

Comparison of Analytical Nutrient Values to Food Label Values in Select Breakfast Cereals

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ABSTRACT

USDA determines nutrient values for selected foods in the U.S. diet to update the USDA National Nutrient Database for Standard Reference. Label data are sometimes used for breakfast cereals when analytical data are unavailable. According to labeling regulation 21CFR 101.9(g), analytical values for fortification nutrients must be at least equal to label values, while naturally occurring nutrient values must be at least 80% of label values for "beneficial" nutrients (e.g., protein, dietary fiber, potassium, magnesium) or no more than 120% of label values for "nutrients to limit" (e.g., total fat, sugar, sodium). Manufacturers typically add overages to fortified foods to ensure that their products meet the FDA regulations. Six types of ready-to-eat breakfast cereals, selected based on consumption data and other factors, were analyzed as part of USDA's National Food and Nutrition Analysis Program. Analytical iron results ranged from -3% to +80% of label values and vitamin D results were -5% to +128% of label values. Vitamin A results ranged from -3 to +118%. Most B vitamin results indicated overages of 7-112%, but thiamin and riboflavin were below label values in some cereals (-2 to -18%). Most "beneficial" nutrient results were at least 80% of label values, as required, although dietary fiber was below 80% for four of the cereals. Total fat results were >120% of label values for three of the cereals, but sodium and sugar results were all below 120%, as required. This study of breakfast cereals indicates that analytical values can vary widely when compared to values shown on the Nutrition Facts panel.

INTRODUCTION

The National Food and Nutrition Analysis Program (NFNAP) includes laboratory analysis of select foods to provide data for the USDA National Nutrient Database for Standard Reference. The Nutrient Data Lab has top-selling ready-to-eat (RTE) cereal products sampled and analyzed on a regular basis. Data derived from cereal package Nutrition Facts labels are sometimes used when analytical or manufacturer data are not available. The goal of this analysis was to compare the NFNAP analytical results from a 2011 sampling to the corresponding label values for the same products, and determine the extent of compliance with or deviation from the U.S. Food and Drug Administration's (FDA) regulations.

METHODS

- Six brands of RTE breakfast cereal were sampled for analysis in summer 2011: bran flakes with raisins, crisp toasted rice, frosted corn flakes, multigrain flakes with oat clusters, oat rings, and toasted oat shapes with marshmallows.
- Cereals were selected based on NHANES 2007-08 consumption data, unit sales, and other factors.
- National Food and Nutrition Analysis Program protocol [1]
 - Each product was sampled from retail outlets in 12 cities across the United States, which were selected using a multi-stage probability-proportional-to-size method.
 - Food Analysis Laboratory Control Center at Virginia Tech prepared samples according to standard protocols and shipped composited samples to pre-qualified analytical laboratories along with quality control materials. Samples from different cities were combined in composites, resulting in 1 to 6 separate analyses for each nutrient.
 - Laboratories conducted analyses of proximate components, sugars, dietary fiber, vitamins, minerals, and fatty acids using AOAC or other validated, published methods.
- Information was collected from all 12 labels of each products sampled. Data were converted from values per serving to values per 100 g, with % Daily Value converted to metric unit, as needed.
- Analytical values were compared to the label values: analytical/label = % of label. Variance from label was compared to FDA regulations, which are described in Table 1.

Table 1. FDA Label Regulations [2]

Class I. Added nutrients in fortified or fabricated foods

Rule: Analytical ≥ label

21CFR 172.5 General provisions for direct food additives – "The quantity of the substance added to food does not exceed the amount reasonably required to accomplish its intended physical, nutritive, or other technical effect in food." Thus, the amount of allowed overage is not specified.

Class II. Naturally occurring nutrients

a) Beneficial nutrients (vitamins, minerals, protein, total carbohydrate, dietary fiber, polyunsaturated or monounsaturated fat)

Rule: Analytical ≥ 80% of label

b) Nutrients to limit (calories, sugar, total fat, saturated fat, cholesterol, or sodium)

Rule: Analytical ≤ 120% of label

RESULTS & DISCUSSION

Fortification nutrients:

The RTE cereals studied were all fortified with vitamins A, D, B₆, B₁₂, thiamin, riboflavin, niacin, and iron. Cereal manufacturers typically add amounts greater than the labeled amount in order to account for losses during processing and storage. These overages are demonstrated in this study's results, shown in Table 2.

- The majority of fortificant levels were greater than the label values (105-228%).
- Other levels were equal to or close to (82-98%, indicated in red) the label value.
- The variability of some nutrient levels among the six cereals was more pronounced than others.
- Variability in iron levels is illustrated in Figure 1, which shows percentages that represent each of the six analytical values for each cereal. Crisp Toasted Rice has the widest range (74 -138% of label), whereas the iron level in Oat Rings cereal has the least variability (111 – 119%).

