

ASSESSMENT ON GOOD HYGIENIC PRACTICES OF AMERICAN AND MYANMAR PACKAGED FOODS*

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Abstract

Food safety is an issue not only in Myanmar but also in the United States. Recall and market withdrawals of unsafe food products and safety alerts to customers by Food and Drug Administration, U.S. are well known recognized while Department of Food and Drug Administration, Myanmar takes action on some food products which adulterated with unpermitted chemicals and pathogens. Five types of packaged food processed in Myanmar and the United States were assessed for their nutritional constituents and hygienic practices. Physical and biological contaminations in packaged foods were investigated. Proper labeling of packaged foods was also studied. It was observed that American packaged food manufacturers described full information of product ingredients, nutritional facts per serving and claims while Myanmar packaged food manufacturers could not be able to include nutritional facts and claims. No physical contamination and no contamination of food borne pathogens such as *E.coli*, *Listeria*, mold and yeast were found in all American and Myanmar packaged foods.

Keywords: American and Myanmar packaged food, contamination, hygienic practices

Introduction

Food can convey risks to health and food contamination can happen in any points of the food chain. Food production is a complex process and produced food is expected to be safe. Traceability of the food production chain is identified by the World Health Organization (WHO) in terms of a farm-to-fork approach focusing efforts on those points of the food production chain where contamination of food is most likely to occurred or most likely to be prevented. The wholesomeness and safety of a food are influenced by all the people and processes that handle it from production to consumption (Liezl et al., 2015). Risks for food contamination at the packaging manufacturing

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stage are often overlooked because the emphasis on food safety usually lies in the preparation of the food itself. Management in Food safety of packaging and labeling of foods, however, can only do so much to protect end users. It is necessary to defend against an outbreak and mitigate any failures in packaging labeling by reviewing and preparing against the factors at play in the packaging process, and ensure that manufacturing practices are adhering to all safety and quality standards (Casillas., 2013).

The packaged food market of the United States reached around 378 billion U.S. dollars with U.S. consumers in 2017. It is expected to be steady growth in the coming years (<https://www.statista.com/statistics/491685/packaged-food-united-states-market-value/>). The growth of packaged food market in the U.S. is driven by innovative processing techniques for boosting the shelf life. Recent recalling of packaged foods such as shredded coconut that are adulterated with *salmonella*, biscuit contaminated with *listeria* and beef patties contaminated with *E.coli*, and beef stew product that may be contaminated with foreign matter, specifically plastic and metal, increase in concern with food safety especially on packaging materials and contamination of pathogens. 67 recalls and 145 cases of food poisoning were reported in the United States in 2017 (<https://www.fda.gov/safety/recalls/> & <https://www.fsis.usda.gov/wps/portal/ffsis/topics/recalls-and-public-health-alerts/current-recalls-and-alerts>). Food safety issue is still growing on food production, food distribution and storage systems in the U.S.

Micro, Small and Medium Enterprises (SMEs) in Myanmar are now in developing with the change in economic sector. Agriculture and the agribusiness sectors make an important contribution to the national economy of Myanmar. Food and beverage industries take place of 65.36% of MSMEs (SMEs Development Policies Report, 2009). Packaged food industries are in line with the growth of over half of the food and beverage industries in Myanmar. It is expected to grow export section of Myanmar packaged foods due to migration of people from Myanmar across the region and some border areas. Department of Food and Drug Administration (DFDA), Myanmar is implementing to support safe food products to consumers. From 2013 to 2017, 152 food products have been banned for those which were contaminated with unpermitted chemicals and some pathogens. Some have been temporally

banned for those that did not follow DFDA labeling guidelines (Public announcement for unsafe food products, 2017).

The present research studied proper knowledge of American and Myanmar packaged food manufacturers on food labeling and assessed hygienic practices through examination of physical and biological contaminations in packaged foods.

Materials and Methods

Materials

Five different kinds of American packaged foods such as cream cheese (CC), creaming dressing (CD), blueberry jam (BJ), sausage (S) and instant mashed potato (MP) were purchased from Smith's Food & Drug, Logan, Utah state, USA. The storage temperature for cream cheese and sausage in food store was at 4 °C.

