FDA U.S. FOOD & DRUG ADMINISTRATION

LifeSmarts
Learn it. Live it.

NUTRITION

A CLOSER LOOK AT FATS

The "A Closer Look at Fats" module provides students with a detailed understanding of the different types of fats in our diet and their impact on health. This module breaks down the complexities of saturated, unsaturated, and trans fats, explaining how each type affects the body and how to make healthier choices. A significant focus of this module is on the role of fats in heart health, making the information especially relevant for students interested in long-term wellness. Developed by educators and FDA experts, this module ties directly into LifeSmarts topics such as health, nutrition, and consumer awareness. With engaging videos, clear explanations, and practical tips for reading food labels, teachers will find this module an invaluable tool for helping students navigate the often confusing world of dietary fats and prepare for LifeSmarts competitions.

DISCUSSION QUESTIONS

- Explain the differences between saturated and unsaturated fats in terms of their chemical structure and health effects. Why is it recommended to limit the intake of saturated fats?
- Discuss the role of trans fats in the diet and the reasons for their removal from many processed foods. How do trans fats compare to other types of fats in terms of health impact?

CHALLENGE QUESTION

- Research a public health initiative that has successfully reduced the consumption of trans fats in a population. What strategies were used, and what were the outcomes of the initiative?

VOCABULARY

- Lipids
- Saturated Fat
- Unsaturated Fat
- Monounsaturated Fatty Acids (MUFAs)
- Polyunsaturated Fatty Acids (PUFAs)
- Trans Fat
- Omega-3 Fatty Acids
- Cholesterol
- Triglycerides
- Hydrogenation

ACTIVITIES

- Get the Facts About Fats!
- Saturated and Unsaturated Fat Modeling

VIDEOS

* See reverse side for list

See this lesson and more at LifeSmarts U.

This lesson was developed by educators and experts in conjunction with the U.S. Food & Drug Administration

FDA U.S. FOOD & DRUG ADMINISTRATION

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VIDEO LINKS

Good Fats vs. Bad Fats (3:43)
https://www.youtube.com/watch?v=Foh4DyqMc1A

What is fat? (4:22)
https://ed.ted.com/lessons/what-is-fat-george-zaidan

Unsaturated and Saturated Fats - Biology in Minutes
https://www.youtube.com/watch?v=Cbt-WWJRcqw

OTHER WEB LINKS

FDA's Interactive Nutrition Facts Label Sheets (downloadable)
www.accessdata.fda.gov/scripts/InteractiveNutritionFactsLabel/

Dietary Guidelines for Americans, 2020-2025
http://www.dietaryguidelines.gov/sites/default/files/2021-03/Dietary_Guidelines_for_Americans-2020-2025.pdf

American Heart Association: The Skinny on Fats
https://www.heart.org/en/health-topics/cholesterol/prevention-and-treatment-of-high-cholesterol-hyperlipidemia/the-skinny-on-fats

Molecular Structure of Fat (interactive)
http://www.biointeractive.org/classroom-resources/molecular-structure-fat

How the Body Uses Fat (interactive)
http://www.biointeractive.org/classroom-resources/how-body-uses-fat

Virtual Molecular Model Kit
http://www.chemagic.org/molecules/amini.html

What's ice cream, and why do we scream for it?
http://cen.acs.org/environment/food-science/What-s-ice-cream-and-why-do-we-scream-for-it/96/i31

Many Forms of Lipids
http://www.chem4kids.com/files/bio_lipids.html

Lipids - Khan Academy
http://www.khanacademy.org/science/biology/macromolecules/lipids/a/lipids

DISCUSSION QUESTIONS (SAMPLE ANSWERS)

- A: Saturated fats have no double bonds between the carbon atoms in their fatty acid chains, meaning all available bonds are "saturated" with hydrogen atoms. This straight structure allows them to pack tightly together, making them solid at room temperature. In contrast, unsaturated fats have one or more double bonds, creating kinks in the chain that prevent tight packing, which is why they are usually liquid at room temperature. Health-wise, saturated fats are associated with an increased risk of cardiovascular disease because they raise LDL ("bad") cholesterol levels. Unsaturated fats, especially monounsaturated and polyunsaturated fats, can reduce LDL cholesterol levels and are considered heart-healthy. Therefore, it is recommended to limit the intake of saturated fats to reduce the risk of heart disease.

- A: Trans fats are a type of unsaturated fat that has been chemically altered through a process called hydrogenation, which makes the fat more solid and extends the shelf life of processed foods. However, trans fats behave more like saturated fats in the body and are even more harmful because they not only raise LDL ("bad") cholesterol but also lower HDL ("good") cholesterol. This double impact significantly increases the risk of cardiovascular disease. Due to these health risks, the FDA has removed the "Generally Recognized as Safe" (GRAS) status from partially hydrogenated oils, the primary source of artificial trans fats, leading to their removal from many processed foods. The reduction of trans fats in the food supply is a significant public health victory, as it has led to a decrease in heart disease rates.

CHALLENGE QUESTION (SAMPLE ANSWER)

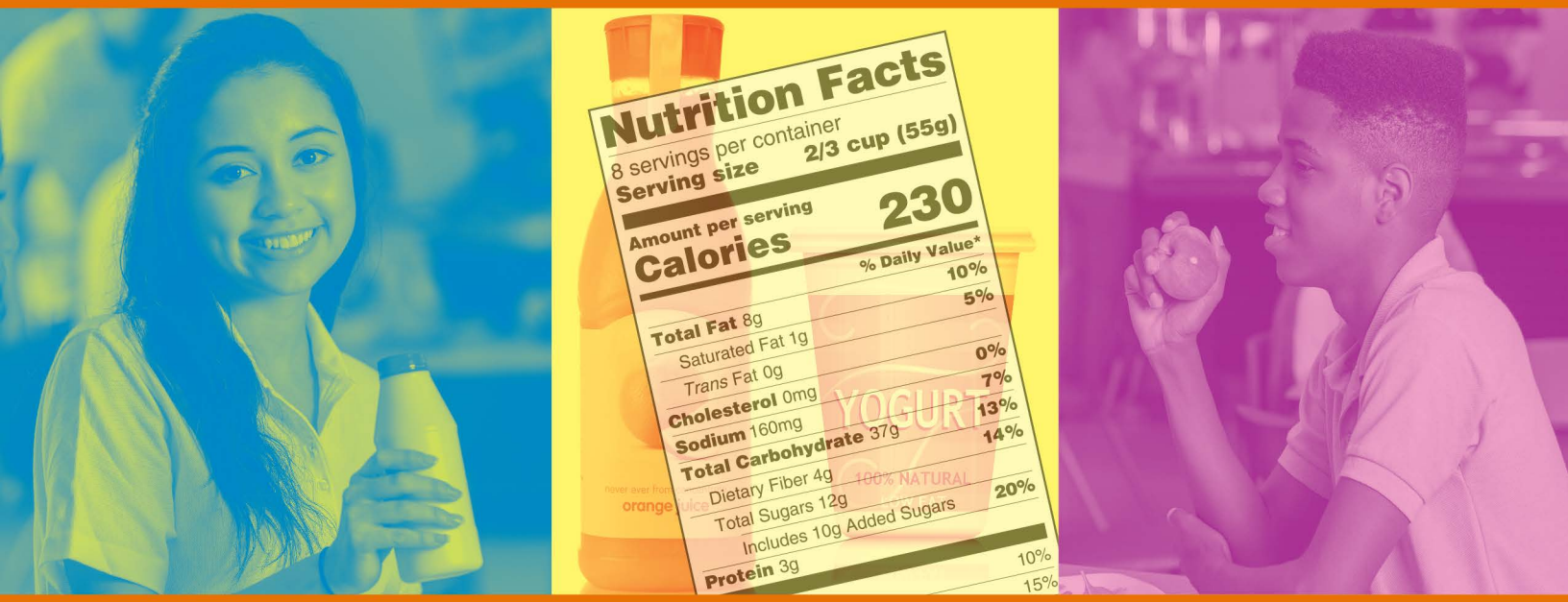
- **An example of a successful public health initiative is Denmark's ban on trans fats.**
https://resolvetosavelives.org/wp-content/uploads/2023/05/Trans-Fat-Elimination-Policy-in-Denmark-2.pdf

  Key Points:
  Strategies Used: Denmark was the first country to implement a ban on industrially produced trans fats in 2003. The government set a limit on the amount of trans fats allowed in food products, effectively eliminating them from the food supply. This was enforced through strict regulations and regular inspections.

