

**Chemical Hazards Evaluation**

**Report No. 1**

**USE OF PRESERVATIVES AND  
COLOURING MATTER  
IN  
CHINESE NEW YEAR FOODS**

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Food and Environmental Hygiene Department  
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**Risk Assessment Studies**

**Report No. 1**

**Chemical Hazards Evaluation**

**Use of Preservatives and Colouring Matter  
in Chinese New Year Foods**

An Evaluation of Food Surveillance Findings 1996 to 1999

## Abstract

From 1996 through 1999, 499 and 386 samples of Chinese New Year Foods were tested for preservatives and colouring matter against the statutory standards. These foods were classified into five categories: steamed puddings, fried dumplings, sweetened fruits and vegetables, glutinous rice balls, and seeds. Of 499 samples tested for preservatives, 15 (3.0%) were reported unsatisfactory. Seven of 275 steamed puddings examined contained benzoic acid, which is not permitted in these flour-made products. Eight of 71 samples of sweetened fruits and vegetables examined were found to contain sulphur dioxide exceeding the permitted level. The most common items incriminated were sweetened melon and sweetened water chestnut. Of 386 samples tested for colouring matter, 15 (3.9%) contained non-permitted ones. Thirteen of 175 samples of steamed puddings examined contained Orange II, and two out of 72 samples of fried dumplings contained Rhodamine B. However, such practices have become less common in the last two years. Samples of glutinous rice balls and seeds examined were all satisfactory. Since Chinese New Year Foods were mainly consumed during festive seasons and the proportion of unsatisfactory samples was small, it was unlikely to have caused significant adverse impact on public health. The trade is advised to adhere to Good Manufacturing Practice.

***Use of Preservatives and Colouring Matter***

***in Chinese New Year Foods***

***- An evaluation of the food surveillance findings in Hong Kong 1996-1999***

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**Introduction**

Chinese New Year is the beginning of the lunar year, generally coincides with late January or February of the commonly used civil calendar. It signifies hope and joy, and is among the most important festivals in the Chinese culture. A number of special foods are taken during this period as part of the celebration and they exemplify strong local features. In Hong Kong, as the majority of residents are from Southern China, the Chinese New Year Foods are closely related to Guangdong cultures.

2. In this paper, we classify the Chinese New Year Foods commonly

consumed in Hong Kong into five categories and examine preservatives and colouring matter in these food items using the food surveillance findings collected in 1996 to 1999.

### **Five Categories of Chinese New Year Foods**

3. As the name implies, Chinese New Year Foods refer to a spectrum of food items that are commonly consumed during Chinese New Year. According to their compositions and manufacturing processes, Chinese New Year Foods can be classified into five categories – steamed puddings, fried dumplings, sweetened fruits and vegetables, glutinous rice balls and seeds. Many of these foods carry cultural meanings. The characteristics of these foods are listed in Table 1.

### **Food additives**

4. Food additives, which are generally chemical in nature, may be potentially hazardous. The nature and magnitude of such hazards determine the suitability of these chemicals for use in food. The choice of food additives also depends on the effectiveness of additives to which the food is applied. According to Codex Alimentarius Commission, *food additive* means any substance not normally consumed as a food by itself, the intended use of which may reasonably be expected to result, directly or indirectly, in its becoming a component or otherwise affecting the characteristics of any food (1). From the legal perspective, as listed under the *Food and Drugs (Composition and Labelling) Regulations* in Hong Kong, additive means any substance, not

commonly regarded or used as food, which is added to, or used in or on, food at any stage to affect its keeping qualities, texture, consistency, appearance, taste, odour, alkalinity or acidity, or to serve any other technological function in relation to food, and includes processing aids in so far as they are added to, or used in or on food (2). In this paper, we focus on two commonly used additives in Chinese New Year Foods, namely *preservatives* and *colouring matter*. Reviewing the findings of food surveillance from 1996 to 1999, we examine the hazards originated from inappropriate use of preservatives and colouring matter in the five categories of Chinese New Year Foods.

### Preservatives

5. Preservatives are used to prolong shelf life of a food by protecting against deterioration caused by microorganisms (1). Their uses in foods are sometimes necessary when the foods are not consumed immediately after production. From the legal perspective, as listed under the *Preservatives in Food Regulations* in Hong Kong, preservative means any substance which is capable of inhibiting, retarding or arresting the process of fermentation, acidification or other deterioration of food or of masking any of the evidence of putrefaction (2).

