5.8: Lipids and Disease

Skills to Develop

- Describe how saturated fat and cholesterol intake can impact health.

Because heart disease, cancer, and stroke are the three leading causes of death in the United States, it is critical to address dietary and lifestyle choices that will ultimately decrease risk factors for these diseases. According to the US Department of Health and Human Services (HHS), the following risk factors are controllable: high blood pressure, high cholesterol, cigarette smoking, diabetes, poor diet, physical inactivity, being overweight, and obesity. In light of that, we present the following informational tips to help you define, evaluate, and implement healthy dietary choices to last a lifetime. The amount and the type of fat that composes a person’s dietary profile will have a profound effect upon the way fat and cholesterol is metabolized in the body.

Watch Out for Saturated Fat and Cholesterol

In proper amounts, cholesterol is a compound used by the body to sustain many important body functions. In excess, cholesterol is harmful if it accumulates in the structures of the body’s vast network of blood vessels. High blood LDL and low blood HDL are major indicators of blood cholesterol risk. The largest influence on blood cholesterol levels rests in the mix of saturated fat and trans fat in the diet. According to the Harvard School of Public Health, for every extra 2 percent of calories from trans fat consumed per day—about the amount found in a midsize order of French fries at a fast-food establishment—the risk of coronary heart disease increases by 23 percent. Harvard School of Public Health. “Fats and Cholesterol: Out with the Bad, In with the Good.” Section 2.02. http://www.hsph.harvard.edu/nutritio...hat-should-you-eat/fats-full-story/. A buildup of cholesterol in the blood can lead to brittle blood vessels and a blockage of blood flow to the affected area.
How saturated is the fat in your diet? Is it really necessary to eat saturated fat when the body makes all the saturated fat that it needs? Saturated fats should fall into the “bad” category—the body does not demand this kind of fat and it is suggested to be a forerunner of cardiovascular disease. In the United States and other developed countries, populations acquire their saturated fat content mostly from meat, seafood, poultry (with skin consumed), and whole-milk dairy products (cheese, milk, and ice cream). Some plant foods are also high in saturated fats, including coconut oil, palm oil, and palm kernel oil.

This being said, there are a growing number of physicians and nutrition experts who disagree that Saturated Fat and Cholesterol are “bad” at all. Because this is not the opinion of the American Heart Association, it will not be discussed further here but if you wish to read about the controversy, please click here: https://blog.virtahealth.com/the-sad-saturated-fat/ and read an article by Jeff Volek, PhD, RD Stephen Phinney, MD, PhD of Virta Health.

Food Cholesterol’s Effect on Blood Cholesterol

Dietary cholesterol does have a small impact on overall blood cholesterol levels, but not as much as some people may think. The average American female consumes 237 milligrams of dietary cholesterol per day and for males the figure is slightly higher—about 358 milligrams. The USDA dietary guidelines suggest a daily limit intake of cholesterol not to exceed 300 milligrams for healthy people and 200 milligrams for those who may be suffering from high cholesterol. Most people display little response to normal dietary cholesterol intake as the body responds by halting its own synthesis of the substance in favor of using the cholesterol obtained through food. Genetic factors may also influence the way a person’s body modifies cholesterol.

A Prelude to Disease

If left unchecked, improper dietary fat consumption can lead down a path to severe health problems. An increased level of lipids, triacylglycerols, and cholesterol in the blood is called hyperlipidemia. Hyperlipidemia is inclusive of several conditions but more commonly refers to high cholesterol and triacylglycerol levels. When blood lipid levels are high, any number of adverse health problems may ensue. Consider the following:

- **Cardiovascular disease.** According to the AHA, cardiovascular disease encompasses a variety of problems, many of which are related to the process of atherosclerosis. Over time the arteries thicken and harden with plaque buildup, causing restricted or at times low or no blood flow to selected areas of the body.

- **Heart attack.** A heart attack happens when blood flow to a section of the heart is cut off due to a blood clot. Many have survived heart attacks and go on to return to their lives and enjoy many more years of life on this earth. However, dietary and lifestyle changes must be implemented to prevent further attacks.

- **Ischemic stroke.** The most common type of stroke in the United States, ischemic stroke, occurs when a blood vessel in the brain or leading to the brain becomes blocked, again usually from a blood clot. If part of the brain suffers lack of blood flow and/or oxygen for three minutes or longer, brain cells will start to die.

- **Congestive heart failure.** Sometimes referred to as heart failure, this condition indicates that the heart is not
pumping blood as well as it should. The heart is still working but it is not meeting the body's demand for blood and oxygen. If left unchecked, it can progress to further levels of malfunction.

