Understanding Metabolic Syndrome

A Conversation with Dr. Peter Jones

Peter H. Jones, MD, FACP

Dr. Jones, an Associate Professor of Medicine in the Section of Atherosclerosis and Lipid Research at Baylor College of Medicine in Houston, Texas, is also Medical Director for The Methodist Weight Management Center in Houston. He is the lead study physician at Baylor for Look AHEAD, a multicenter, randomized, clinical trial funded by the National Institutes of Health that is studying lifestyle interventions to achieve and maintain weight loss, with a focus on type 2 diabetes. From 1989 to 1998, Dr. Jones was a member of the steering committee for the Air Force Coronary Atherosclerosis Prevention Study. He is a board member and former president (2005-2006) of the National Lipid Association (NLA). Dr. Jones is the author of numerous journal articles, book chapters, reviews and abstracts.

Reducing the risk for cardiovascular disease and diabetes is important to the long-term health of a growing number of people in developed countries around the world. Although there are well-known risk factors for these diseases, doctors have also noted a clustering of several of these factors, higher than would normally be expected, in some individuals. This clustering, once referred to as syndrome X, is now known as metabolic syndrome, which better reflects its link to insulin resistance and other abnormalities in metabolism.

Epidemiological data have recently linked specific foods and beverages, including regular and diet soft drinks, to metabolic syndrome. To better understand metabolic syndrome and the role of dietary and other lifestyle choices, the Beverage Institute for Health & Wellness (BIHW) of the Coca-Cola Company talked with noted cardiologist Peter H. Jones, MD, FACP.

BIHW: ***What is metabolic syndrome?***

Dr. Jones: Metabolic syndrome is a clustering of several factors that puts an individual at increased risk for cardiovascular disease, type 2 diabetes and, possibly, premature death. These factors are: high body mass index (BMI) coupled with a large waist circumference; elevated blood pressure; dyslipidemia, including elevated triglycerides and decreased high-density lipoprotein cholesterol or HDL; and elevated fasting glucose, usually indicating underlying insulin resistance.[1] When at least three of these five risk factors are present, a person is said to have metabolic syndrome.

ATP/NCEP Criteria for Metabolic Syndrome

Presence of at least three of the following:

Waist circumference	≥ 40 inches (≥102 cm) in men; ≥ 35 inches (≥88 cm) in women
Triglycerides	≥ 150 mg/dL (≥ 1.7 mmol/L)
HDL cholesterol	≤ 40 mg/dL (≤ 1.0 mmol/L) in men; ≤ 50 mg/dL (≤ 1.3 mmol/L) in women
Blood pressure	≥ 130/85 mm Hg
Fasting glucose	≥ 110 mg/dL (≥ 6.1 mmol/L)

Source: 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) final report. *Circulation* 2002;106:3143-3421.

BIHW: ***Why is metabolic syndrome such a concern?***

Dr. Jones: People with metabolic syndrome have twice the risk for cardiovascular disease and a four times greater risk for developing diabetes.[2] We don't know for certain whether this risk is increased above and beyond the simple additive risk of the three or more individual risk factors. However, we do know that it is very important to identify people with the clustering of risk factors that make up metabolic syndrome as early as possible, because this gives us the greatest opportunity to help them make changes to their lifestyle to lower their risk of adverse events such as diabetes, stroke or heart attack.[2]

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Other health problems associated with metabolic syndrome include sleep apnea, polycystic ovary disease, fatty liver disease, hyperuricemia, and a pro-inflammatory state characterized by elevated C-reactive protein.[3] The latter is currently of great scientific and clinical interest because of its link to obesity, heart disease, diabetes and possibly other systemic diseases like cancer, and the potential benefit of phytosterols, phytonutrients and other nutrients.

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BIHW: ***Who is most likely to develop metabolic syndrome?***

Dr. Jones: Metabolic syndrome occurs most commonly in overweight people, especially those classified as obese. Based on the most recent National Health and Nutrition Examination Survey (NHANES) data, metabolic syndrome rates are about 60 percent in men with a BMI over 30 and 22 percent in men with a BMI of 25 to 30. A similar pattern is seen among women, with about 50 percent of women with a BMI over 30 having metabolic syndrome.[4]

Although excessive body weight is clearly an important factor, genetics, ethnicity and age also play a role. For example, the age-adjusted rate among Mexican Americans is 32 percent, compared to 24 percent for whites and 22 percent for African Americans. With the possible exception of African Americans, where the prevalence is 57 percent higher in women than in men, gender appears to be less of a factor.[5] And, getting older definitely matters. The prevalence among adults ages 60 to 69 is nearly 44 percent, which is nearly twice the age-adjusted prevalence for the overall population.[5]

BIHW: ***Can people who are not obese have metabolic syndrome?***

Dr. Jones: Yes. With the NHANES data, we find the prevalence increases in a graded fashion with BMI, from about 1 to 3 percent at BMIs between 18.5 and 21, to about 9.6 to 22 percent at BMIs of 25 to 26.[4] These people are considered metabolically obese because, although they do not have the high BMI typical in metabolic syndrome, they do have several of the other characteristic risk factors, such as insulin resistance, high blood pressure, elevated cholesterol and a high visceral (belly) fat level. Genetics could certainly play a role here, but most of these people have a high body fat percentage despite a relatively normal BMI. They also tend to be physically inactive.

