



Monitoring the Distribution of Ready-to-eat Food Products Made with Liquid Nitrogen

Iwan Rachmad Soetijono¹, Ida Bagus Oka Ana², Antikowati³, R.A. Rini Anggraini⁴, Eddy Mulyono⁵, M. Arief Amrullah⁶

^{1,2,3,4,5,6} Faculty of Law, Universitas Jember, Indonesia.

ABSTRACT

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The circulation of ready-to-eat food is a concern in the food safety sector, especially regarding the dangers of the content in processed food. One of them is the use of liquid nitrogen in ready-to-eat food, which has many potential risks that will arise if the processed food is consumed by the public. So a principle is needed that can be related to the handling of liquid nitrogen in the circulation of ready-to-eat food products. It is also necessary to organize food safety in handling the use of liquid nitrogen in the circulation of ready-to-eat food products. This research uses a qualitative method, namely the literature study method. The lack of scientific certainty related to the use of liquid nitrogen in processed ready-to-eat food cannot be used as an excuse to delay prevention efforts. As well as strategies in realizing food safety implementation need to be implemented as an effort to protect the public from various types of food that are dangerous and pose a potential risk to health.

KEYWORDS:

Supervision, Food Distribution and Liquid Nitrogen.

INTRODUCTION

Food is one of the most important human needs, apart from clothing and shelter. Food plays an important role in human life, so it is necessary to ensure that the food we eat every day is safe to a high degree so that people are not exposed to food-borne diseases or hazards.¹ The government recognizes the importance of food safety and has therefore enacted Law No. 18/2012 to regulate food in Indonesia. In addition, Government Regulation No. 28/2004 on Food Safety, Quality and Nutrition has also been issued. The debate on safe, quality and nutritious food cannot be separated from the food safety factor.

Food safety regulations cover food hygiene, food additives, genetic engineering and food irradiation, food packaging, quality assurance and laboratory testing, and contaminated food.² In addition to this, the same regulation

also states that every person is prohibited from distributing food containing toxic, hazardous materials, which can harm or endanger health. The development of the food industry has increased rapidly, characterized by an increasing variety of ready-to-eat foods, which indicates that ready-to-eat foods have the potential to continue to grow. One of the factors for this development is due to changes in consumer tastes in the current era of modernization. The high level of demand creates a pattern of intense competition among players in the ready-to-eat food industry. This is evident from the increasing variety of processed ready-to-eat food with various ingredients and processing. One of them is processed ready-to-eat food with the addition of liquid nitrogen. For example, the addition of liquid nitrogen to processed chiki ngebul, which is one of the snacks that is currently being sold and has become a new *trend* in the ready-to-eat snack industry. This

Corresponding Author: Iwan Rachmad Soetijono

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¹ Anna S. Wahongan, *Strategi Mewujudkan Keamanan Pangan Dalam Upaya Perlindungan Konsumen, Lex Et Societastis Vol 9 No. 3, September 2021*, p. 43

² Bambang Hermanu, *Studi Implementasi Izin Edar Produk Pangan Industri Rumah Tangga (PIRT) Dalam Mewujudkan Keamanan Pangan Yang Optimal Di Kota Semarang, Hukum dan Dinamika Masyarakat Vol 11 No. 2 April 2018* p. 158. 158

snack product is also known as *smoke snack* or *dragon breath* which is a processed ready-to-eat food type of extrudate snack food which in the processing process is poured or dipped in liquid nitrogen (LN₂) to cool the food.

In June 2022, the Ministry of Health recorded 25 reported cases of children suffering from food poisoning as a result of consuming snacks containing liquid nitrogen. Then in some areas also affected by this liquid nitrogen, among others, there are 24 children in one of the West Java Elementary Schools (SD) experiencing symptoms with various levels that require all students to undergo examinations.³ The same incident also occurred in East Java, where victims experienced symptoms of nausea, vomiting and abdominal pain after consuming snacks added with liquid nitrogen. As for 2022, a 5-year-old child was also a victim and suffered 30% burns and there are many more cases caused by liquid nitrogen in ready-to-eat food.⁴ Including poisoning cases, in July 2022, in Ngasinan Village, Jetis District, Ponorogo Regency, there was an incident of a child eating *ice smoke* which caused burns. On November 19, 2022, the UPTD Puskesmas Leuwisari, Tasikmalaya Regency, reported a case of food poisoning with 23 cases, one of whom was rushed to the hospital. Symptoms occurred after consuming Ciki Ngebul snacks. On December 21, 2022, the emergency room of the Jakarta Hajj Hospital reported a 4.2-year-old boy who complained of severe abdominal pain after consuming Ciki Ngebul snacks.⁵

In this context, when the risks that arise later are estimated to be more dangerous than before, an integrated research is needed to find solutions or preventive efforts as a treatment for the impacts caused. In the meantime, the use of these technologies or materials should be limited or stopped to reduce dependency. Furthermore, if it turns out that the existing hazards are considered serious enough, the precautionary principle is needed to suppress and limit the processing of products and prohibit their use or temporarily moratorium.

