FDA regulations regarding iodine addition to foods and labeling of foods containing added iodine[1,2]

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ABSTRACT

The US Food and Drug Administration (FDA) regulates the addition of iodine to infant formulas, the iodization of salt, and the addition of salt and iodine to foods. The required amount of iodine in infant formulas is based on caloric content, and the label must provide the iodine content per 100 kcal. Cuprous iodide and potassium iodide may be added to table salt as a source of dietary iodine at a maximum amount of 0.01%; if added, the label must indicate that the salt is iodized. Table salt to which iodine has not been added must bear the statement, "This salt does not supply iodide, a necessary nutrient." If a nutrient is to be appropriately added to a food for the purpose of correcting a dietary insufficiency, there should be sufficient scientific information available to demonstrate a nutritional deficiency and/or identify a public health problem. Furthermore, the population groups that would benefit from the proposed fortification should be identified. If iodine is added to a food, the percent Daily Value of iodine must be listed. There are no FDA regulations governing ingredient standards for dietary supplements. As a result, some dietary supplements include iodine and others do not. If a supplement contains iodine, the Supplement Facts label must list iodine as a nutrient ingredient. If iodine is not listed on the Supplement Facts label, then it has not been added. There are similarities between the FDA, which establishes US food regulations and policies, and the Codex Alimentarius (Codex), which develops international food standards and guidelines under the aegis of the FAO and the WHO. Both the FDA and Codex call for the labeling of table salt to indicate fortification with iodine, voluntary labeling of iodine on foods, and a Daily Value (called a Nutrient Reference Value by Codex) of 150 μg for iodine. *Am J Clin Nutr* 2016;104(Suppl):864S–7S.

Keywords: dietary supplements, foods, infant formula, iodine, labeling

INTRODUCTION

US Food and Drug Administration (FDA)[3] regulations allow for the safe addition of nutrients to foods and infant formulas. Other FDA regulations govern the nutritional labeling of conventional foods and dietary supplements. This article summarizes the various regulations overseen and enforced by the FDA that concern the addition of iodine to foods and infant formulas and the labeling of conventional foods, dietary supplements, and infant formulas that contain added iodine.

REQUIRED IODINE CONTENT OF INFANT FORMULAS

Infant formula is defined as "a food that purports to be or is represented for special dietary use solely as a food for infants" (1). In accordance with section 412 of the Federal Food, Drug, and Cosmetic (FFD&C) Act, infant formulas are required to contain a number of nutrients, including macronutrients, vitamins, and minerals. These nutrients must be present within specified minimum and maximum amounts per 100 kcal (1). For iodine, FDA regulations establish minimum and maximum calorie-based contents of 5 and 75 μg/100 kcal in infant formula (2). In addition, FDA regulations require declaration of the nutrient content (per 100 kcal) on the label of infant formulas (3). In addition to the per-100-kcal listing, the nutrient content "per 100 mL" or "per L" may also be listed on the label. If an infant formula does not contain at least the minimum amount of each of the nutrients required by the FDA (2), then it is considered "adulterated" and subject to recall.

ADDITION OF SALT AND IODINE TO FOODS

Under sections 201(s) and 409 of the FFD&C Act (1), any substance that is intentionally added to food is a food additive, subject to premarket review and approval by FDA, unless the substance is generally recognized, among qualified experts, as having been adequately shown to be safe under the conditions of its intended use or unless the use of the substance is otherwise excluded from the definition of a food additive. Under sections 201(s) and 409 of the FFD&C Act (1) and the FDA's implementing regulations (4, 5), the use of a food substance may be Generally Recognized As Safe (GRAS) either through scientific procedures or, for a substance used in food before 1958, through experience based on common use in food. On the basis of the latter definition of GRAS, common food ingredients such as table salt (sodium

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[3] Abbreviations used: Codex, Codex Alimentarius Commission; FDA, Food and Drug Administration; FFD&C, Federal Food, Drug, and Cosmetic; GRAS, Generally Recognized As Safe.

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chloride) are regarded as safe for their intended use in the manufacturing and processing of food (6), although no standards have been set concerning the concentrations in food that constitute "safe use."

General recognition of the safety of a food substance through scientific procedures requires the same quantity and quality of scientific evidence required to obtain approval of the substance as a food additive. Such recognition ordinarily is based on scientific evidence provided in published studies, which may be corroborated by unpublished studies, other data, and other information (5). General recognition of safety through experience based on common use in foods requires a substantial history of consumption for food use by a number of consumers (4, 5).

In 1924, the addition of iodine to table salt on a voluntary basis was established to address the health problem of goiter, which was then prevalent in the United States. Cuprous iodide and potassium iodide have been determined to be GRAS; the FDA permits their addition to table salt as a source of dietary iodine at a maximum amount of 0.01% (7, 8). Other ways in which iodine can be added to foods on a voluntary basis are described in **Tables 1** and **2**.

