Risk Assessment Studies
Report No. 76

Nutrient Evaluation

CONSUMER ACCEPTANCE OF REFORMULATED DIM SUM FOR SODIUM REDUCTION

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EXECUTIVE SUMMARY

Excessive sodium intake is closely related to hypertension, which is a known risk factor for certain non-communicable diseases (NCDs). The World Health Organization recommends daily salt intake of less than 5g (i.e. 2,000mg of sodium) for adults.

According to the studies from the Centre for Food Safety (CFS), dim sum is the fifth major contributor to the total sodium intake of the adult population in Hong Kong. The study results on "Sodium Content in Dim Sum" from the CFS in 2022 showed that certain types of dim sum were found to contain high levels of sodium. The trade members were advised to reduce the sodium content of dim sum through modification of preparation methods and the use of ingredients. However, some trade members were concerned about the acceptance of consumers to reformulated products that are less salty.

The objectives of the study are (1) to assess the consumer acceptance of reformulated dim sum with reduced sodium content, and (2) to facilitate the discussion with the trade to provide healthier food products with less sodium content through recipe reformulation.

Between March and April 2024, a type of difference test known as triangle test was conducted to determine whether detectable sensory differences exist between the standard and sodium-reduced (about 10-20% reduction) dim sum samples of two types of dim sum, shrimp siu mai (蝦肉燒賣) and steamed pork ribs with black bean sauce (豉汁蒸排骨). 72 subjects aged not less than 15 were recruited to conduct the tasting test.

The triangle test requested the subjects to taste one different and two alike dim sum samples (i.e. one standard dim sum sample plus two sodium-reduced dim sum samples, or vice versa) and then identify the odd sample. In accordance with the design of the triangle test, at least 32 among the recruited 72 subjects which could correctly identify the odd samples would result in a significant difference in taste between the standard and sodium-reduced dim sum samples.

The results of the triangle tests showed that only 15 and 13 out of the 72 recruited subjects correctly identified the odd sample of shrimp siu mai (蝦肉燒賣) and steamed pork ribs with black bean sauce (豉汁蒸排骨) respectively. The findings suggested that there is no perceptible sensory difference between the standard and the reformulated dim sum with 10-20% reduction in sodium content.

Conclusion

The results of the study indicated that a 10-20% reduction of the sodium content in the dim sum concerned would not result in perceptible sensory difference, reflecting the acceptability of consumers to such range of sodium reduction and the feasibility of the trade to reduce the sodium content in dim sum.

Advice to the trade

1. Reduce the sodium content of food through product reformulation by making reference to the CFS' "Trade Guidelines for Reducing Sodium in Foods" (e.g. choose ingredients with lower sodium content, use natural ingredients for flavouring and marinating).
2. Serve sauces in separate containers to allow consumers to add sauces based on their preference.

Advice to the public

1. Request the food to be served separately from sauces, and taste before dipping in sauces.
2. Maintain a balanced diet with variety and accustom to milder taste by gradual cutback on salty food.

OBJECTIVES

This study aims (i) to assess the consumer acceptance of reformulated dim sum with reduced sodium content, and (ii) to facilitate the discussion with the trade to provide healthier food products with less sodium content through recipe reformulation.

BACKGROUND

2. Table salt is a chemical compound known as sodium chloride (NaCl), which consists of 40% sodium and 60% chloride. Sodium is essential for body functions. Although it helps to maintain fluid balance and acid-base balance in the body, required for nerve transmission and muscle contraction, excessive sodium intake is closely related to hypertension[1], which is a known risk factor for certain non-communicable diseases (NCDs) including cardiovascular disease, stroke and coronary heart disease.