  Outcomes: The ban led to a significant reduction in trans fat consumption and contributed to a decrease in the incidence of heart disease. Studies have shown that Denmark's trans fat ban resulted in a measurable improvement in public health, serving as a model for other countries and regions looking to reduce the health risks associated with trans fats.

SCIENCE AND OUR FOOD SUPPLY

Nutrition - A Closer Look at Fats



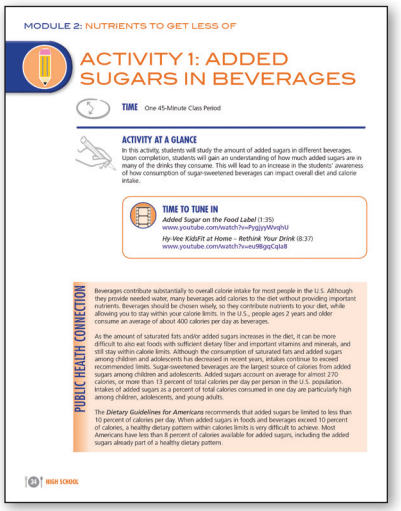
Teacher's Guide for High School Classrooms

2nd Edition

FDA

OVERVIEW OF ACTIVITIES

The activities are written in this easy-to-understand format.


MODULE 2: NUTRIENTS TO GET LESS OF

ACTIVITY 1: ADDED SUGARS IN BEVERAGES

TIME One 45-Minute Class Period

ACTIVITY AT A GLANCE

In this activity, students will study the amount of added sugars in different beverages. Upon completion, students will gain an understanding of how much added sugars are in many of the drinks they consume. This will lead to an increase in the students' awareness of how consumption of sugar-sweetened beverages can impact overall diet and calorie intake.

TIME TO TUNE IN

Added Sugar on the Food Label (1:35)
www.youtube.com/watch?v=PygjyWvqhU

Hy-Vee KidsFit at Home – Rethink Your Drink (8:37)
www.youtube.com/watch?v=ueJ8BgqCqUs8

PUBLIC HEALTH CONNECTION

Beverages contribute substantially to overall calorie intake for most people in the U.S. Although they provide needed water, many beverages add calories to the diet without providing important nutrients. Beverages should be chosen wisely, so they contribute nutrients to your diet, while allowing you to stay within your calorie limits. In the U.S., people ages 2 years and older consume an average of about 400 calories per day as beverages.

As the amount of saturated fats and/or added sugars increases in the diet, it can be more difficult to also eat foods with sufficient dietary fiber and important vitamins and minerals, and still stay within calorie limits. Although the consumption of saturated fats and added sugars among children and adolescents has decreased in recent years, intakes continue to exceed recommended limits. Sugar-sweetened beverages are the largest source of calories from added sugars among children and adolescents. Added sugars account on average for almost 270 calories, or more than 13 percent of total calories per day per person in the U.S. population. Intakes of added sugars as a percent of total calories consumed in one day are particularly high among children, adolescents, and young adults.

The *Dietary Guidelines for Americans* recommends that added sugars be limited to less than 10 percent of calories per day. When added sugars in foods and beverages exceed 10 percent of calories, a healthy dietary pattern within calories limits is very difficult to achieve. Most Americans have less than 8 percent of calories available for added sugars, including the added sugars already part of a healthy dietary pattern.

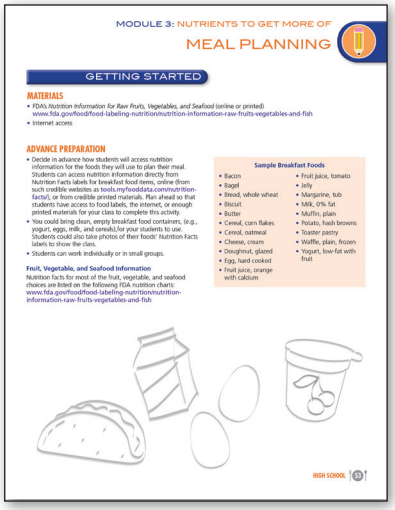
HIGH SCHOOL

TIME: The approximate amount of time needed to perform the activity.

ACTIVITY AT A GLANCE: Briefly summarizes the activity.

TIME TO TUNE IN: Shows the URL for online video or digital content (for youth) related to that module. Video URLs and web links are shown in purple.

PUBLIC HEALTH CONNECTION: Relates background information to relevant public health impact.


MODULE 3: NUTRIENTS TO GET MORE OF

MEAL PLANNING

GETTING STARTED

MATERIALS

- *FDA's Nutrition Information for Raw Fruits, Vegetables, and Seafood* (online or printed) www.fda.gov/food/food-labeling-nutrition/nutrition-information-raw-fruits-vegetables-and-fish
- Internet access

ADVANCE PREPARATION

- Decide in advance how students will access nutrition information for the foods they will use to plan their meal. Students can access nutrition information directly from Nutrition Facts labels for breakfast food items, online (from such credible websites as tools.myfooddata.com/nutrition-facts), or from credible printed materials. Plan ahead so that students have access to food labels, the internet, or enough printed materials for your class to complete this activity.
- You could bring clean, empty breakfast food containers, (e.g., yogurt, eggs, milk, and cereals),for your students to use. Students could also take photos of their foods' Nutrition Facts labels to show the class.
- Students can work individually or in small groups.

Fruit, Vegetable, and Seafood Information

Nutrition facts for most of the fruit, vegetable, and seafood choices are listed on the following FDA nutrition charts: www.fda.gov/food/food-labeling-nutrition/nutrition-information-raw-fruits-vegetables-and-fish

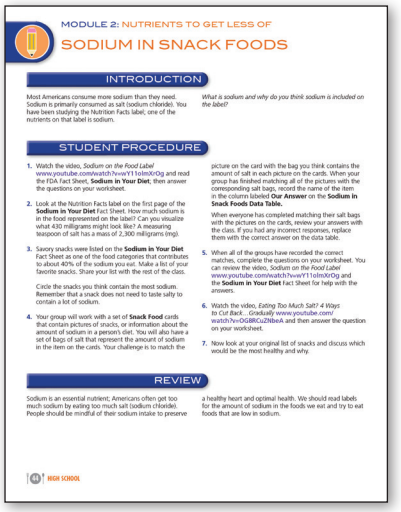
Sample Breakfast Foods

- Bacon
- Bagel
- Bread, whole wheat
- Biscuit
- Butter
- Cereal, corn flakes
- Cereal, oatmeal
- Cheese, cream
- Doughnut, glazed
- Egg, hard cooked
- Fruit juice, orange with calcium
- Fruit juice, tomato
- Jelly
- Margarine, tub
- Milk, 0% fat
- Muffin, plain
- Potato, hash browns
- Toaster pastry
- Waffle, plain, frozen
- Yogurt, low-fat with fruit

HIGH SCHOOL

MATERIALS: Lists the items needed to perform the activity.

ADVANCE PREPARATION: Indicates what you need to do *before* conducting the activity.


MODULE 2: NUTRIENTS TO GET LESS OF

SODIUM IN SNACK FOODS

INTRODUCTION

Most Americans consume more sodium than they need. Sodium is primarily consumed as salt (sodium chloride). You have been studying the Nutrition Facts label, one of the nutrients on that label is sodium.

What is sodium and why do you think sodium is included on the label?

STUDENT PROCEDURE

1. Watch the video, *Sodium on the Food Label* www.youtube.com/watch?v=wY11olmXrOg and read the FDA Fact Sheet, **Sodium in Your Diet**; then answer the questions on your worksheet.
2. Look at the Nutrition Facts label on the first page of the **Sodium in Your Diet** Fact Sheet. How much sodium is in the food represented on the label? Can you visualize what 430 milligrams might look like? A measuring teaspoon of salt has a mass of 2,300 milligrams (mg).
3. Savory snacks were listed on the **Sodium in Your Diet** Fact Sheet as one of the food categories that contributes to about 40% of the sodium you eat. Make a list of your favorite snacks. Share your list with the rest of the class.