### Colouring matter

6. The colour of a food is affected by processing and storage. To meet the consumers' expectations, manufacturers may add colouring agents to certain foods to produce the appetizing and attractive appearance. Colouration of food may also be a reflection of different cultures and life style (3). To this end, *food colouring matter* is defined as any substance that adds or restores colour in



a food (1).

7. Colour carries special meaning in the Chinese culture. For instance, red means “luck and happy”. Some food items are coloured in red, such as “red egg” and “birthday bun” for birthday celebration. Barbecued pork is also coloured red to make it more appealing. There are practical reasons for the use of colouring matter in Chinese New Year Foods:

- To provide a colourful appearance to food for sacrifice and celebration. For example, sesame balls are coloured to create festive and joyful appearance.
- To correct natural variations in colour, for example, New Year Pudding.
- To offset colour loss due to exposure to light, air, extremes of temperature, moisture and storage conditions, for example, sweetened fruits and vegetables.

### **Legal provision in Hong Kong**

8. The uses of preservatives and colouring matter are stipulated in the regulations made under Part V of the Public Health and Municipal Services Ordinance (Cap. 132). No food intended for sale for human consumption shall contain any colouring matter or preservatives which is not specified in the schedule, and no person shall sell, or import into Hong Kong, any such food which does not comply with the provisions of these regulations.

9. The permitted preservatives for use in foods are stipulated in the First Schedule to the Preservatives in Food Regulations made under section 55 of the Public Health and Municipal Services Ordinance (Cap. 132), which specifies the

permitted preservatives for use in respective foods, as well as the relevant maximum permitted levels.

10. The types of permitted colouring matter for use in food are stipulated in the First Schedule to the Colouring Matter in Food Regulations made under section 55 of the Public Health and Municipal Services Ordinance (Cap. 132).

### **Results of Chinese New Year Foods Surveillance in Hong Kong 1996-1999**

11. The surveillance results from 1996 through 1999 were reviewed to examine the potential hazards related to preservatives and colouring matter in the locally sold Chinese New Year Foods. A total of 499 and 386 samples were sent to Government Laboratory for testing of preservatives and colouring matter respectively. Fifteen samples (3.0%) were found to have used preservatives that were either not appropriate for the specified food or at higher than permitted level (Table 2). For colouring matter, 15 samples (3.9%) were found to contain non-permitted colouring matter (Table 3).

#### Steamed Puddings

12. Preservatives are generally used in steamed puddings to extend the shelf life. Like flour confectionery and other bakery products, the permitted preservatives in steamed puddings are sorbic acid and propionic acid. However, it was found that some manufacturers used benzoic acid in a number of steamed puddings, namely New Year Pudding, Taro Pudding, and Turnip Pudding, during the period from 1996 to 1998.

13. The use of non-permitted preservatives in Chinese New Year steamed puddings has decreased – none of the 107 samples taken in 1999 was found to contain the non-permitted benzoic acid.

14. Colouring matter may also be used in steamed puddings. A total of 13 samples of steamed puddings, namely New Year Pudding, Coconut New Year Pudding, Taro Pudding, and Water Chestnut Pudding, have been found to contain Orange II in the past four years. However, a closer examination revealed a downward trend. The use of Orange II in steamed puddings has decreased from 9 out of 29 samples in 1997 to 2 out of 65 samples in 1999 (Table 3).

#### Fried Dumplings

15. Traditionally sesame balls may be given a red spot to add festive feelings. In two consecutive years 1996 and 1997, Rhodamine B was found in two samples of sesame balls. Testing in the subsequent years did not find such phenomenon (Table 3).

#### Sweetened fruits and vegetables

16. Preservatives are commonly used in the preparation of sweetened fruits and vegetables. In the past three years, a total of eight sweetened melon or water chestnut samples were found to contain sulphur dioxide at levels above the maximum permitted concentration stipulated in the Regulations.

## Glutinous rice balls and seeds

17. There were no irregularities detected in the surveillance of glutinous rice balls and seeds for preservatives and colouring matter.