3. The World Health Organization (WHO) recommends that the daily intake of salt of an average adult should be less than 5g (i.e. less than 2,000mg of sodium).[2]

Local Dietary Intakes of Sodium

4. In Hong Kong, according to the Population Health Survey 2020/2022 conducted by the Department of Health, persons aged 15-84 years consumed 8.4g of salt (i.e. around 3,400mg sodium) per day[3], which exceeded the WHO's recommendation of salt intake of less than 5g (2,000mg sodium) per day for adult.

5. In May 2018, the Hong Kong Government published “Towards 2025: Strategy and Action Plan to Prevent and Control Non-communicable Diseases in Hong Kong”, which set a list of actions that Hong Kong will pursue to achieve the committed NCD targets towards 2025. One of the 9 local NCD targets includes “A 30% relative reduction in mean population daily intake of salt/sodium”.[4]

Dietary Sources of Sodium of Local Population

6. In Hong Kong, dim sum is one of the favourite food choices for breakfast and lunch, as well as during holidays in Chinese restaurants. According to the studies from the Centre for

Food Safety (CFS), dim sum is the fifth major contributor to the total sodium intake of the adult population.

Sodium Content in Dim Sum

7. The CFS released the study results on "Sodium Content in Dim Sum" in July 2022 and individual samples of certain types of dim sum (e.g. shrimp siu mai and spring roll with shrimp) were found to contain relatively high levels of sodium.[5]

8. Members of the trade were advised to reduce the sodium content of dim sum through modification of preparation methods and use of ingredients by making reference to the CFS' Trade Guidelines for Reducing Sodium in Foods. Upon discussion with the trade members, some of them raised concern about consumers' acceptance to reformulated products that are less salty. Therefore, the CFS conducted this risk assessment study to investigate the consumer acceptance of reformulated dim sum with less sodium, in order to ease the concern of the trade that less salty products would not be welcomed by consumers.

SCOPE OF STUDY

9. This study covered 2 types of non-prepackaged dim sum, shrimp siu mai (蝦肉燒賣) and steamed pork ribs with black bean sauce (豉汁蒸排骨), which were found to contain relatively high average sodium content. The shrimp siu mai (蝦肉燒賣) and steamed pork ribs with black bean sauce (豉汁蒸排骨) were found to have sodium content of 590mg/100g and 570mg/100g respectively according to the previous CFS's study on "Sodium Content in Dim Sum" (released in July 2022)[5] and the CFS' Nutrient Information Inquiry System (NIIS)[6] respectively.

METHODOLOGY

Materials

10. In this study, all shrimp siu mai (蝦肉燒賣) and steamed pork ribs with black bean sauce (豉汁蒸排骨) samples were produced by the Chinese Culinary Institute (CCI). The CCI provides training in Chinese culinary skills, including making of dim sum and features a number of facilities, including training kitchens, a training restaurant, and a food science laboratory, which is equipped for preparing dim sum samples with various sodium contents.

11. Dim sum with two different sodium contents, namely standard and sodium-reduced dim sum, were prepared for consumer tasting. To approximate the usual sodium content of dim sum

in the local market, the sodium content of the standard dim sum was set at around 600mg/100g. The sodium content of the sodium-reduced dim sum was made with 10-20% less sodium than that the standard dim sum. By simply adjusting the amount of salt added during production, the sodium levels of the standard and the sodium-reduced dim sum were obtained.

12. All dim sum samples were cooked and then kept at -18ºC or below after production. The samples were reheated using microwave oven before the tasting by the recruited subjects was conducted. All samples were reheated and stored under the same condition.

