Safe Frosting for Iowa 4-H Fairs

February 14, 2023 Marlene Geiger 3 Comments

The recently released ***Foods for Iowa 4-H Fairs – Quick Reference Guide (2023)*** lists "traditional vanilla buttercream made with butter, powdered sugar, extract, and milk" as an acceptable homemade frosting for baked goods exhibited or displayed at Iowa 4-H fairs. Identifying a safe "traditional buttercream frosting" recipe for exhibit has been a source of confusion for 4-H members and their families as well as County Extension Educators and fair judges. Store-bought, commercially prepared frostings that are shelf stable are acceptable for food product exhibits.

Food products exhibited at 4-H Fairs must be shelf stable or stable (non-perishable) at room temperature and not require refrigeration to be safe. Due to the various ingredients and quantities that may be incorporated into a homemade frosting, many frostings require refrigeration to be unquestionably safe. Three factors play a role in determining the safety of a frosting: acidity (pH), water activity (A_w), and percent of soluble solids (%Brix).

The **acidity (pH)** of a frosting is affected by the ingredients used. Traditional frostings made with dairy or eggs tend to increase pH making them more basic than acidic and susceptible to spoilage. Therefore, frosting made with cream cheese, whipped cream, or eggs requires refrigeration to inhibit spoilage and molding despite the fact that frostings are laden with sugar, known for its ability to inhibit microbial growth.

Water activity (A_w) is the measure of available water in a food product that can support microbial growth and affect the quality and safety of food. This differs from moisture content which refers to water bound to ingredients within the food. The FDA has established that a water activity (A_w) value greater than 0.85 on a scale of 0 (bone dry) – 1.0 (pure water) indicates a high-risk food product capable of facilitating the growth of microorganisms in the product. Sugar may lower the A_w while water or dairy can increase the A_w; fat has no effect on A_w.

Percent **soluble solids (%Brix)** in a frosting is determined by the amount of sugar available to bind up the available water to reduce bacterial growth. As %Brix increases, A_w decreases.

Due to these factors, frostings are considered TCS, foods that require either temperature or time control for food safety. TCS foods may allow pathogens to grow and possibly produce toxins when held at temperatures between 41-135 degrees F. (For additional information see: Food Safety of Frostings and Fillings by K-State Research and Extension.) To be considered a non-TCS food, the percent soluble solids (%Brix) must be above 65% and the A_w value less than 0.85.[1]

There are numerous recipes for buttercream frosting. It is not a given that all buttercream frostings meet the %Brix and A_w requirements to be a non-TCS food or safe without refrigeration. To determine the safety of a vanilla buttercream frosting for Iowa 4-H exhibits, three members of the AnswerLine team prepared an adapted version of the Simple Buttercream Frosting tested and considered stable at room temperature by K-State Research and Extension[1]. Milk (dairy) was substituted for heavy cream in the K-State recipe. The frostings were prepared at the individual homes of the team members using the same butter and powdered sugar; the percent of milk fat and vanilla extract were the two variables. The three samples were submitted to the Iowa State University Food Quality and Safety Laboratory for analysis of water activity and %Brix with results shown in the table below.

Table 1. Average water activity and % soluble solids of frostings tested.

Sample	Water Activity	% Soluble Solids
Sample 1 – Skim milk	0.788± 0.003	68.60 ± 0.30
Sample 2 – 2% Milk	0.812 ± 0.004	67.83 ± 0.23
Sample 3 – Whole Milk	0.808 ± 0.006	67.17 ± 0.35

All three samples met the requirements of a non-TCS food as recommended by K-State Research and Extension[1] exhibiting an average Brix of 67.87% and an A_w value of 0.803.

Tested Vanilla Buttercream recipe ingredients.
Photo credit: Rachel Sweeney

Tested Vanilla Buttercream Recipe
Required for use with Iowa 4-H Fair Food Product Exhibits.
(All Iowa 4-Hers must reference and attach this blog to their write-up for full credit if a homemade frosting is used in the exhibit. Any change or addition of ingredients will be unacceptable and will result in disqualification.)

1 cup unsalted butter, slightly softened
4 cups powdered sugar
¼ teaspoon salt
1 teaspoon vanilla extract
2 Tablespoons **dairy** milk (skim, 2%, or whole)

Beat the butter, salt, and vanilla together until fully combined on medium speed. Reduce speed and add the powdered sugar and milk. Add the milk a teaspoon at a time to achieve the right consistency for the way you want to use the frosting. DO NOT use more than 2 tablespoons of milk. Slowly increase the speed of the mixer and beat until the frosting is light and fluffy.

What Does This Mean for Iowa 4-H Food Products?

- **It is highly suggested that exhibits be presented without frosting unless the frosting is part of the exhibit goal.**

Example 1: *My goal is to bake an angel food cake for exhibit at the fair*.
No frosting is needed for this exhibit. Cake recipe should be included with the exhibit.

Example 2*: *My goal is to bake and frost a chocolate cake for my Dad's birthday. I will also exhibit a similar cake and frosting at the fair.*
Cake should be frosted with the tested vanilla buttercream frosting or with a commercially prepared frosting to assure that it is not a TCS food. No chocolate, cocoa, or other ingredient should be added to the tested recipe or commerical frosting. Recipe for cake and frosting (if homemade) should be included with the exhibit, along with this blog.

Example 3*: *My goal is to learn to make a cake and a frosting for exhibit at the fair.*
Cake should be frosted with the tested vanilla buttercream frosting; no chocolate, cocoa, or other ingredient should be added to the tested recipe. Cake and frosting recipes, along with this blog, should be included with exhibit.

*For examples 2 and 3, another option is to prepare the product using any frosting desired; before serving, take pictures of the frosted product. Exhibit the product without frosting at the fair and note in the write up that the product is being exhibited without frosting due to food safety concerns. Add pictures of the frosted product to the write up and include the product recipe with the exhibit.

- **Homemade Cream Cheese, German Chocolate or Coconut-Pecan, Ganache, or 7-Minute frostings or fillings are not to be exhibited at the fair. They are potential TCS foods due to the range of water activity (A_w) in various recipes and should be stored in the refrigerator.**
- **Decorator frostings of any type may be used when the goal is to decorate a cake. The cake may be food, cardboard, or Styrofoam and will be judged on design, neatness, originality, skill, and technique; the cake will not be tasted or judged on product characteristics.**
- **Fresh or canned fruit, vegetable, or zest should not be used as decoration or garnish on a baked product or decorated cake.**
- **When a glaze is desired, it should be made with powdered sugar and water only. No fruit juice or zest should be added.**

Plan ahead for a successful fair experience. 4-H members are encouraged to call or email AnswerLine with questions about their food project prior to exhibit.

Call: 1-800-262-3804 or 515-296-5883, M-F 9-12, 1-4
Relay Iowa (hearing impaired) 1-800-735-2942
Email: answer@iastate.edu

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[1]Blakeslee, Karen, et al. (December 2020). *Food Safety of Frostings and Fillings.* MF3544. K-State Research and Extension. https://bookstore.ksre.ksu.edu/pubs/MF3544.pdf. Date accessed, January 11, 2023.

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