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Medallion Laboratories
ANALYTICAL PROGRESS

Nutrition Labeling

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Why Consumers Want to Know

The demand for reliable nutrition information is increasing. More consumers are elevating their health consciousness and, particularly, there are concerns with the increasing levels of obesity in our population. Nutrition information allows consumers to make good decisions with regard to their eating habits. Therefore, we should expect commensurate improvements in health and reduction in conditions such as heart disease and obesity. Nutrition information is used by consumers to make wise choices when preparing meals. Not only is nutrition information available on packaged food products, but is increasingly prevalent in restaurants as well, thus allowing consumers to make healthier meal choices both in home and out.

Nutrition Facts: Assuring Accuracy

Food manufacturers need to provide accurate information in the nutrition facts panel to offer consumers the ability to make informed decisions. When working with an analytical laboratory to generate the data necessary to populate the panel, there are a number of things the food manufacturer can do to optimize the quality of the data and minimize unnecessary extra effort in the process. Discussion and information on the following should be considered (a more detailed discussion of each will follow): What are the best means of sampling and shipping? Is the sample an ingredient or a finished product? Is there a checklist available of what needs to be done (available from the laboratory)? Are estimates of analytes available? What form is the analyte in, i.e. is the vitamin A present as Beta-carotene or as retinol? Some analyses may be unneccessary based on knowledge of the sample. Is the serving size known?

Sampling

No matter how effective the analysis, the results are only as good as the sample being analyzed. Representative sampling is an essential part of obtaining accurate data. The more heterogeneous the product or ingredient, the broader the sampling scheme should be. For example, compare samples with particulates versus a similar product without. A cupcake without nuts is easily homogenized. A cupcake with nuts is not only heterogeneous within the cupcake, but the number of nuts within each cupcake can vary significantly. Therefore a much larger sampling of the cupcakes with nuts is in order. The USFDA selects twelve packages or samples from a particular lot (e.g. day of production) and composites them prior to conducting analysis. Analytical laboratories are well equipped for compositing and homogenizing samples, and this service should be considered to assure a representative sample is being analyzed. It is generally most effective to allow experienced laboratory staff to complete the compositing.

Preparation & Shipping of Samples

Samples for analysis should be carefully prepared, packaged, and shipped. Since foods are labeled on an “as is” basis, preservation of moisture content is essential for representative results. Samples that dry out will become concentrated, samples that pick up moisture will be diluted. In most causes, 200 grams of sample is an adequeate amount for analysis. All

samples should be sealed and adequately cushioned to assure no loss due to breakage or leakage. In many cases shipping in the retail container and allowing the laboratory to grind and composite the sample (see above) is best. Dry goods and powdered ingredients are most easily shipped in plastic bags or solid plastic cups (with the lids taped shut). Wet products that won't spoil are best shipped in sealable plastic jars. Fresh and/or raw foods are best placed in flexible plastic bags, frozen, then shipped with dry ice to assure sample integrity. Sealable, foil lined packages provide optimum protection and ease of use. Label each package (sample) and include all necessary paperwork. Do not use magic markers for samples that are to be tested for pesticide residues or flavor/odor. Such markers will contaminate the sample.

Estimates, Analyte Form, and Avoiding the Unnecessary

Rerunning an analysis results in added expense for the laboratory and delay for the customer in obtaining critical data. A good estimate of the analyte content provides the laboratory with a reference point when testing. For many assays, the sample size (amount weighed), the dilution during testing, the amount of reagents to use, and occassionally even the procedures followed are influenced by the quantity of analyte present. However, not having an estimate is better than a highly inaccurate estimate. For analysis such as vitamin A, the analyte form is important. Both retinol and beta carotene are sources of vitamin A activity, but the analyses involved are entirely different. Further, beta carotene is synthetic or plant sourced, while retinol is synthetic or animal sourced. Unnecessary analysis for either beta carotene or retinol can be avoided if the food's origin is known or the type of fortification (if known) is used. Similarly, cholesterol is found in animal fats while plant fats contain little or no cholesterol. So knowing a product is entirely of plant origin alleviates the need for cholesterol analysis. Total dietary fiber has two components, insoluble dietary fiber and soluble dietary fiber. For calorie calculations, insoluble dietary fiber has a value of zero, while soluble dietary fiber has a value of four. If caloric value of the product is of concern, analysis of insoluble and soluble dietary fiber rather than total dietary fiber may worth considering.