   Circle the snacks you think contain the most sodium. Remember that a snack does not need to taste salty to contain a lot of sodium.
4. Your group will work with a set of **Snack Food** cards that contain pictures of snacks, or information about the amount of sodium in a person's diet. You will also have a set of bags of salt that represent the amount of sodium in the item on the cards. Your challenge is to match the picture on the card with the bag you think contains the amount of salt in each picture on the cards. When your group has finished matching all of the pictures with the corresponding salt bags, record the name of the item in the column labeled **Our Answer** on the **Sodium in Snack Foods Data Table.**

   When everyone has completed matching their salt bags with the pictures on the cards, review your answers with the class. If you had any incorrect responses, replace them with the correct answer on the data table.
5. When all of the groups have recorded the correct matches, complete the questions on your worksheet. You can review the video, *Sodium on the Food Label* www.youtube.com/watch?v=wY11olmXrOg and the **Sodium in Your Diet** Fact Sheet for help with the answers.
6. Watch the video, *Eating Too Much Salt? 4 Ways to Cut Back… Gradually* www.youtube.com/watch?v=OGBRCuZNbeA and then answer the question on your worksheet.
7. Now look at your original list of snacks and discuss which would be the most healthy and why.

REVIEW

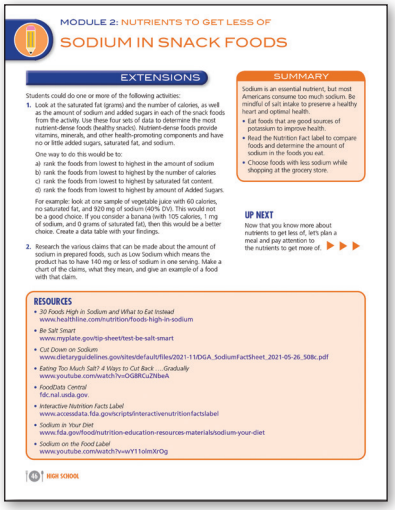
Sodium is an essential nutrient; Americans often get too much sodium by eating too much salt (sodium chloride). People should be mindful of their sodium intake to preserve a healthy heart and optimal health. We should read labels for the amount of sodium in the foods we eat and try to eat foods that are low in sodium.

HIGH SCHOOL

INTRODUCTION: Provides fun, innovative suggestions for introducing the activity. Where provided, suggested teacher dialogue is indicated by ***boldface italics***.

STUDENT PROCEDURE: Gives the step-by-step process for the activity. Where provided, suggested teacher dialogue is indicated by ***boldface italics***.

REVIEW: Uses interesting questions to guide students through a review of what they learned in the activity.


MODULE 2: NUTRIENTS TO GET LESS OF

SODIUM IN SNACK FOODS

EXTENSIONS

Students could do one or more of the following activities:

1. Look at the saturated fat (grams) and the number of calories, as well as the amount of sodium and added sugars in each of the snack foods from the activity. Use these four sets of data to determine the most nutrient-dense foods (healthy snacks). Nutrient-dense foods provide vitamins, minerals, and other health-promoting components and have no or little added sugars, saturated fat, and sodium.

   One way to do this would be to:

   a) rank the foods from lowest to highest in the amount of sodium
   b) rank the foods from lowest to highest by the number of calories
   c) rank the foods from lowest to highest by saturated fat content.
   d) rank the foods from lowest to highest by amount of Added Sugars.

   For example: look at one sample of vegetable juice with 60 calories, no saturated fat, and 920 mg of sodium (40% DV). This would not be a good choice. If you consider a banana (with 105 calories, 1 mg of sodium, and 0 grams of saturated fat), then this would be a better choice. Create a data table with your findings.
2. Research the various claims that can be made about the amount of sodium in prepared foods, such as Low Sodium which means the product has to have 140 mg or less of sodium in one serving. Make a chart of the claims, what they mean, and give an example of a food with that claim.

SUMMARY

Sodium is an essential nutrient, but most Americans consume too much sodium. Be mindful of salt intake to preserve a healthy heart and optimal health.

- Eat foods that are good sources of potassium to improve health.
- Read the Nutrition Fact label to compare foods and determine the amount of sodium in the foods you eat.
- Choose foods with less sodium while shopping at the grocery store.

UP NEXT

Now that you know more about nutrients to get less of, let's plan a meal and pay attention to the nutrients to get more of. ▶ ▶ ▶

RESOURCES

- *30 Foods High in Sodium and What to Eat Instead* www.healthline.com/nutrition/foods-high-in-sodium
- *Be Salt Smart* www.myplate.gov/tip-sheet/test-be-salt-smart
- *Cut Down on Sodium* www.dietaryguidelines.gov/sites/default/files/2021-11/DGA_SodiumFactSheet_2021-05-26_508c.pdf
- *Eating Too Much Salt? 4 Ways to Cut Back …Gradually* www.youtube.com/watch?v=OGBRCuZNbeA
- *FoodData Central* fdc.nal.usda.gov.
- *Interactive Nutrition Facts Label* www.accessdata.fda.gov/scripts/InteractiveNutritionFactslabel
- *Sodium in Your Diet* www.fda.gov/food/nutrition-education-resources-materials/sodium-your-diet
- *Sodium on the Food Label* www.youtube.com/watch?v=wY11olmXrOg

HIGH SCHOOL

SUMMARY: Summarizes key concepts learned in the activity.

EXTENSIONS: Suggests activities to help students learn more about the topic.

RESOURCES: Provides references to online resources that enhance the activity or for further study.

UP NEXT: Gives a preview of the next activity.

MODULE 4 A CLOSER LOOK AT FATS

This module introduces terminology for fats, discusses the connection between health and dietary fats, and provides engaging activities for students to learn about fats in foods.

BACKGROUND INFORMATION

This module describes the role of fats in food and in the body, and how they serve as a source of energy. It provides information on different types of fats that are listed on the Nutrition Facts label – including total fat, saturated fat, and *trans* fat—and defines *trans* fat and cholesterol. The module also includes dietary guidance for fat consumption.

ACTIVITY 1

Get the Facts about Fats! — Interactive Label Research helps students identify which types of fats are found in different foods and how food choices may impact health.

Time to Tune In
These videos provide an overview of the types of fats and their health benefits as well as health risks.

Good Fats vs. Bad Fats (3:43)
www.youtube.com/watch?v=Foh4DyqMc1A

What is fat? (4:22)
ed.ted.com/lessons/what-is-fat-george-zaidan

ACTIVITY 2

Saturated and Unsaturated Fat Modeling guides students through constructing models of saturated and unsaturated fat molecules.

DID YOU KNOW?

The *Dietary Guidelines for Americans*, 2020-2025 recommends that starting at age 2, people should consume less than 10 percent of calories per day from saturated fat.

BACKGROUND INFORMATION

TERMINOLOGY

Lipids are a large group of organic compounds that are oily to the touch and insoluble in water. Lipids include fats, oils, and waxes and are a source of stored energy.

The terms **lipids** and **fats** are often used interchangeably. Fats are also called triglycerides, because they are usually made up of three fatty acids and a glycerol molecule. For this module, we will use the term "fat" to represent all dietary lipids.

Oils are usually liquid at room temperature, high in monounsaturated or polyunsaturated fatty acids, and lower in saturated fatty acids than fats that are solid at room temperature.

