

High Triglycerides

Background:

- “Triglyceride is a chemical name for fat, indicating structure; attachment of three fatty acids attached to a glycerol base. Thus lipids are glycerides composed of glycerol and fatty acids.” (Williams, 73) “When glycerol is combined with one fatty acid, it is called a monoglyceride; with two fatty acids, a diglyceride; and with three fatty acids, a triglyceride. Whether in food or in the body, fatty acids combine with glycerol to form glycerides.” (Williams, 73)
- Most natural lipids, from either animal or plant sources, are triglycerides. These lipids, the triglycerides, occur in body cells as oily droplets. They circulate in the water-based blood serum encased in a covering of water-soluble protein. These lipid-protein complexes are called lipoproteins. (Williams, 73)
- Food lipids, as well as body lipids, are composed of saturated and unsaturated fatty acids. “If the food lipid is made up mainly of saturated fatty acids, it is called a saturated fat.” (Williams, 73) Food from animal sources- such as meat, milk, and eggs- contain saturated fats. (Williams, 73) Conversely, foods from plant sources such as vegetable oils are usually unsaturated. (Williams, 73)
- Saturated triglycerides are “solid at room temperature” (Williams, 73). “Unsaturated triglycerides are usually liquid at room temperature.” (Kozier, 1173) Exceptions to the usual pattern “are tropical oils as coconut oil and palm oil, which are saturated lipids.” (Williams, 73) These saturated plant fats are used extensively in commercial products such as nondairy creamers because they are usually cheaper oils. (Williams, 73)

- “Triglycerides in plasma are derived from fats eaten in foods or made in the body from other energy sources like carbohydrates. Calories ingested in a meal and not used immediately by tissues are converted to triglycerides and transported to fat cells to be stored. Hormones regulate the release of triglycerides from fat tissues so they meet the body’s needs for energy between meals.”

www.americanheart.org

- “In normal amounts, triglycerides are important to good health”
<http://www.webmd.com/cholesterol-management/tc/high-triglycerides-overview>
Normal level is <150 mg/dL. They provide cells with energy needed to function.
- When triglyceride level is high (>150 mg/dL), it is defined as hypertriglyceridemia (National Cholesterol Education Program Adult Treatment Panel).
- “Hypertriglyceridemia may be primary or secondary in nature. Primary hypertriglyceridemia is the result of various genetic defects leading to disordered triglyceride metabolism. Secondary causes are acquired causes, such as, high fat diet, obesity, diabetes, hypothyroidism, and certain medications.” (Pejic, 2006)
- “Hypertriglyceridemia is a risk factor for pancreatitis and it accounts for 1 to 4% of cases of acute pancreatitis.” (Pejic, 2006) “More importantly however, hypertriglyceridemia is typically not an isolated abnormality. It is frequently associated with other lipid abnormalities and the metabolic syndrome (abdominal obesity, insulin resistance, low high-density lipoprotein (HDL), high triglyceride, and hypertension), which are linked to coronary artery disease.” (Pejic, 2006)

- “Considering the current obesity epidemic (32% of US adults 20 years of age and older are obese), there will be a significant rise in the incidence of the metabolic syndrome.” (Pejic, 2006) Thus, there will be more people who are needed to be evaluated and managed with this common disorder.
- “The majority of the time, hypertriglyceridemia is discovered after performing a routine lipid profile.” (Pejic, 2006) Usually, high triglycerides do not cause any symptoms. “However, severe hypertriglyceridemia (>500 mg/dL) may cause pancreatitis, eruptive xanthomas, or lipemia retinalis.” (Pejic, 2006) “The finding of hypertriglyceridemia should prompt an investigation for other components of the metabolic syndrome.” (Pejic, 2006)
- “A major reason to treat hypertriglyceridemia is to prevent pancreatitis. The triglyceride level should be reduced to <500 mg/dL to prevent this serious disease. The relationship between triglycerides and cardiovascular disease is less clear. There have been multiple conflicting studies regarding the role of triglycerides and development of CHD. Hypertriglyceridemia is clearly associated with CHD in univariate analysis. However, many multivariate studies have shown that its risk is markedly attenuated after adjustment for other strong CHD risk factors, namely, low HDL and increased small, dense LDL particles. These findings have led some researchers to believe that hyperglyceridemia serves more as a proxy for abnormal cholesterol level.... Most interventions aimed at lowering the triglyceride level also raise the HDL level, which is well known for reducing coronary events. ...Treating isolated hypertriglyceridemia does not prevent coronary events.” (Pejic, 2006)