For labeling purposes, table salt to which cuprous iodide or potassium iodide has been added (7, 8) must be labeled as "iodized salt" or "iodized table salt." The product label must also state the following: "This salt supplies iodide, a necessary nutrient" (14). Table salt to which iodine has not been added must bear the statement, "This salt does not supply iodide, a necessary nutrient" (14).

FDA POLICY ON FORTIFICATION OF FOODS

With the exception of some standardized foods such as "enriched flour" (15), fortification with vitamins and/or minerals is not mandatory in the United States. In the absence of regulations regarding the fortification of specific foods, food manufacturers are urged to follow the recommendations set forth in the FDA fortification policy (16) if they elect to add nutrients to a food intended for human consumption. According to the principles of rational fortification provided in the fortification policy, fortification is intended to do the following: *1*) correct a recognized nutrient insufficiency and/or serve a public health purpose (e.g., folic acid for the prevention of neural tube defects); *2*) restore nutrients to concentrations present before storage, handling, and processing; *3*) maintain a balanced nutrient profile in relation to caloric value; or *4*) improve the quality of a replacement food. Adding nutrients to specific foods is an effective way of maintaining and improving the overall nutritional quality of the food supply. However, indiscriminate fortification of foods could result in over- or underfortification of consumers' diets and create nutritional imbalances in the food supply. The FDA fortification policy does not encourage indiscriminate addition of nutrients to foods. If a nutrient is to be appropriately added to a food for purposes of correcting a dietary insufficiency, there should be sufficient scientific information available to demonstrate a nutritional deficiency and/or identify a public health problem. In addition, the population groups that would benefit from the proposed fortification should be identified. Finally, sufficient information should be available to show that the food is suitable to act as a vehicle for the added nutrients. As part of its fortification policy, the FDA provides a table listing the nutrients (including iodine) that can be added to foods (16).

OVER-THE-COUNTER DIETARY SUPPLEMENTS AND PRESCRIPTION PRENATAL VITAMINS

There are no FDA regulations governing ingredient standards for dietary supplements. As a result, some dietary supplements include iodine and others do not. There is also no requirement that iodine be included in prescription prenatal vitamins. Because iodine-containing supplements formulated for pregnant women are available in both prescription and over-the-counter formulations, pregnant women can be directed to the appropriate supplements by their health care providers.

TABLE 1
Iodine compounds that are GRAS, their uses in foods in the United States, and their maximum added concentrations[1]

Compound[2]	Uses and maximum added concentrations[3]	Reference
Cuprous iodide	Used as a nutrient supplement. Used only in table salts in accordance with 21 CFR 184.1(b)(2) as a source of dietary iodine at a maximum concentration of 0.01% (wt:wt).	(7)
Potassium iodide	Used as a nutrient supplement. Used in table salts in accordance with 21 CFR 184.1(b)(2) as a source of dietary iodine at a maximum concentration of 0.01% (wt:wt).	(8)
Potassium iodate	Used as a dough strengthener. Used in the manufacture of bread in accordance with 21 CFR 184.1(b)(2) at a maximum concentration of 0.0075% (wt:wt of flour).	(9)
Calcium iodate	Used as a dough strengthener. Used in the manufacture of bread in accordance with 21 CFR 184.1(b)(2) at a maximum concentration of 0.0075% (wt:wt of flour).	(10)

[1]CFR, Code of Federal Regulations; GRAS, Generally Recognized As Safe.

[2]Earlier sanctions for these ingredients that differ from the uses established in this section do not exist or have been waived.

[3]According to 21 CFR 184.1(b)(2), "If the ingredient is affirmed as GRAS with specific limitation(s), it shall be used in food only within such limitation(s), including the category of food(s), the functional use(s) of the ingredient, and the level(s) of use. Any use of such an ingredient not in full compliance with each such established limitation shall require a food additive regulation" (11).

TABLE 2
Iodine sources approved for use as food additives in the United States

Iodine source	Approved use	Reference
Potassium iodide	Approved for use as a source of iodine[1,2]	(12)
Kelp[3]	Approved for use as a source of iodine[1]	(13)

[1]May be safely used in a food as a source of the essential mineral iodine in accordance with the following prescribed conditions: Provided the maximum intake of the food (as may be consumed in 1 d, or as directed for use in the case of a dietary supplement) will not result in daily ingestion of the additive so as to provide a total amount of iodine in excess of 225 μg for foods labeled without reference to age or physiologic state or, when age or physiologic state (pregnancy or lactation) are specified, in excess of 45 μg for infants, 105 μg for children aged <4 y, 225 μg for adults or children aged >4 y, and 300 μg for pregnant or lactating women.

[2]To ensure the safe use of the additive, in addition to the other information required by the Federal Food, Drug, and Cosmetic Act (1), the label of the additive shall bear the name of the additive and, in dry mixtures, the concentration of the additive.

