

Risk Assessment Studies

Report No. 3

Microbiological Hazards Evaluation

Moon cakes in Hong Kong

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Food and Environmental Hygiene Department

HKSAR

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Moon Cakes in Hong Kong

An Evaluation of Moon Cakes

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1997-1999

Abstract

Moon cakes are commonly taken by Chinese to celebrate Mid -Autumn Festival, which refers to the 15th day of the eighth lunar month. While the conventional Guangdong Moon Cake (CGMC) had been commonly used in Hong Kong, Snowy Moon Cake (SMC) is a variant introduced to the local market in the past years. The microbiological surveillance findings on 70 samples of CGMC and 107 samples of SMC collected from 1997 through 1999 were reviewed in the present study. All CGMC had achieved satisfactory hygienic quality, as reflected in the APC count and/or *E. coli* (total) measurement, and none was found containing specific pathogens. On the other hand, 11% (12) of all SMC samples, had unsatisfactory hygienic quality. A decreasing trend, from 18.6% in 1997, 7.4% in 1998, and 5.4% in 1999, was observed. In addition, *Salmonella* spp. was detected in 2 samples in 1997 and one sample in 1999, and *S. aureus* in one sample in 1998. The final baking step in the production of CGMC had effectively virtually eliminated the microbiological hazards. In SMC, the design of production flow, training for the food handlers, as well as the storage conditions are extremely important in maintaining satisfactory microbiological quality. Both the trade and consumers are advised to take necessary precautions to enhance food safety of consuming moon cakes.

Risk Assessment Studies –

Microbiological Hazards Evaluation

Moon Cakes in Hong Kong

- An Evaluation of Moon Cakes Microbiological Surveillance 1997 - 1999

Introduction

Moon cake is a type of traditional Chinese festive food taken for the celebration of the Mid -Autumn Festival (which refers to the 15th day of the eighth lunar month). It is available on market in August and September of the year.

Moon cakes are categorized as flour confectionery. The production requires a food factory or a bakery licence under the Hong Kong Law. On the other hand, however, sale of moon cakes does not require any special licence or permit. Retail outlets can be found in many places like cakes shops, supermarkets and food stores.

In Hong Kong, the most popular type of moon cakes is the conventional Guangdong moon cakes (CGMC). In the early 1990s, a new type of moon cakes known as snowy moon cakes (SMC) was introduced into the local market and has gained increasing popularity.

Production Process and Microbiological Hazards

Microbiological hazards refer to the presence of pathogens that can cause food poisoning to those who have consumed the food. In moon cakes, pathogens identified are mainly *Staphylococcus aureus* and *Salmonella* species which are usually the results of cross contamination during processing or storage.

The pathogens may grow and reach infective dose if the moon cakes especially SMC, are kept within the Temperature Danger Zone (i.e. between 4°C and 63°C) for a prolonged period of time.

For *S. aureus*, a toxin dose of about 1.0 microgram in contaminated food will produce symptoms of intoxication. This toxin level is reached when *S. aureus* populations exceed 10^5 per gram (1). While all people are susceptible to staphylococcal intoxication, intensity of symptoms may vary. Death from staphylococcal food poisoning is, however, very rare (1).

The infective dose of *Salmonella* spp. may be as few as 15-20 cells, depending upon age and health status of host, and strain differences among the members of the genus (2). Symptoms of (salmonellosis) are most severe among the elderly, infants, and immuno-compromised people (2).

In Hong Kong, no food poisoning cases have been reported due to consumption of moon cakes during the last three years.

Conventional Guangdong moon cakes

The production process of CGMC can be divided into purchasing, storage, preparation, baking, cooling, packaging, storage and delivery (Figure 1). Raw lotus seeds are cooked, ground and wrapped, sometime with a salted egg yolk, by a flour pastry. The wrapped product is then molded and baked at about 200°C-300°C for 15 -25 minutes. After cooling, the moon cakes are packaged and ready for delivery.