The importance of anticipatory action in handling the use of liquid nitrogen in processed food as in the authority possessed by the government and together with local governments in the health sector. To maintain the stability of national food security, safety and independence, efforts are needed in terms of handling including the obstacles faced and the solutions experienced. This is none other than to maintain the stability of food existence, including food safety, which of course involves many parties, including the government. As we know that in maintaining the stability of food security,

safety and independence, concrete efforts need to be made in handling the use of liquid nitrogen. one of them is to increase the supervision of ready-to-eat food by the local government and the ranks of institutions that take care of food and health. So that the first step can be done by conducting an assessment of industrial products related to monitoring and licensing of food industry products that use liquid nitrogen in their ingredients and processing.

RESEARCH METHODOLOGY

In this research, normative legal research methods and library research methods are used to achieve research results. Library or bibliographic research is research whose field of study is literature or literature. In this research, research is conducted using similar or related studies.⁶ After collecting various literature related to the object of study under study, the research was carried out using various bibliographic information from books, scientific journals, digital data, documents, and so on to analyze the precautionary principle of using liquid nitrogen in the circulation of ready-to-eat food products. Researchers have obtained, presented and analyzed primary, secondary and tertiary legal materials, then described and correlated them in such a way that they are presented more systematically to answer the problems formulated above. Analysis of this legal material is carried out by treating the legal material deductively, namely by drawing conclusions from a general problem to the specific problem at hand.⁷

1. Application of the Precautionary Principle in Handling the Distribution of Ready-to-eat Food Products.

Food is one of the most important human needs. Food plays an important role in people's lives. Therefore, it is necessary to ensure that the food consumed by the public every day has a high level of food safety so that people are free from food-borne diseases or hazards. The Indonesian government realizes the importance of ensuring the safety of food consumed by the public by enacting Law No. 18/2012 on Food, "food is everything that comes from biological sources of agricultural products, plantations, forestry, fisheries, livestock, waters and water, both processed and unprocessed which are intended as food or drink for human consumption, including food additives, food raw materials and other materials used in the process of preparing, processing, and/or making food or drinks."

Discussing the issue of safe, quality and nutritious food cannot be separated from the food safety factor. The

3

<https://www.bbc.com/indonesia/articles/c1w036yd323o> accessed on February 2, 2023

⁴ <https://nasional.kontan.co.id/news/kemenkes-larang-penggunaan-nitrogen-cair-pada-pangan-siap-saji> accessed on February 1, 2023

⁵ Circular Letter Number: KL.02.02/C/90/2023 Regarding the Supervision of the Use of Liquid Nitrogen in Ready-to-eat Food Products.

⁶ Purwanto, *Metodologi Penelitian Kuantitatif Untuk Psikologi dan Pendidikan* (Yogyakarta: Pustaka Pelajar, 2008), p. 168.

⁷ *Ibid.* 393.

issue of food safety has always been a strategic state issue that should be considered carefully in order to maintain the quality of public health. In addition, the same regulation also states that it is prohibited for anyone to distribute food that contains toxic, hazardous materials, and can harm or endanger people's health or life. People may obtain food that is unsafe and unfit for consumption for various reasons. One of them may be caused by the ignorance of some people regarding food safety. This has led to emergency cases of food poisoning (outbreaks) which are feared to have an impact on public health in the medium and long term. A food poisoning outbreak is an event where two or more people fall ill with the same or similar symptoms after consuming food, and based on epidemiological analysis it is proven that the food is the source of the poisoning.⁸ In accordance with Article 72 Paragraph (1) of Government Regulation No. 86/2019 on Food Safety, every person who is aware of suspected food poisoning experienced by more than 1 (one) person must report to a Health Service Facility". Following up on this regulation, the Ministry of Health through Circular Letter 01.07/111/5/67/2023 instructs the public to report the discovery of cases of poisoning of processed ready-to-eat food using liquid nitrogen.

The trend of using liquid nitrogen in food that is applied to food products just before consumption to produce a smoke-like effect is very dangerous. The low temperature of nitrogen is so low that it creates a kind of fog. If liquid

nitrogen is used as an auxiliary material in the production process, the risk is very small because the nitrogen takes a long time to reach the consumer, is no longer cold, and has completely evaporated. However, this is not the case if liquid nitrogen is introduced into the food immediately before it is served and consumed directly by the consumer.⁹ It has also been emphasized in the Regulation of the Indonesian Food and Drug Administration (BPOM) Number 20 of 2020 concerning Amendments to the Regulation of the Food and Drug Administration Number 28 of 2019 concerning Auxiliary Materials in Food Processing, that liquid nitrogen is not a Food Additive (BTP) which is allowed, but only as an auxiliary material for the cooling process and based on the regulation in Appendix II, it is explained that liquid nitrogen is included in the class of auxiliary materials for desiccant and anti-clay materials.¹⁰

Auxiliary materials are materials that do not include equipment, which are usually not consumed as food ingredients, but are prioritized for use in food processing to achieve certain technological goals and do not leave residues in the final product, but unavoidably, such residues and/or ingredients derived in the final product do not pose a health risk and have no technological function. Meanwhile, auxiliary materials included in the category of cooling and freezing contact materials are materials that come into contact with food and are used to cool and/or freeze food, which then disappear from food under certain conditions.