[3]The food additive kelp is the dehydrated, ground product prepared from *Macrocystis pyrifera*, *Laminaria digitata*, *Laminaria saccharina*, and *Laminaria cloustoni*.

NUTRITION AND SUPPLEMENT FACTS LABELS

In the United States, the Nutrition Facts label is required on most conventional foods. The FDA requires that certain nutrients be listed on the label (17), whereas other nutrients can be listed voluntarily. Nutrients added to a food by the manufacturer must be listed. FDA regulations provide Daily Values for differential requirements of different subpopulations. In 2014, the FDA proposed to provide regulations that include subpopulation-specific Daily Values for foods represented or purported to be for infants (130 mg), children <4 y of age (90 mg), or pregnant and lactating women (290 mg) (18). The Nutrition and Supplement Facts labels list the percent Daily Value of individual nutrients, which indicates the relative amount that a serving of food or dietary supplement contributes to the Daily Value. Declaration of the percent Daily Value of iodine in the Nutrition Facts label is voluntary. However, if iodine is added to a food, then it is a requirement that the percent Daily Value of iodine be listed. The current Daily Value for iodine is 150 μg for individuals aged ≥4 y. Thus, if a serving of food contains 15 μg iodine, the percent Daily Value for that age group would be 10%. The Supplement Facts label must list all of the nutrient ingredients of dietary supplements (19). Therefore, if iodine is not listed on the Supplement Facts label, then it has not been added as an ingredient.

NUTRIENT CONTENT CLAIMS

Nutrient content claims characterize the concentration of a nutrient in a food. Regulations provide for various types of nutrient content claims that indicate the amount of a nutrient that is in a serving of the food or in the "reference amount customarily consumed." For example, if a product contains ≥10% and ≤19% of the Daily Value for a particular nutrient, then the food can be labeled as being a "good source" of that nutrient. If the product contains ≥20% of the Daily Value, then the food can be labeled as being an "excellent source" of, "high" in, or "rich in" that particular nutrient (20).

COMPARISON WITH OTHER INTERNATIONAL REGULATORY FRAMEWORKS

The FDA does not have the expressed authority to require the fortification of foods (except to meet a standard of identity) or to set ingredient standards for dietary supplements. Whereas salt iodization is voluntary in the United States, in some countries (e.g., Australia and New Zealand) iodine fortification of salt is mandatory. Despite the fact that salt iodization is voluntary in the United States, the high prevalence of goiter that was observed in the early 1900s no longer exists. Although some dietary supplements in the United States contain iodine and others do not, iodine must be listed if added as an ingredient (18). Therefore, the consumer has the ability to identify and purchase a dietary supplement that contains iodine, if needed or desired.

The Codex Alimentarius Commission (Codex), established by the United Nations FAO and WHO, develops international food standards, guidelines, and codes of practice to protect the health of consumers and promotes coordination of all food standards work undertaken by international governmental and nongovernmental organizations. Codex provides general principles for the voluntary or mandatory addition of essential nutrients to foods (CAC/GL 09-1987) (21). Labeling of conventional foods and dietary supplements with the Nutrition and Supplements Facts labels, respectively, is required in the United States, whereas in many countries there is no labeling requirement. Codex also provides guidelines on nutrition labeling of foods (CAC/GL 2-1985), as well as on the use of nutrient content claims (CAC/GL 23-1997) (21). The use of Codex standards and guidelines by government agencies is voluntary. There are similarities between the FDA, which establishes its own regulations and policies, and the Codex Alimentarius (Codex), which develops international food standards and guidelines under the aegis of the FAO and the WHO. Both the FDA and Codex call for the labeling of table salt to indicate that it is fortified with iodine, voluntary labeling of iodine on foods, and a Daily Value (called a Nutrient Reference Value by Codex) for iodine of 150 μg for individuals ≥4 y of age.

CONCLUDING REMARKS

As described by Ershow et al. (22) in this supplement issue, the NIH Office of Dietary Supplements convened 3 workshops in 2014 focused on research needs for assessing iodine intake, iodine status, and the effects of maternal iodine supplementation. When assessing iodine intake in the US population, it is of course helpful to understand what the FDA regulates with respect to iodine supplementation as well as what the FDA does not regulate. For example, the fact there are no ingredient standards for prenatal vitamins or other nutritional supplements is relevant to the design and interpretation of studies that examine maternal dietary iodine intake during pregnancy. It is also important to be aware of international differences in regulatory frameworks that may affect the assessment of iodine intake in studies conducted outside the United States. It is the author's hope that the information provided in the present article, by clarifying current FDA regulations pertaining to the addition of iodine to conventional foods and nutritional supplements and the labeling of foods fortified with iodine, will serve to inform the efforts of the NIH Office of Dietary Supplements to formulate a research agenda for iodine and likewise the implementation of that agenda.

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