

FOOD CHEMISTRY

WHAT IS A FOOD SCIENTIST?

Refer to the handout given in class.

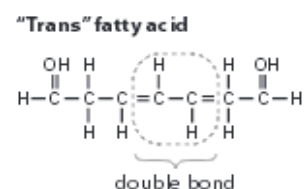
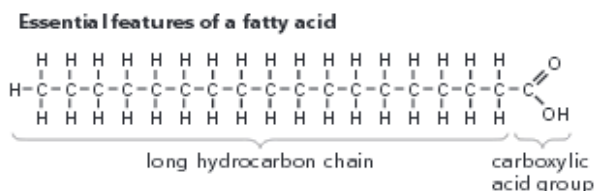
Looking for Fat

Chemically, fats are triesters of glycerol and fatty acids and are generally insoluble in water. Fats may be either solid or liquid at room temperature, depending on their structure and composition. Although the words oils, fats and lipids are all used to describe fats, oils are more often used to describe fats that are liquids at room temperature while fats refer to fats that are solids at room temperature. Lipid is used to refer to both liquid and solid fats and relates more to their chemical structure and physical properties of the fats.

There are many different kinds of fats, but each is a variation of the same chemical structure. All fats consist of three fatty acids (chains of carbon and hydrogen atoms, with a carboxylic acid group at one end) bonded to a backbone structure, usually glycerol (made of carbon, hydrogen and oxygen). Chemically, this is triester of glycerol. An ester is a molecule formed from the reaction of carboxylic acid and an organic alcohol. The properties of each fat molecule depend on the particular fatty acids it contains. In general, the longer the fatty acid, the higher the melting point. Long fatty acid chains also yield more energy per molecule when metabolized by the body.

A fat's fatty acids may also differ in the number of hydrogen atoms that are bonded to the chain of carbon atoms. Each carbon atom is typically bonded to two hydrogen atoms. This makes it a saturated fat because it's saturated with hydrogen, bonded to as many hydrogen atoms as possible. In other fats, carbon atoms double bond to the neighboring atom and to only one hydrogen atom creating an unsaturated fat.

There are two ways the carbon-carbon double bond in an unsaturated fat can be arranged: the isomer with both parts of the chain on the same side of the double bond (the cis-isomer) or the isomer with the parts of the chain on opposite sides of the double bond (the trans-isomer). Because of their different chemistry, trans fatty acids metabolize differently in the human body and significantly increase the risk of coronary heart disease.



Materials:

- Sudan III stain in a plastic dropper bottle
- Plastic bag
- Water
- Food Samples

Procedure:

1. 1). Gather the food samples to be tested.
- 2). Break the food into small pieces and place a small amount of each food in a different plastic bag. Label each bag with the food inside.
- 3). Add water to the bag until the food is covered.
- 4). Mix the food and water together
- 5). Add 3 drops of Sudan stain to each food bag. Shake gently to mix. If fat is present, a red stained oil layer will separate out and float on the water surface.

Data:

Food Sample	Colour of Sudan III	Fat Present (Yes or No)
Mini Donut		
Hamburger patty		
Cotton Candy		
Popcorn		
Bun or Bread		
Food of your Choice: _____		

Questions/ Discussion:

What is a food scientist?

1. Create a summary of a food chemist. (3-5 sentences)
2. Research the foods you tested and describe the fatty acids in each. Use this information to explain which food has the highest melting point. How are melting points and fatty acids related?
3. What are the benefits and disadvantages of long fatty acids in foods?
4. Do some research on saturated and unsaturated fats. Are the fats in the foods you ate saturated or unsaturated? Draw a picture of the fat molecule of each of the foods. Explain the benefits and disadvantages of saturated and unsaturated fats.
5. Using one fat molecule of one of the foods you ate, calculate the number of moles of fat, and the number of molecules of fat.

Looking for fat?

Did any item that you tested surprise you? If so, why? _____

Chew a mini donut for a minute without swallowing it. Spit out the dough on the paper towel, put it in a clean plastic bag and test for fat again. What are the results this time? Explain your answer

Assignment:

In groups of 3, you must create a video that encompasses your entire project.

Your video must contain an effort from each member (ie. Everyone must appear at least ONCE!). The video must contain:

- the experiment in action (film yourselves testing for fat)
- observations (explain what you see)
- answer to the questions
- maximum 5 minutes!

No paper answer please- maybe do an interview format. email the url to your teacher!