Table 1. Types of Auxiliary Materials permitted classes of cooling and freezing contact materials

No.	Types of Containers and Freezers		CAS number	INS	Maximum Usage Limit
	Name in Indonesian	English Name			
1	Nitrogen	Nitrogen	7727-37-9	941	CPPB
2	Carbon dioxide	Carbondioxide	124-38-9	290	CPPB

Source: BPOM data, not processed, 2023

The use of additives occurs in the food industry and the production of various ready-to-eat foods, which are usually produced by small businesses or households. The use of BTP (food additives) in the production process needs to be supervised jointly by both food sellers and consumers. According to Badan POM, food additives are ingredients or a mixture of ingredients that are not a natural part of food raw materials and are added to food to affect its viscosity or shape, such as colorants, preservatives, flavorings, antioxidants. Blocking agents, bleaches and thickeners.

The addition of liquid nitrogen to ready-to-eat food products that are not in accordance with Standard Operating

Procedures (SOP) can cause health problems or food poisoning, among others:¹¹

1. Causes frostbite and burns especially on some soft tissues such as skin.
2. Inhaling too much vapor produced by food or beverages processed using liquid nitrogen can trigger severe breathing difficulties.
3. Consuming nitrogen that has been thawed can cause your throat to feel like it is on fire, due to the extremely cold temperature and direct contact with organs. In fact, there are many severe cases that show that *ice smoke* can trigger internal organ damage.

⁸ Adhi S. Lukman and Feri Kusnandar, "Adhi S. Lukman dan Feri Kusnandar, "Keamanan Pangan Untuk Semua," *Jurnal Mutu Pangan Institut Pertanian Bogor* 2, no. 2 (2015):152-58. 155

⁹ <https://kesehatan.jogjakota.go.id/artikel/id/6> accessed on February 2, 2023

¹⁰ Article 15 of Food and Drug Administration Regulation No. 20/2020 on the Amendment to Food and Drug Administration Regulation No. 28/2019 on Food Processing Auxiliaries

¹¹ Ali D et al, "A Qualitative Risk Assessment of Liquid Nitrogen in Food and Beverages," *Food Protection Trends* 41, no. 3 (2021).

The data above shows how important prevention and treatment efforts are with concrete steps and actions, even though there is no scientific evidence regarding the scope and extent of possible impacts. One of the principles of environmental protection, the precautionary principle, can be applied as a prevention and treatment effort. Because of this principle, the focus is on preventing a decline in environmental quality due to water pollution or excessive water use. In addition, this principle also regulates the prevention of environmental damage.

The French *National Assembly* on March 1, 2005 adopted the 2004 *Charter for the Environment* and integrated the *charter* into the *Constitution of the French Fifth Republic* (Marrani, 2009). The Charter for the Environment is further elaborated in Article 10 which contains various rights and obligations related to environmental management.¹² According to Jimly Asshiddiqie, the adoption of the environmental charter in the French Constitution is not just an affirmation that there will be no legislation that contradicts the environmental charter, but is an effort to strengthen the principles of environmental management as part of the law and incorporate the principles of environmental management that have been recognized in international law into national law. *Preventive principle* and *precautionary principle* are principles that are included in the form of sustainable development principles. This principle is a development of national and international policies aimed at protecting humans and the environment from serious and irreversible harm.¹³

Issuance of Risk Mitigation Guidelines: Use of Liquid Nitrogen Auxiliary Materials in Processed Food 2023 is one of the manifestations of risk mitigation measures for the handling of processed food using liquid nitrogen in accordance with the application of the precautionary principle. The objectives of the guideline are, among others:

1. To guide the use of liquid nitrogen auxiliary materials in processed food.
2. Provide information to the public (consumers) on the potential risks of liquid nitrogen in food.
3. Provide information to business actors (*food handlers*, food producers) regarding the potential risks of using liquid nitrogen in food and good handling of the use of liquid nitrogen.
4. As a reference for food safety supervisors and facilitators, especially assistance for Micro, Small and Medium Enterprises (MSMEs) in providing guidance to processed food business actors.

So based on the rampant incidents of poisoning by processed ready-to-eat food using liquid nitrogen, there must be further study of the potential risks to find appropriate measures that are enforced as preventive and supervisory measures. As stated in Article 50 of Government Regulation No. 86/2019 on Food Safety, which reads: In order to strengthen supervision of Food Safety, Food Quality, and Food Nutrition, the Head of the Agency coordinates the activities of (1) Food safety risk assessment, (2) Food safety risk management, and (3) Food safety risk communication. Efforts to strengthen vigilance are in line with the precautionary principle, which aims to take preventive measures to avoid a decrease in the quality of the environment due to pollution. In addition, this principle also regulates the prevention of environmental damage. The precautionary principle is used as an effort to anticipate and respond to concerns that arise as a result of *possible harmful effects of technologies* that pollute or endanger the environment.¹⁴ So that from the studies, management and communication that have been carried out, steps will be found as risk mitigation efforts that will then be applied, namely as follows:

1.1 Risk Mitigation for Food Vendors/Merchants

The following requirements must be met by food vendors when using liquid nitrogen in the food manufacturing process:¹⁵

1. Apply hygiene and sanitation in the food production process.
2. Restaurants or places that sell ready-to-eat food have obtained a health certificate.
3. Food vendors or machine operators must be trained or have received *personal safety* training on how to serve or handle liquid nitrogen properly.
4. Use personal protective equipment (PPE) when handling liquid nitrogen, such as: special gloves (*cryogenic gloves*), masks, closed shoes and protective glasses (*safety gloves*).
5. Use specialized equipment and machinery that is standardized for safety (e.g., use a dewar for liquid nitrogen transfer instead of simple equipment such as a long spoon).
6. It is recommended that food vendors have attended training related to food safety, especially the handling of frozen food that uses liquid nitrogen as an auxiliary material.
7. Using *food-grade* liquid nitrogen.
8. Monitor the oxygen content in the process room.

¹² G. Wibisana Andri, "Konstitusi Hijau Perancis: Komentar atas Asas Kehati-hatian dalam Piagam Lingkungan Perancis," *Jurnal Konstitusi* 8, no. 3 (2004). 56

¹³ Liza Farihah dan Femi Angraini, "Prinsip Kehati-hatian Dan Kerugian Potensial Dalam Perkara Tata Usaha Negara Terkait Lingkungan Hidup (Kajian Putusan No. 71/G.TUN/2001/PTUN-JKT)," *Jurnal Yudisial: Fakultas*

Hukum Universitas Indonesia 5, no. 3 (3 Desember 2021): 241-60. 243

¹⁴ G. Wibisana Andri, *Loc.Cit* 142

¹⁵ Food and Drug Administration of Indonesia, *PEDOMAN MITIGASI RISIKO: Penggunaan Bahan Penolong Nitrogen Cair Pada Pangan Olahan* (Jakarta: Food and Drug Administration, 2023). 23

9. Include nitrogen hazard warnings in a place that can be clearly seen by consumers.
10. Restricting consumer access to liquid nitrogen containers, e.g. prohibiting consumers from requesting additional liquid nitrogen and providing consumers with containers containing leftover liquid nitrogen.
11. Develop clear procedures for handling emergencies or accidents.
12. Avoid excessive direct contact with nitrogen.
13. Ensure liquid nitrogen is no longer contained in food products and packaging before serving to consumers.
14. Provide cutlery (such as spoons or forks) and cup sleeves to customers.

1.2 Mitigating Risks to Consumers

The risks to consumers relate to the potential physical hazards of liquid nitrogen during consumption and the risk of high-pressure gas generation when liquid nitrogen is ingested. If liquid nitrogen is ingested at normal temperatures, it will create gas in the gastrointestinal tract and cause gastric damage. In addition, there is the possibility of *non-food grade* liquid nitrogen contamination. Measures that consumers can take to prevent potential risks include:¹⁶

1. Supervision by adults if the person consuming the chiki ngebul is a child.
2. Before consuming chiki ngebul food, you must wait for the liquid nitrogen to evaporate completely or until there is no liquid nitrogen left.
3. Consumers have to blow and chew on the liquid nitrogen-covered snacks so that they vaporize completely before consumption.
4. To reduce the risk of injury, you can wait for the cloudy vapor to subside and eat one snack at a time.
5. Consumers should not touch the liquid nitrogen remaining at the bottom of the serving pack or consume either the product or the nitrogen.
6. If any injury or discomfort is experienced after exposure to these snacks, consumers should seek medical attention as soon as possible.

It also states that this principle is the foundation for the preservation of ecological resources for future generations through the careful utilization of these resources. Harald Hohmann states that the precautionary principle results in the following obligations:¹⁷

¹⁶ *Ibid.*, 21

¹⁷ Elly Kristiani Purwendah, "Perlindungan Lingkungan Dalam Perspektif Prinsip Kehati-Hatian (Precautionary Principle)," *Jurnal Media Komunikasi Pendidikan Pancasila dan Kewarganegaraan* 1, no. 2 (2019): 82-94. 85

¹⁸ J. Ticker and C. Raffensperger, "Health Protection and the Environment: Implementing the Precautionary

1. Commitment to minimize the possibility of causing environmental damage by carrying out activities based on the latest technology or science (*state of technology* or *state of science and technology*) if evidence of such damage has not been collected, the mere possibility of such damage is sufficient as a basis for the obligation to *recycle the waste* produced;
2. The obligation to avoid the generation of waste and the transportation/use of hazardous materials originating from the production process and the obligation to recycle the waste generated;
3. The prohibition against degradation of the current state of the environment (*principle of the status quo preservation*), meaning that everyone is encouraged not to do damage that could have been avoided (*avoidable impairments*). *Status quo preservation* also means that there is an obligation to pay compensation for unavoidable damage;
4. Environmental aspects should always be considered in any political planning. This means that there is a greater need to implement EIA;
5. Environmental management that takes into account aspects of natural economy, protection and natural resources;
6. Economically efficient use of natural resources;
7. Obligation to place restrictions on the use and marketing of chemicals.