Understanding Dietary Fat

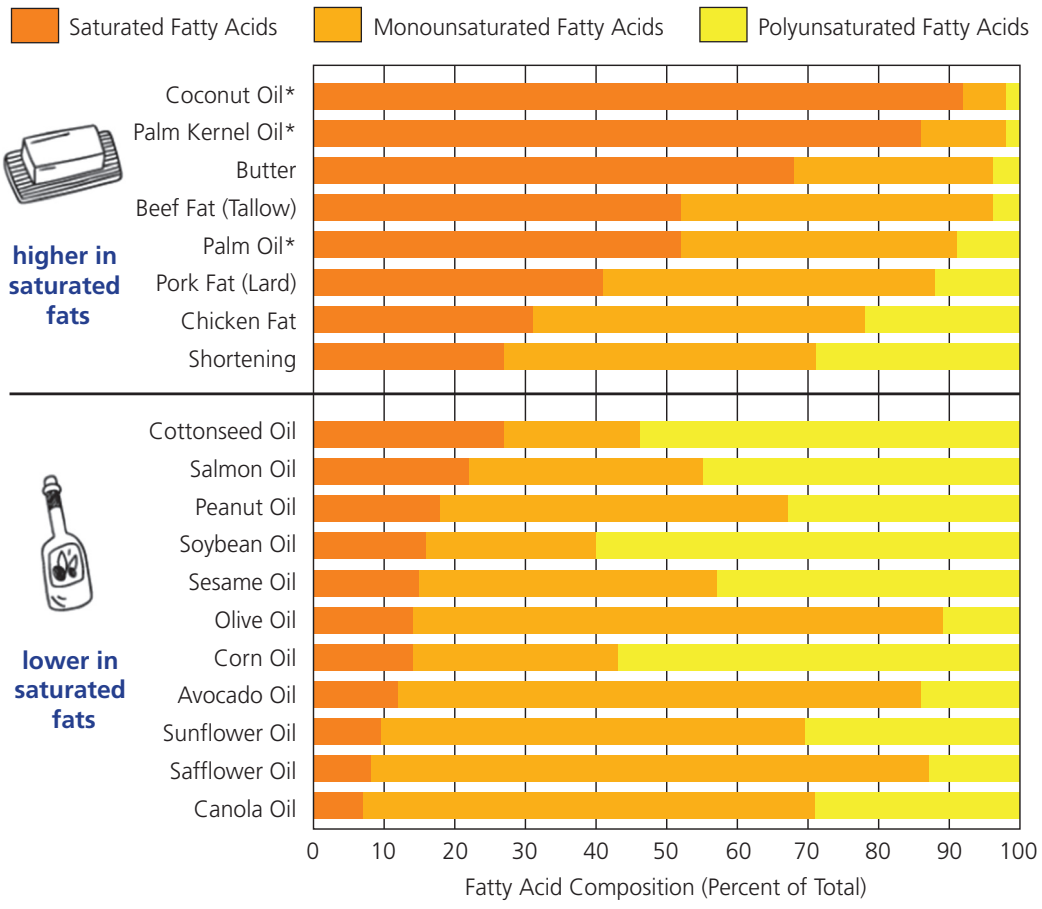
Dietary fats are found in both plant and animal foods, and they are broken down into fatty acids during digestion. All dietary fats are composed of a mix of saturated, monounsaturated, and polyunsaturated fatty acids, in varied proportions. For example, most of the fatty acids in butter are saturated, but it also contains some monounsaturated and polyunsaturated fatty acids. Fat is also a source of essential fatty acids (linoleic acid and alpha-linolenic acid), which the body cannot synthesize (produce) and therefore must obtain from the diet.

Are all fats created equally?

No. The FDA allows the following health claim to be made about fats:

Diets low in saturated fat and cholesterol may reduce your risk of heart disease.

Fatty Acid Profiles of Common Fats and Oils



*Coconut, palm kernel, and palm oil are called oils because they come from plants. However, they are solid or semi-solid at room temperature due to their high content of short-chain saturated fatty acids.

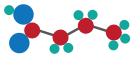
Graphic adapted from the *Dietary Guidelines for Americans, 2015 - 2020.*

BACKGROUND INFORMATION

Fat in foods is a major source of energy for the body and aids in the absorption of the fat-soluble vitamins A, D, E, and K. Fats are also important for proper growth and maintenance of good health, since they play a role in the structure and function of cell membranes, the integrity of skin, maintaining healthy blood cells, and fertility. As a food ingredient, fats provide taste, consistency, and stability and help us feel full.

The Daily Value for total fat is 35% of total calories, which is 78 grams/day based on a 2,000-calorie diet: saturated fats should contribute less than 10% of daily calories. **All fat has 9 calories per gram**, making it a concentrated source of energy, so it should be eaten in moderation. Although most people consume enough fat, many people consume too much saturated fat and not enough unsaturated fat. **The Nutrition Facts label is a useful tool for checking how much, and what kind of fat is in a food**.

About Saturated Fatty Acids



Saturated fats are typically found in animal products. Dietary fats that have more saturated fatty acids tend to be solid at room temperature. They are called "saturated" because all the spaces on the fat molecule that can hold a hydrogen atom do so and are "full" – that is, the molecule is "saturated" with hydrogen atoms.

Saturated fats taste good and reduce hunger, but eating too much of them increases the risk of cardiovascular disease. Saturated fatty acids are found in the greatest amounts in animal fats (including beef, pork, lamb, and poultry with skin), full-fat dairy products (butter, cream, cheese, and ice cream), many sweet desserts (cakes and cookies), fried foods, and some plant-based oils such as coconut oil, palm oil, and palm kernel oil.

Teacher Note

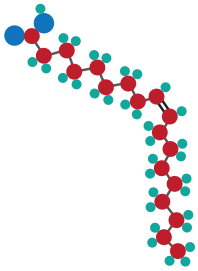
For more about Saturated Fats, see:

- *Dietary Guidelines for Americans, 2020-2025* Chapter 1
- *American Heart Association: The Skinny on Fats*

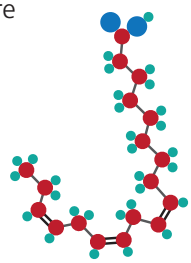
About Unsaturated Fatty Acids – Heart Healthy Fats!

Unsaturated fatty acids include monounsaturated and polyunsaturated fatty acids. They are called "unsaturated" because some of the carbon atoms in the fat molecule do not hold a hydrogen atom. They are found in higher proportions in plants and seafood.

Monounsaturated fatty acids have one double bond in the fat molecule, and polyunsaturated fatty acids have more than one double bond. Oils that are high in unsaturated fatty acids are not considered to be a separate food group, but they are important because they can reduce the risk of developing cardiovascular disease when eaten *in place of* saturated fat.



- **Monounsaturated fatty acids (MUFAs)** are found in relatively large amounts in olive, canola, safflower, and sunflower oils as well as in avocados, peanut butter, and most nuts. There is no recommended daily intake of MUFAs.



- **Polyunsaturated fatty acids (PUFAs)** are found in vegetable oils and fatty fish such as salmon, mackerel, and sardines. PUFAs include omega-3 and omega-6 fatty acids, which are the two primary types of essential fatty acids (EFAs). EFAs are nutrients required for normal body functioning, but they cannot be made by the body and must be obtained from food. The body uses this fat to build cell membranes and nerve tissue (including the brain), and to regulate hormones.

Reducing Saturated Fats

Unsaturated fats and oils should *replace* saturated fats in the diet, rather than just being added to it. This allows the total amount of fat consumed to remain within recommendations without exceeding daily calorie limits. Unsaturated fatty acids may be voluntarily listed on the Nutrition Facts label and included under Total Fat. **One gram of unsaturated fat is healthier than one gram of saturated fat, but both have the same number of calories: 9 calories per gram**.

BACKGROUND INFORMATION

About *Trans* Fats, A Danger Zone!

Trans fat is an unhealthy fat. Although *trans* fatty acids are unsaturated, they are structurally similar to saturated fatty acids and therefore behave like them. *Trans* fat raises LDL ("bad" cholesterol), and an elevated LDL increases the risk of developing cardiovascular disease (see the Cholesterol section below).

The National Academies of Science, Engineering, and Medicine recommends that *trans* fat consumption be as low as possible without compromising the nutritional adequacy of the diet. As of June 2018, partially hydrogenated oils (PHOs), the major source of artificial *trans* fat in the food supply, are no longer Generally Recognized as Safe (GRAS). Therefore, PHOs are no longer added to foods. But *trans* fat will not be completely gone from foods because it occurs naturally in small amounts in some animal products and is present at very low levels in refined vegetable oils. This hidden fat can add up if you eat several servings of products that contain it.

