

Introduction

In the United States the prevalence of obesity among children is growing at an alarming rate. Children ages 6 to 19 have a 30 percent chance of being overweight and at risk for becoming obese. These children are also at risk for chronic diseases such as hyperlipidemia, hypertension and abnormal glucose levels as well as the risk for cardiovascular disease (CVD) (1,2). The diets of overweight or obese children often contain lower amounts of fiber and higher amounts of sodium than are recommended for a healthy diet which contributes to the excessive weight gain (2).

The Dietary Guidelines for Americans 2005 report states that increasing the amounts of whole grains and dietary fiber consumed in our diet is beneficial for lowering risks of chronic diseases (3). The recommended amount of fiber that should be consumed is 20-35 grams per day (4). In the United States, the average intake of fiber per day is 14 grams per day, well below the recommended daily total (3). Increasing the daily intake of fiber has many benefits for the body. The primary benefits include lowering cholesterol levels, increase fecal bulk, and increasing satiety, or the feeling of being full. Eating a meal with a high level of fiber allows the body's digestive process to move slower and allows more nutrients to be absorbed over a longer period of time. Also, studies have shown that fiber reduces risk of cancer and heart disease (4).

The Dietary Guidelines for Americans 2005 also states that the intake of sodium should be less than 2,300 milligrams per day. On average, most American's intake of sodium is over 3,400 milligrams per day, which is far more than needed (5). Although sodium is needed for the body to regulate fluids, excessive sodium can be harmful.

Excessive sodium causes water retention and the volume of blood increases also. With an increase in the volume of fluid in the body, the heart must work harder which increases blood pressure in the arteries. Sodium also causes the arteries to constrict, making normal blood flow more difficult for the heart. High blood pressure, or hypertension can cause heart disease, kidney disease and strokes. (5).

With obesity rates rising in children, healthier foods that are familiar and appealing need to be made available. The “Sloppy Joe” is a well-known American family dish made with ground beef, onions, tomato sauce and seasonings, and served on a bun. The “Sloppy Joe was thought to be invented in a bar called the Sloppy Joe Bar in Key West, Florida, and the earliest recorded recipe of the “Sloppy Joe” was in 1963(6). The original recipe for the “Sloppy Joe” is high in fat and sodium, and low in fiber.

This recipe for a meatless Sloppy Joe was developed to create a low sodium and high fiber adaptation of the familiar family favorite sandwich. This version of the Sloppy Joe was also developed with overweight or obese children ages 6-12 as a target customer. This product will still provide children the taste of a “Sloppy Joe”, but be a much healthier alternative. This product can be sold in the refrigerated or freezer section.

Materials and Methods

The original recipe for the meatless Sloppy Joe was found in wikibooks.org typing in meatless Sloppy Joe (7). The original recipe has low levels of fiber and high levels of sodium see table A. Original recipe contained olive oil, sweet onion, green bell pepper, carrots, chili bean, white rice, water (for the rice to be cooked in), and hickory smoked barbecue sauce (See chart A). Each ingredient was weighed out at correct levels.

To reach the goal of above 5 grams of fiber per meatless Sloppy Joe, the chili beans were replaced with lentils and the white rice was replaced with organic brown rice. Making those changes in addition to removing the barbeque sauce also helped lower the sodium content. The barbeque sauce was replaced with brown sugar, garlic powder, mustard powder, vinegar, French's[™] Worcestershire reduced sodium sauce, chili powder, black pepper, cumin seed, onion powder and Fona® salt enhancer. These are the changes that led to the final product (See table B). Also to see the equipment used for final product (See table C). All of the ingredients for the final product were weighed out on a scale.

Directions:

1. Wash carrots, sweet onion, and bell pepper.
2. Peel skin of carrots, then grate using the large holes/coarse side of grater.
3. Remove skin of sweet onion, then chop into very small pieces.
4. Chop green bell pepper into very small pieces.
5. In a 3.0 saucepan, add Wild Harvest organic brown rice. Fill with Organic Reduced Sodium Vegetable Broth and water. Bring to boil and then cover pan and cook rice for 50 minutes at low heat (which was a 4 on the GE Oven). Stir with metal kitchen spoon after 15 minutes and cover for remaining 35 minutes. Drain any excess liquid from brown rice in strainer but do not rinse. Set aside.
4. In a 3.0 saucepan, add lentils to Organic Reduced Sodium Vegetable Broth. Bring to boil, cover slightly, and cook lentils for 25 minutes at low heat, (which was a 5 on the GE Oven). Occasionally stir with metal kitchen spoon. Drain lentils in a strainer but do not rinse.
5. Add olive oil to the 12` Electric Skillet at 350° F .