Furthermore, Ticker and Raffensperger explain that the precautionary principle has derivative components, both juridically and politically, as follows:¹⁸

1. *Precautionary action* is taken before scientific certainty of cause and effect has been obtained;
2. Goal setting, i.e. the precautionary principle, encourages planning that is more oriented towards appropriately defined goals rather than goals that are often based on false and distorted scenarios or risk calculations;
3. Research and evaluation of political alternatives, that is, the precautionary principle emphasizes issues of risk reduction or elimination and the pursuit of all alternatives, rather than relying on the question of what level of pollution can be considered safe;
4. Decisions made in the context of applying the precautionary principle must be open, democratic, informed and must include parties who may be affected by the issuance of the decision;

Principle" (Island Press 1999): Comparative Regulation (EC) No. 178/2002 of the European Parliament and of the Council Law," OJ L.031 (Wingspread Statement on the Precautionary Principle January 25, 1998., European Food Safety Authority: Procedures in Matter of Food Safety, 2003).

5. Reversal of the burden of proof is required, whereby the activity proponent must demonstrate that the activity does not cause harm to human health and safety and ecosystems;
6. Develop more democratic and in-depth decision-making methods and criteria. The community warning principle combines scientific and other (non-scientific) evidence/considerations to deal with uncertainty and therefore requires more careful consideration and greater community participation in decision-making.

So it can be said that the precautionary principle is a manifestation of environmental management based on an anticipatory approach. The issuance of Circular Letter Number: KL.02.02/C/90/2023 concerning Supervision of the Use of Liquid Nitrogen in Ready-to-eat Food Products by the Ministry of Health of the Republic of Indonesia in the field of Disease Prevention and Control is one of the concrete steps of handling efforts or applies to anticipatory action. The processing is included in the scope of prevention of activities and/or operations that are not yet known to be large and the amount of loss and/or damage. This prevention must be carried out with concrete steps, even though there is no scientific evidence regarding the scope and magnitude of the impact or risk that may occur. This principle only applies to estimates that cause serious and irreversible environmental damage.

Government policy on the response to the case of poisoning in processed *chiki ngebul* food using liquid nitrogen is the fulfillment of obligations by the government to ensure prevention and minimize the impact of damage. Based on the application of the precautionary principle, the *risk assessment* procedure will be followed by provisional and proportional efforts to prevent damage, namely to the potential risks that may occur in the use of liquid nitrogen in processed ready-to-eat food, especially in *chiki ngebul snacks*. The precautionary principle shows that caution needs to be exercised by the state in policy making, especially in handling the use of liquid nitrogen in ready-to-eat food circulation. Activities that have the possibility to cause serious and irreversible impacts should be prevented under the precautionary principle and this cannot be used as an excuse to delay prevention efforts.

2. Policy on the Use of Liquid Nitrogen in the Distribution of Ready-to-eat Food Products in Indonesia

Food problems often occur in Indonesia and government policies to deal with them are a series of food safety realizations. Nowadays, food safety has become a global issue, so it needs to get the main attention. Article 1

point 5 of Law No. 18/2012 on Food states that food safety is a condition and effort to prevent food from possible biological, chemical, and other contaminants that can interfere with, harm, and endanger human health and does not conflict with religion, beliefs, and culture of the community so that it is safe for consumption. Indonesia as a country with a large population and on the other hand has diverse natural resources and food sources, Indonesia is able to meet its needs sovereignly and independently. Food is everything that comes from biological sources of agricultural products, plantations, forestry, fisheries, waters and water, processed or unprocessed which are intended as food or drinks for human consumption, including food additives, food raw materials and other materials used in the process of preparing, processing and/or making food or drinks.¹⁹ Meanwhile, ready-to-eat processed food is food and/or beverages that have been processed and are ready to be served directly inside or outside the place, for example in a restaurant. B. Food served in catering services, hotels, restaurants, eateries, cafes, canteens, and others. Street vendors, mobile food stalls (*food trucks*) and street vendors or similar businesses.²⁰ There are four (4) main food safety issues:²¹

1. microbial contamination due to poor hygiene and sanitation.
2. chemical contamination due to contaminated raw materials.
3. misuse of hazardous substances in food.
4. the use of food additives exceeds the maximum permitted limit.

The case of problems in processed ready-to-eat food using liquid nitrogen, namely in *chiki ngebul snacks*, indicates the urgency regarding food safety, especially in processed ready-to-eat food. The increasing number of victims due to consuming this snack has led the Ministry of Health to give instructions to report any cases of poisoning by liquid nitrogen or *chiki ngebul* in their respective regions through Circular Letter 01.07/111/5/67/2023. The reports recorded are dominated by victims who are children, this is because the processed *chiki ngebul* food is produced by the *street food* industry. This is not recommended because the use of liquid nitrogen requires special handling skills. Therefore, every party using liquid nitrogen in food must pay attention to all aspects regarding the use of liquid nitrogen.