Laboratory Analysis

13. Laboratory analysis of sodium contents of the standard and sodium-reduced dim sum was conducted by the accredited laboratory commissioned by the CFS. The sodium contents of the standard and sodium-reduced dim sum are summarised in **Table 1.**

Table 1. Sodium contents of standard and sodium-reduced dim sum

Dim sum item	Sodium content (mg/100g)		Reduction in sodium content in sodium-reduced dim sum
	Standard dim sum	Sodium-reduced dim sum	
Shrimp siu mai (蝦肉燒賣)	576	464	19%
Steamed pork ribs with black bean sauce (豉汁蒸排骨)	632	547	13%

Subject in the Study

14. Subjects were recruited from the Consumer Liaison Group (with about 400 members) of the CFS . An invitation email with a screening questionnaire assessing basic demographic information (i.e. ages and genders), frequency of consuming dim sum and smoking habit was sent to all members. According to the design of the triangle test (i.e. the tasting test in this study), a sample size of 72 subjects could determine if the subjects can differentiate between the standard and sodium-reduced dim sum. Finally, a total of 72 subjects with different sex and age groups were selected, based on the inclusion criteria of a habit of consuming dim sum at least every three months (**Table 2**). In addition, smokers were excluded as smoking may dull taste sensations[7].

Table 2. Information of subject

Information	Category	Total number of subject (%)
Gender	Male	42 (58%)
	Female	30 (42%)
Age	15-30	8 (11%)
	31-40	15 (21%)
	41-50	23 (32%)
	51 or above	26 (36%)
Frequency of consuming dim sum	Every day	8 (11%)
	Every week	43 (60%)
	Every month	19 (26%)
	Every three months	2 (3%)

Triangle Test

15. The triangle test is a discriminative method with many uses in sensory science including to gauge if an overall difference is present between two products.[7] In this study, the two products were the standard dim sum and the sodium-reduced dim sum. Triangle test was conducted with 72 subjects for both shrimp siu mai (蝦肉燒賣) and steamed pork ribs with black bean sauce (豉汁蒸排骨). During the test, the subject was provided with one different and two alike dim sum samples and the subject tasted all three dim sum samples (i.e. one standard dim sum sample plus two sodium-reduced dim sum samples, or vice versa). The samples were blinded with three-digit random numbers. Six possible serving orders (AAB, ABA, BAA, BBA, BAB, ABB where A denotes for standard dim sum and B denotes for sodium-reduced dim sum) were counterbalanced across all subjects. The test design is shown in **Table 3.1** and **Table 3.2**.

Table 3.1 Triangle test design for shrimp siu mai (蝦肉燒賣)

Sample Identification	Codes in Sets with Two As	Codes in Sets with Two Bs
A. Standard dim sum	659, 234	682
B. Sodium-reduced dim sum	931	160, 932
Subjects Number	**Serving Order**	**Codes in Order**
1,7,13,19,25,31,37,43,49,55,61,67	AAB	659, 234, 931
2,8,14,20,26,32,38,44,50,56,62,68	ABA	659, 931, 234
3,9,15,21,27,33,39,45,51,57,63,69	BAA	931, 659, 234
4,10,16,22,28,34,40,46,52,58,64,70	BBA	160, 932, 682
5,11,17,23,29,35,41,47,53,59,65,71	BAB	160, 682, 932
6,12,18,24,30,36,42,48,54,60,66,72	ABB	682, 160, 932

Table 3.2 Triangle test design for steamed pork ribs with black bean sauce (豉汁蒸排骨)

Sample Identification	**Codes in Sets with Two As**	**Codes in Sets with Two Bs**
A. Standard dim sum	679, 905	951
B. Sodium-reduced dim sum	159	582, 709
Subjects Number	**Serving Order**	**Codes in Order**
1,7,13,19,25,31,37,43,49,55,61,67	ABB	951, 582, 709
2,8,14,20,26,32,38,44,50,56,62,68	BBA	582, 709, 951
3,9,15,21,27,33,39,45,51,57,63,69	BAB	582, 951, 709
4,10,16,22,28,34,40,46,52,58,64,70	BAA	159, 679, 905
5,11,17,23,29,35,41,47,53,59,65,71	AAB	679, 905, 159
6,12,18,24,30,36,42,48,54,60,66,72	ABA	679, 159, 905

16. All subjects tasted the same batches of samples in rooms in the Government Office between March and April 2024. Samples of the roughly the same size (enough for two bites) were served. The subjects were instructed to cleanse their palates with distilled water before and after each trial to prevent carryover taste. The subjects tasted the samples in the serving orders and were instructed to identify the odd sample and recorded their answers.

