STUDENT ACTIVITY GUIDE

Oxidative Rancidity in Potato Chips

Like all food components, fats undergo deteriorative changes which result in undesirable flavors and odors with time. These changes in fats are given the term "rancidity." Rancidity can be of two types, hydrolytic and oxidative. Hydrolytic rancidity is caused by a breakdown of the fat into glycerol and fatty acids. This is the type of rancidity that gives "rancid" butter its bad flavor.

Oxidative rancidity results from oxidation of unsaturated and polyunsaturated fatty acids. The products of these reactions produce undesirable flavors and odors. These flavors sometimes develop in foods such as peanut butter, potato chips, and crackers. Manufacturers are permitted to add antioxidants to some foods to slow down this oxidative deterioration. The antioxidants normally used are butylated hydroxyanisole (BHA), butylated hydroxytoluene (BHT), tertiary butyl hydroquinone (TBHQ), and propyl gallate. You may see these terms on the labels of some foods. In some cases, the antioxidant is incorporated into the packaging material. The antioxidant slowly diffuses into the packaged food product during storage, thus protecting the snack. Another means of slowing down oxidation is to package the food so that it is protected from light, moisture, and oxygen, three things that accelerate oxidation.

The purpose of this experiment is to demonstrate typical off-flavors in fat caused by oxidative rancidity and to study one of the factors which causes lipid oxidation.

MATERIALS REQUIRED

Fresh potato chips
Pint or quart canning jars with lids
Aluminum foil

EXPERIMENTAL PROCEDURE

1. Wrap a pint or quart canning jar with aluminum foil. Tape the foil in place so that no light can enter the container.

2. Place fresh potato chips in the foil-wrapped jar and in a similar clear jar without foil around it.

3. Taste the potato chips and rate their flavor on a 5-point scale: 1 = extremely dislike the flavor, 2 = slightly dislike the flavor, 3 = neither like nor dislike the flavor, 4 = slightly like the flavor, and 5 = extremely like the flavor. Enter the data on the Day 0 line in the table below.

4. Place the two jars on a window sill where they will be exposed to sunlight. Turn each jar one-quarter turn each day (every 24 hours).

5. Taste potato chips from each jar at intervals of 1–2 days for 1–2 weeks. The length of time for this experiment is dependent on the amount of sunlight that the jars are exposed to. Enter the data in the table below.

6. Make a graph of your data, noting the flavor of the potato chips stored these two ways versus storage time. The y-axis should be the flavor score and the x-axis the time in days.

QUESTIONS

1. What can you conclude about the effect of packaging material (how a product is packaged) on the flavor of a food?

2. How did wrapping the jar in aluminum foil affect the flavor of the stored potato chips?

3. Are potato chips that you purchase in the store packaged in containers that permit light to enter or exclude light?

4. Is there anything else, besides UV light, in the atmosphere that we would like to keep away from potato chips while they are in a package?

DATA TABLE	Flavor score (1 = dislike extremely, 5 = like extremely)	
Day	**Clear jar**	**Foil-wrapped jar**
0		
1		
2		
3		
4		
5		
6		
7		
8		
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