Oreos case study essay sample

Food & Diet

Introduction

“ Stressed backwards spells desserts.” I hate to admit it, but when I am stressed, I am an eater and most of them time, I conjure cravings for food that contains chocolate such as the Oreo ® cookie instead of a nice big salad. I have tried time and time again to dig into a salad when stressed, but it just does not seem to stop the cravings for my sugary Oreo ® cookies. Studies have shown that sugars make us feel good and reduce stress and anxiety. The tests on rats have shown that giving it one dose of sugar stimulates the pleasure center. The same results are said to be seen with humans. It is no wonder why nothing is more satisfying to me than dunking this delectable cream filled chocolate cookie in a glass of cold milk, waiting until the Oreo ® gets soggy, and then munching on them at the end of a stressful day.

Oreo ® is the brand name of one of the most popular sandwich cookies in the world. It was manufactured and introduced to the world by Nabisco Corporation (National Biscuit Company). The most recent design of the sandwich cookie consists of a sweet creamy filling in between two circular chocolate cookies. During the first time it was introduced to the public in February 1912, it had sold over four hundred and ninety billion cookies and was awarded the best selling cookie of the twentieth century. [7] Its target initially was the British market who was selling cookies that for Nabisco were “ too common”. There were originally two flavors of Oreos ® on the market: lemon meringue and cream. Both these cookies were mound-shaped not flat like the Oreos ® of today.

Due to greater demand for the cream flavored cookies, the company decided to stop the production of the lemon flavored cookies. According to Nabisco's facts on the Oreo ® cookie more than 345 billion Oreo ® cookies have been consumed since the year 2002. [24] More than 7. 5 billion Oreo ® cookies are consumed each year, 625 million per month, and 20. 5 million per day. [24] The 345 billion Oreo ® cookies sold to date would fill up the world's largest freight train, consisting of 660 freight cars, more than 45 times. If every Oreo ® cookie ever made were stacked on top of each other (over 345 billion Oreos ®), the stack of cookies would reach to the moon and back more over five times. If the Oreo ® cookies were placed side by side, they would circle around the earth 381 times at the equator. An Oreo ® cookie is 29% cream, 71% cookie. I found it interesting that chocolate is the least used ingredient in an Oreo ® cookie. [24]

There are many theories concerning the history of the name Oreo ® . One theory says that the name was derived from the French word " or" meaning gold. [12] Others say that the name was from the Greek word " oros" meaning " mountain hill" depicting the original shape of the cookies. [12] Still other theories assert that the " re" from cream were placed in between two O's from chocolate. [12]

The manufacture of these delicate cookies consists of two stages. First is the production of the cake dough to form the two chocolate cookies. This dough is molded into their familiar shape in a three hundred foot long oven. The cookies ingredients include sugar, Dutch cocoa and pure chocolate liquor.

The original cookies of the Nabisco Corporation were composed of enriched flour (wheat flour, niacin, reduced iron, thiamine, mononitrate (Vitamin B1), Riboflavin (Vitamin B2), folic acid), sugar, canola oil and/or palm oil and/or soybean oil (some of which is partially hydrogenated), corn syrup which is high in fructose, cornstarch, salt, baking soda, soy lecithin (a natural product extracted from the soy bean that is used to improve chocolate's flow properties). [9] A serving size of 35g of Oreos ® cookies gives a person 170 calories and 60 of that is derived from fat. Based on percent daily values, a serving size of 35g containing 15 pieces per container comprises 7g of total fat (11%), 2g saturated fat (10%), 120mg sodium (5%) and 25g of total carbohydrate (8%). This includes 13g of sugars and 1g of protein. In 2003, a lawsuit was started seeking to ban Kraft Foods from selling Oreos ® to children because the cookies contained trans fat. Later that lawsuit was dropped, but gave awareness to Kraft Foods, which Nabisco is under, as well as the rest of America.

