon supplements, standardized to 5.1% triterpenes, at 200 mg B.I.D., has been shown to significantly lower blood sugar in insulin dependant diabetics.
- Principle constituents are lectins, charantin and momordicine.
- Lectins from the bitter gourd have shown significant anti-lipolytic and lipogenic activities.
- Contains Gurmarin, a polypeptide considered to be similar to bovine insulin. (insulin mimetic)
- Reportedly suppresses the neural response to sweet taste stimuli.

Phyto-Ceuticals?

- New research to be presented at the 16th Annual Scientific Meeting of the American Society of Hypertension provides evidence that a natural tomato extract produced from non-GMO tomatoes rich in lycopene, phytoene, phytofluene, tocopherols, phytosterols, phospholipids and other phytonutrients, may help lower blood pressure in **hypertensive** patients.
- Diets rich in carotenoids are linked with a decreased risk of **heart disease**.
- *Functional Foods and Nutraceuticals*, March 2003, p. 64

More on Phytochemicals

- Polyphenols found in berries, teas, and soybeans, appear to inhibit inflammation, ...platelet aggregation,...(and) block the angiotensin-converting enzyme (ACE) that is responsible for raising blood pressure.*
- Natural plant chemicals (phytochemicals) play an important role in preventing cancer and artery disease (atherosclerosis, like stroke and heart attack)**
- Catechins in green tea and isoflavones in soy inhibit platelet aggregation***
 - <http://www.oralcancerfoundation.org/facts/phytonutrients.htm>
 - “Phenolic compound contents in edible parts of broccoli inflorescences after domestic cooking” by F. Vallejo in the October 2003 issue of the *Journal of Science, Food and Agriculture*
 - <http://www.nutritional-solutions.net/lectures/phytonutrients.pdf>

Poly-Phenols and Organic Acids

- Berries rich in polyphenols and organic acids, like raspberries and pomegranates, may help regulate the inflammatory response, promote health vascular function, provide potent antioxidant activity, and maintain optimal CV health.

- Prepared Foods August 2005, p 64

Green Tea Polyphenols

- Green tea extracts (ECGC) fed to a second group of rats being fed an identical high-calorie diet demonstrated significant improvements in lipid levels and fat metabolism.
- After 8 weeks fasting blood glucose decreased by 21.5 per cent,
- fasting plasma insulin decreased by 40.7 percent.
- insulin sensitivity increased, fasting serum triglycerides decreased up to 54.3 percent.
- significant decreases in the abdominal adipose fat deposits and a decrease in the ratio of insulin to glucagons indicating that the extract effectively increased fat metabolism and reduced abdominal fat deposits.
- <http://www.vrp.com/art/1001.asp>

Green Tea and Weight loss

- Scientific study supports green tea's ability to burn fat and increase metabolism.
- What's more, other studies show that, when combined with other sensible lifestyle choices like maintaining a healthy body weight, both green and black teas can help reduce the risk of heart disease.
- **American Journal of Clinical Nutrition November 1999;70:1040_1045 ■**

Quercetin

- As a group, bioflavonoids, including hesperidin, rutin, [quercetin](#), and catechin, work to keep the capillary blood vessels strong and to reduce vascular fragility and subsequent bleeding and bruising.
- Quercetin is a powerful antioxidant, like all polyphenols.
- Quercetin also inhibits some inflammatory enzymes, such as lipid peroxidases, and decreases leukotriene formation.
- It may also be helpful in preventing eye and nerve damage in diabetes by decreasing tissue inflammation and oxidation.

Phytochemicals Inhibit Blood Clotting

- After screening hundreds of phytochemicals found in a variety of plants, an ARS scientist has identified, characterized, and synthesized two potentially heart-healthy natural compounds
- The natural compounds are found in sweet peppers, Chinese wolfberry, and cocoa.
- When tested in larger quantities than likely found in foods, these compounds suppress the mechanism whereby blood platelets stick to blood vessel walls.