Learn more about *trans* fat at this FDA webpage: www.fda.gov/food/food-additives-petitions/trans-fat

Fatty Acid Composition and Melting Point

Unsaturated fatty acids have one or more double bonds in their carbon chains. Most naturally-occurring unsaturated fatty acids have their hydrogen atoms on the same side of the double bond, which is known as the "*cis*" configuration ("*cis*" means "on this side"). This type of geometry produces a kink at the double bond which causes the carbon chains to bend so they cannot become closely aligned. When fatty acids are separated from each other like this, they have weak intermolecular interactions and tend to form liquids. Thus, products such as olive oil and canola oil are liquid at room temperature and are said to have a low melting point. The melting point is the temperature at which a solid fat "melts" and becomes liquid. A melting point below room temperature (70° F) is considered "low." The melting points of different fatty acids vary, depending on the number of double bonds and the length of the carbon chain.

Trans fatty acids have their hydrogen atoms on opposite sides of the double bond ("*trans*" means "across"), which does not result in a kink at the double bond or cause bending. The carbon chains of *trans* fatty acids remain relatively straight, like the configuration of saturated fatty acids. Thus, *trans* and saturated fatty acids can pack together tightly with relatively little space between them, so their intermolecular interactions are stronger which results in a more solid structure. Therefore, foods such as butter and animal fats, which are relatively high in saturated fatty acids, are solid at room temperature and have higher melting points; i.e., they don't become liquid unless exposed to higher temperatures. In addition, longer chain saturated fatty acids have higher melting points than shorter chain saturated fatty acids.

Fat vs. Fatty Acid

Many consumer education and outreach efforts use the term "Fat" in place of "Fatty Acid" for Total Fat, Saturated Fat, Mono- and Polyunsaturated Fat, and *Trans* Fat. This Guide generally uses the more common term "Fat" for "Fatty Acid" also.

Fatty Acid Chain Length

In addition to whether they are saturated or unsaturated, fatty acids are categorized by their chain length. Most naturally occurring fatty acids have an unbranched chain with an even number of carbon atoms (between 4 and 28).

- Short-chain fatty acids have 6 or fewer carbon atoms.
- Medium-chain fatty acids have 8 – 12 carbon atoms.
- Long-chain fatty acids have 14 – 20 carbon atoms. These are the most common types.
- Very long-chain fatty acids have 22 or more carbon atoms and make up only a small percentage of the total fatty acid content of most foods.

BACKGROUND INFORMATION

About Cholesterol

Cholesterol is a waxy, fat-like substance made by all cells of the body. The organs that make the most cholesterol are the liver and intestines. The body uses cholesterol to produce vitamin D and certain hormones (e.g., estrogen and testosterone) and bile (a fluid that aids in fat digestion). Cholesterol in food is referred to as "dietary cholesterol" and is found *only* in animal products—never in plants. Cholesterol is transported in the blood by particles called "lipoproteins," which contain both fat and protein. Over time, cholesterol and other substances can build up in the arteries and cause cardiovascular problems. The human body makes all the cholesterol that it needs, so it is not necessary to get cholesterol from food.

HDL & LDL Cholesterol

- **High Density Lipoprotein (HDL)** cholesterol is often referred to as "good" cholesterol. HDL cholesterol travels from the body tissues to the liver, where it is broken down and removed. Higher levels of HDL cholesterol in the blood can help prevent cholesterol buildup in blood vessels, decreasing the risk of developing cardiovascular disease.
- **Low-density Lipoprotein (LDL)** cholesterol is often referred to as "bad" cholesterol. It is the form that moves cholesterol from the liver to the arteries and body tissues. Higher levels of LDL in the blood can lead to a harmful cholesterol buildup in blood vessels, increasing the risk of cardiovascular disease.

Foods such as meats and dairy products that are high in saturated fats may also be sources of dietary cholesterol. This combination can increase the risk of developing cardiovascular disease. The goal for consumption is to get less than 100% of the Daily Value for saturated fat and cholesterol each day: limiting intake of saturated fats will also help to limit intakes of dietary cholesterol.

More About Cholesterol

Saturated fat and *trans* fat intake affect the level of cholesterol in blood more than consumption of dietary cholesterol does; therefore saturated and *trans* fats are more important dietary risk factors for cardiovascular disease than is dietary cholesterol. It's more important to limit saturated fat and *trans* fat in the diet than it is to limit dietary cholesterol.

- Foods that are high in cholesterol also are often high in saturated fat, so by limiting the consumption of saturated fat from animal sources, one can usually also reduce cholesterol intake.
- FDA considers the amount of dietary cholesterol in foods to be important information for consumers to know.
- The *Dietary Guidelines for Americans, 2020-2025*, address dietary cholesterol with the following statement: "The National Academies recommends that *trans* fat and dietary cholesterol consumption to be as low as possible without compromising the nutritional adequacy of the diet. The USDA Dietary Patterns are limited in *trans* fats and low in dietary cholesterol. Cholesterol and a small amount of *trans* fat occur naturally in some animal source foods."

PUBLIC HEALTH CONNECTION

- Developing healthy eating habits during adolescence can help reduce the risk of major chronic diseases. A healthy diet includes limiting saturated fat and *trans* fat and eating unsaturated fat in moderation.
- Saturated and *trans* fats raise LDL (or "bad") cholesterol levels in the blood, which can increase the risk for heart disease.
- Unsaturated fats such as monounsaturated and polyunsaturated fat do not raise LDL cholesterol and are beneficial when *substituted for* saturated fat and consumed in moderation. Choose foods low in saturated fat, *trans* fat, and dietary cholesterol as part of a healthful diet, and include sources of omega-3 and omega-6 fatty acids, such as fish and olive oil.

DID YOU KNOW?

HDL cholesterol and LDL cholesterol are found *only* in blood, not in food. They are the forms of cholesterol that move through the body. You can't "look for" foods high in HDL and low in LDL to optimize your diet, but regular aerobic exercise may increase levels of HDL ("good") cholesterol in the blood.

ACTIVITY 1: GET THE FACTS ABOUT FATS! – INTERACTIVE LABEL RESEARCH

TIME One 45-minute class period

ACTIVITY AT A GLANCE

In this activity, students will learn about fats and oils, their functions and related health concerns. They will use Fact Sheets from FDA's Interactive Nutrition Facts Label website to distinguish between different kinds of dietary fats, their characteristics, food sources, and health connections.

TIME TO TUNE IN

These videos provide an overview of the types of fats and their health benefits as well as health risks.

Good Fats vs. Bad Fats (3:43)
www.youtube.com/watch?v=Foh4DyqMc1A

What is fat? (4:22)
ed.ted.com/lessons/what-is-fat-george-zaidan

MODULE 4: A CLOSER LOOK AT FATS

GET THE FACTS ABOUT FATS! — INTERACTIVE LABEL RESEARCH

GETTING STARTED

MATERIALS

- One copy of the **Interactive Label Research** worksheet for each student
- Internet access
- Printed Fact Sheets or online access to FDA's **Interactive Nutrition Facts Label** pages for Saturated Fat, Monounsaturated and Polyunsaturated Fat, *Trans* Fat, and Cholesterol.
  www.accessdata.fda.gov/scripts/InteractiveNutritionFactsLabel/#downloadables

Note: This assignment could be completed in class or given as a homework assignment.

INTRODUCTION

Get the Facts about Fats! - Interactive Label Research

Ask these questions to introduce fats and foods that contain fats:

- **Do you think that most Americans consume too much fat? What is the basis of your opinion?**
- **What is fat?**
- **Which of your favorite foods contain fat?**
- **What do you know about the different kinds of fat?**

Let's look at the Interactive Nutrition Facts Label Fact Sheets to find out more about the different kinds of fat.

STUDENT PROCEDURE

1. Watch these two videos: *Good Fats vs. Bad Fats*
   www.youtube.com/watch?v=Foh4DyqMc1A

   What is fat?
   ed.ted.com/lessons/what-is-fat-george-zaidan

2. Open the link to the Interactive Nutrition Facts label below; you will see a bar across the top with various topics that explain components of the label; click onto the last one: **Fact Sheets**
   www.accessdata.fda.gov/scripts/InteractiveNutritionFactsLabel/

3. Open the following Fact Sheet links to complete the **Interactive Label Research** worksheet:
   - Monounsaturated and Polyunsaturated Fats
   - Saturated Fat
   - *Trans* Fat
   - Cholesterol

4. As you read the Fact Sheets, complete the table on the **Interactive Label Research** worksheet and respond to the questions below the table.