Naturally occurring nutrients:

- Most of the "beneficial" nutrients were at least 80% of the label value (Table 3), with the exception of fiber which had some low analytical values (indicated in red).
- Sodium and total sugar levels were no more than 120% of label (Table 4), thus falling below the FDA limit.
- Total fat results were greater than 120% of the label for three of the cereals (indicated in red), possibly attributed to NFNAP lab's analytical method (acid hydrolysis) which tends to extract more fat than the method typically used by industry (ether extraction).

Table 2. Class I fortificant nutrients: analytical results as percent of label values

	Crisp		Multigrain		Toasted Oat		FDA Rule
	Bran Flakes With Raisins	Toasted Rice	Frosted Corn Flakes	Flakes With Oat Clusters	Oat Rings	Shapes With Marshmallows	
Iron	158	111	180	97	114	134	≥ 100%
Vitamin A	152	176	97	111	185	152	≥ 100%
Vitamin D	228	136	141	138	95	105	≥ 100%
Thiamin	116	164	152	98	100	124	≥ 100%
Riboflavin	144	82	122	89	93	108	≥ 100%
Niacin	161	118	166	107	117	137	≥ 100%
Vitamin B₆	212	153	210	147	134	158	≥ 100%
Vitamin B₁₂	172	160	162	194	126	121	≥ 100%

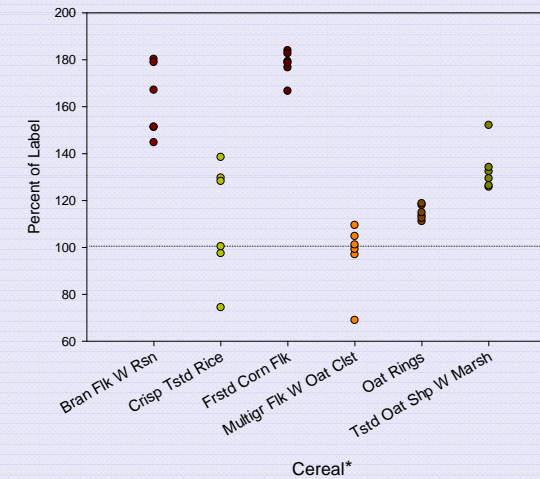
Table 3. Class IIa intrinsic "beneficial" nutrients: analytical results as percent of label values

	Crisp		Multigrain		Toasted Oat		FDA Rule
	Bran Flakes With Raisins	Toasted Rice	Frosted Corn Flakes	Flakes With Oat Clusters	Oat Rings	Shapes With Marshmallows	
Dietary fiber	96	27	67	63	88	68	≥ 80%
Potassium	110	137	113	114	106	120	≥ 80%
Protein	91	111	121	106	113	104	≥ 80%

Table 4. Class IIb intrinsic "nutrients to limit": analytical results as percent of label values

	Crisp		Multigrain		Toasted Oat		FDA Rule
	Bran Flakes With Raisins	Toasted Rice	Frosted Corn Flakes	Flakes With Oat Clusters	Oat Rings	Shapes With Marshmallows	
Sodium	103	91	100	96	101	103	≤ 120%
Total Fat	159	140	106	110	94	135	≤ 120%
Total Sugar	109	82	96	99	119	98	≤ 120%

Figure 1. Percent difference between analytical and label values for iron



*Bran Flakes with Raisins, Crisp Toasted Rice, Frosted Corn Flakes, Multigrain Flakes with Oat Clusters, Oat Rings, and Toasted Oat Shapes with Marshmallows

CONCLUSIONS

- Label values provide a reasonable estimate of some, but not all, nutrient levels in RTE breakfast cereals.
- The extent of overages for some nutrients and deficits in other nutrients should be of interest to the cereal industry.
- Health professionals should be aware that cereal labels often provide underestimations of actual amounts of vitamins in products.
- The results of the nutrient analyses of six RTE name brand cereals are available in the USDA National Nutrient Database for Standard Reference, Release 25 [3].

REFERENCES

- [1] Haytowitz DB, Pehrsson PR, Holden JM. The National Food and Nutrition Analysis Program: A Decade of Progress. Journal of Food Composition and Analysis 2008; 21(Supp. 1):S94-S102.
- [2] Code of Federal Regulations (CFR). 2010 ed. Nutrition labeling of food. Title 21 Ch. I, Pt. 101.9(g).
- [3] U.S. Department of Agriculture (USDA), Agricultural Research Service. 2012. USDA National Nutrient Database for Standard Reference, Release 25. Nutrient Data Laboratory Home Page, <http://www.ars.usda.gov/nutrientdata>.