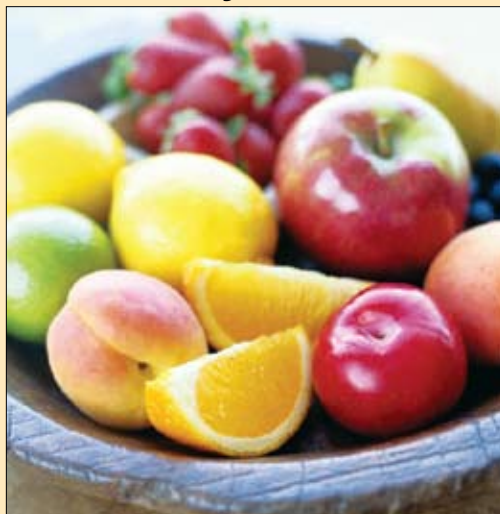




Nutrition Corner:

What is Metabolic Syndrome?

Over 50 million Americans today have Metabolic Syndrome.



As Dr. Mark Hyman expressed in his recent talk at the Yellow Courtyard, Metabolic Syndrome has become a 'hot topic' with global epi-

demics of diabetes, obesity, and cardiovascular disease, all aspects of the metabolic syndrome. Preventing and managing this syndrome will be ever more important in coming years and for future generations.

Metabolic Syndrome, also coined, "Syndrome X" is characterized by insulin resistance with accompanying abnormally high blood sugar, serum lipids, elevated blood pressure, excess abdominal weight and obesity, and increased blood-clotting tendencies. Insulin resistance is a generalized metabolic disorder in which the body can't use insulin efficiently.

Metabolic Syndrome dramatically increases cardiovascular disease risk and a recent study of 1200 men followed for 11 years found that those diagnosed were up to 360% more likely to die from coronary heart disease.

Although the diagnostic criteria for metabolic syndrome can differ slightly depending on the medical experts consulted, a standard, accepted

definition was established by the Third Report of the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III). According to it's definition, one has metabolic syndrome if three or more of the following are present:

- Central obesity as measured by waist circumference: Men: > 40 inches. Women: > 35 inches.
- Fasting blood triglycerides: > 150 mg/dL.
- Blood HDL: Men: < 40 mg/dL. Women: < 50 mg/dL.
- Blood pressure: $\geq 130/85$ mmHg.
- Fasting glucose: ≥ 100 mg/dL (recently changed from ≥ 110 mg/dL to reflect the revised American Diabetes Association criterion for impaired fasting glucose).

The primary goal of clinical management of metabolic syndrome is to reduce the risk for cardiovascular disease and type 2 diabetes.

For managing both long and short term risk, lifestyle therapies are the first-line interventions to reduce the metabolic risk factors. These lifestyle interventions include:

- Weight loss to achieve a desirable weight
- Increased physical activity, with a goal of at least 30 minutes of moderate intensity daily
- Healthy eating habits that include reduced intake of saturated fat and trans fat and cholesterol
- Reduce refined sugars and carbohydrates

The Diet Connection

Although diet has been linked to metabolic syndrome, it's role in the syndrome's genesis is still poorly understood in medical circles, although the scientific field of nutrition has been treating



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this syndrome for the past decade. Dr. Lyn M. Steffen at the University of Minnesota's School of Public Health and her colleagues set out to take a broad look at the relationship between metabolic syndrome and dietary intake. They used data from 9,514 middle-aged adults enrolled in the multicenter Atherosclerosis Risk in Communities (ARIC) study. The study was initiated by NIH's National Heart, Lung and Blood Institute (NHLBI) to investigate the factors that contribute to atherosclerosis (the buildup of cholesterol and fat in the walls of arteries) and the incidence of cardiovascular diseases.

ARIC assessed dietary intake, both at the beginning of the study and 6 years later, by using a 66-item food frequency questionnaire. By 9 years later, nearly 40% of the study's participants had developed metabolic syndrome. The new analysis of ARIC data appeared in the February 19, 2008, issue of *Circulation*. The study found that a Western dietary pattern—characterized by high intakes of refined grains, high fructose corn syrups, processed meat, fried foods and red meat—was associated with a greater risk of developing metabolic syndrome. Upon closer analysis, the researchers found that those who ate the most meat were more likely to develop metabolic syndrome. In particular, hamburgers, hot dogs and processed meats were each associated with higher rates of metabolic syndrome. Fried foods were also associated with an increased risk.