- “There have been many other studies that have shown hypertriglyceridemia to be an independent risk factor for CHD even after adjustment for HDL and LDL. Furthermore, the NCEP considers hypertriglyceridemia to be an independent risk factor for CHD and calls for medical treatment in cases where therapeutic lifestyle changes are not adequate to reduce the triglycerides to appropriate levels.” (Pejic, 2006)
- “The treatment of hypertriglyceridemia begins with therapeutic lifestyle changes. Specifically, a low fat, carbohydrate-controlled diet should be adopted. Saturated fat should not make up more than 7% of total daily calories, carbohydrates should be restricted to 50% to 60% of daily calories, and simple sugars like sucrose should be avoided. Patients may also consider increasing intake of oily fish (salmon, mackerel, herring) to at least 2 servings per week. Alcohol should be greatly reduced or sopped altogether, along with smoking cessation if indicated. Discontinuation of any offending medications should be considered as well. Titration upwards to a goal of at least 30 minutes of aerobic exercise 5 days a week is greatly beneficial. If present, diabetes and hypothyroidism should be treated accordingly. These measures often have a dramatic effect on triglyceride levels and can lower it hundreds of points. If TLC and control of secondary medical conditions are not adequate to lower the triglyceride level to < 200mg/dL, then medical therapy is warranted.” (Pejic, 2006)

Statement of the Problem:

Because obesity is associated with high triglycerides, and it is one of the causes of hypertriglyceridemia, “Healthy People 2010” in section 19 “Nutrition and Overweight” proposed:

- “Increase the proportion of persons aged 2 years and older who consume at least 2 daily servings of fruit to 75%.
- Increase the proportion of persons aged 2 years and older who consume at least 3 daily servings of vegetables to 50%.
- Increase the proportion of persons aged 2 years and older who consume at least 6 daily servings of grain products, with at least 3 being whole grains.
- Increase the proportion of persons aged 2 years and older who consume less than 10% of calories from saturated fat to 75%.
- Increase the proportion of persons aged 2 years and older who consume no more than 30% of calories from total fat to 75%.” (Healthy People 2010)

Because regular physical activity is very important in prevention and treatment of hypertriglyceridemia, “Healthy People 2010” in Section 22 “Physical Activity and Fitness” proposed:

- “Reduce the proportion of adults who engage in no leisure-time physical activity to 20%.
- Increase the proportion of adults who engage regularly, preferably daily, in moderate physical activity for at least 30 min per day to 30%.
- Increase the proportion of adults who engage in vigorous physical activity that promotes the development and maintenance of cardiorespiratory fitness 3 or more days per week for 20 or more min per occasion to 30%.

- Increase the proportion of adults who perform physical activities that enhance and maintain muscular strength and endurance to 30%.” (Healthy People 2010)

Because high triglycerides are often associated with other lipid abnormalities, metabolic syndrome, and abnormal cholesterol levels, it is important that

“Healthy People 2010” in Section 12 “Heart Disease and Stroke” proposed:

- “Reduce the mean total blood cholesterol levels among adults. Target: 199 mg/dL (mean). (<http://www.healthypeople.gov>)
- “Reduce the proportion of adults with high total blood cholesterol levels to 17%.
- Increase the proportion of adults who have had their blood cholesterol checked within the preceding 5 years.

(Developmental) Increase the proportion of persons with coronary heart disease who have their LDL-cholesterol level treated to a goal of less than or equal to 100 mg/dL.”

(Healthy People 2010)

Epidemiologic Picture of the Problem:

“The Third National Health and Nutrition Examination Survey (NHANES) found that the prevalence of hypertriglyceridemia in US adults age 20 years and older was approximately 35% in men and 25% in women. Triglyceride levels in African American men and women were 21% and 14%, respectively; 40% and 35% in Mexican American men and women, respectively; and in 37% and 25% in white American men and women, respectively. Prevalence of severe hypertriglyceridemia, defined as triglycerides greater than 2000 mg/dL, is estimated to be to be 1.8 cases per 10,000 white adults, with a higher prevalence in patients with diabetes or alcoholism. The most severe form of

hypertriglyceridemia, LPL deficiency, occurs in approximately 1 case per 1 million.”

(Citkowitz, 2008)

Triglycerides are lower in African Americans than in whites. (Citkowitz, 2008)

- “In the Prospective Cardiovascular Munster study (PROCAM), a large observational study, mild hypertriglyceridemia (triglycerides >200 mg/dL) was more prevalent in men (18.6%) than in women (4.2%).” (Citkowitz, 2008)
- “Triglycerides increase gradually in men until about age 50 years and then decline slightly. In women, they continue to increase with age.” (Citkowitz, 2008)
- “Mild hypertriglyceridemia (triglycerides >150 mg/dL) is slightly more prevalent in men beginning at age 30 years and women starting at age 60 years.”
(Citkowitz, 2008)

Solutions to the Problem:

There are several programs on the Web that propose best ways to lower triglycerides.

MayoClinic.com suggests:

- **“Lose excess pounds.** If you're overweight, losing the excess pounds can help lower your triglycerides. Motivate yourself by focusing on the benefits of losing weight, such as more energy and improved health.
- **Consume fewer calories.** Remember that excess calories are converted to triglycerides and stored as fat. Reducing your calories will reduce triglycerides.

