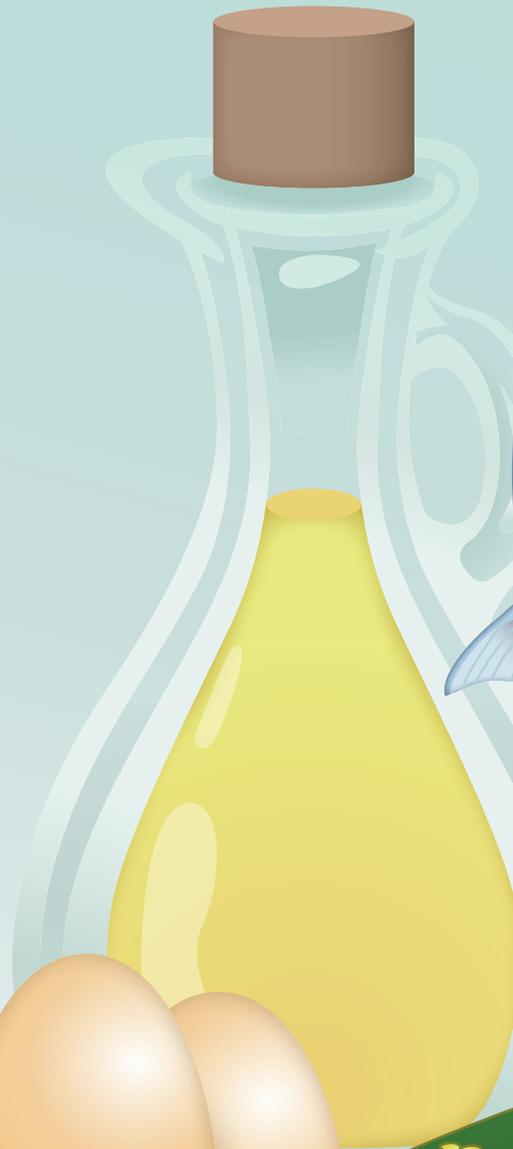


Agriculture in Education:  
Exploring Critical Issues

# The Skinny on Fats

*What's essential about fatty acids?*



A Teaching  
and Learning  
Resource for  
Biology 20



### **The Skinny on Fats**

In his book, "Souvenir of Canada 2," Douglas Coupland recognizes canola by saying:

*"Yes, Canola, formerly rapeseed, is named after Canada. . . . And it's only when you look at something like this that you begin to realize how difficult it can be to try to cobble together a national identity from things like canola and, say, the discovery of insulin or basketball. But we're used to doing it. It keeps us humble and it keeps us trying harder at just about everything."*

As an association, Alberta Canola Producers is committed to trying harder to provide you with the basic information about canola – the science that describes its composition and the research that justifies its health benefits. And in keeping with whomever said that "nothing is ever this simple," we are committed to updating the information as new science on the world of fats provides new data.

Till then, we always appreciate your feedback. May this resource be of assistance in exploring the world of fats and fatty acids with the students in your classroom.

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**Alberta Canola Producers Commission** gratefully acknowledges the following groups and individuals who have participated in the development of this resource.

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*Every effort has been made to acknowledge sources used in this resource. If any have been inadvertently missed, please contact Patricia Shields-Ramsay at InPraxis Group Inc. at 866.925.7163. Corrections will be made in subsequent printings.*

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# INTRODUCTION & OVERVIEW

One dietary message for consumers has not changed in a decade: eat less fat. This advice aims to help millions of North Americans reduce their risk of obesity, diabetes and heart disease. In recent years, a new message about fat has emerged – the type of fat in the diet is also important. However, how do consumers sift through the various messages about saturated, unsaturated, *trans*, fat-free or fat-reduced labelling and content? Why should students know and understand the implications of the choices they make when they select foods? What does the biochemistry of fats have to do with these choices?

## A Critical Issues Approach

Issues that are relevant and meaningful to students support a constructivist, inquiry-based approach to learning. Critical issues frame learning around key questions that pose problems that intrigue and interest students, and set a focus for motivated learning. Posed effectively, critical issues ask students to develop and apply critical thinking skills and look at multiple perspectives, consider alternatives and recognize that challenges can often involve many different solutions.

This teaching and learning resource is developed around a critical issues approach and promotes inquiry-based learning and critical thinking. The exploration of issues is framed around inquiry questions that are relevant and meaningful to students, engage them in deliberative research and promote social participation skills.

## Curriculum Support

This resource supports learning in the following Alberta high school programs of study:

- This resource addresses concepts related to human digestive systems and the chemical nature of lipids and supports **Biology 20** learning outcomes in **Unit D: Human Systems**.
- The inquiry-based activities in this resource also support learning outcomes in the **Information and Communication Technologies (ICT)** program of study.

This resource develops processes and skills, including critical thinking and creative thinking, decision making and problem solving, research and information inquiry, oral, written and visual literacy. A curriculum correlation chart follows. The lesson sequence includes activities that may take two to five 50-minute class periods, depending on activities selected.

This resource can provide support for specific **Chemistry 30** outcomes and examples in **Unit C: Chemical Changes of Organic Compounds**. It can also provide learning support for outcomes in CTS courses in the Food program strand, including **FOD1020: Contemporary Baking**, **FOD1050: Fast & Convenience Foods**, **FOD1080: Food & Nutrition Basics** and **FOD3020: Nutrition & Digestion**. Learning outcomes are provided in **Appendix A** on **page 37**.

# THE SKINNY ON FATS: What's essential about fatty acids?

## Alberta Curriculum Connections Summary

### Inquiries

Why is it important to know about fatty acids?

Why is the consumption of *trans* fats considered a health issue?

What impact do fatty acids have on body health?

- Attitude Outcomes that support the responsible acquisition and application of knowledge related to science and technology are also developed and supported by this resource.

### Biology 20

#### General Outcome 1

*Students will explain how the human digestive and respiratory systems exchange energy and matter with the environment.*

#### Specific Outcomes for Knowledge

**20-D1.2k** describe the chemical nature of carbohydrates, lipids and proteins and their enzymes; i.e., carbohydrases, lipases and proteases

#### Specific Outcomes for Skills

**20-D1.2s** conduct investigations into relationships between and among observable variables and use a broad range of tools and techniques to gather and record data and information:

- perform experiments, using qualitative tests, to detect the presence of carbohydrates, proteins and lipids (PR-NS2, PR-NS3, PR-NS4, PR-NS5)

### ICT Outcomes

*C.1 - Students will access, use and communicate information from a variety of technologies.*

- ICT-C1 4.1 plan and perform complex searches, using more than one electronic source
- ICT-C1 4.2 select information from appropriate sources, including primary and secondary sources
- ICT-C1 4.3 evaluate and explain the advantages and disadvantages of various search strategies
- ICT-C1 4.4 communicate in a persuasive and engaging manner, through appropriate forms, such as speeches, letters, reports and multimedia presentations, applying information technologies for context, audience and purpose that extend and communicate understanding of complex issues

*C.2 - Students will seek alternative viewpoints, using information technologies.*

- ICT-C2 4.1 consult a wide variety of sources that reflect varied viewpoints on particular topics
- ICT-C2 4.2 evaluate the validity of gathered viewpoints against other sources

*C.3 - Students will critically assess information accessed through the use of a variety of technologies.*

- ICT-C3 4.2 demonstrate discriminatory selection of electronically accessed information that is relevant to a particular topic

*C.6 - Students will use technology to investigate and/or solve problems.*

- ICT-C6 4.5 evaluate the appropriateness of the technology used to investigate or solve a problem

# THE CRITICAL ISSUE & INQUIRY PROCESS

## THE SKINNY ON FATS

### *What's essential about fatty acids?*

#### Inquiries

In the lesson sequence of this resource, students explore the critical issue by learning about the structures and functions of fat molecules. Fats and oils are lipids that come from both plant and animal sources. They provide the human body with a source of energy.

Students delve into the critical issue through the following inquiry questions:

- Why is it important to know about fatty acids?
- Why is the consumption of *trans* fats considered a health issue?
- What impact do fatty acids have on body systems and health?

These three inquiry questions encourage students to build understandings of the differences between fatty acids. Students explore the biochemistry of fats and oils and examine the chemical composition of fatty acids. They analyze the differences between saturated and unsaturated fats and their impact on the human body.