Insulin sensitivity and Minerals

- Intracellular **magnesium** is a cofactor for numerous enzymes involved in carbohydrate metabolism
- **Chromium**, AKA Glucose Tolerance Factor, enhances insulin's sensitivity and may effect serum lipids favorably as well.
- Chromium deficiency in diabetes may be a risk factor for CVD*
- **Vanadium** is an insulin mimetic

• Simonoff M. *Chromium Deficiency and CV Risk*, CardioVasc res 1984;18:591-6

Diet For Metabolic Syndrome

- The diet for the treatment of the metabolic syndrome should be limited in the intake of saturated fat, while high fiber/low-glycemic-index foods should be used *without specific limitations*.
- Such diets usually recommend small frequent meals.
- Dietary treatment of the metabolic syndrome — the optimal diet
- Authors: Riccardi G.*; Rivellese A.A.1, Source: British Journal of Nutrition, Volume 83, Supplement s1, 2000, pp. 143-148(6)

Pritikin & Low Carb

- “Thanks to the low carb approach we’ve seen many patients reduce or completely eliminate drug therapy”- *Mary Vernon, President of the American Bariatric Society for bariatric Physicians at AHA conference 11/05.*
- Researchers from UCLA claim that 3–week high fiber, low fat diet can reverse type -2 diabetes and metabolic syndrome.
- *Food Navigator.com 1-19-06 and J of App Physy 12-15-06 doi:10.1152*

21 day Pritikin Diet

- Three-week diet/exercise study shows 50% reversal in metabolic syndrome.
- The study shows, contrary to common belief, that Type 2 diabetes and metabolic syndrome can be reversed solely through lifestyle changes
- changes occurred in the absence of major weight loss. Participants did lose 2 to 3 lb/week, but they were still obese after the 3-week study.
- high-fiber, low-fat vegan **Pritikin** diet with no limit to the number of calories. .The daily diet was low fat (12-15% of calories), moderate protein (15-20% cal.), and high in unrefined carbs. (65-70% of cal.) and fiber (40+ grams).
- The participants also did 45-60 minutes of aerobic exercise per day on a treadmill.
- Effect of a diet and exercise intervention on oxidative stress, inflammation, MMP-9, and monocyte chemotactic activity in men with metabolic syndrome factors," is in the online edition of the Journal of Applied Physiology published by the American Physiological Society. Researchers were Christian K. Roberts, Dean Won, Sandeep Pruthi, Silvia Kurtovic, and R. James Barnard, all of UCLA; Ram K. Sindhu of Charles R. Drew University, Los Angeles; and Nosratola D. Vaziri of University of California, Irvine.

Insulin: It's what you hoped for!

- Despite such findings, Aventis Pharmaceuticals places full page ads declaring “ When I learned I had diabetes I thought. Please, no insulin. Now I am glad I said yes.”
- “Insulin it's not what you think. It's what you hope for.”
- Same issue's in Discover w/ articles that promoted natural approaches!

7 Eating Styles linked to Overeating, Overweight and Obesity*

- Fast food over fresh food
- Food Fretting –being over concerned/quilty
- Task Snacking- eating while distracted
- Eating atmosphere- rushed, loud atmosphere
- Social fare- eating alone related to obesity
- Emotional Eating- eating to change your state
- Sensory Spiritual Nourishment- infusing food with special meaning
- * Larry Scherwitz and Deborah Kesten, Explore, Sept 2005.

Fast Food Health Food

- Only 3 % of the people consume the recommended amounts of at least 4 of the 5 USDA recommended food groups
- Products like *Ensure*, *Slim Fast*, *Balance Bars* are commercial attempts at providing convenience forms of instant meals that help control blood sugar and support weight loss in our “always on the go” society

Eating “ On the Go!”*

- Nine out of 10 U.S. adults eat meals on the go.
- Six out of 10 do so daily!
- Over 25% eat on the go 2-3 times a day
- Harris Interactive Poll, Rochester NY

The Problem

- The first line of defense in Metabolic Syndrome is diet and exercise.
- It is hard to get people to exercise.
- It is hard to get them to eat well
- Even if they intend to, 5 small, low glycemic meals a day can strain compliance.

Simple Solutions

- “ we need simple snack and meal-time solutions that fit our modern-day, multi-tasking lives. They need to taste great, be readily available or prepared in a matter of minutes”
- Carolyn O’Niel, author, *The Dish on Eating Healthy and Being Fabulous*

ADA Position Paper on Functional Foods- 1995

- Expanding knowledge of the role of physiologically active food components, from both plant (phyto-chemicals) and animal (zoo-chemicals) sources, has notably changed the role of diet in health. The development of “**functional foods**” has evolved as food and nutrition science has advanced beyond the treatment of primary deficiency syndromes ... functional foods ... are usually understood to be any potentially healthful food or food ingredient that may provide a health benefit beyond the traditional nutrients it contains. The term “functional” implies that the food has some identified value leading to health benefits, including reduced risk for disease, for the person consuming it.

Functional Food for Metabolic Syndrome

Ideal Functional Foods for Metabolic Syndrome would be:

- high in lean protein, fiber, omega 3 fats,
- low glycemic yet provide carbohydrates,
- low or free of saturated , trans, or omega 6 fats,
- fortified with vitamins and minerals, and rich in phytonutrients- zoonutrients.
- Mix easily and taste good.