5. Discuss your responses as a class.

GET THE FACTS ABOUT FATS! — INTERACTIVE LABEL RESEARCH

REVIEW

What are the different types of fat? (Saturated, monounsaturated, polyunsaturated, and *trans)*

What food sources are high in saturated fats? Saturated fatty acids (saturated fats) are found in the greatest amounts in coconut and palm kernel oils, in butter and beef fats, and in palm oil. They are also found in other animal fats such as pork and chicken fats, and in fats from some plant foods.

What are good sources of unsaturated fats? They are found in higher proportions in plants and seafood.

What dietary fats limits are recommended?
The recommended daily amount of fats to eat is 25-35% of total daily calories, with saturated fats contributing less than 10% of daily calories. Try to limit *trans* fats as much as possible.

SUMMARY

Dietary fats are a good source of energy. Although most people consume enough fat overall, many people consume too much saturated fat and not enough unsaturated fat. You can use the Nutrition Facts label to make smart choices about dietary fat consumption.

Chip Dip Challenge

Read the following scenario:

You are having a party. Which one of the chip dips listed below would you choose and why? Include evidence from what you have learned along with reasoning to support your position. Consider both health and taste concerns in your evaluation.

Look at the options below and consider the grams (g) of saturated fat per serving. Also check/evaluate other nutrients to make the best (healthiest) choice. Note: Total fat on a Nutrition Facts label may be higher than the amount of saturated fat, since the total also includes unsaturated fats.

How can you use the Nutrition Facts label to tell which one of the foods on the chart below would be the best choice for a dip?

Creamy cheese dip (2 tbsp/serving)		Salsa (2 tbsp/serving)		Guacamole (2 tbsp/serving)		Sour cream (2 tbsp/serving)	
							
Saturated Fat:	4.3g	Saturated Fat:	1g	Saturated Fat:	0.6g	Saturated Fat:	3.5g
Unsaturated Fat:	2.6g	Unsaturated Fat:	0g	Unsaturated Fat:	3.1g	Unsaturated Fat:	1.5g
Cholesterol	25 mg	Cholesterol	0 mg	Cholesterol	0 mg	Cholesterol	20 mg

RESOURCES

- *Cut Down on Saturated Fat*
  www.dietaryguidelines.gov/sites/default/files/2021-11/DGA_FactSheet_SaturatedFats-07-09_508c_0.pdf
- *Dietary Guidelines for Americans, 2020-2025*
  www.dietaryguidelines.gov
- *FDA's Interactive Nutrition Facts Label Sheets (downloadable)*
  www.accessdata.fda.gov/scripts/InteractiveNutritionFactsLabel
- *Harvard Health Publications: The truth about fats: the good, the bad, and the in-between December 2019*
  www.health.harvard.edu/staying-healthy/the-truth-about-fats-bad-and-good
- *Hidden Fats*
  www.fatsecret.com/calories-nutrition/usda/hard-salted-pretzels?portionid=62057&portionamount=45

STUDENT WORKSHEET

ACTIVITY 1: GET THE FACTS ABOUT FATS! – INTERACTIVE LABEL RESEARCH

Name _____ Date _____ Class/Hour _____

The Interactive Label website has some great information to help you make healthier choices. This activity will help you learn more about fats.

1. Open up the link below, click on the Fact Sheets tab, and read the following Fact Sheets: Monounsaturated and Polyunsaturated Fats; Saturated Fat; *Trans* Fat.
2. When you finish reading the Fact Sheets, complete the table and the questions that follow.

Use information found at this link to complete this chart: www.accessdata.fda.gov/scripts/InteractiveNutritionFactsLabel/

Kind of Fat	Health Benefits	Health Risks	Sources	Characteristics
Saturated				
Monounsaturated				
Polyunsaturated				
Trans				

1. Fat is called the best source of energy. Why? _____

2. How is the amount of energy that you get from fats different from the amount of energy that you get from proteins and carbohydrates? _____

3. Why are fats important for proper growth and health? _____

4. What are the major sources of fats in the diet? _____

5. To reduce the amount of saturated fat in your diet, which foods would you limit and why? _____

6. Create a Venn diagram to compare and contrast saturated and unsaturated fats. (Use a blank sheet of paper if needed.)

7. Explain the differences in carbon bonds in saturated fat, monounsaturated fat, and polyunsaturated fat. _____

8. What are typical food sources for cholesterol? What kind of fats do these same foods typically have more of? _____

9. At the beginning of this activity, you were asked if you thought most Americans consumed too much fat. Based on what you have learned about fats in this lesson, what is your opinion now of this statement? Explain the reasons for your opinion.

ACTIVITY 2: SATURATED AND UNSATURATED FAT MODELING

TIME One 45-minute class period

ACTIVITY AT A GLANCE

Students will construct models of saturated and unsaturated fat molecules.

GETTING STARTED

ADVANCE PREPARATION

1. Divide the class into groups.
2. Gather a variety of food samples composed mainly of fat for display. A clear bottle of cooking oil and a container of shortening are good choices. (Use caution: Do not use foods for which students have known food allergies.)
3. Print an image of a saturated fatty acid chain and an unsaturated fatty acid chain for each group, or show this short video of saturated and unsaturated fat molecule models: *Unsaturated and Saturated Fats - Biology in Minutes* www.youtube.com/watch?v=Cbt-WWJRcqw.

MATERIALS

Each group will construct 5 saturated fatty acid chain models and 5 unsaturated fatty acid chain models with 10 carbons each.

You will need:

- 3 different colored miniature items, such as marshmallows, small Styrofoam balls, gum drops, playdough, etc. (320 pieces per group total: 100 carbon atoms, 200 hydrogen atoms, and 20 oxygen atoms for the 10 models)
- Flat toothpicks cut in half: 300 pieces per group
- 12" ruler (or measuring tape)
- Make copies of the **Saturated and Unsaturated Fatty Acid Molecular Modeling** worksheet for each group to record data.

TEACHER NOTE

For sturdier molecule models, allow miniature marshmallows to air dry for a day or two before use.

INTRODUCTION

Saturated and Unsaturated Fat Modeling

Now that you have learned about fat and the different kinds of fat, let's see how saturated and unsaturated fatty acids differ using molecular models. How do you think they will be the same? How do you think they will differ?

Some fats are really easy to identify as having more saturated or more unsaturated fatty acids because we can see and feel their properties. (Look at butter and oil.)

Fats at room temperature come in both solid and liquid form depending on the amounts of different types of fatty acids they contain, but when they are hidden in food they are harder to identify. Today we are going to make models of saturated and unsaturated fatty acids to see how well they pack together.

As you do this activity, remember that each carbon atom can form a single bond with up to four other atoms.

The four types of bonds formed by a single carbon to other atoms include:

- Four single bonds
- Two single and one double bond
- Two double bonds
- One triple and one single bond

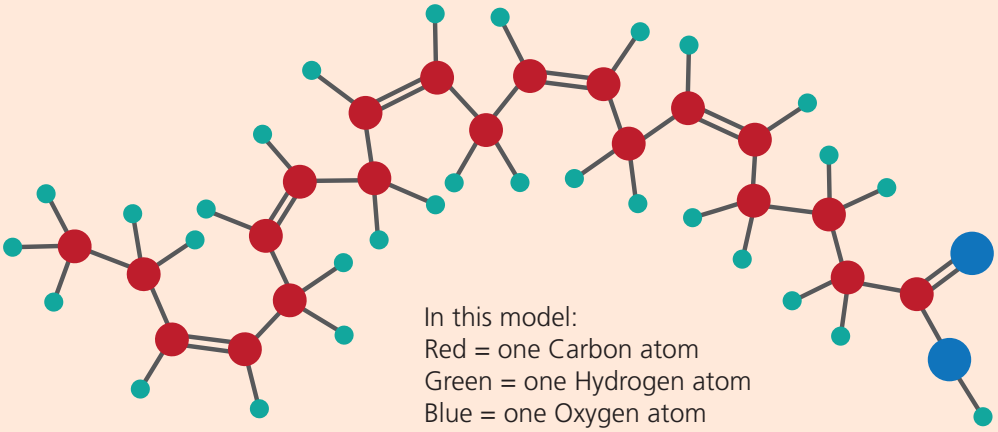
Create a model (example is made with miniature marshmallows) with a single marshmallow to represent a carbon atom, connected to four marshmallows of a different color that represent hydrogen atoms.