#### The Process

This resource is structured around three inquiry questions that form the basis for exploring the critical issue. These inquiry questions also provide a focus for the lesson sequence and deliberative research. The lesson sequence contains “I can...” statements that set a context for research, provide criteria for assessment and help students focus their learning. These statements can be shared with students at the beginning of the lesson sequence.

The lesson sequence in this resource is structured around the following assumptions:

- The lesson sequence provides activities that introduce and explore the three inquiry questions in **two to five 50-minute** class periods. Choices should be made by teachers and students about the scope and extent of research and assignments associated with the lesson sequence. Depending on the time available, modify the number of class periods for the lesson sequence.
- Additional activity suggestions provide opportunities to extend the lesson sequence and further develop research and inquiry skills.

This Critical Issues Guide is one in a series of Critical Issues Guides produced by the **Alberta Canola Producers**. Other Critical Issues Guides can be ordered or accessed on the Alberta Canola Producers website at [http://canola.ab.ca/clc/learning\\_resources.aspx](http://canola.ab.ca/clc/learning_resources.aspx).

- An overview of instructional strategies is provided with each activity.
- Rubrics can be used to assess many of the products that students create in the lesson sequences. Sample rubrics and criteria statements are provided at the end of this section of the resource, as well as a template for creating customized rubrics.
- Student products may be displayed and shared with other classrooms and students, the school, parents and the community. If appropriate, discuss ways that projects may be completed in cross-curricular contexts with other subject area teachers.

The lesson sequence is self-contained and provides the instructional process, activity ideas, briefing notes and other handouts. **Therefore, teachers should select those activities in the lesson sequence that they believe will be most effective in supporting their students' learning in the Biology 20 program.**

## Briefing Notes

The lesson sequence centres on three inquiry questions and content that is introduced and explored through Briefing Notes. The Briefing Notes handout opens with *Predict* questions that emphasize critical thinking and connect to students' prior knowledge, understandings, attitudes and assumptions.

The Briefing Notes also provide questions, activities and Internet website links that encourage research and the exploration of multiple viewpoints and opinions on issues relating to fatty acids, their impact on the human body and agriculture.

The Briefing Notes format provides an opportunity for students to take on a variety of research roles. Each Briefing Note contributes to research that students gather to explore the critical issue. Students should be encouraged revisit, discuss and reflect on the critical issue when the lesson sequence has been completed.

# At a Glance

The following chart provides an overview of each lesson sequence, inquiry focus, instructional strategies, curriculum connections and assessment focus.

## Lesson Sequence

### The Skinny on Fats

#### What's essential about fatty acids?

In the Lesson Sequence, students explore the biochemistry of fats and oils and examine the chemical composition of fatty acids. They analyze the differences between saturated and unsaturated fats and their impact on the human body.

- **Attitude Outcomes** that support the responsible acquisition and application of knowledge related to science and technology are also developed and supported by this resource.

#### Inquiry Focus, Concepts & Relevant Terms

Why is it important to know about fatty acids?

- Lipids
- Fats
- Oils
- Phospholipids
- Fatty Acids
- Macronutrients
- Glycerol
- Triglycerides
- Fat-soluble
- Hydrophilic
- Hydrophobic
- Steroids
- Lipases
- Enzyme
- Caloric Density
- Invisible
- Visible

Why is the consumption of *trans* fats considered a health issue?

- Saturated
- Unsaturated
- Monounsaturated
- Polyunsaturated
- Essential

What impact do fatty acids have on body systems and health?

- Cis Double Bond
- Trans Double Bond
- Hydrogenation
- Partial Hydrogenation

#### Curriculum Connections Biology 20

##### Knowledge

**20–D1.2k** describe the chemical nature of carbohydrates, lipids and proteins and their enzymes; i.e., carbohydrases, lipases and proteases

##### Skills

**20–D1.2s** conduct investigations into relationships between and among observable variables and use a broad range of tools and techniques to gather and record data and information:

- perform experiments, using qualitative tests, to detect the presence of carbohydrates, proteins and lipids (PR–NS2, PR–NS3, PR–NS4, PR–NS5)

#### Assessment Focus (I Can... Statements)

- **I can** describe the chemical nature of lipids, including the difference between fats and fatty acids.
- **I can** identify sources of lipids.
- **I can** identify and compare the chemical structure of fatty acids.
- **I can** analyze the impact of fatty acids on the human body.

Students should understand the chemical nature of lipids through their exploration of fats, oils and fatty acids. They should be able to explain why knowledge of fatty acids can impact dietary and nutritional decision-making, sources of fats and how different types of fatty acids affect digestive systems.

#### Instructional Strategies

- Board Share Challenge
- KWFL Chart
- Lab Work and Analysis
- Venn
- Press Conference
- Comparison Chart



# ASSESSMENT TOOLS

The assessment criteria statements that follow can be developed into rubrics and applied to many of the products that students develop in the activities in this resource. The criteria statements should be discussed, adapted and developed with students. A template is provided for the creation of customized rubrics.

## VISUAL ORGANIZERS

Excellent 4	<ul style="list-style-type: none"> <li>• Demonstrates a thorough understanding of the topic, its relationships and related concepts and ideas</li> <li>• Provides descriptive labels and organizers; provides information that reflects the topic</li> <li>• Links are made appropriately</li> <li>• Uses the visual organizer to make connections and draw relationships</li> </ul>
Proficient 3	<ul style="list-style-type: none"> <li>• Demonstrates an adequate understanding of the topic and concepts</li> <li>• Provides appropriate labels and organizers</li> <li>• Provides information that relates to the topic</li> <li>• Attempts to make links</li> <li>• Uses the visual organizer appropriately for topic and concepts</li> </ul>
Acceptable 2	<ul style="list-style-type: none"> <li>• Identifies concepts and ideas that relate to the topic</li> <li>• Provides labels and organizers</li> <li>• Includes information that relates to the topic</li> <li>• Uses the format of the visual organizer</li> </ul>
Limited 1	<ul style="list-style-type: none"> <li>• Provides limited information related to the topic</li> <li>• Uses parts of the visual organizer to present information</li> </ul>

*These criteria statements can be developed into self-assessment tools that students can use. Criteria statements can be combined with the "I Can..." statements to self-assess understandings and skills for a particular product.*

*For example, criteria statements for assessing a Venn diagram in which students compare different types of fatty acids may include the following criteria for an Excellent rating:*

- **I can** compare three positive and three negative effects that fatty acids have on body functions.
- **I can** describe the composition of each of these fatty acids through labelled diagrams.
- **I can** apply my understanding of these fatty acids to assess their role and impact in my own food choices.

## GROUP ACTIVITIES

Excellent 4	<ul style="list-style-type: none"> <li>• Demonstrates clear understanding of the group task and their individual contribution to the group</li> <li>• Listens to group members</li> <li>• Expresses original opinions and ideas</li> <li>• Contributes meaningful information and research</li> <li>• Works with the group to fulfill group responsibilities</li> </ul>
Proficient 3	<ul style="list-style-type: none"> <li>• Articulates understanding of the group task and the role they play within the group</li> <li>• Listens to group members</li> <li>• Contributes ideas and information</li> <li>• Fulfills individual responsibilities for the group</li> </ul>
Acceptable 2	<ul style="list-style-type: none"> <li>• Describes the group task</li> <li>• Describes individual role within the group setting</li> <li>• Listens to group members</li> <li>• Contributes information to group task</li> </ul>
Limited 1	<ul style="list-style-type: none"> <li>• Describes individual role within the group setting</li> <li>• Listens to others in the group</li> <li>• Contributes limited ideas</li> </ul>