6. Add sweet onion, green bell pepper and carrots to heated oil in skillet and sauté for 4 minutes, occasionally mixing with rubber spatula.
7. Turn skillet to 300° F, then add organic brown rice, lentils, Hunts™ Tomato Sauce No salt added, Hunts™ Tomato Paste No salt added, water, brown sugar, garlic powder, mustard powder, vinegar, French`s™ Worcestershire reduced sodium sauce, chili powder, black pepper, cumin seed, onion powder and Fona® salt enhancer to vegetables in skillet. Cook for 4 minutes uncovered, mixing frequently with spatula.
8. Turn temperature on skillet to “*Keep Warm*” setting, cover mixture, and cook for additional 16 minutes.
9. The temperature was taken after the time cooked and recorded.
10. Add meatless Sloppy Joe to bun of choice.

Chart A: Original Recipe Sodium and Fiber Verve Goals

These charts represent the sodium and fiber in the original recipe compared to the goals.

Table B: Ingredient Listing of Final Product

| Ingredient | Source | Weigh (g) | Percentage |
|---|-------------------------|------------------|-------------------|
| Jewel Brand Olive Oil | Jewel Boise, IL | 8 | .30 |
| Sweet Onion | Jewel, Fresh | 61.6 | 2.3 |
| Green Bell Pepper | Jewel, Fresh | 73.1 | 2.7 |
| Carrot | Jewel, Fresh | 33.3 | 1.2 |
| Jewel Brand Lentil (cooked) | Jewel, Eden Prairie, MN | 256 | 9.5 |
| Wild Harvest™ Organic Brown Rice (cooked) | Jewel, Eden Prairie, MN | 226.1 | 8.4 |
| Organic Low Sodium Vegetable Broth (for rice) | Whole Foods, | 497.5 | 18.5 |

| | | | |
|--|------------------------|--------|-------|
| Hunts™ Tomato Sauce No salt added | Jewel, Omaha, NE | 416.7 | 15.5 |
| Organic Low Sodium Vegetable Broth (for lentils) | Whole Foods, | 677.9 | 25.2 |
| Brown Sugar | GFS | 37.1 | 1.4 |
| Garlic Powder | GFS | 6.3 | .23 |
| Mustard Powder | GFS | 5.2 | .20 |
| Jewel Brand White Distilled Vinegar | Jewel Eden Prairie, MN | 30.6 | 1.1 |
| French's Worcestershire Sauce Reduced Sodium | Jewel, Parsippany, NJ | 13.7 | .51 |
| Chili Powder | GFS | 5.5 | .20 |
| Onion Powder | GFS | 6.3 | .23 |
| Cumin Seed | GFS | 1.8 | .10 |
| Black Pepper | GFS | 1 | .03 |
| Hunts™ Tomato Paste No salt added | Jewel Omaha, NE | 36.4 | 1.4 |
| Water (for rice) | Tap | 228.6 | 8.5 |
| Water | Tap | 76.2 | 2.8 |
| FONA® Salt Enhancer | FONA® Geneva, IL | .7 | .03 |
| Total | | 2690.7 | 100.6 |

This chart represents the ingredients in the final product in grams. The sources represents the brand and the location where is it made. The percentage represents the percent of the ingredient that was used in to final product.

Table C: Equipment Used For Final Product

| Name | Details |
|----------------|--|
| Cutting Board | 10x4 inch plastic |
| Large Knife | 8" chef knife made by Chef Cutlery model #3408 |
| Sauce Pan | Cuisinant 3.0 quart model # 7193-20 |
| Sauce Pan | Cuisinant 3.0 quart model # 7193-20 |
| Cheese Grater | Multipurpose small cheese crater (large holes) |
| Can Opener | Metal |
| Oven | GE Model #JGSP28BEK4BB |
| Kitchen Spoons | Metal |
| Peeler | Farberware |
| Rubber spatula | Rubbermaid |
| Strainer | Metal |

This chart represents the equipment that was used to make the final product.