SATURATED AND UNSATURATED FAT MODELING

Sample Unsaturated Fatty Acid Model Image

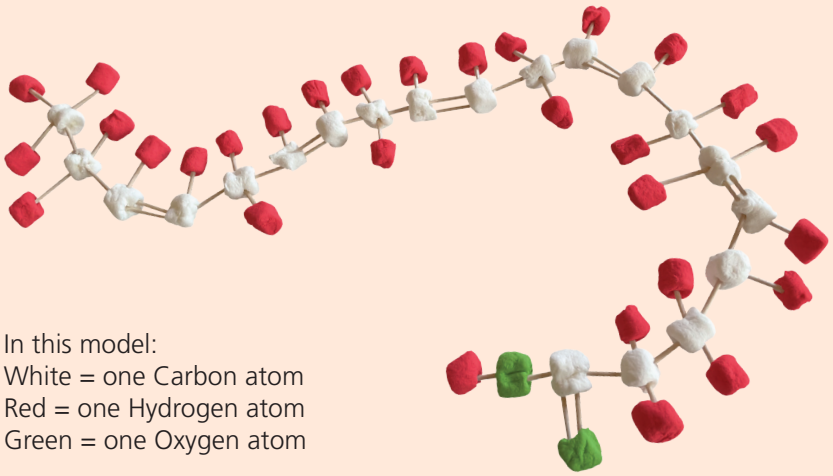
Eicosapentaenoic acid (EPA)

EPA is a 20-carbon polyunsaturated omega 3 fatty acid with 5 *cis* double bonds at positions 5, 8, 11, 14 and 17. It is metabolized and incorporated into cell membrane phospholipids and may play a role in limiting inflammation. EPA is found in fish oils, especially those extracted from fatty fish such as salmon.



In this model:
Red = one Carbon atom
Green = one Hydrogen atom
Blue = one Oxygen atom

Sample Mini-marshmallow EPA Model



In this model:
White = one Carbon atom
Red = one Hydrogen atom
Green = one Oxygen atom

Model courtesy of Laurie Hayes

SATURATED AND UNSATURATED FAT MODELING

STUDENT PROCEDURE

You will construct models for saturated and unsaturated fatty acids and compare how they pack together.

1. Review images of a saturated fatty acid chain and an unsaturated fatty acid chain.
2. Each group will construct 5 saturated fatty acid chains and 5 *cis* unsaturated fatty acid chains, each with 10 carbon atoms, represented by the miniature marshmallows. One toothpick should be used to represent a single bond, and 2 toothpicks would be a double bond. Try to make the bond length as consistent as possible.
3. Measure the length of each fatty acid chain.
4. Stack your 5 intact saturated fatty acid chain models together and measure the 3-dimensional volume (height x width x length) of the stacked models using a ruler.
   - Record this volume on your worksheet.
5. Stack your 5 intact unsaturated fatty acid chain models together and measure the 3-dimensional volume using a ruler.
   - For the unsaturated fatty acid models, record the number of double bonds and their position. For consistency, everyone in the class should count double bond positions from the same end of the fatty acid chain, either the COOH- (carboxyl) end or the CH_3 (methyl) end.
   - Record this volume on your worksheet.
6. Each group should discuss what volumes they have for their saturated fatty acids cluster.
7. Compare the differences (if any) in each group's volume for their fatty acid cluster.
8. Discuss the volumes each group had for their unsaturated fatty acids cluster.
9. Compare the volume of your unsaturated fatty acid cluster with that of the other groups. Are there any differences and if so, describe them.
10. *What difference does it make how far apart the fatty acid chains are from one another?*
    - *How would this affect melting point?*
    - *How did the number of double bonds affect the final cluster volume?*
    - *How did the position of the double bond(s) affect the final cluster volume?*

REVIEW

What is the molecular basis for the melting point variation between saturated and unsaturated fatty acids? The bent configuration of *cis* unsaturated fatty acids keeps molecules further away from each other, which results in weaker intermolecular interactions and lower melting points.

SUMMARY

Saturated fatty acids pack together more densely, resulting in stronger molecular attractions and higher melting points. This causes saturated fats to be solid at room temperature.

SATURATED AND UNSATURATED FAT MODELING

EXTENSION

Students could do the following activity:

Lipids Activity: This interactive activity enables students to learn about the differences in molecular structure between solid and liquid fats. For those looking for a focus on the molecular structure of fats, this is an excellent activity. The game has clickable icons to learn or review information. Students who know little about fats can learn as they progress. To access the activity, students will be asked to sign up for a free account.
www.ck12.org/assessment/tools/geometry-tool/plix.html?eId=SCI.BIO.214&questionId=546a8a335aa413612dcfe6ea&artifactID=1824138&backUrl=http%3A//www.ck12.org/search/%3Fq%3Dfats%26referrer%3Dtop_nav%26autoComplete%3Dfalse%23interactive

RESOURCES

- *Molecular Structure of Fat* (interactive)
  www.biointeractive.org/classroom-resources/molecular-structure-fat
- *How the Body Uses Fat* (interactive)
  www.biointeractive.org/classroom-resources/how-body-uses-fat
- *Virtual Molecular Model Kit*
  www.chemagic.org/molecules/amini.html
- *What's ice cream, and why do we scream for it?*
  cen.acs.org/environment/food-science/What-s-ice-cream-and-why-do-we-scream-for-it/96/i31
- *Many Forms of Lipids*
  www.chem4kids.com/files/bio_lipids.html
- *Lipids*
  www.khanacademy.org/science/biology/macromolecules/lipids/a/lipids

UP NEXT

Now that you know more about fats, let's use what you've learned to choose meals when away from home.

STUDENT WORKSHEET

ACTIVITY 2: SATURATED AND UNSATURATED FATTY ACID MOLECULAR MODELING

Name _____ Date _____ Class/Hour _____

Saturated Fatty Acid Models		Unsaturated Fatty Acid Models			
Length	Cluster volume	Length	# Double bonds	Double bond position(s)	Cluster volume
1.		1.			
2.		2.			
3.		3.			
4.		4.			
5.		5.			

1. How much difference was there between the cluster volume of your saturated fatty acids and the cluster volume for your unsaturated fatty acids?

_____

_____

2. How does cluster volume affect the density of the fatty acids? How would this affect melting point?

_____

_____

3. Why is it important to know about the amount and kind of fat in food?

_____

_____

STUDENT WORKSHEET SAMPLE ANSWERS ACTIVITY 1: GET THE FACTS ABOUT FATS! — INTERACTIVE LABEL RESEARCH

Name _____ Date _____ Class/Hour _____

The Interactive Label website has some great information to help you make healthier choices. This activity will help you learn more about fats.

1. Open up the link below, click on the Fact Sheets tab, and read the following Fact Sheets: Monounsaturated and Polyunsaturated Fats; Saturated Fat; *Trans* Fat.
2. When you finish reading the Fact Sheets, complete the table and the questions that follow.

Use information found at this link to complete this chart: www.accessdata.fda.gov/scripts/InteractiveNutritionFactsLabel/

Kind of Fat	Health Benefits	Health Risks	Sources	Characteristics
Saturated	Provides energy for the body; helps the body absorb certain vitamins; supports body processes	Associated with an increased risk of developing cardiovascular disease	Animal products, baked goods, dairy products, desserts	The human body makes all the saturated fat it needs. Usually solid at room temperature.
Monounsaturated	Provides energy for the body; helps the body absorb certain vitamins; supports body processes	None, when eaten in moderation	Avocados, mayonnaise, nuts, olives, seeds, soft margarine, vegetable oils	Found in higher proportions in plants and seafood. Usually liquid at room temperature.
Polyunsaturated	Provides energy for the body; helps the body absorb certain vitamins; supports body processes	None, when eaten in moderation	Fish, mayonnaise, nuts, seeds, soft margarine vegetable oils	Found in higher proportions in plants and seafood. Usually liquid at room temperature.
Trans	None	Associated with increased levels of bad cholesterol; associated with increased risk of heart disease	Found in small amounts in some animal products. Formed artificially during food processing.	An unsaturated fat but structurally different than unsaturated fat found naturally in plant foods.