## RESEARCH

Excellent 4	<ul style="list-style-type: none"> <li>• Develops a strategy for conducting research</li> <li>• Develops and identifies research and inquiry questions</li> <li>• Analyzes and assesses sources of information selected for the research task</li> <li>• Records information using an appropriate format</li> <li>• Applies research to inquiry question</li> <li>• Makes effective use of research time</li> </ul>
Proficient 3	<ul style="list-style-type: none"> <li>• Identifies a strategy for conducting research</li> <li>• Identifies research and inquiry questions</li> <li>• Selects and assesses sources of information</li> <li>• Records information using an appropriate format</li> <li>• Identifies links between research collected and inquiry question</li> <li>• Makes effective use of research time</li> </ul>
Acceptable 2	<ul style="list-style-type: none"> <li>• Uses a previously identified strategy for conducting research</li> <li>• Records research and inquiry questions</li> <li>• Selects and reads sources of information</li> <li>• Records information using an appropriate format</li> <li>• Uses information from sources to answer inquiry questions</li> </ul>
Limited 1	<ul style="list-style-type: none"> <li>• Selects and reads sources of information</li> <li>• Records identified research and inquiry questions</li> <li>• Records information using an identified format</li> <li>• Identifies information from sources that relates to inquiry questions</li> </ul>

## PROJECTS

Excellent 4	<ul style="list-style-type: none"><li>• Develops a project planning strategy and process</li><li>• Identifies goals and purpose of project</li><li>• Demonstrates understanding of topics and concepts represented in the project</li><li>• Selects an appropriate method of constructing and creating project</li><li>• Uses research and information gathered appropriately and effectively in the project</li><li>• Demonstrates ability to summarize and synthesize information within the project</li><li>• Displays learning with pride in final presentation of project</li></ul>
Proficient 3	<ul style="list-style-type: none"><li>• Identifies a project planning strategy and process</li><li>• Identifies purpose of project</li><li>• Selects information relating to topics and concepts under study for the project</li><li>• Selects an appropriate method of constructing and creating the project</li><li>• Uses research and information gathered appropriately and effectively in the project</li><li>• Demonstrates ability to summarize information within the project</li><li>• Displays learning appropriately in final presentation of project</li></ul>
Acceptable 2	<ul style="list-style-type: none"><li>• Uses a previously identified project planning strategy and process</li><li>• Selects information relating to topics and concepts under study for the project</li><li>• Selects a method for constructing and creating the project</li><li>• Uses research and information gathered throughout the project</li><li>• Displays learning adequately in final presentation of project</li></ul>
Limited 1	<ul style="list-style-type: none"><li>• Selects information relating to topics and concepts under study for the project</li><li>• Constructs and creates the project using an identified approach</li><li>• Uses information gathered for the project</li></ul>

*RUBRIC TEMPLATE*

Excellent 4	
Proficient 3	
Acceptable 2	
Limited 1	
No work completed 0	

# LESSON SEQUENCE: THE SKINNY ON FATS

## Overview

In the lesson sequence, students explore the biochemistry of fats and oils and examine the chemical composition of fatty acids. They analyze the differences between saturated and unsaturated fats and their impact on the human body.

## Rationale

Students should understand the chemical nature of lipids through their exploration of fats, oils and fatty acids. They should be able to explain why knowledge of fatty acids can impact dietary and nutritional decision-making, identify sources of fats and describe how different types of fatty acids affect digestive systems.

Presenting students with “I can...” statements can help focus their learning and provide a context for assessment with this lesson’s activities.

## Critical Issue & Inquiries

### What’s essential about fatty acids?

- Why is it important to know about fatty acids?
- Why is the consumption of *trans* fats considered a health issue?
- What impact do fatty acids have on body systems and health?

## Key Concepts

Lipids Fats Oils Phospholipids Fatty Acids Macronutrients

Glycerol Triglycerides Fat-soluble Hydrophilic Hydrophobic

Steroids Lipases Caloric Density Invisible Visible Saturated

Unsaturated Enzyme Monounsaturated Polyunsaturated Essential

Trans Double Bond Cis Double Bond Hydrogenation Partial Hydrogenation

### “I CAN”

*This Lesson Sequence encourages students to demonstrate their learning by developing understandings such as the following:*

- **I can** describe the chemical nature of lipids, including the difference between fats and fatty acids.
- **I can** identify sources of lipids.
- **I can** identify and compare the chemical structure of fatty acids.
- **I can** analyze the impact of fatty acids on the human body.

## Preparation

### Suggested Time: 2–5 50-minute class periods

The following handouts, materials and resources are used in this lesson sequence:

- Handouts
  - Student Resource 1A: KWFL Chart
  - Briefing Notes 1B: Sorting Out the Fats
  - Student Resource 1C: Venn Diagram
  - Student Resource 1D: Comparison Chart
- Student lab materials
  - Identification of Lipids Lab:**
    - Canola oil
    - Balance or scale
    - Brown paper (unglazed)
    - Sudan IV powder or solution
    - Test tubes and rack
    - Medicine dropper
    - Other substances that will be tested for lipids
  - Optional Extension: Local media sources – newspapers, magazines, Internet-based – including any that provide articles or advertisements related to the role and consumption of fats and oils in the diet (*Ask students to bring copies of current newspapers from home to establish a classroom collection.*)
- Internet access and/or LCD projector or interactive whiteboard to display and share website links



## Teaching & Learning Strategies

*What's essential about fatty acids?*



### Introductory Activity

Students begin with a brainstorming activity in which they think about and discuss what they know about lipids and their characteristics. They are encouraged to identify and consider what they already know and question whether their existing knowledge is based on assumption, first-hand experiences, scientific fact or media messages.

#### **Instructional Strategy: Board Share Brainstorming**

A board share is a cooperative learning activity that encourages students to work as a whole class group to brainstorm ideas, experiences and insights around a specific topic or question. The board share structure encourages students to generate their own ideas and insights as well as consider, and add to, the ideas of others in the class.

A board share strategy starts by having small groups of students brainstorm responses to a question or challenge. While the group brainstorms, an appointed recorder records the group's ideas on the board. The recorder is responsible for ensuring that all of the group's ideas are recorded.

#### **Instructional Strategy: KWFL Chart**

Group discussion, analysis and synthesis of information encourage students to draw conclusions and ask questions that lead to further research. Using a visual organizer such as a KWFL chart, students link their prior knowledge and understandings to ideas for further research. In the four columns of the KWFL chart, students list and summarize what they **know**, what they **want** to find out, what they **found** and what they **learned**.



### DIFFERENTIATE

*The Extend Challenge provided in the Briefing Notes student resource on page 34 can be structured and assigned as a prerequisite or initial home learning assignment for students. Ask students to research the product labels of the food they would eat in a day and calculate their intake of total fat, saturated fat, trans fats and unsaturated fats. Share results and discuss whether levels of fat consumption were surprising or expected. Encourage students to revisit their results as they progress through their research.*



## DIFFERENTIATE

If necessary, use classroom resources, textbooks and whole class discussion to review or revisit concepts related to the chemical composition of carbohydrates, lipids and proteins.

Then, ask students to write a definition of each element and provide examples of their nutritional implications.

## WEBLINKS

A number of websites provide resources that can introduce students to "good" and "bad" fats and oils.

A variety of links that explain nutritional implications of fats, good and bad fats and types of fatty acids can be found on [www.goodfats101.com](http://www.goodfats101.com). Fact sheets can be accessed at [www.goodfats101.com/fat-facts/fact-sheets/](http://www.goodfats101.com/fat-facts/fact-sheets/).

Health Canada provides Fats: The Good, the Bad and the Ugly at [www.hc-sc.gc.ca/hl-vs/alt\\_formats/pdf/iyh-vsv/med/fats-gras-eng.pdf](http://www.hc-sc.gc.ca/hl-vs/alt_formats/pdf/iyh-vsv/med/fats-gras-eng.pdf).

The American Heart Association provides Fats 101, including information on the different types of fats, at [www.heart.org/HEARTORG/GettingHealthy/FatsAndOils/Fats101/Fats-101\\_UCM\\_304494\\_Article.jsp](http://www.heart.org/HEARTORG/GettingHealthy/FatsAndOils/Fats101/Fats-101_UCM_304494_Article.jsp).