December 20, 2005, Kraft issued a press release regarding the lawsuit and trans fat found in the Oreos ® they produced. Kraft Foods voluntary reduced the amount of trans fats and labels the amount of trans fats their contain as is mandatory for food companies by the Food and Drug Administration (FDA). Many are fooled into thinking that the Oreo ® cookie contains no trans fats since the nutrition label of the cookie reads, " Trans Fats 0g". This is because Oreo ® cookies contain, "…less than 0. 5 grams of trans fat per serving, the FDA requires that the content be listed in the package's Nutrition Facts box as ' 0g'. We use that same definition of ' 0g' on this

website. When a label shows 0 grams trans fat per serving and lists a ‘ partially hydrogenated’ vegetable oil (such as soybean or cottonseed, among others) in the ingredients, the product may contain up to 0. 49 grams of trans fat per serving.” [20]

Ingredients of the Oreos ® Cookies

Wheat

As a primary ingredient that is used in many foods, wheat flour is made from grinding

wheat. It contains adequate ratios of starches. Starch is composed of polymer of glucose units (Fig. 1), this polymer is known as polysaccharides. Polysaccharides, one of the complex carbohydrates are polymers consisting of many monosaccharides linked by glycosidic bonds. [19] Thus, they are large molecules and are often branched. These molecules are amorphous, insoluble in water, and have no sweet taste. These polysaccharides have a general formula of $C_n(H_2O)_{n-1}$. Carbohydrates are composed of polyhydroxy aldehydes and ketones.

Fig. 1 Structure of Glucose

Niacin

Fig. 2 [10] Structure of Niacin

Niacin, is part of Vitamin B3, which is soluble in water and comes from, together with other vitamins in the enriched flour used in making the Oreos.

It is also known as nicotinic acid. Its chemical name is 3-pyridinecarboxylic acid. Niacin was discovered in 1937 by Conrad Elvehjem. [14] Vitamin B_3 consists of NADH, NAD, NAD^+ (Fig. 2). These play vital parts in the energy metabolism of the cell and DNA repair. [14] Niacin removes toxic chemicals from the body and acids in the production of steroid hormones, such as sex hormones and stress related hormones from the adrenal gland. A total of 2-12 mg of niacin per day is recommended for children, 14 mg are recommended for women, 16 for men and 18 for pregnant and breast-feeding women. Lack of niacin in the body can decrease tolerance to colds and slow down metabolism. Moreover, severe lack of niacin in the body tolerates the occurrence of pellagra, a disease due to the deficiency of niacin.

Niacin can be found in meat, liver and some plant sources such as beans, peanuts and whole-grain. Based on its structure, it contains carboxyl group. Aside from natural sources, it can be also made synthetically. There are several methods of obtaining niacin. Fig. 3 shows this different method of obtaining niacin. In the first one, niacin is produced through oxidation of nicotine using either nitric acid or potassium permanganate solution. [21] For the second one, it also involves oxidation reaction, picoline can be oxidized using boiling potassium permanganate solution [21] . In the third method, quinoline is oxidized using alkaline potassium permanganate solution, forming quinolinic acid. Then, quinolinic acid can be heated at 120ºC, causing lost of carbon dioxide, yielding to nicotinic acid [21] .

Fig. 3 [21] Synthesis of Nicotinic Acid

Thiamine

Fig. 4 [3] Structure of Thiamine

Thiamine, which is also known as vitamin B1 and aneurine hydrochloride, is a colorless compound which is soluble in water and insoluble in alcohol, comes from the enriched flour used in making Oreos. Its chemical name is 3-[4-amino-2-methyl-5-pyrimidinyl)-methyl]-5-(2-hydroxyethyl)-4-methylthiazolium chloride. Vitamin B1 decomposes in the presence of heat. Its chemical structure is composed of the pyrimidine and thiazole rings and also contains amine groups. (Fig. 2). Thiamine's role in the body is includes the metabolism of carbohydrates and fats in order to produce energy. This vitamin is vital for normal growth and development and aids in the maintenance of the proper functioning of the heart and the digestive and nervous system. Since thiamine is water soluble it can not be absorbed by the body, yet, once inside the body, thiamine can be found concentrated in the muscle tissues.

Thiamine can be found in whole cereal grains, nuts, pork and eggs. For commercial production, there are also methods available in synthesizing it. One is the method of Williams [21] .

Fig. 5 shows the synthesis of thiamine.

Fig. 5 [21] Synthesis of Thiamine

The first step involves formation of ethyl-a-formyl-b-ethoxy-propionate, which then undergo condensation reaction with acetamidine. The product of

this reaction, 5-ethoxymethyl-4-hydroxy-2-methyl-pyrimidine, reacts with phosphorous oxychloride, which causes dehydration of the alcohol in the structure. Substitution of –OH group by the chloride occurs here. The chloride is removed by reaction with alcoholic ammonia, a subsitution also occurs. Another substitution occurs, using hydrogen bromide, replacing the $–OCH_2CH_3$ group, and forming 4-amino-5-bromomethyl-2-methyl-pyrimidine. This, is then reacts with 5-b-hydroxyethyl-4-methyl-thiazole resulting to the bromide form of thiamine.