1. Fat is called the best source of energy. Why? Fats provide more calories per gram of food than the other nutrients.
2. How is the amount of energy that you get from fats different from the amount of energy that you get from proteins and carbohydrates? One gram of fat provides 9 calories of energy; carbohydrates and proteins provide 4 calories of energy per gram.
3. Why are fats important for proper growth and health? Fats are needed for energy; to help our bodies absorb certain vitamins; and, support many body processes.
4. What are the major sources of fats in the diet? Desserts, full fat dairy products, fried foods, and animal products (beef, pork, chicken).
5. To reduce the amount of saturated fat in your diet, which foods would you limit and why? Baked goods, full fat dairy products, and snack foods. Saturated fats contribute to developing cardiovascular disease.
6. Create a Venn diagram to compare and contrast saturated and unsaturated fats. (Use a blank sheet of paper if needed.)
7. Explain the differences in carbon bonds in saturated fat, monounsaturated fat, and polyunsaturated fat. Saturated fats have no double bonds between the atoms; monounsaturated fats have one double bond; and polyunsaturated fats have more than one double bond.
8. What are typical food sources for cholesterol? What kind of fats do these same foods typically have more of? Foods from animals contain cholesterol. Foods high in cholesterol are usually high in saturated fat.
9. At the beginning of this activity, you were asked if you thought most Americans consumed too much fat. Based on what you have learned about fats in this lesson, what is your opinion now of this statement? Explain the reasons for your opinion. Dietary fats contribute to coronary heart disease which is the leading cause of death in the United States. Most people consume too much fat.

STUDENT WORKSHEET SAMPLE ANSWERS

ACTIVITY 2: SATURATED AND UNSATURATED FATTY ACID MOLECULAR MODELING

Name _____ Date _____ Class/Hour _____

Saturated Fatty Acid Models		Unsaturated Fatty Acid Models			
Length	Cluster volume	Length	# Double bonds	Double bond position(s)	Cluster volume
1. 12.5″	Width: 3″ Height: 2″ Cluster Volume: 3 x 2 x 12.5 = 75 cubic inches	1. 12.5″	3	2, 5, 8	Width: 6″ Height: 1.5″ Cluster Volume: 6 x 1.5 x 12.5 = 112.5 cubic inches
2. 12.5″		2. 12.5″	2	3, 8	
3. 12.5″		3. 12.5″	2	2, 5	
4. 12.5″		4. 12.5″	2	3, 6	
5. 12.5″		5. 12.5″	3	2, 4, 6	

1. How much difference was there between the cluster volume of your saturated fatty acids and the cluster volume for your unsaturated fatty acids?

Unsaturated had a much greater volume (112.5 cubic inches) than the saturated volume (75 cubic inches).

2. How does cluster volume affect the density of the fatty acids? How would this affect melting point?

An increase in cluster volume decreases the density. The greater the density, the stronger the molecular attraction and the higher the melting point, which causes saturated fats to be solid at room temperature.

3. Why is it important to know about the amount and kind of fat in food?

Diets high in saturated fats are associated with more heart disease compared to diets high in unsaturated fats.

GLOSSARY

For the purposes of these materials, these terms are defined as follows.

Added Sugars includes sugars that are either added during the processing of foods, or are packaged as such (e.g., a bag of table sugar), and include sugars from syrups and honey, and sugars from concentrated fruit or vegetable juices.

Calories refer to the "energy" supplied from all food sources (fat, carbohydrate, protein, and alcohol).

Cholesterol is a waxy, fat-like substance produced primarily by the liver in both humans and animals. It is found in all cells of the body. Cholesterol in food is referred to as "dietary cholesterol" and is found only in animal products.

Dietary Fiber, or fiber, is sometimes referred to as "roughage." It is a type of carbohydrate made up of many sugar molecules linked together. But unlike other carbohydrates (such as starch), dietary fiber is bound together in such a way that it cannot be readily digested in the small intestine.

An **Essential Nutrient** is a vitamin, mineral, fatty acid, or amino acid required for normal body functioning that either cannot be synthesized by the body at all or in amounts adequate for good health, and thus must be obtained from a dietary source. Some food components that are not essential, such as dietary fiber, are still important for health

A **Healthy Eating Pattern** is the combination of foods eaten over time – at an appropriate calorie level – that provide variety and give you the nutrients you need to maintain your health, feel good, and have energy. These nutrients include protein, carbohydrates, fat, vitamins, minerals, and water.

The **Ingredient List** shows each ingredient in a food by its common or usual name in descending order by weight.

A **Lipid** is an organic compound that is oily to the touch and insoluble in water. Lipids include fats, oils, and waxes and are a source of stored energy. The terms lipid and fat are often used interchangeably.

Minerals are inorganic substances that are not made by living things, but they are important for human growth, development, and normal body functioning. Minerals are naturally found in soil and water and are absorbed by plants, which are then eaten by people and other animals. Examples of minerals are iron, calcium, and potassium. People obtain minerals from both the plant and animal products they eat.

Monounsaturated Fatty Acids (MUFAs) are fats that have one double bond between the carbon atoms and are usually liquid at room temperature. Plant sources rich in monounsaturated fats include vegetable oils (such as canola and olive oil), avocados, peanut butter, and most nuts.

Nutrient-dense foods provide vitamins, minerals, and other health-promoting components and have no or little added sugars, saturated fat, and sodium. A healthy dietary pattern consists of nutrient-dense forms of foods and beverages across all food groups, in recommended amounts, and within calorie limits.

Nutrients are substances in food that contribute to growth and health. Nutrients provide energy, cell-building and structural materials, and agents that regulate body chemistry.

%DV stands for **Percent Daily Value**, which is found on the Nutrition Facts label. It is a guide to how much a nutrient in a serving of the food contributes to a daily diet. For example, if the label lists 15% DV for calcium, it means that one serving of the food provides 15% of the calcium most people need each day.

Phytochemicals are chemical compounds produced by plants, generally to help them resist fungi, bacteria, and plant virus, as well as consumption by other pests.

Polyunsaturated Fatty Acids (PUFAs) are fats that have two or more double bonds between the carbon atoms and are usually liquid at room temperature. Primary sources of this fat are vegetable oils; fatty fish such as salmon, mackerel and sardines; and some nuts and seeds. Polyunsaturated fats provide essential fats.

Saturated Fat is found in higher proportions in animal products and is typically solid at room temperature. The exceptions are seafood (which contains a lower proportion of saturated fat compared to other animal products) and certain tropical plant oils, such as coconut oil, palm oil, and palm kernel oil (which contain a higher proportion of saturated fat compared to other plant products).

Saturated Fatty Acids are fats that have no double bonds between the carbon atoms. They are called "saturated" because all the spaces on the fat molecule that can hold a hydrogen atom do so and are "full" – that is, the molecule is "saturated" with hydrogen atoms. Saturated fats are usually solid at room temperature. Major sources include butter and beef fats, and tropical oils such as coconut or palm oils. The human body makes all the saturated fat that it needs, so it is unnecessary to consume additional saturated fat.

Serving Size is based on the amount of food that is customarily eaten at one time. All of the nutrition information listed on a food's Nutrition Facts label is based on one serving of that food.

Servings per Container indicates the total number of servings in the entire food package or container.

A **Triglyceride** is a compound formed from a glycerol and three fatty acid groups. Triglycerides are the main constituents of natural fats and oils.

***Trans* Fat** is an unsaturated fat, but it is structurally different than unsaturated fat that occurs naturally in plant foods. *Trans* fat has detrimental health effects and is not essential in the diet. Most *trans* fat is man-made (designed to improve texture and help food last longer).

Vitamins are organic substances made by plants and animals, which are then eaten by humans. There are 13 vitamins: vitamins A, C, D, E, K, and the B vitamins (thiamin, riboflavin, niacin, pantothenic acid, biotin, vitamin B6, vitamin B12, and folate). You can get all your vitamins from the foods you eat, but your body also makes vitamins D and K.

Whole Grains include the entire grain seed (usually called the "kernel"), which consists of the bran, germ, and endosperm — nothing has been added or taken away by processing. Whole grains are consumed either as a single food (such as wild rice or popcorn) or as an ingredient in food, such as in cereals, breads, or crackers.

Science and Our Food Supply: Using the Nutrition Facts Label to Make Healthy Food Choices was brought to you by...

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