BIHW: ***What is the underlying pathophysiology of metabolic syndrome?***

Dr. Jones: The prevailing hypothesis is that a combination of overnutrition and lack of physical activity leads to obesity—and in genetically predisposed individuals, to the prominent intra-abdominal or visceral (belly) fat accumulation and insulin resistance that characterizes metabolic syndrome. However, it is not known whether the insulin resistance is primary or secondary to weight gain.

BIHW: ***Can children develop metabolic syndrome?***

Dr. Jones: Metabolic syndrome is predominantly a condition of adults, but the increasing rates of childhood obesity are making it more common in young people. Among overweight/obese adolescents, the prevalence is over 30 percent.[6] Similar findings from Belgium found metabolic syndrome in 39 percent of obese adolescents but in only 2.8 percent of overweight and less than 1 percent of normal-weight adolescents.[7] Changing adolescents' habits that make them prone to obesity may prevent or delay health problems in adulthood.

BIHW: ***How should people manage metabolic syndrome?***

Dr. Jones: People should focus on weight loss and increased exercise because these are modifiable lifestyle risk factors. We know that excess body weight, which is usually a result of consuming more calories than are expended, will affect all of the components of metabolic syndrome. Of course, individuals cannot change their genetic makeup, ethnicity, gender or age, so targeting these factors is not an option.

The primary concern is excess body fat and weight gain. Epidemiological data from the Nurses' Health Study suggest that even moderately small increases in body weight between the ages of 18 and 38 can significantly increase morbidity and mortality. Specifically, that study found that for every 11 pounds of weight gained over a 20-year period, the incidence of diabetes increased 84 percent among Asians, 44 percent among Hispanics, 37 percent among Caucasians, and 38 percent among African Americans.[8]

BIHW: ***How important is exercise?***

Dr. Jones: The evidence supporting the importance of exercise is strong. Both short-term and continued exercise improves insulin sensitivity. In the Heritage Family Study, 30 percent of participants who had metabolic syndrome at baseline no longer did so after engaging in an aerobic exercise program.[9] O'Leary found that a 12-week aerobic exercise program reversed insulin resistance in a group of obese elderly men and women,[10] and a Finnish study found both strength training and aerobic exercise reduced the risk of metabolic syndrome.[11]

Epidemiological results from the Nurses' Health Study showed that high BMI and low levels of habitual exercise were associated with the greatest risks of death from cardiovascular disease.[12] In a study by Redman and colleagues, exercise plus caloric restriction had a greater impact on fitness and metabolic indices than more severe caloric restriction alone.[13]

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BIHW: ***Is there a special diet for managing metabolic syndrome?***

Dr. Jones: Not necessarily, although I believe the Mediterranean diet is the best approach because it focuses on consuming lots of fruits and vegetables, whole grains and mono- and polyunsaturated fats. It has also received some recent support from a cross-sectional study conducted in Greece that looked specifically at the question of food choices and metabolic syndrome. That study found that a dietary pattern that included fruits, vegetables, fish, legumes and cereals—essentially, the Mediterranean diet—was associated with a diminished likelihood of metabolic syndrome and all of its components except elevated glucose levels. Dietary components most associated with metabolic syndrome were potatoes, meat and alcohol.[14]

Regardless of the dietary approach, the goal is to lose weight through decreased calorie intake and increased physical activity. Generally, weight loss of about 10 percent of baseline body weight is the goal. Now, there is some debate in the literature regarding the most appropriate macronutrient distribution to achieve this goal, with the focus of the debate centering on both the amount and type of carbohydrates. Lower carbohydrate diets appear to have a more positive effect on raising HDL and lowering triglycerides, while a low-fat diet appears more effective in reducing LDL.[15,16]

BIHW: ***How important is the glycemic index or glycemic load?***

Dr. Jones: The current consensus is that low glycemic index and low glycemic load diets provide no advantage over calorie reduction for weight control.[17] However, there is some emerging science suggesting that balancing the glycemic load of the diet may influence some parameters associated with metabolic syndrome in susceptible individuals. I think there may be some benefit to balancing the glycemic load at meals, but it is not yet clear what this means or how to do it.