## **Discussion**

18. In this study, we have identified that benzoic acid and sulphur dioxide are the predominantly misused preservatives whereas Orange II is still an occasionally abused colour in Chinese New Year Foods.

## Preservatives

19. Two preservatives found to exceed statutory limits in the Food Surveillance Programme on Chinese New Year Foods between 1996 and 1999 are benzoic acid and sulphur dioxide. Both are among the most widely used preservatives.

20. The use of benzoic acid in flour confectionery is not permitted in the Public Health and Municipal Service Ordinance (Cap. 132). On the other hand, propionic acid or sorbic acid are recommended to be used because they are more effective in minimizing spoilage in flour confectionery products including steamed puddings (4,5,6). The maximum permitted levels of preservatives may vary with its chemical nature and composition of the foods. For examples, for flour confectionery, the law permits the use of 1000 parts per million (ppm) of sorbic acid or propionic acid (2).

21. When exposed to an excessive amount of benzoic acid, individuals may

suffer from adverse reactions such as asthmatic attacks or neurological abnormalities (4,5). The present surveillance findings suggested that manufacturers might have chosen the inappropriate preservatives for the steamed puddings. Strengthening the delivery of relevant information to the food trade may be helpful.

22. ***Sulphur dioxide*** is commonly used in fruits, vegetables, wine, meat and sausages. Its activity usually covers yeast, moulds and bacteria. It also acts as an antioxidant, which prevents unwanted enzymatic browning in fruits and vegetables (7). It is most effective in acidic foods. Allergic reactions to sulphur dioxide were reported in sensitive persons, such as those with asthmatic history (4).

23. In the unsatisfactory sweetened melon and water chestnut samples, the levels of sulphur dioxide have exceeded the maximum permitted limit. It is likely to be related to insufficient quality control during manufacturing process in the trade.

#### Colouring matter

24. The two types of non-permitted colouring matter identified in the present study, namely Rhodamine B and Orange II, are industrial dyes. Their uses in foods are forbidden.

25. Rhodamine B is a dye for wool and silk. It produces a brilliant red colour to the food. It was found in traditional Chinese food items such as red buns and pastries previously. Rhodamine B may cause irritation to lungs, eyes, throat, nose and intestines but details of toxic effects have not been reported.

Erythrosine (BS) is recommended to replace Rhodamine B for food colouring purposes.

26. Orange II is an industrial dye which was occasionally detected in siu mei, lo mei, vegetarian food and bakery products. It produces a golden-yellow colour to the food. It has been forbidden for use in food in Hong Kong since 1994. Sunset Yellow FCF can be used to give the golden-yellow colour similar to Orange II.

27. Data collected in food surveillance is not sufficient to identify why the non-permitted colouring matter is used. However, it is speculated that the small-scale food manufacturers might have been adopting traditional materials in food preparation. Others might have used food ingredients that may contain non-permitted colouring matter.

## **Recommendations**

### Advice to the Public

28. This study revealed that the inappropriate use or excessive use of preservatives and colouring matter in Chinese New Year Foods has been infrequent in the past four years. As they are seasonal foods, the dietary intake is relatively small. It is therefore unlikely to have posed major health hazards to the consumers. Nevertheless, the *public* is recommended to maintain a balanced diet even during the festive seasons.

### Strengthening communication with trade

29. This study highlights the importance of communication with the trade – especially the food manufacturers regarding the use of these food additives. A

systematic communication with the wider public shall enhance the message further. Most importantly, these food additives should be used in accordance with good manufacturing practice such that levels of these additives are just appropriate to achieve their intended purposes.

### Role of the Government

30. The Government has the statutory role to enforce the relevant regulations with a robust food surveillance system. Warning letters and/or prosecution will be issued to those manufacturers or vendors who fail to comply with the laws.