- **Avoid sugary foods.** Simple carbohydrates, such as sugar, can cause a sudden increase in insulin production. This can increase triglycerides.
- **Limit your cholesterol intake.** Aim for no more than 300 milligrams of cholesterol a day — or less than 200 milligrams if you have heart disease. Avoid the most concentrated sources of cholesterol, including organ meats, egg yolks and whole milk products.
- **Choose healthier fats.** Avoid saturated fat and instead choose healthier monounsaturated fat, found in olive, peanut and canola oils. In addition, eat fish high in omega-3 fatty acids — such as mackerel and salmon — instead of red meat.
- **Avoid alcohol.** Alcohol is high in calories and sugar and has a particularly potent effect on triglycerides. Even small amounts of alcohol can promote high triglyceride levels.
- **Exercise regularly.** Aim for at least 30 minutes of physical activity on most or all days of the week. Regular exercise can boost "good" cholesterol while lowering "bad" cholesterol and triglycerides. Take a brisk daily walk, swim laps or join an exercise group.” (<http://www.mayoclinic.com>)

WebMD recommends:

- “If you are overweight, losing weight may be the best way to lower triglycerides. You may be able to lower your triglycerides by eating fewer calories and increasing your activity. Other diet changes that might help include limiting fats and sugars, and limiting or not drinking alcohol.

- If increasing your activity and watching calories do not work, you may also need medicine. Medicines called statins are commonly used to lower LDL ("bad") cholesterol. But drugs called nicotinic acid (or niacin) and fibrates seem to work better for lowering triglycerides. If you have high triglycerides, high LDL cholesterol, and low HDL ("good") cholesterol, you may take more than one type of medicine that lowers cholesterol.” (<http://www.webmd.com/cholesterol-management/tc/high-triglycerides-overview>)

Americanheart.org recommends:

- “If you're overweight, cut down on calories to reach your ideal body weight. This includes all sources of calories, from fats, proteins, carbohydrates and alcohol.
 - Reduce the saturated fat, trans fat and cholesterol content of your diet.
 - Reduce your intake of alcohol considerably. Even small amounts of alcohol can lead to large changes in plasma triglyceride levels.
 - Be physically active for at least 30 minutes on most or all days each week.
 - People with high triglycerides may need to substitute monounsaturated and polyunsaturated fats —such as those found in canola oil, olive oil or liquid margarine — for saturated fats. Substituting carbohydrates for fats may raise triglyceride levels and may decrease HDL ("good") cholesterol in some people.
 - Substitute fish high in omega-3 fatty acids instead of meats high in saturated fat like hamburger. Fatty fish like mackerel, lake trout, herring, sardines, albacore tuna and salmon are high in omega-3 fatty acids.”
- (<http://www.americanheart.org/presenter.jhtml?identifier=4778>)

Internet Resources:

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<http://www.labtestonline.org/understanding/analytes/triglycerides/faq.html>

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High Triglycerides (Class Handout)

- **What are triglycerides?**
 - **Triglycerides** are the chemical form in which most fats exist in food as well as in the body. They are also present in blood plasma. When you eat, your body converts any calories it doesn't need to use right away into triglycerides. Later, hormones release triglycerides for energy between meals. Thus, triglycerides provide your body with energy.
- **How is an excess of triglycerides harmful?**
 - Excess triglycerides in plasma is called **hypertriglyceridemia**, and defined as a triglyceride level >150mg/dL. It may be primary or secondary in nature. Primary hypertriglyceridemia is the result of various genetic defects leading to disordered triglyceride metabolism. Secondary causes are acquired causes, such as a diet high in fat and simple carbohydrates, obesity, diabetes, hypothyroidism, and certain medications.
 - Hypertriglyceridemia is a risk factor for pancreatitis, and it accounts for 1 to 4% of causes of acute pancreatitis.
 - More importantly however, high triglycerides are typically not an isolated abnormality. It is frequently associated with other lipid abnormalities and the metabolic syndrome (abnormal obesity, insulin resistance, low high-density lipoprotein (HDL), high triglyceride, and hypertension), which are linked to coronary artery disease.

How to decrease triglyceride level?

- A major reason to treat hypertriglyceridemia is to prevent pancreatitis and decrease risk for CHD.
- Changes in lifestyle habits are the main therapy for high triglycerides. These are the changes you need to make:
 - If you're overweight, cut down on calories to reach your ideal body weight.
 - Reduce the saturated fat, trans fat and cholesterol content of your diet.
 - Reduce your intake of alcohol considerably. Even small amounts of alcohol can lead to large changes in plasma triglyceride level.
 - Be physically active for at least 30 min on most or all days each week.
 - Substitute monounsaturated and polyunsaturated fats- such as those found in canola oil, olive oil or liquid margarine- for saturated fats.
 - Increase intake of oily fish (salmon, mackerel, herring) to at least 2 servings per week. Fatty fish are high in omega-3 fatty acids, which is good for your heart.
 - If present, diabetes and hypothyroidism should be treated accordingly.