Despite its attractive appearance, food containing liquid nitrogen is considered dangerous by the *Food and Drug Administration* (FDA) in the United States. In 2018 the FDA issued a food safety warning about the potential dangers of consuming foods served with liquid nitrogen. The FDA asserts that fumes emitted from food or beverages

¹⁹ General Provisions Article 1 of Law No. 18/2012 on Food

²⁰ Article 1 of Government Regulation No. 86/2019 on Food Safety.

²¹ Harsi Dewantari Kusumaningrum, "Pakar Pangan Institut Pertanian Bogor" (Press Briefing Food Safety and Sustainability, Jakarta, 2020).

treated with liquid nitrogen can cause respiratory problems, especially in people with asthma. Although liquid nitrogen is non-toxic, it can cause food to freeze, resulting in extremely low temperatures and, in some cases, life-threatening injuries such as damage to the skin and internal organs from food or beverages containing nitrogen. In addition, there are other impacts, including:²²

1. *Frostbite*

Frostbite is blistering of the skin due to exposure to extreme cold temperatures. This condition usually occurs from exposure to temperatures below - 0.55°Celsius. If it affects the skin of your hands, you will experience symptoms such as: burns; blisters; numbness; redness and darkening of the skin. This condition is usually prone to occur if you fill your mouth with liquid nitrogen snacks for too long or accidentally stick to your gums. The severity of *frostbite* depends on the length of exposure to nitrogen. In more severe cases, *frostbite* can eventually lead to skin tissue death.

2. *Hole in the digestive tract*

Nitrogen can transform smoke if it changes form from liquid to vapor. This change in form occurs when nitrogen is exposed to air or comes into contact with temperatures above its boiling point. This vaporization causes the nitrogen to expand and increase in volume. It can increase the volume of nitrogen up to 694 times. For example, if you use a tablespoon of liquid nitrogen to make a snack, the mixture becomes 9.5 liters of gas. Too much gas can damage the digestive tract. In severe cases, the digestive tract can rupture, perforate, and bleeding can occur. This condition is also known as gastrointestinal perforation.

3. Respiratory problems

Nitrogen becomes a gas that causes shortness of breath. These snacks can certainly worsen symptoms in people with respiratory problems. When you consume liquid nitrogen snacks in a closed place at room temperature, the nitrogen decreases and the amount of oxygen in the air decreases.

4. Food poisoning

Liquid nitrogen can actually be a good environment for the growth of harmful microorganisms. These microorganisms usually come from liquid nitrogen storage tanks. Some of the bacteria that can be found include:

- a) *Escherichia coli*
- b) *Bacillus cereus*
- c) *Mucor spp.*
- d) *Staphylococcus spp.*, and
- e) *Pseudomonas aeruginosa*

Considering the potential risks above, parties related to the use of liquid nitrogen need to pay attention to anticipatory efforts to strengthen supervisory measures against the risks of using liquid nitrogen in ready-to-eat processed foods. As a preventive measure and in order to realize food safety goals, it is necessary to play a joint role between the government, the food product industry and consumers to avoid potential risks and maintain the safety, health of themselves, the work environment, and others. The relationship between the responsibilities of the government, industry and consumers in implementing food safety systems and safety, among others:

Government	Food Products Industry	Community
a. Drafting strategic policies, programs, and regulations b. Implementation of mitigation (prevention) program c. Implementation of the food law and related regulations d. Supervision and <i>low enforcement</i> e. Data collection f. Science Technology development and research g. Human Resources Development (food inspectors, food extension workers, food industry) h. Counseling and dissemination of information to consumers or the public i. Investigation and investigation of cases of irregularities in food quality and safety	a. Implementation of food safety systems and food quality assurance. b. Product quality and safety supervision c. Application of appropriate technology (safe, environmentally friendly, etc.) d. Appropriate use of Food Additives (BTP). e. Human Resource Development.	a. Human Resource Development (counseling and dissemination of information to consumers) on food safety. b. Good food handling, prevention and processing practices c. Public participation and concern about food quality and safety

²² Center For Food Safety & Applied Nutrition, "Liquid nitrogen and dry ice in food" (U.S. Food & Drug, 2018), <https://accessdata.fda.gov/scripts/fcrs/>.



According to Law No. 18/2012 on Food, it states that conditions and efforts that need to be considered to prevent food from possible biological, chemical and other contaminants that disturb, harm and endanger human health and do not contradict the religion, beliefs and culture of the community so that it is safe for consumption." According to Government Regulation No. 28 of 2004 on Food Safety, Quality and Nutrition, food safety is a shared responsibility between the government, the food industry and consumers. The government is responsible for implementing a food safety monitoring system by regulating, standardizing, evaluating and testing food safety, as well as educating consumers and the food industry about food safety. The food industry is responsible for maintaining the quality and safety of food for quality and safe consumption. Meanwhile, consumers need to be well informed about food safety, including knowledge about good hygiene practices in handling, processing, serving and storing food. There is an urgent need for synergy between the three parties with their respective responsibilities to improve national food safety and achieve the regulations stipulated in food safety regulations in Indonesia.