**Table 1: Characteristics of Chinese New Year Foods**

<b>Food categories</b>	<b>Characteristics</b>	<b>Food additives potentially used</b>	<b>Examples</b>
Steamed Puddings (蒸糕類)	There are two main types of steamed puddings- sweet and savoury.  Sweet pudding consists of flour, sugar, with or without vegetables or coconut milk  Salty pudding consists of flour, preserved meat, turnip or taro	Preservatives may be present; colouring matter may be added to give a festive appearance	Sweet puddings – New Year Pudding (年糕) Coconut New Year Pudding(椰汁年糕)  Savoury puddings – Turnip Pudding (蘿蔔糕) Taro Pudding (芋頭糕)
Fried Dumplings (煎堆類)	Deep-fried pastries, with or without fillings	Preservatives may be present; colouring matter may be added to give a festive appearance	Sesame Balls (煎堆) Sesame Cookies (笑口棗) Crispy Triangles (油角) Deep Fried Taro (炸芋絲) Rosettes (糖環)
Sweetened fruits and vegetables (糖果類) (8)	Fruits and vegetables are sliced, cooked in sugar syrup and dried.	Preservatives are generally present; colouring matter may be added	Lotus seed (糖蓮子) Melon (糖冬瓜) Water Chestnut (糖馬蹄) Lotus Root (糖蓮藕) Coconut Slice (糖椰絲)
Glutinous Rice Balls (湯圓類)	Made of glutinous flour filled with sweet paste which consists of sesame seeds, and peanuts inside.	Preservatives may be present	Sesame/Peanut Glutinous Dumplings
Seeds (瓜子類)	Seeds are fried/dried, with or without the addition of colours	Colouring matter may be present	Red Melon Seed Black Melon Seed White Melon Seed



**Table 2: Preservatives in Five categories of Chinese New Year Foods**

	Steamed Puddings		Fried dumplings		Sweetened fruits and vegetables		Glutinous rice balls		Seeds		Total	
	N	P	N	P	N	P	N	P	N	P	N	P
<b>96</b>	39	2	31	0	13	0	2	0	3	0	88	2
<b>97</b>	63	3	29	0	13	1	1	0	13	0	119	4
<b>98</b>	66	2	29	0	20	5	6	0	8	0	129	7
<b>99</b>	107	0	29	0	25	2	2	0	0	0	163	2
Total	275	7	118	0	71	8	11	0	24	0	499	15
Remarks	Benzoic acid in New Year Pudding, Taro Pudding, and Turnip Pudding samples.				Sulphur dioxide above permitted level in sweetened melon and water chestnut samples.							

**NOTE**

N- Total Number of Samples

P- Number of Unsatisfactory Samples

**Table 3: Colouring Matter in Five categories of Chinese New Year Foods**

	Steamed Puddings		Fried dumplings		Sweetened fruits and vegetables		Glutinous rice balls		Seeds		Total	
	N	P	N	P	N	P	N	P	N	P	N	P
<b>96</b>	19	2	11	1	3	0	0	0	19	0	52	3
<b>97</b>	29	9	16	1	10	0	0	0	19	0	74	10
<b>98</b>	62	0	25	0	17	0	4	0	24	0	132	0
<b>99</b>	65	2	20	0	27	0	1	0	15	0	128	2
Total	175	13	72	2	57	0	5	0	77	0	386	15
Remarks	Orange II in New Year Pudding, Coconut New Year Pudding, Taro Pudding and Water Chestnut Pudding samples		Rhodamine B in Sesame Balls									

NOTE

N- Total Number of Samples

P- Number of Unsatisfactory Samples

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## **Appendix 1: Methodology**

### **Sampling**

Samples of Chinese New Year Foods were obtained from restaurants, bakery shops, supermarkets and other retail outlets during the Chinese New Year period (usually in January and February) from 1996-1999.

### **Laboratory analysis**

#### (1) Preservatives

Preservatives tested in Chinese New Year puddings, fried dumplings, glutinous rice dumplings and seeds are sorbic acid, benzoic acid, esters of  $\beta$ -hydroxybenzoic acid and salicylic acid using High Performance Liquid Chromatography (HPLC).

For sweetened fruits & vegetables, preservatives determined include sulphur dioxide, benzoic acid and esters of  $\beta$ -hydroxybenzoic acid. Sulphur dioxide isolated from food samples was quantified by titration with iodine solution.

#### (2) Colouring matter

Samples were sent to Government Laboratory for chemical analysis. Colouring matter being analysed in Chinese New Year Food samples include those listed in the First Schedule to the Colouring Matter in Food Regulations made under section 55 of the Public Health and Municipal Services Ordinance (Cap. 132), as well as the most common non-permitted colouring matters, such as Crocein Scarlet 7B, Orange II, and Rhodamine B. Paper or Thin Layer Chromatography (TLC) is used to identify colouring matter present in food samples.