- **Arrhythmia.** This is an abnormal rhythm of the heart. The heart may beat above one hundred beats per minute (known as tachycardia) or below sixty beats per minute (known as bradycardia), or the beats are not regular. The heart may not be able to pump enough volume of blood to meet the body’s needs.

- **Heart valve problems.** Stenosis is a condition wherein the heart valves become compromised in their ability to open wide enough to allow proper blood flow. When the heart valves do not close tightly and blood begins to leak between chambers, this is called regurgitation. When valves bulge or prolapse back into the upper chamber, this condition is called mitral valve prolapse.

- **Obesity.** Obesity is defined as the excessive accumulation of body fat. According to US Surgeon General Richard Carmona, obesity is the fastest growing cause of death in America. The HHS reports that the number of adolescents who are overweight has tripled since 1980 and the prevalence of the disease among younger children has doubled. US Department of Health and Human Services. “Childhood Obesity.” Accessed October 5, 2012. [http://aspe.hhs.gov/health/reports/child_obesity/](http://aspe.hhs.gov/health/reports/child_obesity/). Obesity has been linked to increased risks of developing diabetes and heart disease. To help combat this problem important dietary changes are necessary. Reducing the type and amount of carbohydrates and sugar consumed daily is critical. Limiting the intake of saturated fats and trans fats, increasing physical activity, and eating fewer calories are all equally important in this fight against obesity.

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**Figure \(\PageIndex{1}\):** A 4-ml sample of hyperlipidemic blood with lipids separated into the top fraction (Sample is in an EDTA collection tube.). This is a standard EDTA (cell count) tube, as may be used to obtain a full blood count or iron studies. The tube was set upright for four hours - it was not centrifuged. This sample was not analysed; however, a similar sample showed a serum triglyceride of over 130mmol/L (over 5000mg/dl), and an LDL over 40mmol/L (over 1540mg/dl). Image used with permission (public domain) from Carmen Crisp-Obenhaus.

https://med.libretexts.org/Bookshelves/Nutrition/Book%3A_An_Introduction_to_Nutrition_(Zimmerman)/05%3A_Lipids/5.08%3…

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What You Can Do

Remember that saturated fats are found in large amounts in foods of animal origin. They should be limited within the diet. Polyunsaturated fats are generally obtained from nonanimal sources. While they are beneficial for lowering bad cholesterol they also lower good cholesterol. They are better for you than saturated fats but are not to be consumed in excess. Monounsaturated fats are of plant origin and are found in most nuts, seeds, seed oils, olive oil, canola oil, and legumes. Monounsaturated fats are excellent because they not only lower bad cholesterol, but also they elevate the good cholesterol. Replace current dietary fats with an increased intake of monounsaturated fats.

Choose whole-grain and high-fiber foods. Reduced risk for cardiovascular disease has been associated with diets that are high in whole grains and fiber. Fiber also slows down cholesterol absorption. The AHA recommends that at least half of daily grain intake should originate from whole grains. The Adequate Intake value for fiber is 14 grams per 1,000 kilocalories. These amounts are based upon the amount of fiber that has been shown to reduce cardiovascular risk.

Do not be sedentary. Get more exercise on a regular basis. Increasing your energy expenditure by just twenty minutes of physical activity at least three times per week will improve your overall health. Physical exercise can help you manage or prevent high blood pressure and blood cholesterol levels. Regular activity raises HDL while at the same time decreases triacylglycerols and plaque buildup in the arteries. Calories are burned consistently, making it easier to lose and manage weight. Circulation will improve, the body will be better oxygenated, and the heart and blood vessels will function more efficiently.

Key Takeaways

- Food cholesterol does not affect blood cholesterol as much as some people think. The main causes of unfavorable blood cholesterol values come from an overconsumption of saturated fats and trans fats.
- An increased intake of lipids is associated with heart disease, obesity, cardiovascular disease, and other problems.
- Making dietary choices that limit the intake of saturated and trans fats to the recommended levels, replacing saturated and trans fats with monounsaturated and polyunsaturated fats, increasing physical activity, and cessation of smoking can reduce the risk of developing heart disease and other ailments.

Discussion Starters

1. Explain why saturated fats and trans fats contribute to unfavorable blood cholesterol levels.
2. Discuss some of the diseases that can result from an unhealthy lipid profile for an extended period of time.
3. List the types of fat that will help you achieve a healthy blood lipid profile. List the sources of these fats.
4. Evaluate your personal dietary and lifestyle habits. Identify key areas where you need to improve. Construct an overall plan of diet and lifestyle choices that you implement to help you reach healthy goals.