



5 chapter

Nutrition Labeling Using a Computer Program

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5.1 INTRODUCTION

5.1.1 Background

The 1990 Nutrition Labeling and Education Act mandated nutritional labeling of most foods. As a result, a large portion of food analysis is performed for nutritional labeling purposes. Interpretation of these regulations (21 CFR 101.9) and the appropriate usage of rounding rules, available nutrient content claims, reference amounts, and serving size can be challenging. Additionally, during the product development process, the effect of formulation changes on the nutrition label may be important. As an example, a small change in the amount of an ingredient may determine if a product can be labeled low fat. As a result, the ability to immediately approximate how a formulation change will impact the nutritional label can be valuable. In some cases, the opposite situation may occur and a concept called reverse engineering is used. In reverse engineering the information from the nutrition label is used to determine a formula for the product. Caution must be used during reverse engineering. In most cases, only an approximate formula can be obtained and additional information not provided by the nutrition label may be necessary.

The use of nutrient databases and computer programs designed for preparing and analyzing nutrition labels can be valuable in all of the situations described earlier. In this laboratory you will use a computer program to prepare a nutrition label from a product formula, determine how changes in the formula affect the nutrition label, and observe an example of reverse engineering.

5.1.2 Reading Assignment

Metzger, L.E. and Nielsen, S.S., 2017. Nutrition labeling. Ch. 3, in *Food Analysis*, 5th ed. S.S. Nielsen (Ed.), Springer, New York.

5.1.3 Objective

Prepare a nutrition label for a yogurt formula, determine how formulation changes will affect the nutrition label, and observe an example of reverse engineering.

5.1.4 Materials

TechWizard™ – Formulation and Nutrition Labeling Software for Microsoft Excel for Windows.

Owl Software. TechWizard™ Software Manual, Columbia, MO. www.owlsoft.com

5.1.5 Notes

Instructions on how to receive and install the software used for this laboratory are located online at www.owlsoft.com, under the *Academic* link located in the

heading. It is possible that the TechWizard™ program has been updated since the publication of this laboratory manual and any changes in the procedures described below will also be found on this web page.

***Install the software prior to the laboratory session to ensure that it works properly with your PC.**

5.2 PREPARING NUTRITION LABELS FOR SAMPLE YOGURT FORMULAS

5.2.1 Procedure

1. Start the TechWizard™ program. (Start the program, the message appears “TechWizard successfully opened the necessary files...” and click OK. Click on the Enter Program button. Select User Name “Administrator” and click OK.)
2. Enter the Nutrition Labeling section (From the Labeling tab select Labeling Section. You should see “TechWizard™ – Nutrition Info & Labeling with New Formats” in the top left corner of the screen.)
3. Enter the ingredients for Formula #1 listed in Table 5.1. (Click on the Add Ingredients button, then select an ingredient from the ingredient list window, and click the Add button. Repeat for each ingredient. After all the ingredients have been added, close the window.)
4. Enter the amounts of the ingredients. (Enter the percentage of each ingredient for Formula #1 in the % (wt/wt) column. Selecting the Sort button above that column and then Sort Descending will sort the ingredients by the % (wt/wt) in the formula.)
5. Enter the serving size (common household unit and the equivalent metric quantity) and number of servings. (First click on the Serving Size button under Common Household unit, enter 2/3 in the window, click on OK, and select cup from the units drop down list; next click on the Serving Size button under Equivalent Metric Quantity, enter 170 g in the window, click on OK, and select g from the units

5.1

table

Sample yogurt formulas

	Formula #1 (%)	Formula #2 (%)
Milk (3.7% fat)	38.201	48.201
Milk (skim), no vit. A	35.706	25.706
add		
Milk (skim), condensed (35% TS)	12.888	12.888
Sweetener, sugar (Liquid)	11.905	11.905
Modified starch	0.800	0.800
Stabilizer, gelatin, dry powder, unsweetened	0.500	0.500

drop down list; and finally click on the Number of Servings button, enter 1 in the window, and click on OK.)