Five different kinds of Myanmar packaged foods such as chilli sauce (CS), instant fish broth (FB), instant chicken-coconut broth (CB), pickled tea leaves (PL) and pineapple jam (PJ) were purchased from Gamonepint supermarket, Kabaaye, Yangon, Yangon Region, Myanmar. The storage temperature for Myanmar packaged foods in supermarket was about 25 °C.

Inspection of Labeling and Type of Packaging

Fulfilling of general food labeling requirements such as name of food, net quantity of content statements, ingredient lists, nutrition labeling and claim was inspected according to U.S. FDA (2013). Packaging materials used for foods were also examined. For this study, total number of packaged foods was varied from 15 to 20 and from 4 to 6 for American and Myanmar packaged foods respectively.

Determination of Nutritional Constituents of Packaged Foods

Contents of ash, moisture, crude fat by Babcock method, crude fiber by Ceramic Fiber Filter Method (AOAC 945.38) and crude protein by the Kjeldahl method (AOAC 981.10) of packaged foods were determined for their nutritional values.

pH and Water Activity of Packaged Food

Preliminary examination of packaged foods was carried out by measurement of pH using pH Testr 30 portable pH meter and water activity, a_w using AQUA LAB 4 TE measurement Decagon Devices, USA.

Examination of Microbial Contamination

Spread plate technique was used for total plate count (TPC) in packaged foods. Plate count agar (Hi-Media Laboratories Pvt. Ltd, India) was used as media for TPC. The presence of mold and yeast, *E.coli/Coliform*, *Staphylococcus*, *Listeria* were examined using 3 M™ Petrifilm™ plates following the standard methods of AOAC 997.02, 991.14, 2003.07 and compendium of Methods for the Microbiological Examination of Foods, Section 3.512 and 3.521 respectively.

Examination of Physical Contamination

Detection of metal pieces, plastics, dirt, and hair falls in packaged foods was conducted visually and mechanically using metal detectable bandages.

Results and Discussion

The adaptation to the statements of product display panel (PDP) and information panel described by U.S. FDA (2013) was observed in all types of packaged foods as shown in Table 1. All American packaged food industries have been experienced under the strict guidelines of U.S. FDA labeling system while DFDA, Myanmar has enforced Myanmar packaged food industries to follow the labeling guidelines. It has been observed that full labeling on statements of product description, address of manufacturer, ingredient lists and nutrition facts including claim were included in all American packaged foods. One interesting thing was that American packaged food manufacturers utilized combination of at least three emulsifiers in one formulation and many ingredients were formulated in a product. As regards in Myanmar packaged food manufacturers, the name, amount of food and address of manufacturer or distributor were stated on PDP. It has been found that some could not include the ingredient lists on their information panels. Full nutrition facts of Myanmar packaged foods could not also be described in

the information panel due to availability of inadequate laboratory facility for nutritional analysis in Myanmar. Sufficient knowledge on labeling system was observed for Myanmar packaged food manufacturers. DFDA in Myanmar also enforced and noticed to the manufacturers to be implemented international labeling system in order to **ensure quality and safety**. Type of packaging in most Myanmar foods was polyethylene plastic bags. Packaging system of Myanmar packaged foods is poor and needs to be developed. Proper packaging is important for keeping the quality and shelf-life of food. When the foods expose to light and air if the packaging system is not good enough, it can change the flavor and color of food.

Table 1: Observation of Labeling and Type of Package

	American packaged foods					Myanmar packaged foods				
	CC	CD	BJ	S	MP	CS	FB	CB	PL	PJ
Name of food, Address of Manufacturer	√	√	√	√	√	√	√	√	√	√
Net quantity of content statement	√	√	√	√	√	√	√	√	√	√
Ingredient list	√	√	√	√	√	√	√	√	×	×
Nutrition labeling and claim	√	√	√	√	√	×	×	×	√	×
Type of packaging	Aluminum bag	Plastic bottle	Glass bottle	Vacuum bag	Vacuum bag	Glass bottle	Plastic bag	Plastic bag	Vacuum bag	Plastic bag

Some nutritional constituents of packaged foods are presented in Table 2. American consumers take care of health into their own hands and respond to the concept of good fat that means no transfat and probiotic products such as yoghurt (<http://www.euromonitor.com/packaged-food-in-the-us/report>). Description of nutrition facts in packaged food is also necessary for empowerment of consumers' choice. There should also have knowledge of Myanmar consumers on nutritious food with safe food supply. When compared to Myanmar packaged foods, American packaged food consisted of higher total fat content and low fiber content. It was observed that

