

## INTRODUCTION

The diet most Americans consume is one that is high in fat, especially saturated fat, refined carbohydrates, and high in sodium.<sup>1</sup> This diet is most often referred to as “The Western Diet”. A significant food staple of this diet is baked goods that are typically high in sugar, high in cholesterol and fat, especially saturated fat. Fat should only make up 20-35% of a person's daily intake, which equals anywhere between 44 and 77 grams per day, according to the CDC. Icing is a sweet and desirable topping for baked goods such as cookies, cakes, and cinnamon rolls. It may be used to enhance the flavor of foods or even be used to add moisture to cake to mold into cake pops. According to *Obesity Research*, Americans eat an average of one pound of cake per year.<sup>2</sup> The cake icing is the component of the cake that contributes a significant amount of calories and fat, especially saturated fat to the cake (i.e. 11.52 grams fat and 7.29 grams saturated fat per 1 tablespoon).<sup>3</sup> Therefore, reducing the fat content in icing could help Americans reduce their overall fat intake while still being able to enjoy sweets in moderation.

## PURPOSE

The purpose of this research project was to decrease the saturated fat content of a traditional chocolate icing prepared with butter while enhancing the quality of fat used in the icing recipes prepared with fat alternative. The goal of this study was to develop a chocolate icing recipe using healthier fats such as avocados, tofu cream cheese and Greek yogurt, was economical and receives a palatability and appearance rating similar to traditional chocolate icing recipe.

## METHODS

The control recipe contained butter as the main fat source and therefore, the only ingredient altered in the recipe. To control for variability, each researcher conducted the same tasks in the experiment throughout the four-week cycle of this study. All icings were made with the same ingredients: confectionary sugar, cocoa powder, vanilla extract, and evaporated milk; the recipe variations only differed in the fat source of the icing. The panelists who were fellow classmates ranging in age of 18-22 used a scorecard to assess selected sensory qualities that included appearance, texture, flavor and overall acceptability of the four samples presented for each lab. Each sample was evaluated on a scale from one to five (one representing very undesirable to five representing very desirable). Panelist were seated in a room free from distractions and odors and were presented a plate divided into four quadrants with one tablespoon of icing representing each recipe variation. Panelists were given instruction on how to proceed with taste-testing and how to use the scorecard to record their assessment of each recipe variation. The panelist also had an opportunity to provide written comments. Recipes were adjusted after each taste-testing session to address challenges and issues with the cake icings identified by the panelists. The scorecard data was calculated using means and the nutritional content of each final recipe analysis was determined using Esha Food Processor software. Cost per recipe and per serving were calculated using sales receipts and the ingredient amounts.

## RESEARCH OBJECTIVES

- Decrease the saturated fat content of a traditional chocolate icing prepared with butter by replacing it with healthier fat alternatives (avocado, tofu cream cheese, and Greek yogurt).
- Assess the acceptability for selected sensory qualities of the recipes prepared with the fat alternatives.
- Compare the cost per serving and the cost per recipe of the recipes prepared with healthier fats and with the traditional chocolate icing recipe.

## RESULTS

Table #1

Average Sensory Analysis Scorecard Results

Variation	Appearance	Texture	Flavor	Overall Acceptability
Control	4.42	3.75	4	4.17
Avocado	4.54	4.29	3.5	3.67
Tofu Cream Cheese	4.58	4.17	2.75	2.96
Greek Yogurt	3.71	3.63	2.83	3.08

Note: Appearance: 1= Dry/Brittle, 2=Chalky, 3=Lumpy, 4= Thick, 5= Fluffy/Decadent; Texture 1= Gritty, 2= Lumpy, 3= Thick/Thin, 4= Greasy/Oily, 5= Smooth/Creamy; Flavor: 1= Bitter, 2= Tangy, 3= Bland, 4= Rich, 5=Chocolately; Overall Acceptability: 1= Would not eat again, 2= Not good, 3= Indifferent, 4= Enjoyable, 5= Love it, would eat again

Table #2

Cost analysis of icing made with butter, avocado, tofu-based cream cheese, and yogurt

Variation	Cost Per Serving	Cost Per Recipe
Control	\$0.16	\$1.97
Avocado	\$0.20	\$2.40
Tofu Cream Cheese	\$0.35	\$4.21
Greek Yogurt	\$0.17	\$2.09

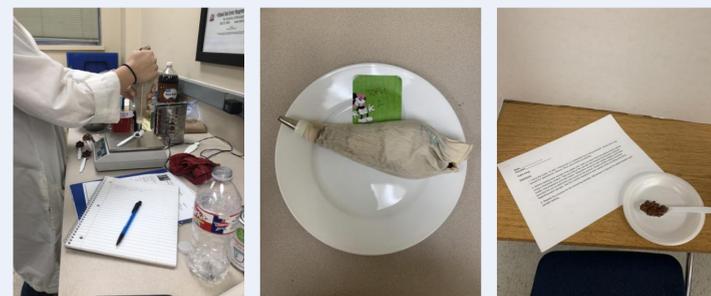
Note: Cost analysis calculated using Walmart.com

Table #3

Nutrient analysis of icing made with butter, avocado, tofu-based cream cheese, and yogurt

Variation	Calories (kcal)	Total Fat (g)	Saturated fat (g)	Cholesterol (mg)	Sugar (g)	Calcium (mg)
Control	173	6	4	17	27	10
Avocado	131	1	0	1	27	10
Tofu Cream Cheese	134	2	1	1	27	10
Greek Yogurt	125	0	0	1	27	20

Note: Nutrient analysis was calculated using MyFitnessPal



## RESULTS

The panelists rated the control recipe as the one with highest overall acceptability of 4.17 whereas, the vegan cream cheese was ranked the lowest score for overall acceptability of 2.96. The icings prepared with Greek-style yogurt and avocado had overall acceptability scores of 3.08 and 3.67, respectively. The control was the most economical with a total cost of \$1.97 per recipe. The tofu cream cheese was the most expensive to prepare, at a cost of \$4.21 while, the Greek-style yogurt was \$2.40 per recipe and the avocado was \$2.09 per recipe. The control icing contained 173 calories, and 6 grams of total fat, but the fat was reduced across the recipe variations with the avocado yielding 131 calories, 0 grams fat and Greek-style yogurt having 125 calories and 0 grams of fat; vegan cream cheese providing 134 calories and with 1 gram saturated fat. In addition, there was also a reduction in cholesterol for the recipe variations yielding 1 mg of cholesterol per serving.

## CONCLUSION

The cost of the avocado, tofu cream cheese, and Greek yogurt variations of the icings were more expensive than the control. However, the variations had less calories and total fat when compared to the control and panelist liked the tofu cream cheese variation the least. This may be a viable alternative with additional research to improve the acceptability of this reduced calorie and fat icing variation.

## REFERENCES

- <sup>1</sup>Manzel, A., Muller, D.N., Hafler, D.A, Erdman, S. E, Linker, R.A. and Kleinewietfeld, M. (2014). Role of “Western Diet” in Inflammatory Autoimmune Diseases. *Curr Allergy Asthma Rep.* 14(1): 404.
- <sup>2</sup>Bandini, Linda G., Vu, Dung, Must, Aviva, Cry, Helene, Goldberg, Alison, Dietz, William H. (1999). Comparison of high-calorie, low-nutrient-dense food consumption among obese and non-obese adolescents. *Obesity Research*, 7(5), 438-443.
- <sup>3</sup>Butter 101: Nutrition Facts and Health Effects Retrieved 2/19/2021 from <https://www.healthline.com/nutrition/foods/butter#nutrition>.