Serving Sizes

All Nutrition Facts information is based on a particular serving size. Laboratory analysis are typically reported in units that are standard for the analytical community. The laboratory analytical information (ususally in units per 100 grams) can be converted to label information (expressed in quantities per serving), complete with effects of rounding rules for various items if the laboratory is supplied with an accurate serving size expressed in grams.
Recogniition of the difficulty that consumers have comparing one product to another came to the forefront as part of NLEA. The approach taken by the regulating agencies (USFDA and USDA) to assist consumers in their comparison was to require the use of standard reference serving sizes in the Nutrition Facts data panel. Specifics on these serving sizes can be found in 21 CFR 101.9(b). Common household units such as cups, tablespoons, teaspoons, pieces, or fluid ounces are to be used to express serving size followed by the metric equivalents in milliliters or grams (21 CFR 101.9(b)(5), (b)(7). In some cases, reference amounts commonly consumed per eating occasion are the required serving sizes. Special rules apply for products that are sold in packages expected to be consumed at one eating occasion that are significantly smaller or larger than the reference amount. (21 CFR101.9(b)(6).

Nutrition Facts Panel: Required Labeling

The following are required on all packaged food labels (unless the package is not labled for single unit sale). *Serving Size, Servings per Package, Calories, Calories from Fat, Total Fat, Saturated Fat, Cholesterol, Sodium, Total Carbohydrates, Dietary Fiber, Sugars, Protein, Vitamin A, Vitamin C, Calcium, and Iron. Beginning January 1, 2006 labeling of trans fat will also be required.*

Trans Fat Labeling

Effective January 1, 2006, Labeling of the trans Fat content of packaged Food Products is required per the Federal Register of July, 2003. The US Food and Drug Administration (FDA) amended the food regulations on nutrition labeling (21 CFR §101.9 and 21 CFR §101.36) to require that the amount of trans fatty

acids in a food, including dietary supplements, be included in the Nutrition Facts. FDA has used "trans fatty acids" and "trans fat" interchangeably in the same manner it has used "saturated fatty acids" and "saturated fat".

For more information, see the following website: (http://www.fda.gov/OHRMS/DOCKETS/98fr/94p-0036-nfr0001.pdf)

Nutrition Facts Panel: Optional Labeling

In addition to the required nutrients in the Nutrition Facts panel, there are a significant number of nutrients that are optional for labeling at the producer's discretion. These are: C*alories from Saturated Fat, Polyunsaturated Fat, Monounsaturated Fat, Potassium, Soluble Fiber, Insoluble Fiber, Sugar Alcohols, Other Carbohydrate, Vitamin D, Vitamin E, Vitamin K, Thiamin (vitamin B1), Riboflavin (vitamin B2), Niacin, Vitamin B6, Folate, Vitamin B12, Biotin, Pantothenic Acid, Phosphorous, Iodine, Magnesium*

The quantities of vitamins and minerals are expressed as a percentage of the recommended quantity of daily intake established by the National Academies of Sciences (the RDI's-Recommended Daily Intakes).

Nutrition Labeling: The Details

MANDATORY NUTRIENT LABELING

Calories--Calories per serving must be expressed to the nearest 5 calories up to and including 50 calories per serving and in 10 calorie increments above 50 calories. Calories may be determined by a number of methods (all calories must be calculated and added together before rounding, regardless of the method used). (A). Use of specific Atwater calorie factors as defined in Table 13 of the "Energy Value of Foods-Basis and Derivation" USDA Handbook 74. This handbook supplies accurate energy values for many common foods and some food products. (B). Using the general Atwater factors of 4 calories times the grams of protein in a serving, 9 calories times the grams of fat in a serving, and 4 calories times the grams of carbohydrate in a serving and adding the three quantities. (C). If the grams per serving of insoluble dietary fiber have been determined for the food or food product, this can be subracted from the total carbohydrate content before multiplying by 4. (D). Using data for specific food factors for particular foods or ingredients approved by the FDA and included in 21CFR172 or 184. (E). Using bomb calorimetry data but subtracting 1.25 calories per gram of protein to correct for incomplete digestibility.

Calories from Fat - Based on 9 calories per gram of total fat per serving.

Total Fat - States the number of grams of fat per serving defined as total lipid fatty acids expressed as triglycerides. (AOAC Official Method of Analysis 996.06 is recommended by FDA for this determination). If it is less than 0.5 grams per serving, it can be expressed as zero, but still must be listed.