Myanmar packaged foods was formulated with low total fat and high fiber content. The highest total fat content involved in Myanmar favorite food such as instant chicken-coconut broth and it was 18.5% per serving. Instant fish broth and chicken-coconut broth contained the mixture of crushed ingredients such as ginger, garlic, onion, crushed lemongrass roots and other spices. As regards in calories, American packaged foods had much more calories than Myanmar packaged foods when converted to 9 calories per gram of all fat, 4 calories per gram of protein and 4 calories per gram of carbohydrate. Myanmar favorite foods such as instant fish broth and instant chicken-coconut broth were found to be high calorie foods. It needs to support the **nutrition facts** in Myanmar food products to be helpful in people with different health concerns and to guide them in choosing foods that are suitable for their health condition.

Table 2: Nutritional Constituent in Packaged Foods

Constituent (%w/w)	American packaged foods					Myanmar packaged foods				
	CC	CD	BJ	S	MP	CS	FB	CB	PL	PJ
Moisture	35.22 ±0.12	28.53 ±0.02	23.37 ±0.10	40.27 ±0.02	3.69 ±0.10	67.93 ± 0.01	28.83± 0.10	19.07± 0.03	41.78± 0.12	13.57± 0.04
Ash	0.99 ±0.23	2.21 ±0.12	0.25 ±0.10	3.79 ±0.22	7.27 ±0.10	4.89± 0.03	7.83± 0.03	9.78± 0.03	7.81± 0.03	0.19± 0.01
Fiber	0.00	0.00	0.00	0.00	1.16 ±0.12	0.00	3.79± 0.02	3.28± 0.03	4.29± 0.02	0.37± 0.05
Protein	4.55 ±0.73	0.16 ±0.07	0.00	1.21 ±0.42	1.63 ±0.47	0.11 ± 0.03	1.13 ± 0.02	2.57 ± 0.19	3.35 ± 0.19	0.07 ± 0.01
Fat	21.15 ±0.64	30.15 ±3.18	0.00	12.6 ±1.27	0.00	0.00	7.50 ± 0.70	18.50 ± 2.25	0.00	0.00
Carbohydrate	37.09 ±0.72	38.95 ±3.39	76.38 ±0.20	42.13 ±1.93	86.25 ±0.79	27.07± 0.07	50.92± 0.87	46.80± 2.53	42.77± 0.36	85.80 ± 0.11

pH and a_w are predictors for the chemical reactions and growth of microorganisms in foods and specify the wholesomeness and safety of foods. The growth of microbes are limited by the minimum levels of pH and a_w . Based on the results tabulated in Table 3, pH of both packaged foods are below neutral pH, specifically pH of cream cheese, creaming dressing and blueberry jam for American foods and pH of chili sauce, pickled tea leaves and pineapple jam for Myanmar foods were less than pH 4.6 . They can be

categorized as acid foods and the foods having pH greater than pH 4.6 can be categorized as low acid foods. Low acid foods have favorable pH of greater pH 4.2 for the growth of pathogenic bacteria such as *S. aureus*, *E.coli*, *Samonella*, and *C. botulinum*. *C. botulinum* can produce a deadly toxin and low acid foods can be contaminated by botulinum (Nunmer, 2008). Both instant broths of Myanmar favorite foods have potential hazards for the growth of microorganisms due to their low acid contents. Regarding the water availability of foods, a_w ranged from 0.3 to 0.9 and favored for the growth of yeast and mold. The presence of yeast and mold can produce toxin like mycotoxin and mycotoxin cannot be destroyed during cooking and processing.

Table 3: pH and Water Activity (a_w) of Packaged Food

	American packaged foods					Myanmar packaged foods				
	CC	CD	BJ	S	MP	CS	FB	CB	PL	PJ
pH	4.86	3.89	3.05	6.31	6.02	3.96	5.98	6.04	4.55	3.87
a_w	0.98	0.96	0.83	0.95	0.30	0.93	0.85	0.62	0.93	0.60
	±	±	±	±	±	±	±	±	±	±
	0.13	0.01	0.10	0.05	0.21	0.03	0.05	0.21	0.10	0.02