Riboflavin

Fig. 6 [25] Structure of Riboflavin

Riboflavin, commonly known as Vitamin B2, is a micronutrient that is easily absorbed by the body and comes from the enriched flour used the production of Oreos. It is also known as 7, 8-dimethyl-10-(D-ribo-2, 3, 4, 5-tetrahydroxypentyl) isoalloxazine. Its structure contains amine group. Like other B vitamins, it has also its vital roles needed in the maintenance of the human body. One of the main functions of riboflavin is to aid of the metabolism of proteins and fats. Good sources of riboflavin includes milk, cheese, liver, leafy vegetables, legumes, and soybeans. Riboflavin is easily destroyed when exposed to light.

Aside from the natural sources of riboflavin, it can be obtained commercially through microbiological production and through chemical synthesis. Fig. 7 shows the chemical synthesis of riboflavin [21] . This method is done by Kuhn [21] . D-gluconate is oxidized by ferric acetate and hydrogen peroxide

resulting to D-arabinose, which is then converted to acetobromo-D-arabinose by substitution reaction, where the –OH group is replaced by a Br. It is followed by formation of D-arabinal, then by D-ribose. D-ribose is reduced forming D-ribamine, which is then reacts with 1, 2-dimethyl-4, 5-dinitrobenzene through condensation reaction. The condensed product, 1, 2-dimethyl-4-nito-5-(D-1-ribitylamino-0-benzene, then is reduced to its amino derivative using platimun oxide by catalytic hydrogen and then the product undergoes condensation reaction with alloxan tetrahydrate forming riboflavine.

Aside from this route, there are also two routes in obtaining the product, which are also done by Kuhn. This two routes involves production of 4-amino-1, 2-dimethyl-5(D-1-ribtyl-amino)-benzene. In the first one, labeled as (2) in the figure, 1, 2-dimethyl-4, 5-dinitrobenzene was converted to 5-amino-1, 2-dimethyl-4-nitobenzene by treating it with ammonia. Then, 5-amino-1, 2-dimethyl-4-nitobenzene with phosgene produce 4, 5-dimethyl-2-nitro-phenylisocyanate, which by treating it with alcohol yields to corresponding carboethoxyamino compound. Catalytic reduction of this product yields to 6-amino-1-carbethoxyamino-3, 4-dimethylbenzene, which then undergoes reductive condensation with ribose followed by hydrolysis, gives 4-amino-1, 2-dimethyl-5-(D-1-ribitylamino)-benzene. On the other one, labeled (3) in the figure, 5-amino-1, 2-dimethyl-4-nitrobenzene is heated with D-arabinose. The product undergoes hydrogenation reaction.

Fig. 7 [21] Synthesis of Riboflavin

Folic Acid

Fig. 8 [2] Structure of Folic Acid

Folic acid or N- [4-[[(2-amino-1, 4-dihydro-4-oxo-6-pteridinyl)methyl]amino]benzoyl]-L-glutamic acid, forms of the water soluble Vitamin B9 are naturally occurring and can be taken as supplements. In Oreos, this comes together with other vitamins in the enriched flour. Folic acid can be found in leafy vegetables such as turnip greens, spinach, dried beans, peas, and cereal products. They can also be found in sunflower seeds and other fruits and vegetables.

The structure of folic acid contains amine groups and a xanthopterine moiety. This moiety can be made synthetically, its synthesis is shown in Fig. 9. In the first reaction, 2, 4, 5-triamino-6-hydroxy-pyrimidine reacts with dichloroacetic acid to form 2, 4-diamino-5-dichloroacetylmino-6-hydroxy-pyrimidine through treatment with silver chloride. In the second reaction, it is the formation of the starting material for xanthopterine synthesis. Guanidine undergoes condensation reaction with phenylazocyanoacetic ester. The resulting yield undergoes reduction of the azo group [21] .

Fig. 9 [21] Synthesis of Xanthopterine

Canola Oil/Palm Oil/Soybean Oil

Canola oil is a variety of edible oil. Due to its low saturated fat, canola has been described as a healthy oil. Also, it has high monosaturated oil content and omega-3 fatty acids. On the other hand, palm oil is another form of vegetable oil which is obtained from fruits of the palm tree. The color of palm oil is red due to the high amount of betacarotene. Palm oil is basically

used as cooking oil and in the manufacture of margarine. Also, palm oil is a major component of processed foods. Soybean oil or more commonly known as vegetable oil is a very popular type of oil due to its cheapness, healthfulness, and use of making soaps and products for the skin, which makes it a proof, that it is healthy even for the skin. However, soybean oil does not contain much of the saturated fats and does not contain cholesterol. Moreover, it contains more natural antioxidants which remains in the oil after extraction. This characteristic of the soybean oil prevents oxidative rancidity. The structure of oils or lipids shows that the functional group present is the carboxyl.

