

Development of a method for controlling salt and sodium use during meal preparation for food services¹

Desenvolvimento de um método de controle de sal e sódio em unidades de alimentação e nutrição

Cristina Barbosa FRANTZ^{2,3}

Marcela Boro VEIROS²

Rossana Pacheco da Costa PROENÇA^{2,3}

Anete Araújo de SOUSA³

ABSTRACT

Objective

The study developed a method for controlling the amount of salt and sodium during food preparation, Controlling Salt and Sodium use During Meal Preparation for food services based on the Hazard Analysis and Critical Control Points principles.

Methods

The method was conceived and perfected during a study case in a commercial food service located in *Florianópolis, Santa Catarina, Brazil*. Data were collected from technical cards, recipes and measurements during food preparation. The preparations were monitored and compared with criteria about the use of salt and sodium found in the literature. Critical control points were identified and corrective measures were proposed.

Results

The result was a method consisting of 9 stages: (1) determination of the sodium content in the ingredients; (2 and 3) analysis of menu planning and sodium content; (4) follow-up of food preparation; (5) estimate of the

¹ Article developed as part of dissertation data CB FRANTZ, called "Desenvolvimento de um método de controle de sal e sódio na produção de refeições". Universidade Federal de Santa Catarina; 2011. Support: Programa de Pós-Graduação em Nutrição da Universidade Federal de Santa Catarina, Coordenação de Aperfeiçoamento de Pessoal de Nível Superior e Programa de Apoio ao Plano de Reestruturação e Expansão das Universidades Federais.

² Universidade Federal de Santa Catarina, Centro de Ciências da Saúde, Programa de Pós-Graduação em Nutrição. *Campus* Universitário, Trindade, 88040-900, Florianópolis, SC, Brasil. Correspondência para/Correspondence to: AA SOUSA. E-mail: <anete@ccs.ufsc.br>.

³ Universidade Federal de Santa Catarina, Departamento de Nutrição, Núcleo de Pesquisa de Nutrição em Produção de Refeições. Florianópolis, SC, Brasil.

amount of sodium used in the preparations; (6 and 7) selection and following of the preparations with average- and high-sodium content; (8) definition of the critical points and establishment of corrective actions for the use of salt and sodium; and (9) creation of recommendations for the use of salt and sodium.

Conclusion

The Controlling Salt and Sodium use During Meal Preparation may contribute to global discussions regarding the reduction of salt and sodium intakes and collaborate for the supply of nutritionally and sensorially appropriate meals with respect to salt and sodium content. It may also help to prevent non-communicable chronic diseases.

Indexing terms: Food service. Nutritional quality. Quality control. Restaurants. Salt. Sodium.

RESUMO

Objetivo

O estudo desenvolveu um método de Controle de Sal e Sódio na Produção de Refeições para o processo produtivo de refeições comerciais e coletivas, com base nos princípios do sistema de Análise de Perigos e Pontos Críticos de Controle.

Métodos

O método foi elaborado teoricamente e aperfeiçoado a partir de um estudo de caso realizado em uma unidade de alimentação e nutrição comercial em Florianópolis, Santa Catarina. Dados foram coletados durante o acompanhamento do processo produtivo de refeições, por meio de medições e registros. As operações foram monitoradas e comparadas com critérios sobre o uso de sal e sódio definido a partir da literatura científica.

Resultados

Com a análise das operações foi possível identificar pontos críticos e definir ações corretivas. Como resultado, desenvolveu-se um método composto de 9 etapas de aplicação: (1) levantamento do teor de sódio dos produtos adquiridos, (2 e 3) análise do planejamento e do teor de sódio do cardápio, (4) acompanhamento do fluxo produtivo, (5) estimativa da quantidade de sal utilizada nas preparações, (6 e 7) seleção e acompanhamento de preparações com médio/alto teor de sódio, (8) definição de pontos críticos e ações corretivas para o uso de sal e sódio e (9) elaboração de recomendações para o uso de sal e sódio.