## PROCESS

1. Organize students into small groups and use a group share strategy such as a board share. Challenge students to work with their group to brainstorm and list as many different foods as they can think of that contain fats.
2. Introduce the critical issue to students by writing it on the board: *What's essential about fatty acids?* Ask students what they know or have heard about fatty acids. Tell students that fats are a storage form of fatty acids. How do fats and fatty acids affect human digestive systems and health? Make a jot list of students' initial responses on the board. Use the jot list to connect to and discuss questions and points such as the following:
  - What are sources of fats that we use for food? (*Challenge students to identify examples of animal and plant-based sources of fats and oils, including canola.*)
  - What do you know about the fats you find in foods? Are there fats that are better for you than others? How do you know this? (*Point out that different types of fatty acids are found in varying amounts in fats and oils.*)
  - What do you know about the nutritional and chemical elements of foods? (*Review or revisit what students know about carbohydrates, lipids and proteins. List these elements on the board. Carbohydrates, fats, vitamins, minerals, proteins, fibre and water constitute the basic nutritional elements of food. They are categorized based on the amounts in which the body requires them. Nutrients required in relatively larger amounts by the body are called macronutrients. Carbohydrates, fats, proteins, water and fibre belong to this class of nutrients. Vitamins and minerals are required in comparatively smaller amounts and are called micronutrients. Carbohydrates, fats and proteins are sources of energy. Carbohydrates give four calories of energy per gram while one gram of fat gives nine calories of energy. Molecules of carbohydrates and fats are composed of carbon, hydrogen and oxygen atoms. Proteins contain nitrogen atoms. Foods contain some or all of the nutrients in certain proportions. These nutritional elements of food help maintain metabolism of the body and keep individuals healthy.*)
  - Lipids include both fats and oils. All fats and oils have similar chemical structures. What different types of fats are you aware of? What do you think makes them different? (*Fats and oils both contain fatty acids and glycerol. Fats and oils can come from animal or plant sources. Tell students they will have the opportunity to find out more about why all fats are not equal.*)
  - What are some nutritional benefits of fats? What are some potential issues or debates relating to the consumption of fats? Where do you hear these issues and debates? How do you know these issues are valid? (*Encourage students to identify messages they have heard or seen in the media as well as those that are considered "general knowledge" about "good" or "bad" fats.*)



Ask students to consider where their knowledge of fats and the dietary implications of fat consumption come from and discuss how this knowledge can be validated through understandings and applications of chemistry processes and principles.

Focus on media messages about fat consumption, including those found on the Internet. What do these messages say? Challenge students to consider if these messages are based on:

- o Assumptions they make
  - o Facts
  - o Opinions
  - o Research.
3. Have each student complete **Student Resource 1A: KWFL Chart**. Trade the chart with another student and discuss ideas that are similar and different. Ask students to share their perspectives, responses and ideas with the whole class.
  4. **Extend:** Challenge students to identify issues related to fats in foods and where these fats come from, including the recent emphasis on the dangers of *trans* fats, organic food production or biotechnology. Use a variety of media sources, such as newspapers, magazines and Internet sites. Have students work with a partner or in a small group to identify the issues and collect examples. How does the media, including the Internet, promote attitudes and knowledge about these issues? What effect does this source of information have on issues and decisions about human consumption of fats?



#### **DIFFERENTIATE**

*Provide students with the opportunity to make concrete, real-world connections to the biochemical dimension of what they are learning about lipids. Have students do an Internet search to find current messaging about fat consumption in the diet. To what extent do they think messages about “trans,” “saturated” and “unsaturated” fats influence consumer food and dietary choices?*



## Briefing Notes Activity

Students research and discuss the chemical composition of fats and oils. Students complete a simple test for the presence of fats in different substances and explore the implications of different fatty acids on body systems and health.

### **Instructional Strategy: Lab Work and Analysis**

*Developing skills of comparative analysis can be facilitated through an experiential lab that encourages comparison and qualitative analysis of data.*

### **Instructional Strategy: Venn**

*Graphic organizers provide students with structured strategies for representing and organizing their understandings and knowledge. A graphic organizer such as a Venn encourages students to compare concepts by analyzing how they connect or share characteristics. Students list characteristics of two concepts in each separate circle of the Venn. They then find those characteristics that are similar or the same and list them in the intersecting area of the two circles.*

### **PROCESS**

1. Ask students what the guidelines for fat in a daily diet include. Revisit or introduce the guidelines for fat consumption in *Eating Well with Canada's Food Guide*, which states that a small amount (30 to 45 mL) of unsaturated fat should be consumed daily. Use this information as a starting point to share the following three inquiry questions with students:
  - Why is it important to know about fatty acids?
  - Why is the consumption of *trans* fats considered a health issue?
  - What impact do fatty acids have on body systems and health?
2. Provide each student with a copy of **Briefing Notes 1B: Sorting Out the Fats**. Assign individually, or work with students to discuss or respond in writing to the *Predict* questions at the beginning of the student resource. Have students work with a small group to complete the **Identification of Fats and Oils Lab**, in which they are asked to observe the presence of fat in different foods. Discuss the questions in the Briefing Notes after students complete the lab.

### **WEBLINKS**

Eating Well with Canada's Food Guide provides guidelines for the consumption of fats and oils at [www.hc-sc.gc.ca/fn-an/food-guide-aliment/choose-choix/oil-huile/index-eng.php](http://www.hc-sc.gc.ca/fn-an/food-guide-aliment/choose-choix/oil-huile/index-eng.php).



### **DIFFERENTIATE**

*Students in the class can be grouped into three large groups, with each taking responsibility for constructing and sharing a response to one of the three inquiry questions.*

## Identification of Lipids Lab

This simple lab asks students to use an indicator and visual observation to identify foods that contain lipids. Students test canola oil with Sudan IV powder or solution and complete a translucence test to establish a benchmark and then test a number of other substances for lipids.

Lipids can be identified with an indicator test, using Sudan IV powder or solution, which is a fat-soluble dye. Lipids will turn the solution from a pink to red colour. Brown paper can also be used to identify lipids. The oily nature of lipids, when rubbed or crushed on the paper, will turn it translucent and allow light to shine through it.

### Materials

- Canola oil
- 10 mL graduated cylinder
- Brown paper (unglazed)
- Sudan IV powder or solution
- Distilled water
- Safety goggles
- Test tubes and rack (two test tubes for benchmarking and one test tube for each additional item to be tested)
- Medicine dropper
- Other items that will be tested for lipids

### Method

1. Label two test tubes with "Control" and "Test." Measure 3 mL of distilled water into the "Control" tube and 3 mL of canola oil into the "Test" tube. Add a small amount (pinch) of Sudan IV powder or a drop of solution to each test tube, stopper them and shake for two minutes.
2. Record the colour of each mixture and any precipitate as the benchmark for lipid content.
3. Measure and cut two 10 cm square pieces of unglazed brown paper and label one with "Control" and the other with "Test." Place a drop of water on the "Control" paper and a drop of canola oil on the "Test" paper. Air dry the papers by waving them until the water evaporates. Hold both squares of papers to the light and record observations as the benchmark.
4. Use both tests to determine lipid content of other substances. Record results.

Students should be cautioned on the harmful effects of Sudan IV powder or solution. Consult the safety information available in the *Material Safety Data Sheet* at [www.sciencelab.com/msds.php?msdsId=9927614](http://www.sciencelab.com/msds.php?msdsId=9927614).



### DIFFERENTIATE

*Each small group of students can be assigned a different substance to test and record results on a class chart.*

## WEBLINKS

A lab that has students test for triglycerides, glucose, starch and proteins can be found on the Lesson Plans Inc. website at

[www.lessonplansinc.com/biology/detail/macromolecule\\_mystery\\_lab](http://www.lessonplansinc.com/biology/detail/macromolecule_mystery_lab). This website also provides a student worksheet on lipids that can be used for additional practice.

Lesson plans for teaching about macromolecules can be accessed at [www.lessonplansinc.com/proteins\\_lipids\\_carbohydrates\\_lesson\\_plans.php](http://www.lessonplansinc.com/proteins_lipids_carbohydrates_lesson_plans.php).

Additional food chemistry experiments can be found in the IFT Experiments in Food Science Series: Food Chemistry Experiments and accessed at [www.omega3learning.uconn.edu/media/educationresource/FCbook.pdf](http://www.omega3learning.uconn.edu/media/educationresource/FCbook.pdf).

A full colour version of the chart on this page and in the student resource can be ordered free from the Canola Council of Canada at [www.canolacouncil.org/publication-resources/print-resources/canola-oil-resources/comparison-of-dietary-fats-chart-poster/](http://www.canolacouncil.org/publication-resources/print-resources/canola-oil-resources/comparison-of-dietary-fats-chart-poster/).