RESULTS AND DISCUSSIONS

Triangle test of shrimp siu mai (蝦肉燒賣)

17. In accordance with the design of the triangle test of the dim sum of both types, for 72 subject in the triangle test, the minimum number of correct response corresponding to the probability of 5% margins of error (i.e. confidence level of 95%) is 32.[8] It means that if 32 or more subjects correctly identify the odd samples, a significant difference exists between the standard and sodium-reduced dim sum samples at 5% significance level. Out of 72 subjects tasting on the samples of shrimp siu mai (蝦肉燒賣), only 15 subjects correctly identified the odd sample **(Table 4).** As the number of subject who could correctly identify the odd sample was fewer than 32, the result indicated that the sodium-reduced shrimp siu mai (蝦肉燒賣) was not significantly different from the standard one.

Triangle test of steamed pork ribs with black bean sauce (豉汁蒸排骨)

18. Regarding the tasting on the samples of steamed pork ribs with black bean sauce (豉汁蒸排骨), only 13 out of 72 subjects correctly identified the odd sample **(Table 4)**. Since the number of subject who could correctly identify the odd sample was fewer than 32, the result indicated that the sodium-reduced steamed pork ribs with black bean sauce (豉汁蒸排骨) was

not significantly different from the standard one at 5% significance level.

Table 4. Result of triangle test of shrimp siu mai (蝦肉燒賣) and steamed pork ribs with black bean sauce (豉汁蒸排骨)

Dim sum item	Triangle Test		Minimum numbers of correct response showing that a there is a significant difference between two samples at a confidence level of 95%
	Total number of subject	Number of subject identified the odd sample	
Shrimp siu mai (蝦肉燒賣)	72	15	32
Steamed pork ribs with black bean sauce (豉汁蒸排骨)	72	13	32

Sodium reduction in food

19. The WHO opines that reformulation of food products to contain less salt is among others one of the "Best Buy" intervention to reduce salt intake of the population.[9] The CFS has conducted studies on sodium content in different food products in Hong Kong. The study results showed that within the same type of food, the sodium content can vary widely.[10] Such phenomenon is observed in various food types, such as bread, soups, Hong Kong style savoury dishes, "Meal-on-One-Plate" and dim sum, reflecting the feasibility of the trade to reduce the sodium content in their food products.

20. The findings suggested that there is no perceptible sensory difference between the standard and the reformulated dim sum with 10-20% reduction in sodium content, reflecting the acceptability of consumers to such range of sodium reduction. In fact, previous studies in Australia[11] and the Netherlands[12] also showed that a gradual salt reduction in bread did not affect the consumers' choice.

Limitation of the study

21. Since only limited number of subjects were recruited for the tasting test and involved two types of dim sum, there is a limitation to generalise the study findings to all types of dim sum in our local population.

CONCLUSION AND RECOMMENDATIONS

22. The results of the study indicated that a 10-20% reduction of the sodium content in the dim sums concerned would not result in perceptible sensory difference, reflecting the acceptability of consumers to such range of sodium reduction and the feasibility of the trade to reduce the sodium content in dim sum.

Advice to the Trade

23. Members of the trade are advised to:

(a) Reduce the sodium content of food through product reformulation by making reference to the CFS' "Trade Guidelines for Reducing Sodium in Foods" (e.g. choose ingredients with lower sodium content, use natural ingredients for flavouring and marinating).

(b) Serve sauces in separate containers to allow consumers to add sauces based on their preference.

Advice to the Public

24. The public is advised to:

(a) Request the food to be served separately from sauces, and taste before dipping in sauces.

(b) Maintain a balanced diet with variety and accustom to milder taste by gradual cutback on salty food.

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