## **Glossary**

### **Codex Alimentarius**

[<http://www.fao.org/waicent/faoinfo/economic/esn/codex/Default.htm>]

The Codex Alimentarius is a collection of internationally adopted food standards presented in a uniform manner. The food standards aim at protecting consumers' health and ensuring fair practices in the food trade.

### **Colour**

According to Codex Alimentarius, Colour refers to any substance which adds or restores colour in a food.

### **Deterioration**

Deterioration, in relation to food, means deterioration due to the action of bacteria, yeasts or moulds.

*(Public Health and Municipal Services Ordinance Cap. 132)*

### **Food**

Food includes –

- (a) drink;
- (b) chewing gum and other products of a like nature and use;
- (c) smokeless tobacco products; and
- (d) articles and substances used as ingredients in the preparation of food or drink or of such products,

but does not include –

- (i) live animals, live birds or live fish (excluding shell fish);
- (ii) water, other than –
  - (A) aerated water;
  - (B) distilled water;
  - (C) water from natural springs, either in its natural state or with added mineral substances; and
  - (D) water placed in a sealed container for sale for human consumption;
- (iii) fodder or feeding stuffs for animals, birds or fish; or
- (iv) articles or substances used only as drugs.

*(Public Health and Municipal Services Ordinance Cap. 132)*

## **Food additive**

According to Codex Alimentarius, Food Additive means any substance not normally consumed as a food by itself and not normally used as a typical ingredient of the food, whether or not it has nutritive value, the intentional addition of which to food for a technological (including organoleptic) purpose in the manufacture, processing, preparation, treatment, packing, packaging, transport or holding of such food results, or maybe reasonably expected to result, (directly or indirectly) in it or its by-products becoming a component of or otherwise affecting the characteristics of such foods. The term does not include “contaminants” or substances added to food for maintaining or improving nutritional qualities.

It may also mean any substance, not commonly regarded or used as food, which is added to, or used in or on, food at any stage at affect its keeping qualities, texture, consistency, appearance, taste, odour, alkalinity or acidity, or to serve any other technological function in relation to food, and includes processing aids in so far as they are added to, or used in or on food.

*(Public Health and Municipal Services Ordinance Cap. 132)*

## **Food Surveillance**

Food Surveillance is a programme designed to collect and analyze samples (e.g. chemical and bacteriological analyses) from various points in the food chain. The purpose of the programme is to ensure that food products for sale are hygienic and safe.

## **Good Manufacturing Practice (GMP)**

According to Codex Alimentarius, Good Manufacturing Practice means –

- ◆ the quantity of the additive added to food shall be limited to the lowest possible level necessary to accomplish its desired effect;
- ◆ the quantity of the additive that becomes a component of food as a result of its use in the manufacturing, processing or packaging of a food and which is not intended to accomplish any physical, or other technical effect in the food itself, is reduced to the extent reasonably possible; and,
- ◆ the additive is prepared and handled in the same way as a food ingredient.

## **Hazard**

According to Codex Alimentarius, Hazard is a biological, chemical or physical agent in, or condition of, food with the potential to cause an adverse

health effect.

### **Permitted Colouring Matter**

Permitted Colouring Matter means any colouring matter inasmuch as its use is permitted by the Colouring Matter in Food Regulations (Cap. 132 sub. leg.).  
*(Public Health and Municipal Services Ordinance Cap. 132)*

### **Permitted Preservative**

Permitted Preservative means any preservative specified in Column 2 of Part I of the First Schedule or, subject to the provisions of paragraph (3) of this regulation, a preservative specified in Column 2 of Part III of the First Schedule of the Preservative in Food Regulations (Cap. 132 sub. leg.).  
*(Public Health and Municipal Services Ordinance Cap. 132)*

### **Preservative**

According to Codex Alimentarius, Preservative refers to any substance which prolongs the shelf-life of a food by protecting against deterioration caused by microorganisms.

It may also means any substance which is capable of inhibiting, retarding or arresting the process of fermentation, acidification or other deterioration of food or of masking any of the evidence of putrefaction but does not include –

- (a) any permitted antioxidant;
- (b) any permitted colouring matter;
- (c) common salt (sodium chloride).

*(Public Health and Municipal Services Ordinance Cap. 132)*