

# **Food Packaging Safety Issues in Thailand: Current and Future Perspectives**

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# **Food Packaging Safety in Thailand: Current Issues and Perspectives**

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## **ABSTRACT**

Safety of packaged foods has increasingly been a significant global issue in recent years. This paper aims to present the broad information and perspectives on food packaging safety in Thailand. This paper compiles the use of different packaging materials, their safety characteristics, and the regulations in Thailand in accordance with the world regulations. In addition, it covers the opinion of various parties related to food packaging in Thailand. Some scientific based results coupled with the interviewing and questionnaire data from the previous and ongoing researches are discussed here. This paper summarizes the food packaging safety in Thailand today and proposed the trends tomorrow along with the future world requirements.

## **INTRODUCTION**

Asia region is the major food producer of the world, while Thailand is one of the leading food producers from Asia. Thai export has increased about 17.2% from 2005 to 2006 and continues to grow. Food industry is one of the biggest and most important sectors for Thai economies, accounting for about 8.8% of GDP in 2006.

As free trade agreement has increasingly been developed throughout all regions of the world, food products may have come from different places. Recent trends in global trade require the quality, safety, and traceability of packaged foods in the international markets. Without trade barriers, food produced from Asia, including Thailand can now be delivered to consumers across the world. Food safety is a serious public concern in the past decade. This global trade trends and the food safety issue lead to greater international requirements of the safe packaged foods.

In response to the global food safety trends, food products from Asia, including Thailand need to assure safe to be able to compete in the international markets. Risks include microbiological and chemical hazards, involving food preparation, processing, packaging, and distribution. In the food packaging systems when packaging materials are in contact with foods, contaminants are ascribed to the chemical constituents in the materials migrating into foods. Therefore, safety of packaging in contact with foods is also a major concern today.

As it's a worldwide requirement, setting up food packaging safety standards and regulations are needed to ensure safe foods in the international markets. The national regulations should be consistent with the international regulations. Concern on food packaging safety is also the key factor in setting up legislations, standard, regulations. However, this varies among countries. In Thailand, limited data are available on the food packaging safety issues. More data are required to determine if the current standards are adequate and what the enforcement and assessment strategies should be.

## **Role of Packaging in Food Safety**

Packaging plays an essential role in the safety of food products. Basic packaging functions relating to food safety include:

- **Containment:** Packages contain the food products in a closed or partially-closed environment.
- **Protection:** Within the packages, the food products are protected from environmental hazards, such as biological hazards (e.g. insects, mice, rodent), climatic hazards (e.g. dust, storm), and mechanical hazards (e.g. dynamic and static forces).
- **Processing:** Packages serve as a processing aid, aiming at making the food products safe for consumption generally by destroying the microorganisms that cause deterioration of foods.
- **Specific functions:** For example, tamper evidence is used to demonstrate the safe unopened status of the food products.

### **Packaging Materials in Contact with Foods**

Interactions occur in the food-package systems and vary among types of foods and packaging materials. Primary packaging materials used for food are glass, metal, paper, and plastic. While glass is the most inert among other packaging materials, plastic interacts greater with foods. Three mechanisms occurring in the food packaging systems are permeation, migration, and sorption (negative migration). These mechanisms have an effect on safety and quality of the packaged foods. Various types of packaging materials used for food applications in Thailand are discussed below.

#### **Glass Packaging**

As glass is inert, little or no interactions between food and contact materials occur. The most common form of glass for packaging of foods is bottle mostly used in the beverage industry. In the past, there have been several reports on the contaminated or unclean reusable glass bottles in Thailand. This was primarily due to the misuse of glass bottles for filling other products such as engine oils in the household. Cases have been raised publicly at that time, resulting in an increased awareness of the beverage industry on the cleaning process of returned glass bottles. This also resulted in a better understanding of the consumers in using the reusable glass bottles for other applications.