Fig. 10 Structure of Lipids

Fructose

Fig. 11 [5] Structure of Fructose

Fructose is a type of simple sugar or monosaccharide containing a ketone functional group. In the Oreos, it comes from the corn syrup. This is found in plenty of foods. Sources of fructose are honey, tree fruits, berries, melons, and some root vegetables such as sweet potatoes, beets, parsnips, and onions. Fructose is the sweetest type of sugar and considered even sweeter than sucrose. It is even recommended for consumption to people with diabetes mellitus, an abnormally high concentration of glucose in the blood. This is due to its low glycemic index compared to sucrose.

Salt

One of the most important mineral in the world today is salt. It is composed

primarily of sodium and chlorine. One of the most important minerals in the world today is salt. It is composed primarily of sodium and chlorine. The discovery of salt gives way to more tasty food and is also used to preserve food. Salt is vital to us because it helps in the regulation of water fluids in the body. [13] However, too much consumption of salt may lead to increase risk of high blood pressure. The natural sources of salt includes the sea water and earth. It can be also produced synthetically.

Baking Soda

Sodium bicarbonate, is a white solid which often appears as powder and is soluble in water. It is one of the components of the mineral natron and can be found most dissolved in mineral springs. A process called Solvay process primarily prepares $NaHCO_3$. The Solvay process includes heating calcium carbonate in a large hollow tower in order for it to release carbon dioxide ($CaCO_3 \rightarrow CaO + CO_2$). Then, a solution of sodium chloride and ammonia are introduced to the tower in order for the carbon dioxide to produce sodium bicarbonate as its precipitate ($NaCl + NH_3 + CO_2 + H_2O \rightarrow NaHCO_3 + NH_4Cl$). Sodium bicarbonate is then heated to produce soda ash or sodium carbonate due to the release of water and carbon dioxide ($2\ NaHCO_3 \rightarrow Na_2CO_3 + H_2O + CO_2$). [11]

Trona, the hydrated sodium bicarbonate and an evaporite mineral is the primary source of sodium bicarbonate. Trona can be found in the Owens Lake, Searles Lake in California, Green River in Utah, and the Nile River in Egypt. The largest known trona deposit in the world can be found in the Green River in Wyoming.

Response

In glancing over the Oreo ® cookie's nutrition label the Oreo ® cookie is not by any means a lean sensible snack, however, in general, the Oreo ® cookie exhibits healthy ingredients and almost all of the substances included in the manufacture and production of the cookies helps primarily in the maintenance of the human body or enhancement of the metabolism. For example, the flour used in the manufacture of the cookies in the sandwich is comprised of vitamins such as thiamine, riboflavin, niacin and wheat. These ingredients are very essential in the health of the people who are primary consumers of the cookie. Baking soda is needed in the manufacture of the cookie and trona is the essential component of baking soda, thus, it can be inferred that trona is one of the vital components in the manufacture of the cookies. The research displayed the importance of having known the components of the food that we eat.

Knowing the ingredients of the food that we eat is very important to ensure a healthy lifestyle. Though there are plenty of foods that have risen in the world nowadays, it is still vital to choose the ones that gives importance to the health of the consumers. This food should include ingredients that are of the right amount. Also, its ingredients should also be composed of healthy components. Components of the ingredients of the food are also vital because indirectly they are the major components of the food that we eat.

As for the result of the research Oreos ® as one of the most popular if not the most popular cookie sandwich in the world can also be titled as having some of the healthiest ingredients. It is certain that I will continue to enjoy this palatable cream filled cookie.