The teaching resource, *Biofuels: Choice or Necessity?* To what extent would increased production and use of biofuels make a difference to quality of life?, can be accessed or ordered from Alberta Canola Producers at [http://learncanola.com/high\\_school\\_lesson\\_plans.aspx](http://learncanola.com/high_school_lesson_plans.aspx). This resource provides additional information and labs that connect to learning about fatty acids.

### Source:

Alberta Canola Producers Commission [http://canola.ab.ca/canola\\_oil.aspx](http://canola.ab.ca/canola_oil.aspx)



- Give students the choice of working individually or with a partner to complete the research and questions in the Briefing Notes. Provide them with **Student Resource 1C: Venn**. Students use the Venn to make the following comparisons:

- Fats to oils
- Saturated fats to unsaturated fats
- Cis fats to *trans* fats

Discussion questions in the Briefing Notes include:

- What are the chemical properties of lipids? (*Encourage students to discuss what fats, oils, waxes and steroids have in common.*)
- What is the difference between saturated and unsaturated fatty acids? How does this difference impact the effect they have on human health?
- What are the chemical properties of canola oil? What evidence would you use to rate its health benefit? (*Ask students to consider the saturated and unsaturated fatty acid content of canola by comparing it to other vegetable oils.*)

## Comparison of Dietary Fats

### DIETARY FAT

Canola oil	7	21	11	61
Safflower oil	8	14	1	77
Flaxseed oil	9	16		57
Sunflower oil	12	71		1
Corn oil	13	57		1
Olive oil	15	9	1	75
Soybean oil	15	54		8
Peanut oil	19	33		*
Cottonseed oil	27	54		*
Lard	43		9	1
Palm oil	51		10	*
Butter, melted	68			3 1
Coconut oil	91			2 7

#### SATURATED FAT



#### POLYUNSATURATED FAT



linoleic acid  
(an omega-6 fatty acid)



alpha-linoleic acid  
(an omega-3 fatty acid)

#### MONOUSATURATED FAT



oleic acid  
(an omega-9 fatty acid)

\*Trace Fatty acid content normalize to 100%

TABLE SOURCE: POS PILOT CORPORATION

4. Discuss students' responses to the questions in the Briefing Notes with questions that encourage them to synthesize their learning, such as the following:
- How are fats essential to the human digestive system? What role do fatty acids play? *(Revisit the role of fats and nutrients in supplying the digestive system with nutrients that the human body uses for growth, maintenance and repair. Nutrients include amino acids, simple sugars, fatty acids and monoglycerides. These nutrients are metabolized as fuel, which is measured in calories.)*
  - When are fats harmful to the human digestive system? *(Ask students to consider the balance between negative media messages about fat consumption with knowledge of the differences between different fats and the needs of the human body for essential fatty acids. These fatty acids play a role in the development of cell membranes and hormones, insulate the body and protect organs.)*
  - Have there been changes or shifts in attitudes over time about the consumption of different dietary fats? What have these changes been? Why do you think these changes have occurred? *(This question can lead into further or optional research that connects learning about fats and fatty acids to broader issues and "real-world" topics related to the human digestive system and the biochemical basis of nutritional trends. Although students can do an Internet search for research and attitudes about dietary fats, it is important to also identify the source and analyze the validity of any information they find.)*

## WEBLINKS

*A number of websites provide additional information and perspectives on the use of different fats and the implications of saturated, unsaturated, trans or cis fats. Some of the weblinks below are also provided in the student Briefing Notes.*

*Information about dietary fat and comparison of different oils is provided on the Alberta Canola Producers Commission website at [http://canola.ab.ca/canola\\_oil.aspx](http://canola.ab.ca/canola_oil.aspx).*

*Additional information, including video links, can be found on the Canola Council of Canada website at [www.canolainfo.org/health/index.php](http://www.canolainfo.org/health/index.php).*

*The National Association of Margarine Manufacturers, accessed at [www.butteryspreads.org/index.php](http://www.butteryspreads.org/index.php), provides information on the use and benefits of soft spread margarines.*

*The American Heart Association's Face the Fats campaign provides information and perspectives on the differences and implications of different types of fats and fatty acids at [www.heart.org/HEARTORG/GettingHealthy/FatsAndOils/MeettheFats/Meet-the-Fats\\_UCM\\_304495\\_Article.jsp](http://www.heart.org/HEARTORG/GettingHealthy/FatsAndOils/MeettheFats/Meet-the-Fats_UCM_304495_Article.jsp).*

*An article that discusses the role of fats in the diet can be found on the Food Insight website of the International Food Information Council Foundation at <http://www.foodinsight.org/Blog/tabid/60/EntryId/537/Weighing-the-Low-Fat-Conundrum.aspx>.*



## **DIFFERENTIATE**

*If students were not assigned to an inquiry question earlier, they can be asked to draw one of the three inquiry questions, select the question that interests them most or be randomly assigned one question.*

*Students can also be provided with choices or options other than a press conference as they prepare their statements.*

- *Large groups can divide into two or three smaller groups, with each small group preparing a perspective on their assigned inquiry question.*
- *Students can individually prepare a position statement, with the help of other members in their groups. Form new groups of three, with one student from each inquiry question group. Share position statements within the small groups of three.*



## **Closing Activity**

Students organize a press conference to share their insights and conclusions around one of the three inquiry questions.

### **Instructional Strategy: Press Conference**

*A press conference can encourage students to share research and learning with other students or groups in the class. Each group decides how to present a statement that advocates their perspectives with supporting research. A spokesperson can be appointed from each group and a time limit provided for their statement. A table can be set up at the front of the classroom for representatives of each group. Once statements have been presented, other students ask questions of the representative of other groups.*

### **PROCESS**

1. Have each large group of students refocus on their assigned inquiry question:
  - Why is it important to know about fatty acids?
  - Why is the consumption of *trans* fats considered a health issue?
  - What impact do fatty acids have on body systems and health?Provide time for students to prepare a short summary statement that includes perspectives and supporting information in response to the inquiry question they have been assigned. Have students share and compare their statements and appoint three students who will present their responses in the press conference.
2. Revisit the critical issue: What's essential about fatty acids? Encourage students to discuss this question, asking them what misconceptions they have had about dietary fats and how their learning might affect their own dietary decisions.



## Extension Activity

Students work individually or with a partner to research information and “misinformation” about canola oil and connect their research to scientific evidence and knowledge about fatty acids.

### **Instructional Strategy: Comparison Chart**

*A comparison chart is a graphic organizer that can be used to organize information that represents different perspectives or opinions, facilitating analysis and comparisons.*

### **PROCESS**

1. Invite students to research examples of “information” and “misinformation” about canola oil on the Internet, asking them first to discuss and identify the criteria they would use to judge the validity of the examples they find. *(Encourage students to consider criteria such as the use of impartial and professional sources, research-based, biochemical evidence or the use of clinical studies; compared to examples that come from blogs or websites that do not provide scientific evidence.)*
2. Provide students with **Student Resource 1D: Comparison Chart**. Ask students to work individually or with a partner and use the chart to record examples and sources.
3. As a class, discuss the examples that students found. Explore questions such as the following:
  - What are the different messages about canola?
  - What evidence is used to support these messages?
  - How does a knowledge of biochemistry help to determine the validity of the information and sources?

### **WEBLINKS**

*Students can complete an Internet search for different sources related to canola oil, some of which represent information and others which provide misinformation. Have students search using the following search terms:*

- “Canola oil”
- “Canola oil evidence”

*Ensure that students compare any sites they find to the information on the CanolaInfo website at [www.canolainfo.org](http://www.canolainfo.org) and the Canola Council of Canada website at [www.canolacouncil.org/canola\\_oil\\_the\\_truth.aspx](http://www.canolacouncil.org/canola_oil_the_truth.aspx). Additional information can be found on the Mayo Clinic website at [www.mayoclinic.com/health/canola-oil/AN01281](http://www.mayoclinic.com/health/canola-oil/AN01281).*

*Students can also be asked to revisit Eating Well with Canada’s Food Guide at [www.hc-sc.gc.ca/fn-an/food-guide-aliment/choose-choix/oil-huile/oil-huile-eng.php](http://www.hc-sc.gc.ca/fn-an/food-guide-aliment/choose-choix/oil-huile/oil-huile-eng.php) to compare the Food Guide’s recommendations that involve canola oil.*

## KWFL Chart

*What's essential about fatty acids?*

Fatty acids are a source of energy for cells. They are found in oils and other fats that make up different foods. They are an important part of a healthy diet, because the body needs them for several purposes.