How it all breaks down.....or doesn't

Increases in sugar or refined carbohydrate consumption increase insulin and insulin resistance, which leads to the accumulation of fat in the hepatocytes. Increased fat inside the hepatocytes produced from sugar, refined flour products, and

high fructose corn syrup increases oxidative stress that further damage the mitochondria. Damaged mitochondria can't effectively burn fat or calories, which leads to a slower metabolism and more weight gain.

Strikingly, in this study, diet soda was strongly associated with an increased risk for metabolic syndrome. Other recent studies have found links between diet soda and metabolic syndrome as well as weight gain. Aspartame, used in soft drinks (although stevia will soon replace aspartame in both Pepsi and Coca Cola) is also a well researched neurotoxin and carcinogen.

The Environmental Connection

Environmental toxins can interfere with metabolism, overload the liver, promote insulin resistance, alter sleep and wake cycles, activate the stress response and cortisol levels, interfere with thyroid and hormonal function, increase inflammation, damage mitochondria, and lead to obesity.

Toxins can also alter thyroid hormone metabolism and receptor function leading to lowered metabolic rate. Toxins can influence weight through increases in inflammation. Signals triggered by inflammation induce leptin resistance. Toxins alter mitochondria by damaging enzymes involved in fatty acid oxidation and thermogenesis. Toxic body burden also has effects on the liver's ability to regulate fat and glucose metabolism.

While research linking environmental toxins and impaired detoxification to obesity remains in its infancy, these factors can no longer be overlooked. Detoxification is a central component in long-term effective weight management. Detoxification programs must begin slowly and with supervision to not release toxins too quickly, and



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to maximize the body's detoxification pathways.

The Drug Connection

According to the literature, many medications have also been shown to promote weight gain including tranquilizers, sedatives, and antidepressant drugs. It is clear that medications can affect our weight and may play a role in obesity for some people.

Many people reach a plateau during weight loss. After the loss of a few pounds, it is often difficult to shed more weight. What is it that impedes weight loss and interferes with metabolism? Some researchers believe that when fat is metabolized and the pollutants are released from the fat tissue where they are stored, and these circulating toxins cause a lowering of the metabolic rate. Although losing weight to reduce the risk of cardiovascular and degenerative diseases is very desirable, it could be creating an additional toxic body burden. While there is still much to learn about this connection, it must be considered in the evaluation and treatment of obesity.

The Stress Connection

Over 60 years ago, Hans Selye recognized the paradox that the physiologic systems activated by stress can not only protect and restore but also damage the body.

Cortisol has been termed "the stress hormone" because it is secreted in higher levels during the body's 'fight or flight' response to stress, and is responsible for several stress-related changes in the body. Cortisol, an important hormone in the body secreted by the adrenal glands, is also involved in the following functions:

- Proper glucose metabolism
- Regulation of blood pressure
- Insulin release for blood sugar maintenance
- Immune function
- Inflammatory response

Higher and more prolonged levels of cortisol in the bloodstream impair many body processes including insulin and blood sugar regulation.

To keep cortisol levels healthy and under control, the body's relaxation response should be activated after the fight or flight response occurs. Learning various stress management techniques and making lifestyle changes in order to keep the body from reacting to stress in the first place is essential to well being.

Cortisol secretion varies among individuals and people are biologically 'wired' to react differently to stress and one person may secrete higher levels of cortisol than another in the same situation. Studies have also shown that people who secrete higher levels of cortisol in response to stress also tend to eat more food, and consume food that is higher in carbohydrates than people who secrete less cortisol.

Sample Research Study: Mediterranean Diet May Reduce Risk of Metabolic Syndrome

METABOLIC SYNDROME, CARDIOVASCULAR DISEASE - *Mediterranean Diet, Nuts, Diet, Low-Fat Diet*

"Effect of a Mediterranean Diet Supplemented With Nuts on Metabolic Syndrome Status: One-Year Results of the PREDIMED Randomized Trial," Salas-Salvado J, Fernandez-Ballart J, et al, Arch Intern Med, 2008; 168(22): 2449-2458. (Address: Human Nutrition Unit, Faculty



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of Medicine, University of Rovira i Virgili, 43201 Reus, Spain.