References

1. British Nutrition Foundation. (2004). Flour. http://www. nutrition. org. uk/home. asp. (accessed Nov. 1, 2007).
2. Care Group Healthcare System. Folic Acid. http://home. caregroup. org/clinical/altmed/interactions/Images/Nutrients/folicaci. gif. (accessed Nov. 1, 2007).
3. Care Group Healthcare System. Thiamine. http://home. caregroup. org/clinical/altmed/interactions/Images/Nutrients/thiamine. gif. (accessed Nov. 1, 2007).
4. Cerner Multum Inc. (2007). Thiamine. http://www. drugs. com/mtm/thiamine. html. (accessed Nov. 1, 2007).
5. Departamento de Engenharia Química e Engenharia de Alimentos. 2007). Fructose. http://www. enq. ufsc. br/labs/probio/disc_eng_bioq/trabalhos_pos2003/const_microorg /fructose. gif. (accessed Nov. 1, 2007).
6. Dolson, Laura. (2007). Fructose: Sweet, But Dangerous. http://lowcarbdiets. about. com/od/nutrition/a/fructosedangers. htm. (accessed Nov. 1, 2007).
7. Ehler, James T. (2007). Food Reference Website – Food History Timeline http://www. foodreference. com/html/html/food-timeline-1911. html. (accessed Nov. 1, 2007).
8. Ellis-Christensen, Tricia. (2007). What is Baking Powder?

http://www. wisegeek. com/what-is-baking-powder. htm. (accessed Nov. 1, 2007).

9. Funky Processed Food Worries. (2007). Is Soy Lecithin Bad For You? And What Is It, Anyway?. http://www. chow. com/stories/10701. (accessed Nov. 1, 2007).

10. The Half Decent Parhmaceutical Chemistry Blog. (2006). Drug of the Week: Niacin. http://the-half-decent-pharmaceutical-chemistry blog. chemblogs. org/archives/2006/12/07/drug-of-the-week-niacin. (accessed Nov. 1, 2007).

11. Helmenstine, Anne Marie. (2007). Q. What Is the Difference Between Baking Soda & Baking Powder?. http://chemistry. about. com/mbiopage. html (accessed Nov. 1, 2007).

12. Kraft New Zealand. (2007). Where Does The Name Oreo Come From?. http://www. kraft. co. nz/Products/nabiscoOreo. cfm. (accessed Nov. 1, 2007).

13. Linus Pauling Institute. (2004). Sodium. http://lpi. oregonstate. edu/infocenter/minerals/sodium/. (accessed Nov. 1, 2007).

14. Linus Pauling Institute. (2007). Niacin. http://lpi. oregonstate. edu/infocenter/vitamins/niacin/. (accessed Nov. 1, 2007).

15. Linus Pauling Institute. (2007). Thiamine. http://lpi. oregonstate. edu/infocenter/vitamins/thiamin/. (accessed Nov. 1, 2007).

16. Mayo Clinic. (2006, February 28). Canola Oil: Is It Harmful To Your Health. http://www. mayoclinic. com/health/canola-oil/AN01281. (accessed Nov. 1, 2007).

17. MayoClinic. (2007). Niacin To Boost Your HDL ‘ Good’ Cholesterol. http://www. mayoclinic. com/health/niacin/CL00036. (accessed Nov. 1, 2007).

18. Medicine Plus. (2006). Riboflavin (vitamin B2). http://www. nlm. nih. gov/medlineplus/druginfo/natural/patient-riboflavin. html. (accessed Nov. 1, 2007).

19. MW & BC. (2006). Facts About Wheat Flour. http://wbc. agr. mt. gov/Consumers/Nutrition/wheat_flours. html. (accessed Nov. 1, 2007).

20. Nabisco World. (2007). Oreo Product Detail. http://www. nabiscoworld. com/Brands/ProductInformation. aspx? BrandKey= oreo&Site= 1&Product= 4400000820. (accessed Nov. 1, 2007).

21. Robinson, F. A. (1951). The Vitamin B Complex. USA: John Wiley and Sons.

22. Saul, Andrew. (2004). How To Determine A Saturation Level of Niacin. http://www. doctoryourself. com/niacin. htm. (accessed Nov. 1, 2007).

23. Stradley, Linda. (2004). History of Baking Powder. http://whatscookingamerica. net/History/BakingPowderHistory. htm. (accessed Nov. 1, 2007).

24. Techno Spud Products. (2007). Oreo Facts.

http://www. technospudprojects. com/Projects/Oreo/oreo2002_facts. htm. (accessed Nov. 1, 2007).

24. University of Delaware. (2007). Riboflavin. http://www. udel. edu/chem/white/teaching/CHEM642/Riboflavin. gif. (accessed Nov. 1, 2007).

25. Zest For Life. (2007). Vitamin B1 – Thiamine- Information Page. http://www. anyvitamins. com/vitamin-b1-thiamin-info. htm. (accessed Nov. 1, 2007).