Handling (e.g. manipulating ground lotus seeds and pastry with bare hands) of raw lotus seeds and flour may introduce some bacteria into the intermediate products. However, baking the intermediate products at high temperature virtually eliminates all bacteria present, thus removing potential microbiological hazards

Snowy moon cakes

The production process of SMC consists of purchasing, storage, preparation, cooling, packaging, storage and delivery (Figure 2). Ingredients for the production of SMC include ground green bean, egg yolk and flour. All these ingredients have already been cooked before molding and further baking is not required.

Handling (e.g. molding and packaging) of SMC ingredients inevitably introduced some bacteria into the final products. Unlike CGMC, bacteria are able to survive in the final products because of the absence of final baking step. Pathogens, if present, may grow and exceed infective dose if SMC is handled improperly during transportation and storage such as displaying SMC within the Temperature Danger Zone for a prolonged period of time.

Surveillance on moon cakes from 1997 to 1999

Microbiological status of moon cakes was assessed based on the surveillance results of the last few years. Samples of moon cakes were purchased from the market and analysed by the Public Health Laboratories, Pathology Service of the Department of Health.

The microbiological analysis consists of two parts. The first part is an assessment of hygienic quality of moon cakes while the second part is an assessment of safety of moon cakes. The current microbiological criteria for moon cakes include hygienic indicators such as Aerobic Plate Count (APC) and coliform/*E.coli* (total), as well as the presence of pathogens such as *Staphylococcus aureus*, and *Salmonella* spp. (Table 1).

Hygienic quality

APC or *E. coli* (total) reflects the general hygienic status of moon cakes. During the period between 1997 and 1999, 70 samples of CGMC were taken for microbiological examination (Tables 2 and 3). According to the microbiological guidelines, the results of all these samples were satisfactory.

During the same period, a total of 107 samples of SMC were examined. The unsatisfactory rates were 18.6% (8 out of 43) in 1997, 7.4% (2 out of 27) in 1998 and 5.4% (2 out of 37) in 1999 (Table 4).

Specific pathogens

No sample of CGMC was found containing pathogens during the period under study.

As regards SMC, two samples were found containing *Salmonella* spp. in 1997, one containing *S. aureus* (i.e. with level exceeding 10^4 per gm) in 1998 and one containing *Salmonella* spp. in 1999.

Discussion

High levels of APC and *E. coli* (total) reflect unsatisfactory hygienic practice during processing of food from source to table. High counts of APC in foods often indicate contaminated raw materials or unsatisfactory processing and indicate unsuitable time/temperature control during storage (3). Although these organisms may not directly cause human illness, the levels of unsatisfactory samples suggested room for improvement in the production process.

This study showed that the CGMC had obviously achieved a more standard in terms of achieving a better hygienic quality and free of specific pathogens. The final baking step is useful in removing any remaining microbiological hazard introduced during the preparation processes of CGMC.

As for SMC, the hygienic status has to be maintained with a careful design of production flow on the side of manufacturer. Equally important is the training of hygienic practice for the handlers along the process to maintain the hygienic status of the food.

Recommendations

The absence of final baking step during the production of SMC imposes some microbiological risks on the consumption of SMC. However, the risks can be minimized if food manufacturers follow the principles of Good Manufacturing Practice (GMP) and Hazard Analysis and Critical Control Point (HACCP) system (4).

In order to assist food manufacturers in producing safe and sound SMC, the Food and Environmental Hygiene Department (FEHD) has produced, based on the principles of HACCP system, a “*Guidelines on the Production of Snowy Moon Cakes*” (Appendix 1). Key recommendations are summarized below:

Advice for the trade

- ◆ A programme must be established to monitor the quality of raw materials. For example:
 - All materials should be obtained from approved sources.
 - An inspection system should be in place to ensure that raw materials/ingredients are in compliance with the agreed specifications
- ◆ Snowy Moon Cakes should be produced, stored, transported and displayed in a proper manner and at appropriate temperatures to protect them from contamination and deterioration
- ◆ Food handlers should receive proper training in handling and preparing snowy Moon Cakes as well as personal hygiene to enable them to take precautions that are necessary to prevent contamination of snowy Moon Cakes.