6. Save Formula #1. (Click on the File tab, then Formula, and then Save Formula As. Type Student Name_Formula Name in the Formula Name window, click the Save button, then OK, and close the window.)
7. View the nutrition label and select label options. (Click on the View Label button, click on the Label Options button, and select Standard; select Protein = Show ADV for voluntary nutrients since yogurt is high in protein, and enter 1 for the PDCAAS; when you have finished selecting the label options, select Apply, then OK, and then Close to view the label.)
8. Copy and paste the nutrition label for formula #1 to a Microsoft Word file (Click on the Copy button on the Labeling tab, select Standard Label, Enter 1 for the new label format. Click OK. When prompted that the label has been copied, click OK. Open a Word document, and type the name of the formula and paste the label. Return to the TechWizard™ program.)
9. Edit the ingredient declarations list (Click on the View/Edit Declaration button, and click Yes when asked – Do you wish to generate a simple formula declaration using individual ingredient declarations? – Each ingredient used in the formula can be selected in the top window and the ingredient declaration can be edited in the middle window.)

*Note the rules for ingredient declaration are found in 21 CFR 101.4.

10. Copy and paste the ingredient declaration for Formula #1 to a Microsoft Word file. (Select Edit Formula declaration, and click the Copy button then OK to the pop-up and close the window. The declara-

tion can now be pasted into your Microsoft Word Document).

11. Return to the Nutrition Info & Labeling section of the TechWizard™ program. (Go to the TechWizard™ program and click on the Return button.)
12. Repeat the process for Formula #2 (Table 5.1). (Repeat Steps 4–10)

5.3 ADDING NEW INGREDIENTS TO A FORMULA AND DETERMINING HOW THEY INFLUENCE THE NUTRITION LABEL

Sometimes it may be necessary to add additional ingredients to a formula. As an example, let us say you decided to add an additional source of calcium to yogurt formula #1. After contacting several suppliers, you decided to add Fieldgate Natural Dairy Calcium 1000, a calcium phosphate product produced by First District Association (Litchfield, MN), to the yogurt formula. This product is a natural dairy-based whey mineral concentrate and contains 25% calcium. You want to determine how much Dairy Calcium 1000 you need to add to have 50 and 100% of the Daily Value (DV) of calcium in one serving of your yogurt. The composition of the Dairy Calcium 1000 you will add is shown in Table 5.2.

5.3.1 Procedure

1. Add the name of the new ingredient to the database. (From the Edit Ingredient File tab, select Edit Current File; Click on Edit Ingredient File tab again in the Ingredients group; Click Add, type the ingredient name "Dairy Calcium 100_Student Name" in the Enter Ingredient Name box, and click Add. Answer Yes to the question, and click OK. Close the window.)
2. Enter the new ingredient composition (Table 5.2). (Select the ingredient name in the column named "Ingredients and Properties." Click Edit Selected in the Ingredients group under the Edit Ingredient File tab, the row will turn blue, and enter the amount of each component/nutrient in the appropriate column.)
3. Edit the ingredient declaration (which will appear on the ingredient list) for the new ingredient. (Type "Whey mineral concentrate" in the column named "Default, Spec TEXT, zzzIngredient Declaration.")
4. Save the changes to the ingredient file. (Click on the Finish Edit button, and answer Yes to the question. Select Close Ingrid. File from the Edit Ingredient File tab.)