### DEFINING TERMS

Write your definition for each term:

*Lipids*

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*Fats*

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*Fatty Acids*

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*Triglycerides*

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*Micronutrients*

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*Macronutrients*

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*Essential Fatty Acids*

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I Know Now	I Want to Know More About
Finding Out	I Learned

## Sorting Out the Fats

### **Predict**

What do you know about different types of fats? How healthy are these fats?

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### *Dietary Fats*

There are an increasing number of messages in all forms of media about dietary fats. Are all fats bad? Or are there “good” fats? How do you tell the difference between fats that are necessary and those that have negative effects on digestion and body health?

Fats are one type of lipids. **Lipids** provide long-term storage of energy in the human body, with nine kilocalories of energy per gram. Lipids have other roles – they provide padding and insulation for the body, store fat-soluble vitamins, and play a role in the production of hormones and cell membranes. There are four common types of lipids:

- **Fats** are three **fatty acids** linked to an ester of **glycerol**. They can be saturated or unsaturated. **Essential fatty acids** are those acids that are essential for healthy functioning of the human body. They include linoleic and linolenic acids.
- **Waxes** are similar to fats but are composed of much longer fatty acids. Waxes have a higher melting point.
- **Phospholipids** are similar to fats but one of the fatty acid groups is replaced by a phosphate group. This lipid has both **hydrophilic** (water-soluble) and **hydrophobic** (water-repellent) characteristics. The ester of glycerol is hydrophilic but the fatty acid chains are hydrophobic. These molecules are used in the formation of cell membranes.
- **Steroids** are the last common kind of lipids. Examples of steroids include cholesterol and hormones like testosterone and estrogens.

### **EXPLORE**

**What do lipids have in common?**

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### **WEBLINKS**

Revisit the digestive system, macronutrients and their enzymes on the BBC Bitesize website link on Enzymes and Digestion at [www.bbc.co.uk/schools/gcsebitesize/science/add\\_aqa\\_pre\\_2011/enzymes/enzymes\\_and\\_digestion1.shtml](http://www.bbc.co.uk/schools/gcsebitesize/science/add_aqa_pre_2011/enzymes/enzymes_and_digestion1.shtml).

## Briefing Notes 1B

### *Focus on Fats and Oils*

What many people commonly call “fats” are actually called **triglycerides**. This term also refers to oils. **Fats** are triglycerides that are **solid** at room temperature while **oils** are triglycerides that are **liquid** at room temperature. Triglycerides store most of the energy in animals and plants. Therefore, the fats and oils that people consume come from these sources.

#### **DID YOU KNOW?**

*Although fats are found in a number of different foods, all fats are not equal. **Invisible fats** are found in foods such as meat, fish, dairy products, eggs, nuts and seeds.*

***Visible fats** include shortening, salad and cooking oils, margarines and butter. However, if visible fats are used to bake or cook another food, they become invisible fats.*

Fats are also nutrients that the human body needs and uses. If fats eaten aren't burned as energy or used as building blocks, they're stored by the body in fat cells. Besides supplying fuel for the body, fats:

- Aid in the absorption of some vitamins (vitamins A, D, E, and K are **fat soluble**, meaning they can only be absorbed if there is fat in a person's diet)
- Are the building blocks of hormones
- Are necessary for insulating all nervous system tissues in the body
- Help people feel full, so they're likely to eat less.

Fat is a great source of energy but has twice the amount of calories compared with the same amount of carbohydrates or protein. For example, one gram of fat provides nine calories, whereas one gram of both carbohydrates and protein provide four calories each.

#### **EXPLORE**

**What types of foods supply dietary fats? List fats that come from animal and plant sources in the T-Chart below.**


**How do you know when a food contains fat? Record your initial response below, then try the lab that follows.**

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**LAB: Identification of Fats and Oils**

Lipids can be identified with an indicator test, using Sudan IV powder or solution, which is a fat-soluble dye. Brown paper can also be used to identify lipids. Follow each step to test the substances you have been given for lipids.

**Materials**

- Canola oil
- 10 mL graduated cylinder
- Brown paper (unglazed)
- Sudan IV powder or solution
- Distilled water
- Safety goggles
- Test tubes and rack (two test tubes for benchmarking and one test tube for each additional item to be tested)
- Medicine dropper
- Other substances that will be tested for lipids

**Method**

1. Wear your safety goggles and organize your materials.
2. Label two test tubes with "Control" and "Test." Measure 3 mL of distilled water into the "Control" tube and 3 mL of canola oil into the "Test" tube. Add a small amount (pinch) of Sudan IV powder or a drop of solution to each test tube, stopper them and shake for two minutes.
3. Record the colour of each mixture and any precipitate as the benchmark for lipid content.

**Extreme caution must be taken when using Sudan IV powder or solution to ensure it does not come into contact with your skin or eyes. Do not inhale the powder or fumes. Wear gloves and goggles and use in a well-ventilated area.**

	Control	Test
<b>Colour</b>		
<b>Precipitate</b>		



4. Measure and cut two 10 cm square pieces of unglazed brown paper and label one with "Control" and the other with "Test." Place a drop of water on the "Control" paper and a drop of canola oil on the "Test" paper. Air dry the papers by waving them until the water evaporates. Hold both squares of papers to the light and record observations as the benchmark.

	Control	Test
Observations		

Why do you think a "Test" and "Control" has been established for both tests?

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## Briefing Notes 1B

5. Use both tests to determine lipid content of at least six other substances. Record your observations and conclusions in a data chart such as the one below. Then, answer the questions that follow.

Substances and Description [List and predict what you think will occur]	Sudan IV Test Observations	Brown Paper Test Observations	Lipid Content [Identification of item]	Conclusion and Explanation
1.				
2.				
3.				
4.				
5.				
6.				

**EXPLORE**

**1. What chemical changes indicated the presence of lipids?**

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**2. What variations did you observe in the different substances you tested for lipid content? What did these variations indicate?**

Variations Observed	Indications

**3. What is the advantage of using two different tests for lipid content?**

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*The Fatty Acids in Fats*

Fatty acids have increasingly become a topic of discussions relating to health. However, many people probably don't know exactly what they are or why they even should know what they are. It is important to know what essential fatty acids are, what they do, and what the best sources are.

The fundamental unit of fat is the fatty acid. A **fatty acid** is made up of a long chain of carbon atoms on which hydrogen atoms are attached. At one end of the chain is an acid group. These acid groups have different structures. Therefore, they have different effects on the human body.

Fatty acids have different lengths of carbon chains. Short-chain fatty acids have fewer than eight carbons. Medium-chain fatty acids have 8 to 14 carbons. Long-chain fatty acids have 16 or more carbons.

Fatty acids are classified by their degree of saturation. Saturation is determined by the number of hydrogen atoms that are attached to a carbon chain. There are different degrees of saturation:

- Saturated
- Unsaturated
- Monounsaturated
- Polyunsaturated.

**Saturated fatty acids** form straight chains because the carbons are fully loaded with hydrogen. Because they stack tightly, they are solid at room temperature. They are usually just called "fats."

**Unsaturated fatty acids** are called unsaturated because they have lost one or more pairs of hydrogens from their carbon chain. When these hydrogen pairs are removed, the fatty acid molecule develops a bend. This bend is known as a double bond. The more hydrogens that are missing, the more bent the fatty acid becomes. Unsaturated fatty acids with several double bonds are not as tightly stacked. Therefore, they are liquid at room temperature and are called "oils."

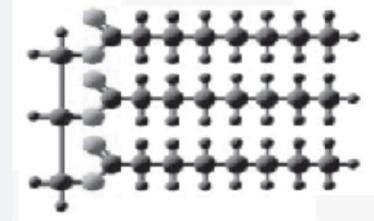
**Monounsaturated fatty acids** have one double bond.