Participants

Participants of the study were untrained unpaid panelists. They were ages 20-30 years old. All were female and all participants were Caucasian. They were selected from a nutrition class. Each participant volunteered so they were not randomly selected. They had no previous knowledge of product.

Measurements

Objective test measurements were done throughout the experiment. These measurements were recorded. The post temperature was taken to make sure that the meatless Sloppy Joe was served at the same temperature each experiment. Post weight of the entire meatless Sloppy Joe was taken after being cooked to keep track of the moisture absorbed for each experiment. Fiber and Sodium levels were computed by using Foodworks version 10 to make sure the meatless Sloppy Joe was on track to meet the goals. The color meter was used to measure the color after each experiment. The texture was a component that could have been useful to monitor after each experiment, but there was no equipment to measure texture in this lab. For listing of objective measurements see appendix 2 and for listing of equipment used to obtain measurements, see appendix 3.

Sensory measurements were completed by the participants after each experiment. This was a basic sensory method. The meatless Sloppy Joe was served at 144 ° F and was served on a glass plate with bun open and with a glass of water at room temperature. It also was served with a fork and napkin on the side. The sensory sheet was given to each participant (See appendix 4). The sensory sheet listed the title and a number, name and date. It had 6 characteristics with a descriptive rating. The characteristics were

filling, flavor, texture (overall), appearance, aftertaste, and overall. Each characteristic had 5 descriptive ratings to be evaluated by. These ranged from 1-5; 1 being worst, and 5 being best. The average of each rating of each characteristic was taken after each experiment.

Results

The overall goals of this experiment were to increase the fiber to above 5 grams and sodium below 140 milligrams per 5 ounce (141.7g) serving of meatless Sloppy Joe. These goals were established by following federal labeling guidelines for high fiber and low sodium per serving. The fiber goal was met when the chili beans were replaced with lentils. This brought the fiber content to 11.1 grams per serving, 7.7 grams more than the 3.4 grams per serving in the original recipe. The reduced sodium goal was also met by replacing the chili beans and removing the hickory smoked barbeque sauce. The baseline product started with 644.7 milligrams per serving and the final product ended with 59 milligrams per serving (See appendix 5). The nutritional goals for the product were met mid way through experiment, however the taste of the product was not acceptable to the sensory panel (See appendix 6). This problem was solved by adding spices and FONA salt enhancer.

Conclusion and Discussion

Initially, the directions on the box of rice and lentils were followed to prepare the items, which resulted in more than required for this recipe. As the amounts of dry rice and lentils were reduced, the liquids used to prepare the rice and lentils were reduced by

similar percentages. In using the Foodworks 10 program to determine the nutritional values of the end product from the recipes, there were three problems; 1) the program used the total amount of precooked vegetable broth in computing the weight of the recipe, not accounting for liquid lost during cooking/boiling or liquid absorbed into the dry ingredients; 2) water was not added because it has no nutritional value, but it added volume/ weight to the end product; 3) it took the total weight of the precooked items to determine the number of servings and subsequent nutritional value per serving. In actuality, there were significantly less servings after cooking the Sloppy Joes than projected by the Foodworks program, therefore the nutritional goals were not met. This problem was not evident during the experiment because each formula was altered with different amounts of vegetable broth and different cooking times. Each variable resulted in different amounts of liquid being absorbed into the rice or beans. When the final product was completed, the issue with the serving size and nutritional values became evident. Therefore, only the baseline and final product have correct numbers or nutritional values in Foodworks.

To correct the problem in the final product, the water weight of the vegetable broth was removed from the Foodworks program and replaced with a dry vegetable broth cube. An average vegetable broth cube makes one cup of broth, which is 249 milliliters. The vegetable broth used in the recipe is 277.9 mL. Using the cube, the program was able to compute the exact nutritional content without the issue of serving size skewed by the liquids in the recipe.

After the final product was completed and the issue of the broth was identified, it was determined that the vegetable broth was probably not necessary to give the meatless

Sloppy Joe necessary flavor. This could have been accomplished by adding more spices. Although using the vegetable broth made it difficult to determine the nutritional value throughout the process, the final Meatless Sloppy Joe product met the qualification to be labeled low sodium, high fiber and low fat. (see appendix 7)