#### **Metal Packaging**

Metal container has been used for food packaging over the long period of time. It is involved in the thermal processing of food products. Processed foods packaged and sealed in the metal containers can be kept at normal temperature for a long period of time (1-2 years). Advantages of metal container include great resistance to high temperature and pressure during processing and excellent barrier to oxygen and moisture during packaging. However, metal is a reactive material. Therefore, food packaged in the metal containers may not be safe from the contamination of metal elements in the can. According to the Notification of the Ministry of Public Health No.144 re Food Packed in Sealed Containers in virtue of the Thai Foods Act B.E. 2522 (1979), the foods packed in metal container shall contain no foreign matters except as shown in Table 1.

**Table 1** Minimum quantity of contaminants in the metal containers

<b>Detail</b>	<b>Level</b>
Tin	Not exceeding 250 mg/1 kg of food
Zinc	Not exceeding 100 mg/1 kg of food
Copper	Not exceeding 20 mg/1 kg of food
Lead	Not exceeding 1 mg/1 kg of food (except the food

Detail	Level
	with natural constituent of lead at high quantity which is allowed as approved by the FDA)
Arsenic	Not exceeding 2 mg/1 kg of food
Mercury	Not more than 0.5 mg/1 kg of sea food and not more than 0.02 mg/1 kg of other foods

*Source: Adapted from the Notification of the Ministry of Public Health (No. 144) B.E. 2535 (1992) Re: Food Packed in Sealed Container*

#### Paper and Paperboard Packaging

There have been no specific regulations for paper packaging in contact with foods. However, paper and paperboard (and also plastic) packages used in food applications are required to manufacture under the Good Manufacturing Practices (GMP). In addition, most paper and paperboard used for food are laminated with plastics. Nevertheless, possible contaminants in paper and paperboard are subject to evaluate for heavy metal and some other risk metal elements, fillers, and additives used in the process. Chlorine used in the bleaching process as well as phthlates that may be present in paper manufacturing are other possible contaminants in paper packaging.

#### Plastic Packaging

Based on the Notification of the Ministry of Public Health (No. 295) B.E. 2549 (2006), the plastic container shall have qualities or standard as follows:

- Clean
- Not give out other substances to contaminate with food in a quantity that may be hazardous to health
- Not contain pathogenic microorganisms
- Not give out color to contaminate with food

Apart from the above requirements, plastic container in contact with foods shall have qualities or standard as listed in Table 2 and 3. In addition, the plastic used for containing milk or milk products, excluding in form of powder or dried, shall be polyethylene, ethylene, 1-alkene copolymerized resin, polypropylene, polystyrene, or polyethyleneterephthalate. It is also prohibited to use color plastic containers to contain food except the laminated plastics, which are not the contact layer with food or those used for packaging of fruits with peel. It is prohibited to use plastic containers made from re-use plastic to contain food except for fruits with peel. The use of plastic containers made from plastic containers used to contain or pack fertilizer, toxic substances or other hazardous substances to health is also prohibited.

**Table 2** Qualities and Standard of Plastic

Detail	Plastic							
	PVC	PE, PP	PS	PVDC	PET	PC	Nylon	PVOH
Lead	100	100	100	100	100	100	100	100
Heavy metal (calculated as lead)	-	-	-	-	-	-	-	-
Barium	-	-	-	100	-	-	-	-

Plastic	Maximum level (mg/1 kg)							
	PVC	PE, PP	PS	PVDC	PET	PC	Nylon	PVOH
Vinyl chloride monomer	1	-	-	-	-	-	-	-
Toluene	-	-	5,000	-	-	-	-	-
Vinylidene chloride	-	-	-	6	-	-	-	-
Arsenic	-	-	-	-	-	-	-	-
Cadmium	100	100	100	100	100	100	100	100

Source: Adapted from the Notification of the Ministry of Public Health (No. 295) B.E. 2549 (2006) Re: Qualities or standard for container made from plastic

In addition to the maximum level of substances contained in the plastic packages shown in Table 2, the substances from plastics migrating into foods may not exceed the quantity shown in Table 3.