**Polyunsaturated fatty acids** have two or more double bonds.

**Essential fatty acids** are those fats that the human body cannot produce on its own and therefore must obtain from dietary fat sources. Compared to other fatty acids, essential fatty acids with 18 carbons are considered to be short-chain. Those with 20 carbons or more are long-chain.

There are two essential fatty acids:

- Alpha-linolenic acid (ALA), known as an omega 3 fatty acid
- Linoleic acid (LA), an omega 6 fatty acid.

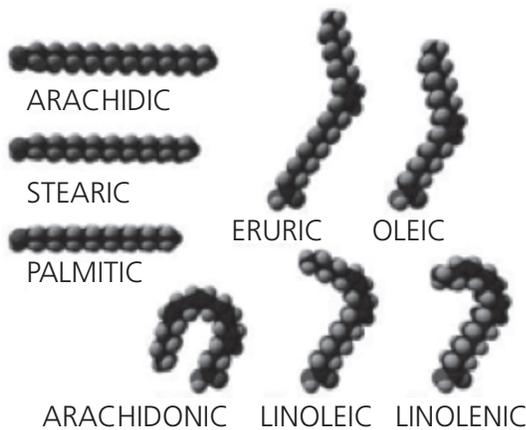


**Triglycerides** have three fatty acids that are attached to a 3-carbon glycerol. The fatty acids are attached to the glycerol chain. The lighter atoms show the acid group.

**DID YOU KNOW?**

Food labels identify fat content in all prepackaged foods, including the presence of saturated and trans fats.

The absence of the essential fatty acids from the diet has been associated with health problems, including flakey or scaly skin, dehydration and slowed growth.



Each diagram shows a different type of fatty acid. Arachidic, stearic and palmitic acids are saturated. Monounsaturated acids include erucic and oleic fatty acids. Linoleic and linolenic fatty acids are polyunsaturated.

**How would you identify each type of fatty acid just by looking at each diagram?**

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*What are the implications of each type of fatty acid for the healthy functioning of the human body?*

Health authorities have paid increasing attention to the biochemistry of fatty acids, focusing on the different effects saturated and unsaturated fats can have on human health. Many of the most recent health studies show that the types of fat people eat directly affects their health. Unsaturated fats generally come from plants and some fish. The double bond in monounsaturated and polyunsaturated fatty acids is called a **cis double bond**. The name "cis" comes from Latin and means "on the side." This name is used because the hydrogen atoms are on the same side of the double bond.

The cis double bonds in unsaturated fats are not as stacked as the fatty acid chains in saturated fats. This means that they are more likely to react with the oxygen in the air, break apart into smaller molecules and cause the fat to go rancid or spoil. Rancid food has an acrid, nasty smell and taste.

The opposite of a cis double bond is a **trans double bond**. The name "trans" also comes from Latin and means "across." In a *trans* double bond, the hydrogen atoms are on the opposite side of the double bond.

*Trans* double bonds are created from cis double bonds during a manufacturing process called **partial hydrogenation**. The hydrogenation process was developed in the early 1900s to convert vegetable oils to solid shortenings or margarines. **Hydrogenation** adds hydrogen atoms to the double bonds, which converts them to single bonds and has the following effects:

- If all the double bonds are hydrogenated, the unsaturated fat becomes saturated.
- When only some of the double bonds are hydrogenated, the fat is called "partially hydrogenated."
- However, the double bonds that are not hydrogenated change from cis to *trans*.

Foods with *trans* fats tend to last longer on grocery shelves because the *trans* double bonds do not oxidize as quickly. Consumers thought, because the *trans* fats came from unsaturated fats, that these products were healthy. However, recent research has shown that *trans* fats are not a healthy choice.

### WEBLINKS

Canada's Food Guide provides some basic information about the amount and types of fats to include in a daily diet at [www.hc-sc.gc.ca/fn-an/food-guide-aliment/choose-choix/oil-huile/oil-huile-eng.php](http://www.hc-sc.gc.ca/fn-an/food-guide-aliment/choose-choix/oil-huile/oil-huile-eng.php).

Information on dietary fats and the issue of trans fats can be found on the Health Canada website at [www.hc-sc.gc.ca/hl-vs/iyh-vsv/food-aliment/trans-eng.php](http://www.hc-sc.gc.ca/hl-vs/iyh-vsv/food-aliment/trans-eng.php).

Information on saturated and trans fat sources can be found on the Health Canada website at [www.hc-sc.gc.ca/fn-an/label-etiquet/nutrition/cons/fats-lipides-eng.php](http://www.hc-sc.gc.ca/fn-an/label-etiquet/nutrition/cons/fats-lipides-eng.php).

Health Canada provides information on their Task Force for reducing trans fats in Canadian foods at [www.hc-sc.gc.ca/fn-an/nutrition/gras-trans-fats/index-eng.php](http://www.hc-sc.gc.ca/fn-an/nutrition/gras-trans-fats/index-eng.php).



**Extend**

Do consumers make informed choices about dietary fats? Consider the following information:

*"Americans remain confused and concerned about the types of dietary fats they consume. For example, 71 percent of Americans say they are trying to limit some type of fats. Sixty-six percent of Americans say they are trying to limit their consumption of saturated fats and/or **trans** fatty acids. But almost 20 percent say they are trying to limit polyunsaturated and monounsaturated fats—the fats that nutrition experts recommend that people consume more of. When asked which dietary fats they consider to be healthful, nearly one in five Americans say they do not consider any fats to be healthful. And when asked whether Americans understood current dietary guidance to limit solid fats, less than one percent of Americans correctly identified the six fats considered to be solid according to the Dietary Guidelines; nearly half of Americans were not even willing to venture a guess."*

**Source:**

From the International Food Information Council Foundation's Food Insight website at [www.foodinsight.org/Resources/Detail.aspx?topic=2011\\_Food\\_Health\\_Survey\\_Consumer\\_Attitudes\\_Toward\\_Food\\_Safety\\_Nutrition\\_Health](http://www.foodinsight.org/Resources/Detail.aspx?topic=2011_Food_Health_Survey_Consumer_Attitudes_Toward_Food_Safety_Nutrition_Health)

How do you think Canadian attitudes compare to American attitudes?

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## Briefing Notes 1B

Canola oil	7	21	11	61
Safflower oil	8	14	1	77
Flaxseed oil	9	16		57
Sunflower oil	12	71		1
Corn oil	13	57		1
Olive oil	15	9	1	75
Soybean oil	15	54		8
Peanut oil	19	33	*	43
Cottonseed oil	27	54		*
Lard	43		9	1
Palm oil	51		10	*
Butter, melted	68		3	1
Coconut oil	91			2

SATURATED FAT      POLYUNSATURATED FAT      MONOUSATURATED FAT  
 ■      ■ linoleic acid (an omega-6 fatty acid)      ■ alpha-linoleic acid (an omega-3 fatty acid)      ■ oleic acid (an omega-9 fatty acid)

SOURCE: POS PILOT CORPORATION

### Table Source:

Alberta Canola  
Producers Commission  
[http://canola.ab.ca/canola\\_oil.aspx](http://canola.ab.ca/canola_oil.aspx)

\*Trace Fatty acid content normalize to 100%

### Find Information

Find out about the composition of canola oil in some of the Canola Council of Canada's publications:

*Canola Oil. Good for Every Body!* at [https://canola-council.merchantsecure.com/canola\\_resources/product74.aspx](https://canola-council.merchantsecure.com/canola_resources/product74.aspx)

*Canola – Trans Fat and Coronary Heart Disease* at [https://canola-council.merchantsecure.com/canola\\_resources/product49.aspx](https://canola-council.merchantsecure.com/canola_resources/product49.aspx)

Other sources of reliable info on fats in the diet include:

A variety of links that explain nutritional implications of fats, good and bad fats and types of fatty acids at [www.goodfats101.com](http://www.goodfats101.com)

*Fats: The Good, the Bad and the Ugly* from Health Canada at [www.hc-sc.gc.ca/hl-vs/alt\\_formats/pdf/iyh-vsv/med/fats-gras-eng.pdf](http://www.hc-sc.gc.ca/hl-vs/alt_formats/pdf/iyh-vsv/med/fats-gras-eng.pdf)