Summary

In a study involving 1,224 older subjects at high-risk of cardiovascular disease, from a multi-center, 3-arm, randomized clinical trial, adherence to a Mediterranean diet plus 30 g/d of mixed nuts was found to reduce the prevalence of the metabolic syndrome by 13.7%. Subjects were randomized to one of three groups: 1) received advice on the Mediterranean diet + were given olive oil (1 liter/week); 2) received advice on the Mediterranean diet + were given mixed nuts (30 g/d); 3) received advice on a low-fat diet - each for a period of 1 year. At baseline, 61% of subjects met criteria for the Metabolic syndrome. After the 1-year intervention, the prevalence of the Metabolic syndrome was reduced by 13.7% in the Med diet + nuts group, by 6.7% in the Med diet + olive oil group, and by only 2% in the control group. The odds ratio for reversion of the Metabolic syndrome was 1.7 for subjects in the Med diet + nuts group and 1.3 for subjects in the Med diet + olive oil. These results suggest that adhering to a Mediterranean diet supplemented by nuts may “be a useful tool in the management of the MetS.”

Research Articles

Chronic stress, combined with a high-fat/high-sugar diet, shifts sympathetic signaling toward neuropeptide Y and leads to obesity and the metabolic syndrome. Kuo LE, Czarnecka M, Kitlinska JB, Tilan JU, Kvetnanský R, Zukowska Z. *Ann N Y Acad Sci.* 2008 Dec;1148:232-7.

Dietary determinants of subclinical inflammation, dyslipidemia and components of the metabolic syndrome in overweight children: a review
Zimmermann MB, Aeberli I. *Int J Obes (Lond).* 2008 Dec;32 Suppl 6:S11-8.

Daily exercise fluctuations and dietary patterns during training predict visceral fat regain in obese women. Koga R, Tanaka M, Tsuda H, Imai K, Abe S, Masuda T, Iwamoto M, Nakazono E, Kamohara T, Sakata T. *Am J Med Sci.* 2008 Dec;336(6):450-7.

Dairy product consumption and the metabolic syndrome.
van Meijl LE, Vrolix R, Mensink RP. *Nutr Res Rev.* 2008 Dec;21(2):148-57.

Effect of a Mediterranean diet supplemented with nuts on metabolic syndrome status: one-year results of the PREDIMED randomized trial.
Salas-Salvadó J, Fernández-Ballart J, Ros E, Martínez-González MA, Fitó M, Estruch R, Corella D, Fiol M, Gómez-Gracia E, Arós F, Flores G, Lapetra J, Lamuela-Raventós R, Ruiz-Gutiérrez V, Bulló M, Basora J, Covas MI; PREDIMED Study Investigators. *Arch Intern Med.* 2008 Dec 8;168(22):2449-58.

Metabolic syndrome: prevalence among American Indian and Alaska native people living in the southwestern United States and in Alaska.
Schumacher C, Ferucci ED, Lanier AP, Slattery ML, Schraer CD, Raymer TW, Dillard D, Murtaugh MA, Tom-Orme L. *Metab Syndr Relat Disord.* 2008 Winter;6(4):267-73

Saturated fatty acid-mediated inflammation and insulin resistance in adipose tissue: mechanisms of action and implications.
Kennedy A, Martinez K, Chuang CC, LaPoint K, McIntosh M. *J Nutr.* 2009 Jan;139(1):1-4. Epub 2008 Dec 3.

Obesity and the metabolic syndrome in developing countries.
Misra A, Khurana L. *J Clin Endocrinol Metab.* 2008 Nov;93(11 Suppl 1):S9-30.

Dietary determinants of subclinical inflammation, dyslipidemia and components of the metabolic syndrome in overweight children: a review.
Zimmermann MB, Aeberli I. *Int J Obes (Lond).* 2008 Dec;32 Suppl 6:S11-8.

Carbohydrate Restriction has a More Favorable Impact on the Metabolic Syndrome than a Low Fat Diet.
Volek JS, Phinney SD, Forsythe CE, Quann EE, Wood RJ, Puglisi MJ, Kraemer WJ, Bibus DM, Fernandez ML, Feinman RD. *Lipids.* 2008 Dec 12. [Epub ahead of print]