Table 4 shows the presence of microorganisms in packaged foods. Total plate counts represent the bacterial constituents in foods. All American packaged foods contained very few counts of bacterial constituents when compared to Myanmar packaged foods in which total plate counts (TPC) in foods were 3.5×10^4 to 4.0×10^5 cfu/g. However, TPC was under the acceptable limit (5.0×10^5 to 10^7) described by ICMSF (International Commission on Microbiological Specification for Foods). One interesting thing was that TPC of Myanmar packaged foods such as instant fish broth, instant chicken-coconut broth and pickled tea leaves was higher than that in two other foods. Poor hygienic practices on raw material to finished product brought bacterial contamination in foods (FSIS (Food Safety and Inspection Service), 2007). The growth of pathogens such as *E.coli*, *Coliform* and *Listeria* was not observed in all packaged foods aside from no growth of yeast and mold. The Myanmar packaged foods were free of most pathogens except instant chicken-coconut broth which has been contaminated with *coliform*. *Coliform* is commonly used as surrogate indicator and its presence in food

generally indicates direct and indirect fecal contamination of water sources used in processing (Edema et al, 2001). The colonies of *coliform* in instant chicken-coconut broth were 400 cfu/g that also fell under the acceptable limit (11 to 500 cfu/g) of ICMSF. Free of yeast and mold in foods eliminated toxic metabolites known as mycotoxins. Good sanitation and hygienic practices in food processing eliminate the presence of food borne pathogens and consequently inhibit their ability to produce mycotoxin or aflatoxins. In general, it is safe to consume Myanmar packaged foods. *S.aureus* was found in two American packaged foods such as cream dressing and sausage, however, it was under the allowable limit of 10^3 cfu/g (ICMSF). Contamination of Staphylococci may come from air, dust, sewage, water, milk and food or on food equipment, environmental surfaces, humans and animals. Food poisoning by *Staphylococcus* is occurred when a food handler contaminates food and then the food is not properly refrigerated. These bacteria multiply quickly at room temperature to produce a toxin that causes illness. *Staphylococcus* is killed by cooking and pasteurization (<https://www.foodsafety.gov/poisoning/causes/bacteriaviruses/staphylococcus/index.html>). Staphylococcal food-borne disease (SFD) is one of the most common causes of reported food-borne diseases in the United States. The majority of SFD outbreak has been found by improper food handling practices in the retail industry account. However, several studies have documented prevalence of *S. aureus* in food and potential risk of its colonization and subsequent infection to consumers. Contamination of pathogens in food products not only imposes potential hazard for consumers but also causes grave economic loss (Kadariya et al., 2014). No metal pieces, and no dust were found in all packaged foods.

Table 4: Microbial Constituents in Packaged Foods

	American packaged foods					Myanmar packaged foods				
	CC	CD	BJ	S	MP	CS	FB	CB	PL	PJ
TPC (cfu/g)	< 250	<250	<250	< 250	<250	3.5×10^4	4.0×10^5	3.0×10^5	3.4×10^5	1.0×10^5
<i>E.coli</i> (cfu/g)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
<i>Coliform</i> (cfu/g)	ND	ND	ND	ND	ND	ND	ND	400	ND	ND
<i>S.aureus</i> (cfu/25 g)	ND	< 10	ND	< 10	ND	ND	ND	ND	ND	ND
<i>Listeria</i> (cfu/25g)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Yeast & Mold (cfu/g)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

ND= Not Detected

Conclusion

Adaptation of U.S. food labeling guidelines was observed in both packaged food manufacturers. Full labeling guidelines were adopted by all American packaged food manufacturers. Nutrition facts and claims could not be facilitated in Myanmar packaged foods. Good sanitation and hygienic practices were generally observed in all American and Myanmar packaged foods.

Potential spoilage of packaged foods has been prevented being processed by the ways of cooking, drying and canning. Risk assessment plan on the time identified on the label, the storage temperature and humidity of the atmosphere should be implemented for safe and good characteristics of packaged foods. Currently, U.S. food control system is monitored by integrated departments such as the Food Safety and Inspection Service (FSIS) of the U.S. Department of Agriculture, the Food and Drug Administration (FDA) and Centers for Disease Control and Prevention (CDC). Food safety issues are arising on part of food production, distribution and storage system. Support of stakeholders including knowledge of consumers can help sustainable development of Myanmar packaged food industries for taste,

safety, quality, and nutrition of foods. Innovation of traditional foods and development of unique product characteristics are challenging for packaged food manufacturers in Myanmar.

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