*Meet the Fats – the Good Fats Brothers and the Good Fats Sisters* – from the American Heart Association at [www.heart.org/HEARTORG/GettingHealthy/FatsAndOils/MeettheFats/Meet-the-Fats\\_UCM\\_304495\\_Article.jsp](http://www.heart.org/HEARTORG/GettingHealthy/FatsAndOils/MeettheFats/Meet-the-Fats_UCM_304495_Article.jsp)

*The Final (Maybe) Verdict on the Low-Fat Diet* from Foundations of Wellness, UC Berkeley at [www.wellnessletter.com/html/fw/fwNut02LowFatDiets.html](http://www.wellnessletter.com/html/fw/fwNut02LowFatDiets.html)

Dietary fats, oils and cholesterol from the Heart & Stroke Foundation at [www.heartandstroke.com/site/c.ikiQLcMWJtE/b.3484237/k.4695/Dietary\\_fats\\_oils\\_and\\_cholesterol.htm](http://www.heartandstroke.com/site/c.ikiQLcMWJtE/b.3484237/k.4695/Dietary_fats_oils_and_cholesterol.htm)

*Cholesterol Management Health Center: Lipid Panel* from WebMD at [www.webmd.com/cholesterol-management/tc/lipid-panel-topic-overview](http://www.webmd.com/cholesterol-management/tc/lipid-panel-topic-overview)

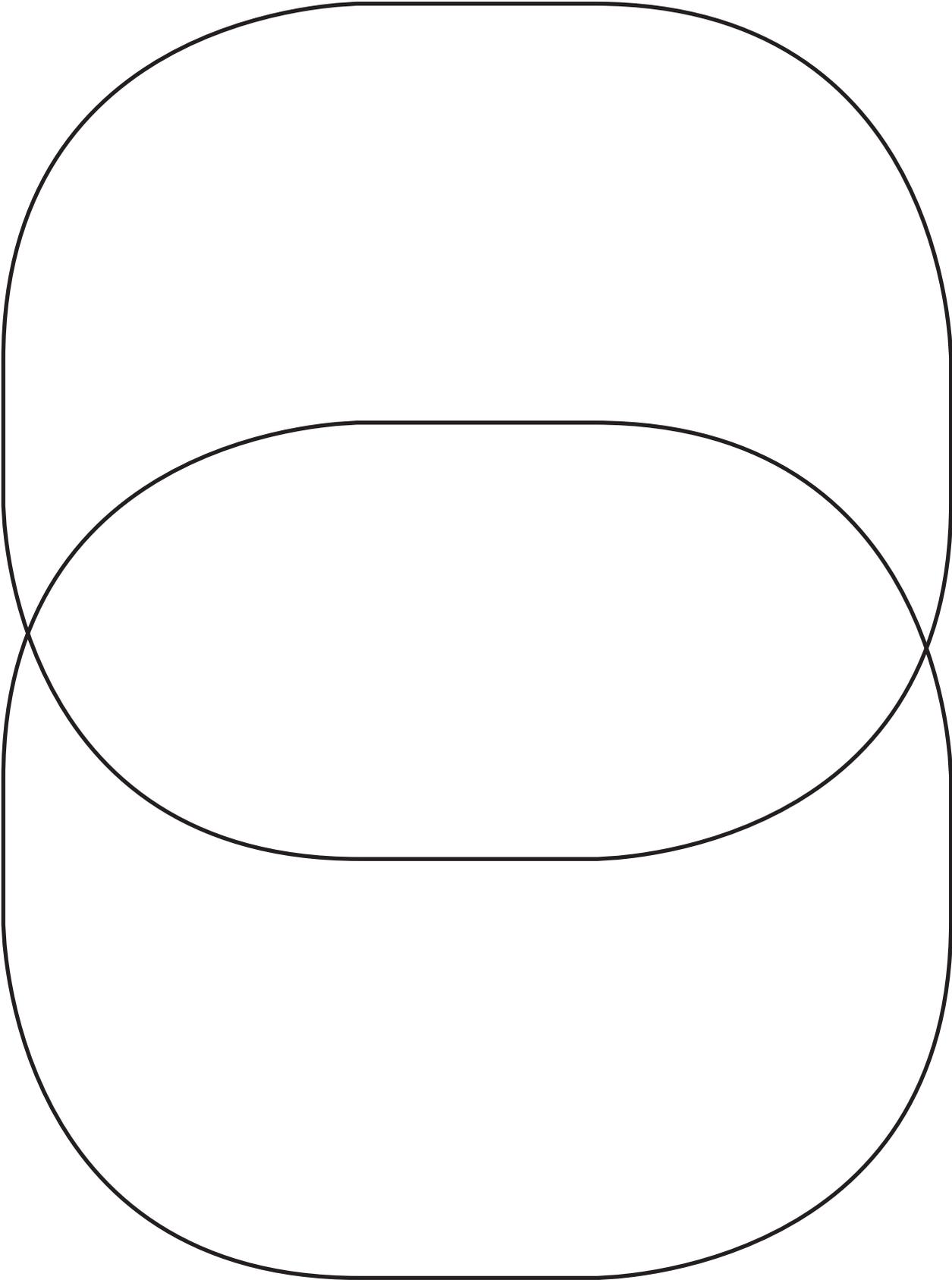


***Extend***

**Try These Challenges!**

- Plan a lunch or dinner meal with little or no saturated and *trans* fats. Or challenge yourself by planning a low saturated or *trans* fat-free menu for a whole day! Remember that Health Canada recommends a maximum of 30-45 mL (2-3 tbsp) of unsaturated fats per day, but no numbers for saturated fat.
- Pick five of your favourite foods and compare their fat content! If you ate all of them in one day, how much fat would you consume? Calculate your intake of total fat, saturated fat, *trans* fats and unsaturated fats.
- Try the quick quiz questions on this weblink: <http://elmhcx9.elmhurst.edu/~chm/vchembook/551fattyacids.html>.

**Venn**



## Comparison Chart

What messages about fats and fatty acids bombard consumers? How do consumers know what to believe? Using canola oil as an example, compare information from different sources. In the chart below, record:

- The source (identify whether the source is an organization or individual and what its credentials are)
- A summary of the message (include examples)
- Your assessment of the source and message.

Source	Summary	Assessment

# APPENDIX A

The activities in this resource can be adapted to support the following outcomes in Chemistry 30 and CTS Foods courses.

## Chemistry 30

### 30-C2.3sts

explain how science and technology have both intended and unintended consequences for humans and the environment (SEC3) [ICT F3-4.1]

- Assess the positive and negative effects of various reactions involving organic compounds, relating these processes to quality of life and potential health and environmental issues; e.g.,
  - production of pharmaceuticals and foods
  - *trans* fats in the diet
- Evaluate the implications of the development of nanoscience and nanotechnology, for application in the petrochemical industry and the medical sciences, on society and the environment.

## CTS Course Support

### FOD1020: CONTEMPORARY BAKING

4. identify contemporary methods of baking that emphasize wellness in baked goods

- discuss the use of fats and alternatives in baking; e.g., applesauce, puréed prunes
- analyze a baked product that has been modified; e.g., gluten free, low fat
- identify a current nutritional issue related to baked goods; e.g., fat substitutes, food labelling, allergies, obesity, *trans* fats

### FOD1050: FAST & CONVENIENCE FOODS

1. identify and compare the variety, availability and nutritional components of fast foods and convenience foods

- 1.4 compare a variety of fast and convenience foods with their nutritionally enhanced counterparts, considering:
  - 1.4.1 carbohydrates
  - 1.4.2 proteins
  - 1.4.3 fats
  - 1.4.4 vitamins and minerals

### FOD1080: FOOD & NUTRITION BASICS

1. identify and explain the interrelationships among food choices, nutrients and wellness

- identify sources and explain functions of the leader nutrients, including:
  - water
  - carbohydrates; e.g., sugar, starch, cellulose
  - proteins
  - fats
  - fat-soluble vitamins
  - water-soluble vitamins
  - minerals

### FOD3020: NUTRITION & DIGESTION

1. describe the processes of digestion, absorption and metabolism in relation to nutrient composition

- 1.3 describe food sources of carbohydrates, fats and proteins and the body's need for these nutrients
- 1.4 relate changes in the structures of carbohydrates, fats and proteins with their digestion, absorption and metabolism
- 1.5 compare fuel factors for carbohydrates, fats and proteins