**Table 3** Qualities and standard of dissemination

Plastics	Maximum level (mg/1 dm <sup>3</sup> of reagent)							
	PVC	PE, PP	PS	PVDC	PET	PC	Nylon	PVOH
Phenol	-	-	-	-	-	-	-	-
Formaldehyde	-	-	-	-	-	-	-	-
Heavy metals (calculated as lead)	1	1	1	1	1	1	1	1
Potassium permanganate used for reaction	10	10	10	10	10	10	10	10
Residue substances which is evaporated in water (acidity > 5)	30	30	30	30	30	30	30	30
Residue substances which is evaporated in 4% acetic acid (acidity < 5)	30	30	30	30	30	30	30	30
Residue substances which is evaporated in 20% concentrated alcohol (alcoholic foods)	30	30	30	30	30	30	30	30
Caprolactame	-	-	-	-	-	-	15	-
Meta crylate	-	-	-	-	-	-	-	-

Source: Adapted from the Notification of the Ministry of Public Health (No. 295) B.E. 2549 (2006) Re: Qualities or standard for container made from plastic

#### Traditional Thai Packaging for Food

There are numerous types of packaging materials used for food applications in Thailand. Apart from the conventional food packaging used worldwide, some traditional Thai packaging remains in use today for selected food products. Typically, these are materials from natural resources. In general and historical, these natural materials are safe for use in food applications. However, it shall be cleaned before use to ensure that no microbial may contaminate the foods. Some foods packaged in these natural materials are additionally heated as part of the cooking process. This helps ensure safety of the food packaging.

The examples of the traditional Thai packages commonly being used for food applications, including packaging, processing, selling, and serving are as follows:

- “Bai Tong” or banana leave: This has been used to package different types of food products both fresh and processed foods. The examples of some food products packaged in this type of materials are Thai desserts, take-home food, fermented Thai sausage (“Nham”), pre-processed pork sausage (“Moo Yor”), etc. In addition, this material has been used regularly in contact with food during processing and serving.
- “Mai Pai” or bamboo shaft: The bamboo shaft is part of the Asian lifestyle for many decades. It has offered various applications to many food products. Packages from bamboo shaft are in various forms. One type of the bamboo package still visible today in Thailand is the rod containing, processing (heating), and selling “Kao Larm”, one type of Thai dessert made from sticky rice. Bamboo is also used for making a basket for produce handling and distributions in Thailand. However, their use is limited in the past 5 years and has mostly been replaced with plastic containers for better protection and damage reduction of produce.
- Other plant leaves such as lotus leave and pandan leave are used in processing and packaging the foods. They may also offer some specific functions such as adding flavor and/or aroma to the food products.

#### **Biodegradable Materials**

Biodegradable packages have increasingly gained interest in the last few years, in responding to the environmental impact of conventional packages. “KU-GREEN” is the first successful biodegradable cassava-based packages developed in Thailand by Kasetsart University. Scientific data has shown its safe use for food packaging. Many biodegradable materials have been developed worldwide in recent years. Concerns about the food packaging safety of these types of materials should be taken into account.

#### **Food Packaging Safety Issues in Thailand**

Awareness in food packaging safety has become more important issue in Thailand today. Consumers are seeking for clearer information and better understanding of the safety of the packaged foods. Questions have been raised whether the packaged foods are safe for consumption. The following example cases are uncertain for their safe use: the printing ink on the packages, the plastic bottles left under the sun heat for a long periods, the reuse of the water bottles for other foodstuffs, the food packaged in the plastic containers after microwaving, etc.

#### **Scientific Data to Ensure Safety**

A number of researches have continually been conducted to ensure safety of food packaging used in Thailand. A few examples of these are as follows:

- Overall migration studies of the plastic wraps used for food packaging in Thailand using the rapid extraction and the ultrasonication extraction methods. The results showed that the migrants extracted from all plastic wraps used in this study were below the limit, except that of the PVC types, which require further investigation.
- Overall migration studies of the plastic cups used for instant food products (e.g. noodle) in Thailand. The overall migration of the samples studied were below the migration limits.

- Contaminations of substances in paper and paperboard packages (plate, bowl, tray, carton) in direct contact with food in Thailand. Substances tested are for example heavy metal, cadmium, mercury remaining in the paper and paperboard materials. Fillers used during paper processing including chlorine, sodium sulfate, antibacterial agents, and antifoaming were also determined. Other significant substances such as phthalate are our ongoing research. The available results showed that the selected paper and paperboard packages used for food packaging in Thailand were safe.
- Microbial contaminants from food packaging materials
- Migration studies of the packaging for microwaved foods.