Functional Food Formulas for MS

- Promote satiation, weight loss, LBM, and thermogenesis w/o CV stress.
- Provide anti-inflammatory, anti-coagulant, anti-oxidant phytochemicals
- Promote Normo-tensive status (DASH/ACE)
- Lower GL, balance blood sugar, increase insulin sensitivity
- Promote normal blood fats and inhibit atherosclerosis

Professional Quality Functional Foods

- Truly professional quality Functional Foods are available. These consist of bars, meal replacements, and phytonutrient drink mixes.
- Stevia has the advantage of non-glycemic sweetness while suppressing appetite.
- To get significant amounts of EPA/DHA supplementation is still needed.

Major Conclusions

- The metabolic syndrome consists of a constellation of factors that raise the risk for CVD and type 2 diabetes.
- Because of the increasing prevalence of obesity in the United States, the metabolic syndrome has increased in frequency.
- National Cholesterol Education Program introduced the metabolic syndrome into its clinical guidelines in the effort to achieve CVD risk reduction beyond LDL-lowering therapy.

Obesity, Inactivity, and Smoking

- Although genetic susceptibility is essential, the metabolic syndrome is relatively uncommon in the absence of obesity and physical inactivity. For this reason, lifestyle modification leading to weight reduction and increased physical activity represents first-line clinical therapy of the metabolic syndrome.
- Smoking cessation, of course, is paramount.

Diet

- Nutritional therapy calls for a
- Small, frequent, relaxed meals/snacks
- low intake of saturated fats, *trans* fats, and cholesterol; increase “good” omega 3 fats.
- reduced consumption of simple sugars; and increased intakes of fruits, vegetables, legumes, nuts, seeds, and whole grains.
- Lean protein w/ every feeding
- Extremes in intakes of either carbohydrates or fats should be avoided.

Ideal Diets?

- July *American Journal of Clinical Nutrition* states that “High-Protein Diets May Promote Weight Loss By Depressing Appetite”.
- The participants ate a high-protein diet, consisting of 30% protein, 20% fat, and 50% carbohydrates.
- An “ideal diet” may emphasize the above ratios, with frequent small feedings, emphasizing whey protein, fish and fish oil, phytonutrients, and amylase starches and fiber.
- <http://www.medpagetoday.com/PrimaryCare/DietNutrition/tb/1431>

Breakfast and the “Time Zone”

- Harvard U study of 2831 breakfast eaters were 44% less likely to be overweight and 43% less likely to have IR than those who skipped breakfast.
- 5 small frequent balanced meals and snacks a day.
- A balanced feeding contains high quality protein, slow digesting carbs; and healthy fats.

Functional Foods and Compliance

- The provision of doctor recommended functional foods can help make compliance much easier as it makes frequent healthy meals possible and limits pill consumption.
- The provision of functional foods is easy for the doctor also, as these are not ‘treatments’ for any particular disease, merely support in the consumption of complete, balanced, nutrient dense foods.
- Virtually the risk for all the common diseases of aging would be significantly lowered by anyone following these guidelines for metabolic syndrome.
- The greater the nutritional compliance, the less need for medication, and the more likely the appreciation for and benefit derived from lifetime chiropractic health care.

Functional Foods: Opportunities and Challenges

- Recognizing the tremendous health benefits offered by functional foods, the Institute of Food Technologists commissioned an expert panel
- Founded in 1939, the Institute of Food Technologists is a 26,000-member international not-for-profit scientific society for food science and technology.
- http://members.ift.org/IFT/Research/IFTExpertReports/functionalfoods_report.htm

IFT Recommendations

- Expand research on "bioactive nutrients", biomarkers and physiological endpoints.
- Use generally recognized as efficacious (GRAE) panels to evaluate health claims and streamline regulatory approval.
- Allow product labeling and health claims to accurately reflect the scientific data without triggering drug status.
-

IFT Conclusions

- The ultimate success of functional foods will depend on delivering bioactive components in a predictable and assured manner to effectively reduce the risk of disease and/or improve body structure or function.
- Consumers want and need these products, and mechanisms must be found to foster their availability.
- Copies of the report are available at www.ift.org.

Reinventing Medicine

- *“In order to understand how healing happens, in the 21st century, we shall look not only at our atoms and molecules but at consciousness as well. In so doing, we shall reinvent medicine, adding ancient wisdom to modern science.”* Larry Dossey, MD

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