5.2

table

Composition of Fieldgate Natural Dairy Calcium 1000 (First District Association)

Component	Amount
Ash (%)	75
Calcium (mg/100 g)	25,000
Calories (cal/100 g)	40
Lactose (%)	10
Phosphorus (mg/100 g)	13,000
Protein (g/100 g)	4.0
Sugars (g/100 g)	10
Total carbohydrates (g/100 g)	10
Total solids (%)	92
Water (%)	8.0

5. **Open food analysis formula #1 in the Formula Development Section of the program.** (Click the *Formula Dev and Batching* tab, and then *Formula Dev*. From the *File* menu, select *Open Formula* and select your Formula #1 file "Student Name_Formula Name," click on the *Open* button, then click on *No* for the first question, and click on *Yes* for the remaining questions).
6. Add the new Dairy Calcium 1000 ingredient to your food analysis formula #1. (Click on the *Add Ingredients* button, then select your ingredient "Dairy Calcium 1000_Student Name" from the ingredient list, click on the *Add* button, and close the window.)
7. Calculate the amount of calcium (mg/100g) required to meet 50 and 100% of the DV (see example below):

$$\text{Calcium required} = \left(\frac{\text{DV for calcium}}{\text{servicing size}} \right) \times 100 \text{ g} \times \% \text{ of DV required}$$

$$\text{Calcium required for 50\% of the DV} = \left(\frac{1300 \text{ mg}}{170 \text{ g}} \right) \times 100 \text{ g} \times 0.50$$

$$\text{Calcium required for 50\% of the DV} = 382 \left(\frac{\text{mg}}{100 \text{ g}} \right)$$

8. Enter the amount of calcium required in the formula and restrict all ingredients in the formula except skim milk and Dairy Calcium 1000. (Find Calcium in the *Property* column and enter 382 in the *Min* and *Max* columns for Calcium. This lets the program know that you want to have 382 mg of calcium per 100 g. In both the *Min* and *Max* columns of the *Ingredients*, enter 38.201 for Milk (3.7% fat); 12.888 for Milk (skim), condensed (35% TS); 11.905 for Swtnr, sugar (Liquid); 0.800 for Modified starch; and 0.500 for Stblzr, Gelatin, dry powder, unsweetened. This lets the program adjust the amount of skim milk and Dairy Calcium 1000 (calcium phosphate) and keeps the amount of all the other ingredients constant. Click on the *Formulate* button, click *OK*.) Record the % wt/wt for Dairy Calcium to answer Question 2 in Sect. 5.5.
9. Save the modified formula with your name. (Click on the *File* tab, then *Formula*, and then *Save Formula As*. Type "Student Name_Formula #1 added calcium 50% DV" in the *Formula Name* window, click the *Save* button, then *OK* to close the window.)
10. Open the new formula into the nutrition labeling section. (Click on the *Labeling* tab, select

Labeling Section, click the *File* tab then *Open Formula*, and select your formula "Student Name_Formula #1 added calcium 50% DV," and click *Open* then click on *No* for the first question, and click on *Yes* for the remaining questions).

11. Make sure you have the correct serving size information (see Sect. 5.2, Step 5).
12. View and print the nutrition label for the new formula with 50% of the calcium DV. Follow the instructions described in Sect. 5.2, Steps 6–10.
13. Produce a formula and label that has 100% of the calcium DV. (Repeat Steps 8–12 except using the calculated amount of calcium required to meet 100% of the calcium DV. You will have to perform this calculation yourself following the example in Step 7.)

5.4 AN EXAMPLE OF REVERSE ENGINEERING IN PRODUCT DEVELOPMENT

5.4.1 Procedure

In this example the program will automatically go through the reverse engineering process. (Start the example by selecting *Cultured Products Automated Examples* from the *Help* menu and clicking on example #4. During this example you proceed to the next step by clicking on the *Next* button.) Each step is described below:

1. The information from the nutrition label for the product you want to reverse engineer is entered into the program. (Comment: In this example serving size, calories, calories from fat, total fat, saturated fat, cholesterol, sodium, total carbohydrate, sugars, protein, vitamin A, vitamin C, calcium, and iron are entered.)
2. The minimum and maximum levels of each nutrient are calculated on a 100-g basis. (Comment: The program uses the rounding rules to determine the possible range of each nutrient on a 100-g basis.)
3. The information about nutrient minimum and maximums is transferred into the *Formula Development* section of the program. (Comment: The program has now converted nutrient range information into a form it can use during the formulation process.)
4. Ingredients used in the formula are then selected based on the ingredient declaration statement on the nutrition label. (Comment: Selecting the right ingredients can be difficult and an extensive understanding of the ingredient declaration rules is necessary. Additionally some of the required ingredients may not be in the database and will need to be added.)

