



Reference Document: 2017 FDA Food Code

Provision: 3-202.12 Additives; 3-302.14 Protection from Unapproved Additives.

Document Name: Liquid nitrogen and dry ice in food

Date: October 31, 2018

Question: Does the 2017 Food Code prohibit the use of liquid nitrogen and dry ice in the preparation or service of food in retail and food service establishments?

Response:

No. The 2017 Food Code does not specifically prohibit the use of liquid nitrogen or dry ice in the preparation or service of food sold in retail and food service establishments.

Liquid nitrogen is the colorless, odorless, clear liquefied form of nitrogen with a density of 0.807 g/ml at its boiling point ( $-195.79\text{ }^{\circ}\text{C}$  ( $-320\text{ }^{\circ}\text{F}$ )) while dry ice is an opaque solid with a density of  $97.5189\text{ lb/ft}^3$  at  $78.5\text{ }^{\circ}\text{C}$  ( $109.3\text{ }^{\circ}\text{F}$ ). Both liquid nitrogen and dry ice can maintain extremely low temperatures.

In retail food and food service establishments, liquid nitrogen has been used as a freezing agent in food preparation and preservation in the rapid freezing of foods (such as ice cream), to process dry herbs and spices, and to rapidly chill beverages. Dry ice has been used in the preservation of frozen foods in situations where mechanical means are unavailable. Both liquid nitrogen and dry ice have been used for their smoke effect in beverages or foods to enhance presentation and consumer appeal.

However, liquid nitrogen and dry ice must not be used in ways that make food unsafe for consumers or that cause other safety hazards. Safety concerns associated with the use of liquid nitrogen and dry ice in the preparation of food and beverages at retail are based on both the physical state of the substances and accidents surrounding their use rather than on any toxicity associated with either substance. Both liquid nitrogen and dry ice can cause severe damage to skin and internal organs if mishandled or accidentally ingested due to the extremely low temperatures they can maintain. As such, liquid nitrogen and dry ice should not be directly consumed or allowed to directly contact exposed skin.

While retail food-related incidents of accidental ingestion or direct contact with liquid nitrogen and dry ice in the United States have been low, injuries have been severe. On August 30, 2018, FDA issued an advisory warning consumers and retailers of the potential for serious injury from

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eating, drinking, or handling food products prepared by adding liquid nitrogen immediately before consumption as the liquid nitrogen may not completely evaporate before reaching the consumer or may leave the product at an extremely low temperature, posing a significant risk of injury.

Retail food and food service establishments can minimize the risks associated with accidental ingestion or skin contact with liquid nitrogen and dry ice in beverages by:

- Incorporating procedures and training for the safe receipt, storage, and handling of these substances when used in the preparation of foods and beverages into their procedures and training plans. Such procedures and training should include:
  - Directions for food employees to:
    - not directly touch or consume liquid nitrogen or dry ice,
    - avoid the addition of liquid nitrogen or dry ice to foods and beverages immediately prior to service, and
    - ensure complete evaporation or sublimation of the materials prior to service and/or consumption.
  - A statement or instructions that touching or consumption of liquid nitrogen or dry ice may result in adverse health conditions, physical abnormalities, and possibly death. Liquid nitrogen can cause rapid freezing on contact with living tissue.
  - Directions to avoid prolonged exposure to liquid nitrogen and dry ice in enclosed or confined spaces, such as walk-in refrigerators or storage rooms. Carbon dioxide gas emitted in a confined or unventilated space may create an oxygen deficient atmosphere.
  - Product specification sheets for equipment used to store or dispense liquid nitrogen and/or dry ice.
  - Safety data sheets for liquid nitrogen and/or dry ice.
- Conspicuously posting, or otherwise providing, warning notices to food employees in areas where liquid nitrogen or dry ice are normally stored and where they are used in the preparation or service of foods or beverages. Warning notices should instruct food employees to not directly touch or consume liquid nitrogen or dry ice and to ensure complete evaporation or sublimation of the materials prior to service. Warning notices should also include a statement that touching or consuming liquid nitrogen may result in adverse health conditions, physical abnormalities, and possibly death and a statement that carbon dioxide gas in enclosed or confined spaces may create an oxygen deficient atmosphere.
- Conspicuously posting, or otherwise providing, notices to consumers in areas where liquid nitrogen or dry ice are used in the preparation or service of foods or beverages.

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Notices should instruct consumers to not directly touch or consume liquid nitrogen or dry ice; to ensure complete evaporation or sublimation of the materials prior to consumption; and a statement that touching or consuming liquid nitrogen may result in adverse health conditions, physical abnormalities, and possibly death.

- Avoiding the storage or use of liquid nitrogen and dry ice in situations where the risks of accidental ingestion or skin contact cannot be appropriately mitigated.

*The model Food Code is neither federal law nor federal regulation and is not preemptive. It represents FDA's best advice for a uniform system of regulation to ensure that food at retail is safe and properly protected and presented. The model Food Code provisions are designed to be consistent with federal food laws and regulations and are written for ease of legal adoption at all levels of government.*

References:

1. 2017 FDA Food Code, 3-202.12 Additives and 3-302.14 Protection from Unapproved Additives.

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