### **Perspectives on Food Packaging Safety (Suppliers/Users/Consumers)**

As awareness on safety of packaged foods has been increased recently, researches on perspectives of packaging suppliers, users, and consumers on food packaging safety have been conducted in various aspects. Based on data available now from questionnaires and interviews of different parties involving food packaging safety, the perspectives and trends on food packaging safety in Thailand can be summarized as follows:

- Food packaging safety is ranked the top ten concerns when consumers buy packaged foods.
- Awareness on food packaging safety will be increased markedly in the next five years due to the global trade requirements
- Most Thai industry has been preparing for the food packaging safety issues
- Food packaging safety information is quite limited in Thailand.
- Most people trust the information from government sources and suggest that television and newspapers are the best channels to obtain information on food packaging safety.
- There is a demand on the food packaging safety seminars from the packaging related industries.
- Plastic is the most concerned materials for food packaging safety.
- Consumers have limited knowledge and understanding on migration of substances from plastic into packaged foods.
- Packaging functions such as tamper evidence, reclosability, and peelability add safety to the packaged foods.

### **Organizations Involving Food Packaging Safety in Thailand**

- Food and Drug Administration Thailand (Thai FDA) is responsible for establishing and enforcing the law, standards, and regulations related to safety of food packaging in Thailand.
- Department of Medical Sciences Thailand provides the testing services, according to both national and international regulations.
- Department of Science Service Thailand provides the testing services, according to both national and international regulations.

### **National vs. International Regulations**

Thai FDA has sought after other countries' regulations relating to food packaging safety to establish the best practices for Thailand. There are differences and similarities between Thai regulations and international regulations such as the EU or the US systems. For example in regards to migration (Table 3), the migration limits have been established specifically for each substance in the Thai regulations, while the overall migration limit (OML), which shall not exceed 10 mg/kg and specific migration limit (SML) for individual substances based on toxicological evaluation have been used for the EU legislation. However, the Thai limits have



been corresponding to the EU. When comparing between the U.S. and EU systems, the analytical and toxicological data requirements for food contact materials clearance are similar. The differences among the two systems are the method and the process of submitting and using the data.

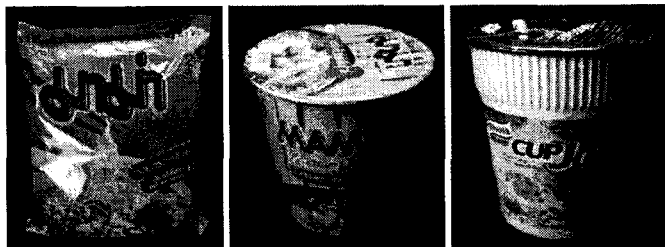
#### **SUMMARY**

The safety of packaging materials in contact with food has become a global requirement today. Thai food packaging industry and regulators have shown positive responses to this global trend to ensure the safety of packaged foods from Thailand to be able to compete in the world markets. Consumers have also shown increased awareness regarding to safety of packaged foods.

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**Some examples of Thai food packaged in different materials**



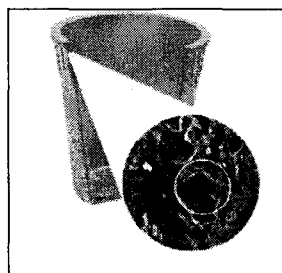
**Figure 1** Instant noodle in a plastic pouch, instant noodle in a paper cup, and instant rice in a plastic cup.



**Figure 2** Ingredients used in Thai cooking: fish sauce in a plastic bottle, curry paste in a multilayer pouch, coconut juice in a metal can, and coconut juice in an aseptic package.



**Figure 3** Drinks: “Red Bull” in a metal can, palm sugar drink in a glass bottle, passion drink in a plastic bottle, and Thai tea in an aseptic package.



**Figure 4** Cassava-based biodegradable package (“KU-GREEN”, by Ngamtip Poovarodom of Kasetsart University).