Saturated Fat - States the number of grams of saturated fat per serving defined as the sum of all fatty acids containing no double bonds. If it is less than 0.5 grams per serving, it can be expressed as zero, but still must be listed.

Cholesterol - States the cholesterol content of the food per serving in milligrams (mg) rounded to 5 mg increments. If it is less than 2 mg per serving it can be stated as zero, or replaced with the statement "Not a significant source of cholesterol" at the bottom of the nutrition facts table. If the food or food product contains 2-5 mg of cholesterol per serving, the content may be stated as "contains less than 5 milligrams".

Sodium - States the number of mg of sodium in a serving, expressed as zero when less than 5 mg, in 5 mg increments when containing 5-140 mg, and in 10 mg increments for amounts greater than 140 mg per serving.

Total Carbohydrates - States the number of grams per serving of total carbohydrate unless there is less than 1 gram, then states "(Contains) less than 1 gram", or if less than 0.5 grams per serving then zero. Total carbohydrate is determined by calculation. The sum of the contents of crude protein, total fat, moisture, and ash are subtracted from 100 to give "total carbohydrate", thus requiring each of the four assays before the calculation can be carried out.

Dietary Fiber - States the number of grams of total dietary fiber in a serving expressed to the nearest gram, except for quantities of less than 1 gram which may state "(Contains) less than 1 gram". A declaration is not required if the statement "not a significant source of dietary fiber" is placed at the bottom of the nutrition facts table. If a serving has less than 0.5 grams of

dietary fiber, zero may be used.

Sugars - States the number of grams of sugars, defined as all free mono and disaccharides (such as fructose, glucose, sucrose, maltose, and lactose) in a serving except for quantities of less than 1 gram which may state "(Contains) less than 1 gram". A declaration is not required if the statement "not a significant source of sugars" is placed at the bottom of the nutrition facts table. If a serving has less than 0.5 grams of sugars per serving, zero may be used.

Protein - States the number of grams of protein in a serving expressed to the nearest gram except for quantities of less than 1 gram which may state "(Contains) less than 1 gram" or if a serving has less than 0.5 grams of protein per serving, zero may be used. If a percent Daily Reference Value (DRV) of the protein is to be declared on the label, the protein "quality factor" must be determined (for details see 21CFR101.9(c)(7). Many food labels do not carry a DRV because of the expense and difficulty in determining protein quality factor(s).

Vitamins and Minerals - States the content of a particular vitamin or mineral in a food as a percent of Daily Reference Value (DRV) or Reference Daily Intake (RDI) which is listed in the CFR (see summary table). Content labeling for ***Vitamins A and C*** as well as minerals Calcium and ***Iron*** are required. ***Beta-Carotene*** can be included in the vitamin A content with application of the proper conversion factor. The percent of the daily value of vitamins and minerals is expressed in 2% increments from 2 to 10% of the daily value, in 5% increments from 10 to 50% of the daily value, and in 10% increments if the level is above 50%. At levels less than 2%, a declaration of zero, or a statement regarding the fact that there is less than 2% or not a significant source can be used.

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DAILY REFERENCE or INTAKE VALUES		
NUTRIENT	**RDI/ DRV**	**UNITS**
Fat	65	Grams
Saturated Fat	20	Grams
Cholesterol	300	Milligrams
Total Carbohydrate	300	Grams
Fiber	25	Grams
Sodium	2400	Milligrams
Potassium	3500	Milligrams
Protein	50	Grams
Vitamin A	5000	International Units
Vitamin C	60	MIlligrams
Calcium	1000	Milligrams
Iron	18	Milligrams
Vitamin D	400	International Units
Vitamin E	30	International Units
Vitamin K	80	Micrograms
Thiamin (B1)	1.5	Milligrams
Riboflavin (B2)	1.7	Milligrams
Niacin	20	Milligrams
Vitamin B6	2.0	Milligrams
Folate	400	Micrograms
Vitamin B12	6	Micrograms
Biotin	300	Micrograms
Pantothenic Acid	10	Milligrams
Phosphorous	1000	Milligrams
Iodine	150	Milligrams
Magnesium	400	Miligrams
Zinc	15	Milligrams
Selenium	70	Micrograms
Copper	2.0	Milligrams
Manganese	2.0	Milligrams
Chromium	120	Micrograms
Molybenum	75	Micrograms
Chloride	3400	Milligrams