BIHW: ***Does high fructose corn syrup (HFCS), which is used in the U.S. to sweeten many foods and beverages, including soft drinks, uniquely contribute to metabolic syndrome?***

Dr. Jones: There is no clinical research to support that suggestion. High-fructose corn syrup has almost the same chemical composition as table sugar. In normal-weight individuals who generally have good dietary habits, reasonable use of HFCS, or table sugar for that matter, is not a problem. Even diabetics are allowed some carbohydrates or sugar in their diet. The issue is how much and how often, which goes back to weight control, portion control and an overall healthy lifestyle.

BIHW: ***Two studies recently linked soft drinks to metabolic syndrome. Should people be concerned that soft drinks cause metabolic syndrome?***

Dr. Jones: No. There is no clinical proof that any one food or beverage by itself is responsible for someone developing metabolic syndrome or becoming obese.

It's important to understand what these studies can and cannot tell us. The two studies linking soft drinks to metabolic syndrome were observational or epidemiological,[18,19] meaning they looked for trends between people's behaviors and the diseases they developed. These types of studies are useful in identifying associations that need to be tested through clinical trials, but their data do not prove cause and effect. Many factors, alone or in combination, could actually be responsible for the associations noted in observational studies.

BIHW: ***What were the other factors that could have contributed to the observed association between soft drinks and metabolic syndrome in these studies?***

Dr. Jones: The Nurses' Health Study found an association between consumption of more than one sugar-sweetened soda a day and an increased risk of diabetes. But the women who drank more sweetened soft drinks over the four-year period also increased their caloric intake from other foods, and they were more likely to smoke and were less physically active than those who didn't have soft drinks.[18] Although the authors tried, it's really impossible to quantitate the separate effects of these lifestyle choices on the risk of developing diabetes.

The second study on soft drink ingestion used data from the Framingham population and is also observational, so confounding lifestyle factors could again be responsible for the findings. For example, the group that drank the most soft drinks in that study also had significantly higher average daily intakes of saturated and trans fats than the group that rarely had soft drinks, and those who drank two or more soft drinks a day were much more likely to smoke. Furthermore, when the people who had diabetes at baseline were excluded from the analysis, the increased risk of developing metabolic syndrome among daily soft drink consumers fell from 44 percent to 16 percent.[19]

Now, this doesn't mean people can ignore the calories in soft drinks. All calories count. People need to manage their calories so they get the nutrients they need to be healthy and still have some room for the occasional pleasurable food or beverage.

BHIW: ***The retrospective study using the Framingham study population data also linked diet soft drinks and metabolic syndrome. Can you explain this?***

Dr. Jones: There is no plausible explanation for why a diet soft drink, which contains no calories, could contribute to metabolic syndrome in and of itself. One possibility could be that reduced-calorie beverage drinkers have inconsistent dietary behaviors. For example, some people may eat a high-calorie meal or snack accompanied by a diet

drink, which helps them rationalize their other choices. The problem is that the overall intake of calories remains high despite the choice of a diet soft drink.

People can successfully lose weight on weight loss diets that include diet soft drinks. Diet beverages can make it easier for some people to control calories. But they can't cause weight loss—or gain. They are a reasonable choice in moderation for many people, and they certainly are safe.

BIHW: ***What can people do to avoid developing metabolic syndrome?***

Dr Jones: Since there is a genetic component to metabolic syndrome, it's important to know your family history. Also, look in the mirror. If you have a thick trunk and tend to put on weight around your middle, that is, if you are apple-shaped, you are more likely to develop metabolic syndrome than a pear-shaped person who would gain weight in their lower body.

Of course, the best prevention for most people is weight control through diet and exercise.[20] People who are overweight need to lose weight. Those who are not overweight also need to make sensible food choices and engage in regular physical activity in order to maintain a healthy weight and get the metabolic benefits associated with aerobic and strength-training exercise.

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As for diet, the basics of a healthy diet include an abundance of fiber-containing foods such as fruits and vegetables, as well as whole grains. A healthy diet also includes lean protein, such as fish. Nuts, another protein source, have a lot of calories; but some nuts, such as walnuts and almonds, also lower cholesterol.[21] Although dietary fat should be reduced to lose weight, a heart-healthy diet calls for more monounsaturated fat and omega-3 fatty acids than the typical American diet.[22] The research also suggests that consuming foods with beta glucan, such as oat products and barley, could be beneficial.[23]

Regular physical activity is also essential. By that I mean at least 150 minutes a week, or 30 minutes 5 times a week, of moderately vigorous activity.

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