5.3

table

Recipe for chocolate chip cookies

Ingredients	Amount	Grams
Wheat flour, white, all-purpose, enriched, unbleached	2.25 cups	281.25
Swtmr, sugar, granulated	0.75 cup	
Candies, semisweet chocolate	100 g	100
Sugars, brown	0.75 cup (packed)	
Butter (salted)	1 cup	227
Egg, whole, fresh	2 units	112
Salt	0.75 tsp	

Source for ingredients: TechWizard, USDA ingredients as source

Conversion data source: USDA web page

- Restrictions on the amount of each ingredient in the formula are imposed whenever possible. (*Comment: This is a critical step that requires knowledge about the typical levels of ingredients used in the product. Additionally, based on the order of ingredients in the ingredient declaration, approximate ranges can be determined. In this example, the amount of modified starch is limited to 0.80%, the amount of gelatin is limited to 0.50%, and the amount of culture is limited to 0.002%.*)
- The program calculates an approximate formula. (*Comment: The program uses the information on nutrient ranges and composition of the ingredients to calculate the amount of each ingredient in the formula.*)
- The program compares the nutrition information for the developed formula to the original nutrition label. (*Comment: This information is viewed in the Nutrition Label to Formula Spec section of the program accessed by selecting Reverse Engineering Section from the Reverse Engineering tab. Click the X to close the Cultured Products Example window when finished.*)

5.5 QUESTIONS

- Based on the labels you produced for yogurt Formula #1 and Formula #2 in Sect. 5.2, what nutrient content claims could be made for each

formula (see 21 CFR 101.13, Nutrient content claims – general principles – and 21 CFR 101-54-101.67, Specific requirements for nutrient content claims or summary tables from the FDA or other sources based on these CFR sections)?

- How much Dairy Calcium 1000 did you have to add to the yogurt formula to have 50 and 100% of the DV of calcium in the formula?
- If Dairy Calcium 1000 costs \$2.50/lb and you are going to have 100% of the DV for calcium in your yogurt, how much extra will you have to charge for a serving of yogurt to cover the cost of this ingredient?
- Assume you added enough Dairy Calcium 1000 to claim 100% of the DV of calcium, would you expect the added calcium to cause any texture changes in the yogurt?
- Make a nutrition label using the chocolate chip cookie recipe and other information in Table 5.3 (for simplicity assume 0% loss of water during baking, number of servings=1, serving size=30 g). Conversion factors to get the weight of sugars and salt can be found in the US Department of Agriculture Nutrient Database for Standard Reference website: <http://ndb.nal.usda.gov/>. When adding ingredients to the formula, you may have to select the tab “USDA Ingredients as Source” in the Add Ingredients window to find the ingredient you need. Enter the grams of each ingredient in the %(wt/wt) column. Select Normalize from the Labeling tab to convert the values so the total is 100. The ingredient, Candies, semisweet chocolate, does not have Added Sugars data. You can enter a temporary value to the ingredient information to calculate the Nutrition Facts. Click on Composition from the Labeling tab. In the row for that ingredient, scroll to the right until you find the column for Added Sugars with the units g. Enter the value you determine for Added Sugars (hint: look at the Sugars value) and click the Enter key. The value will be used for the label but is not saved in the ingredient file.

RESOURCE MATERIALS

Metzger LE, Nielsen SS (2017) Nutrition labeling. Ch. 3. In: Nielsen SS edn. Food analysis, 5th edn. Springer, New York
Owl Software TechWizard™ Manual, Columbia, MO. www.owlsoft.com