Advice for the consumer

Consumer are advised to pay special attention to the following –

- ◆ Buy SMC only from retail outlets with refrigerators;
- ◆ Check expiry date. Consume Moon Cakes within recommended period;
- ◆ Take Moon Cakes (specially snowy Moon Cakes) home immediately after purchase and refrigerate them immediately;

- ◆ Since most Moon Cakes contain high sugars and/or fat, consumers are advised to take a balanced diet even during the festive season s. Those with diabetes should consult their dietitians regarding intake of these foods.

FPHD/FEHD
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Figure 1

Production of Conventional Guangdong Moon Cakes

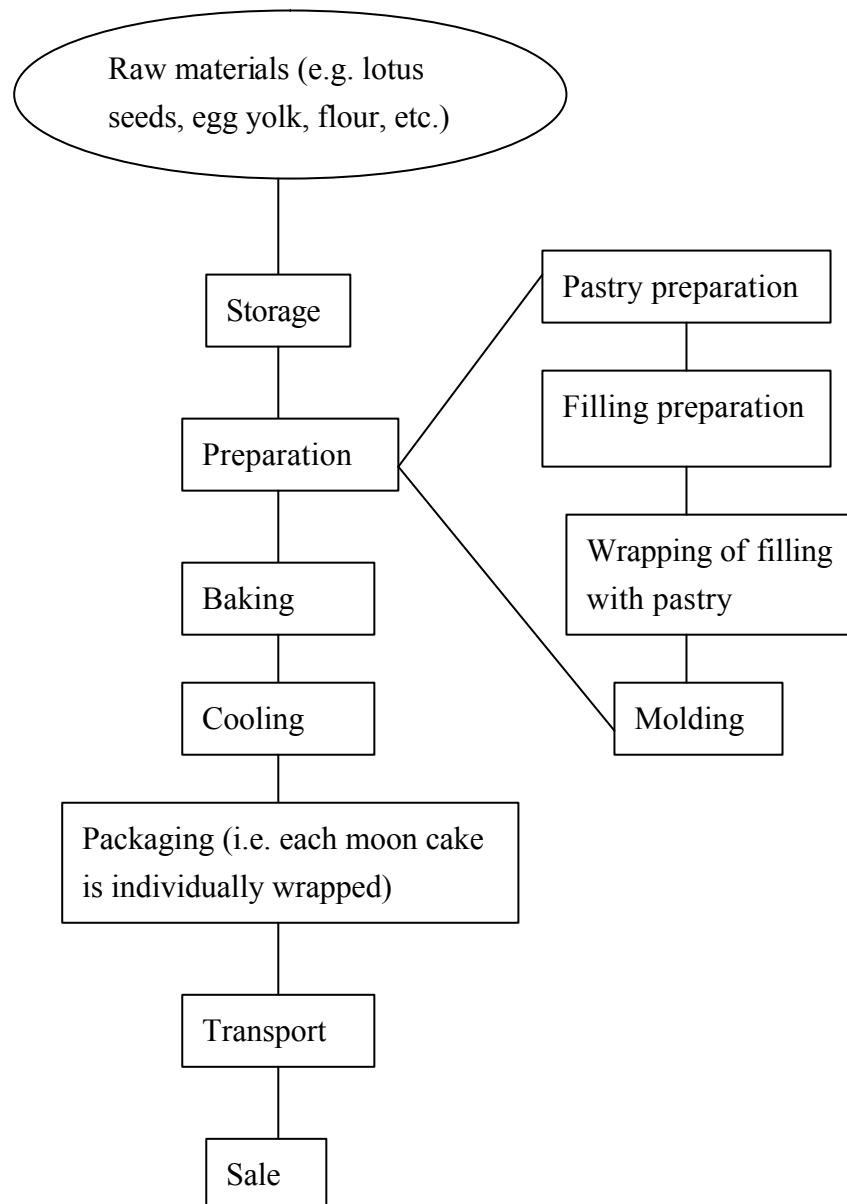


Figure 2

Production of Snowy Moon Cakes

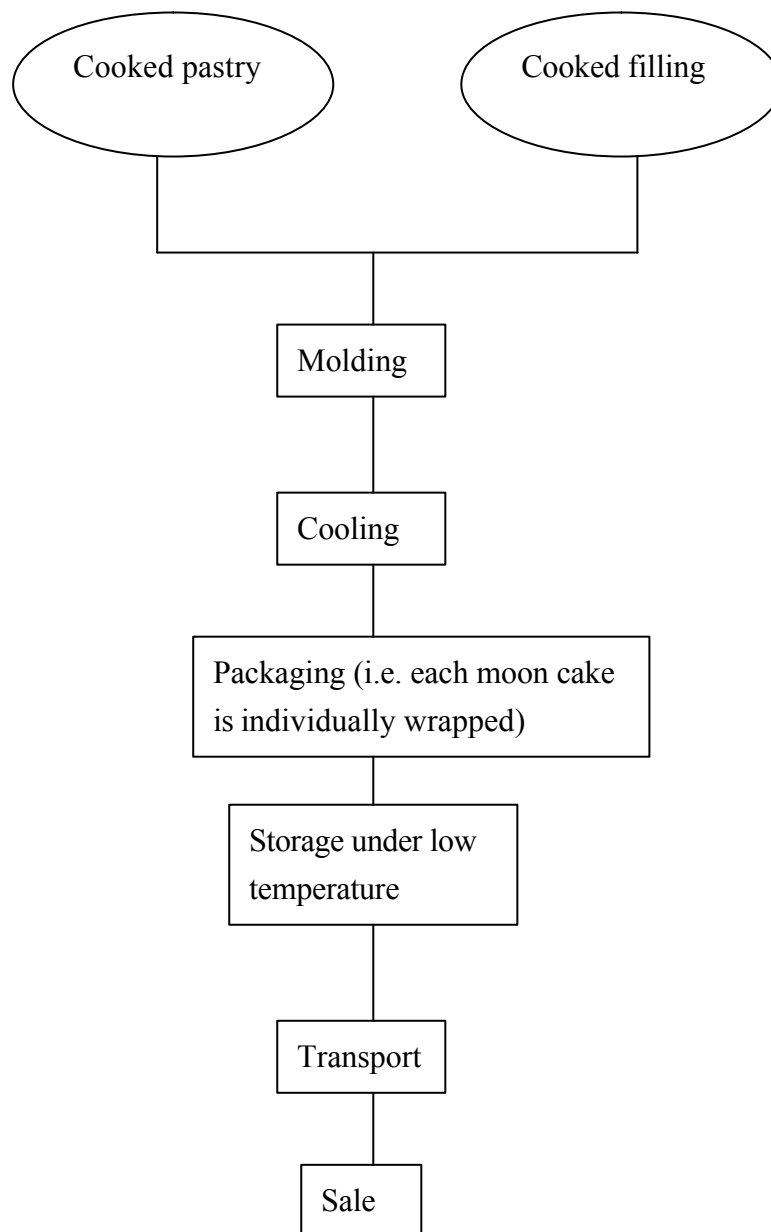


Table 1

Microbiological Guidelines for Moon Cakes*

Test Criteria	Unsatisfactory
Aerobic Plate Count (APC)	$> 1 \times 10^6$ per g
Coliform	> 4 organisms per g (before 1998)
<i>E.coli</i>	$> 10^4$ organisms per g (after 1998)
<i>Staphylococcus aureus</i>	$> 10^4$ organisms per g
Salmonellae	Present in 25 g

*The “Microbiological Guidelines for Ready -To-Eat Food” has been updated and the above guidelines may no longer be applicable. Please refer to the latest version at <http://www.fehd.gov.hk/english/safefood/control-ready-to-eat-food.html>

Table 2

Moon cakes microbiological surveillance in Hong Kong:

Number of samples taken 1997-1999

Food sample	1997	1998	1999	Total
CGMC ¹	22	18	30	70
SMC ²	43	27	37	107
Grand Total	65	45	67	177

Table 3

Moon cakes microbiological surveillance in Hong Kong:

Hygiene quality of conventional moon cakes 1997-1999

Year	Number of sample	No. of unsatisfactory samples (%)
1997	22	0 (0%)
1998	18	0 (0%)
1999	30	0 (0%)

Table 4

Moon cakes microbiological surveillance in Hong Kong:

Hygiene quality of snowy moon cakes 1997-1999

Year	Number of sample	No. of unsatisfactory samples (%)
1997	43	8 (18.6%)
1998	27	2 (7.4%)
1999	37	2 (5.4%)

References

- (1) FD/CFSAN Bad Bug Book – *Staphylococcus aureus* 2000.
- (2) FD/CFSAN Bad Bug Book – *Salmonella* spp. 2000
- (3) International Commission on Microbiological Specifications for Foods. Micro-organisms in foods. London: Blackie Academic & Professional. 1978.
- (4) Joint FAO/WHO Food Standards Programme Codex Alimentarius Commission. Codex Alimentarius Food Hygiene Basic Texts. FAO/WHO. Rome, 1997

Appendix 1

Guidelines on the Production of Snowy Moon Cakes

(A guide to food manufacturers)

Food establishment

- The design and facilities of food establishments producing Snowy Moon Cakes should be in compliance with the licensing requirements and conditions set forth by the Food and Environmental Hygiene Department.
- Food establishments should have a cleaning and sanitation programme in place to monitor and control all equipment, utensils, refrigeration units that have potential impact on the safety of Snowy Moon Cakes.

Raw materials/ingredients

- Raw materials and ingredients should only be obtained from reputable and approved sources.
- Raw materials/ingredients delivered to a food premises should be inspected before acceptance.
- Personnel responsible for inspection should as far as practically possible satisfy that:
 - there are no signs or indications of contamination or damage to the raw materials/ingredients ;
 - chilled/frozen raw materials/ingredients have arrived at the proper temperatures (e.g. frozen items at -18°C or below; chilled items at 4°C or below) and free from observable evidence of temperature abuse.
- Manufacturers should satisfy themselves that their suppliers have developed and fully implemented an appropriate sampling and inspection system to ensure that the raw materials/ingredients are in compliance with the agreed specifications.

Storage of raw materials/ingredients

- Raw materials and ingredients should be stored and handled under suitable conditions to prevent spoilage, contamination and damage.

Stocks of raw materials and ingredients should be properly rotated to ensure that the first-in-first-out principle is followed.

- Raw materials should be stored at proper temperatures :
 - frozen items should be stored at -18°C or below;
 - chilled items should be stored at 4°C or below.
- Packaging materials should be non -toxic and appropriate for snowy Moon Cakes. They should be stored and handled in a clean and sanitary manner.

Preparation and storage of finished products

- Food handlers should receive proper training in handling and preparing Snowy Moon Cakes as well as personal hygiene to enable them to take precautions necessary to prevent contamination of Snowy Moon Cakes.
- Frozen ingredients should be thawed under refrigeration that maintains the temperature at 4°C or below. Thawed ingredients should be used as quickly as possible for the production of Snowy Moon Cakes and under no circumstances be held above 4°C for more than 1 hour.
- Finished products prepared at room temperature should be cooled to 4°C or below within 1 hour.
- Finished products intended to be stored frozen should be maintained at a temperature of -18°C or below.
- Finished products should be labelled properly and the label should include a statement of storage conditions.

Transportation, distribution and display of finished products

- Finished products should be transported, distributed and displayed in a proper manner and at appropriate temperatures to protect them from contamination and deterioration.
- Where possible, transportation, distribution and display units of finished products should be equipped with accurate and reliable temperature control and monitoring instruments.

- Finished products should be rotated to ensure that the distribution and sale of products is carried out in a first-in-first-out basis.
- Appropriate and adequate chillers and/or freezers should be available in authorized retail outlets selling Snowy Moon Cakes.
- Clear instructions on the proper methods of storing, handling and displaying Snowy Moon Cakes should be available and given to retailers.

Management system

- A preventive food safety management system (such as the HACCP system) should be established to ensure that effective control measures are in place to minimize the potential chemical, physical or microbiological contamination of the products during the manufacturing process.