Insight into food safety is an important factor in food system implementation. The purpose of implementing food safety is so that the state can provide protection to the public to consume food that is safe for their health and mental safety. To ensure that the available food is safe for consumption, food safety must be applied to the entire food chain, starting from production (cultivation), processing, storage, distribution and distribution to consumers. Production activities or processes to produce safe food along the food chain are carried out through the implementation of food safety requirements.²³ At the regulatory level, the role of the State in regulating, monitoring and eradicating all types of food safety deviations is quite strong, as the State has all the necessary resources to implement regulations up to the operational level. On that basis, the State must not be negligent in protecting its citizens from threats to food safety, especially processed ready-to-eat food.²⁴

The following sections of legislation are directly related to the issue of the safety of liquid nitrogen-bearing ready-to-eat processed foods, among others:

1. Law No. 18/2012 on Food

Content on food includes food safety, food quality and nutrition, and supervision. Food safety is organized to keep food safe, hygienic, of good quality, nutritious, and not against the religion, belief and culture of the community. The purpose of maintaining this is to prevent the possibility of biological, chemical and other contaminants that can interfere with, harm and endanger human health. The government and local governments guarantee the realization of food safety implementation in every food chain in an integrated manner by establishing food safety norms, standards, procedures and criteria, which are carried out in stages based on the type of food and the scale of the food business. From this condition, the government and/or local governments are obliged to foster and supervise the implementation of food safety norms, standards, procedures and criteria. The provisions related to the implementation of food safety by the government can be carried out in the following ways:

- a. Food sanitation
- b. Regulation of food additives
- c. Regulation of genetically modified food
- d. Regulation on food irradiation
- e. Establishment of food packaging standards
- f. Providing food safety and food quality assurance; and
Halal product assurance for those required.

2. Law Number 36 of 2009 concerning Health

The Health Law also regulates the guarantee of safety in producing, processing, and distributing food and beverages that are treated as food and beverages resulting from genetic engineering technology that are circulated must guarantee that they are safe for humans, animals eaten by humans, and the environment both by individuals and legal entities. Not only that, the provision prohibits the use of deceptive words and/or claims that cannot be proven.

3. Government Regulation No. 28/2004 on Food Safety, Quality and Nutrition.

This regulation contains provisions related to the supervision of food safety, quality and nutrition, every processed food either produced domestically or imported into the territory of Indonesia to be traded in retail packaging before distribution must have a registration

²³ Explanation of Article 1 of Government Regulation No. 86/2019 on Food Safety.

²⁴ Anna S. Wahongan, Yumi Simbala, and Vecky Yanny Gosal, "Strategi Mewujudkan Keamanan Pangan Dalam Upaya Perlindungan Konsumen." 56

approval letter stipulated by the head of the POM Agency. Thus, processed food produced by the household industry is not required to have a registration approval letter but is required to have a household industry food production certificate issued by the Regent/Mayor.

4. Government Regulation 86/2019 on Food Safety.
The content of the provisions in this Government Regulation, related to food safety risk analysis, is carried out by considering the level of danger that can be caused to human health or life. So there are implications for everyone who produces processed ready-to-eat food for trade must use production facilities that have certificates to ensure food safety and food quality.
5. Minister of Home Affairs Regulation No. 41/2018 on Improving Coordination of Development and Supervision of Food and Drugs in the Regions
The provisions in this regulation are related to the coordination of guidance and supervision of drugs and food, including the use of drugs, medicinal materials, traditional medicines, cosmetics, health supplements, processed food and hazardous materials that have the potential to be misused. For the coordination of guidance and supervision of drugs and food in general, it can be carried out by the Minister, Head of non-ministerial Government Institution, Governor, and Regent/Mayor. Supervision of food handler industries and hazardous material distribution facilities is carried out by regional heads individually or jointly in coordination with provincial and/or district/city coordination teams.
6. Presidential Instruction No. 3/2017 on Improving the Effectiveness of Food and Drug Monitoring
To improve the effectiveness and strengthening of drug and food supervision, this regulation instructs the Minister of Industry to conduct synergy, collaboration, and cooperation in the inspection of production facilities related to the Good Processed Food Production Method for mandatory Indonesian National Standard (SNI) processed food; improve supervision of the production and use of hazardous materials that have the potential to be misused through Norms, Standards, Procedures, and Criteria; and review and harmonize food safety standards.
7. Food and Drug Administration Regulation No. 20/2020 on the Amendment to Food and Drug Administration Regulation No. 28/2019 on Auxiliary Materials in Food Processing, that the use of auxiliary materials in the class of contact cooling and freezing materials as referred to in Article 4 paragraph (1) letter m that are permitted to be used in the food processing process is in accordance with the provisions as listed in Appendix II which is an integral part of this Agency Regulation.

Food supervision is a mandatory regulatory action carried out by the central and local governments to protect the public and ensure that all food products from production, handling, storage, processing and distribution are safe, fit and proper for human consumption and meet food safety and quality requirements and are labeled honestly and in accordance with applicable laws. Supervisory measures in Article 4 of the Law on Food also emphasize that food administration aims to:

1. Improve the ability to produce food independently;
2. Provide diverse food that meets safety, quality and nutritional requirements for public consumption,
3. Realizing the level of food sufficiency, especially staple foods at reasonable and affordable prices in accordance with the needs of the community;
4. Facilitate or improve access to food for the community, especially food- and nutrition-insecure communities;
5. Increase the added value and competitiveness of food commodities in domestic and foreign markets;
6. Increase public knowledge and awareness about safe, quality and nutritious food for public consumption;
7. Improving the welfare of farmers, fishermen, fish farmers, and food business actors; and
8. Protect and develop the wealth of national food resources.

Regarding supervision on food safety, Indonesia adopts the *Multiple Agency System* in organizing food quality supervision. Supervision is carried out sectorally and fragmented by national, provincial and regional/local agencies.²⁵ This organizational system is applied to the handling of ready-to-eat snack products containing liquid nitrogen or better known as Chiki Ngebul. Government supervision of food products in circulation is part of the implementation of regulations that must be carried out as part of the state's duty to protect all its citizens from all forms of threats, including threats to food security. Not only does it provide sufficient food for citizens, but it is also responsible for providing safe and high-quality food for consumption by citizens. The *Multiple Agency System* in organizing food quality supervision is very suitable in Indonesia, because this system can reduce obstacles to supervision activities. These obstacles or challenges include:

1. Coverage of a large area or region.
2. Diverse types of food products that must be monitored.
3. Limited knowledge and awareness of food safety among producers and consumers.
4. Limited competent food safety supervisors and extension workers.

²⁵ Christine F. Mamuaja, *Pengawasan Pangan Dan Keamanan Pangan* (Manado: Unsrat Press, 2016). 21

5. Limited supporting infrastructure.

Each institution conducts periodic checks; in a repressive supervisory system this may occur once or twice a month, i.e. monitoring occurs after an action has been taken by comparing what happened with what would have happened. This monitoring consists of verifying whether the activities or policies carried out are in accordance with established guidelines and regulations. The basic principles of the food and beverage supervision system are:²⁶

1. Security measures are fast, accurate and professional.
2. Actions are based on the level of risk and are evidence-based.
3. The scope of supervision is comprehensive, covering the entire process.
4. National/cross-provincial scale, with international networks.
5. Authorities that support the enforcement of the rule of law.
6. Have a cohesive and robust national laboratory network that collaborates with global networks.
7. Have a network of product safety and quality information systems.

One of the state policies to create an adequate food safety system is the implementation of food quality and safety policies. The goal of food development is food safety, which is characterized by freeing people from food that is harmful to health. This clearly indicates efforts to protect the public from food that does not meet health standards and requirements. The targets of the food safety program are:²⁷

- a. Avoiding the public from food types that are harmful to health, which is reflected in the increasing knowledge and awareness of producers on food quality and safety.
- b. Strengthening food institutions, reflected, among others, by the existence of laws and regulations governing food safety.
- c. Increase the number of food industries that meet the provisions of laws and regulations.

The enactment of Law No. 18/2012 on Food and Circular Letter No. KL.02.02/C/90/2023 on the Supervision of the Use of Liquid Nitrogen in Ready-to-eat Food Products is a step forward by the government to provide protection to the public as well as producers against the spread of ready-to-eat snacks with liquid nitrogen. Based on Government Regulation No. 86/2019 on Food Safety, food safety is a shared responsibility between the government, the food industry and consumers. The government is responsible for implementing a food safety monitoring system through food safety regulations, standardization, evaluation and inspection,

and educating consumers and the food industry about food safety. The food industry is responsible for maintaining the quality and safety of the products it produces, and consumers have the responsibility to protect themselves from substandard and unsafe food. Consumers must therefore have adequate knowledge of food safety, including knowledge of good hygiene practices in food processing, handling, serving and storage. The synergy of these third parties and their respective responsibilities is necessary to improve national food security, and their participation has a major impact on the successful development of the national food quality and safety system.

CONCLUSION

To protect the environment and society, the government must supervise by preventing activities that may cause serious and irreversible consequences. In this case, the absence of scientific certainty regarding the use of liquid nitrogen in processed ready-to-eat foods cannot be used as an excuse to delay prevention efforts. Strategies to achieve food security in an effort to protect the public, first by creating national food standards or regulations, second by implementing regulations in the food sector, where there are standards or regulations in the food sector including production, storage, transportation and distribution. The entire food chain is maintained through a system of control, guidance and supervision to protect the public and ensure food meets health standards and requirements.

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²⁶ BPOM] Indonesian Food and Drug Administration. 2006. Regulation of the Head of the Indonesian Food and Drug Administration Number HK.00.05.52.4040 on Food Categories.

²⁷ Ali D dkk., "A Qualitative Risk Assessment of Liquid Nitrogen in Food and Beverages." Hariyadi,

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