Conclusão

O método de Controle de Sal e Sódio na Produção de Refeições pode contribuir nas discussões sobre as iniciativas mundiais de redução do consumo de sal e sódio, colaborando com a oferta de refeições nutricionais e sensorialmente adequadas com relação ao teor de sal e sódio, viabilizando ações de prevenção a doenças.

Termos de indexação: Unidade de alimentação e nutrição. Qualidade nutricional. Controle de qualidade. Restaurantes. Sal. Sódio.

INTRODUCTION

Kitchen salt is the main source of sodium in the human diet. One gram of sodium chloride corresponds to 17.1mmol or 393.4mg of sodium¹. Sodium is also naturally found in foods, water and food additives^{2,3}.

Although sodium is essential for maintaining vital functions, the amount needed by the human body to carry out its functions is small, roughly 184 to 230mg per day¹. According to the North American Institute of Medicine³, adequate intake for individuals aged 9 to 50 years

is 1500mg/day and the tolerable upper intake level is 2300mg/day.

People in many countries consume more than 2300mg of sodium per day, despite the recommendations⁴. In the United States of America (USA), New Zealand and Canada, for example, sodium intake exceeds 3400mg per day⁵⁻⁷. Sodium intake is estimated to be even higher in Brazil, roughly 4500mg/day⁸.

An increased supply of processed foods rich in fats, sugar and salt^{1,9,10} and the growing eating out trend¹⁰⁻¹² have been identified as two of the greatest causes of high sodium intake^{4,13,14}.

Some studies show that meals from restaurants, fast food establishments and cafeterias also contain high sodium content, often above the daily recommendation¹⁵⁻¹⁸.

These observations lead the World Health Organization (WHO) to hold a technical meeting in 2006 as part of the Global Strategy on Diet, Physical Activity and Health (DPAS) to discuss measures that promote the reduction of salt and sodium intakes globally. One of the strategies discussed by the WHO is the reformulation of meals and, for this end, the organization counts with the participation of restaurants and cafeterias^{1,19}.

Since then, some countries have taken action to reduce salt intake, such as Australia, Canada, Switzerland, Belgium and others. In Europe, Finland started taking measures in 1970^{1,13,20,21}.

Some measures that affect the out-of-home eating and processed food industries have already been taken, such as the Swiss Salt Strategy of 2008-2012, which set a goal of reducing the salt content of processed foods and away-from-home meals by 16% in four years²². In Canada, the Canadian Restaurant and Foodservices Association (CRFA) developed a guide for reducing the sodium content of the menus and, consequently, reduce the sodium intake of the population by 30% until 2016²³.

In Brazil, the General Coordination of Food and Nutrition Policy (CGPAN) is considering the development of a manual of good nutrition practices to help the out-of-home eating sector with the task of reducing the sodium content of the menu. Since Brazilians are eating out more and more often, this document is urgently needed if the intake goal of 5g/day recommended by the Food Guide for the Brazilian Population is to be achieved. In other words, the current intake needs to be halved^{24,25}.

Except for the Canadian guidelines²³, there are no papers in the scientific literature helping dietitians and cooks to reduce the amount of sodium and salt in meals. The documents found

on this theme were either written for the industry or contain general recommendations for the population.

Some quality control methods have been developed for the sector. The Hazard Analysis and Critical Control Points (HACCP) focuses on the production of safe foods from the sanitary viewpoint²⁶ and the Nutritional and Sensory Quality Analysis of Preparations (AQNS) focuses on nutritional and sensory aspects²⁷. There are other methods, such as the Assessment of the Gastronomic Heritage Quality (AQPG)²⁸ and the Trans Fat Control in Food Production (CGTR)²⁹.

The development of the AQNS, AQPG and CGTR was based on the HACCP - identification of critical points, creation of control measures and critical limits, manner of monitoring and implementation of corrective actions²⁷⁻²⁹.

Considering the HACCP principles and having the abovementioned quality control methods for food services as reference, this study aimed to develop a method to identify critical points of sodium and salt use. Hence, this study aims to aid food services to implement corrective actions during food preparation so that the foods are nutritionally and sensorially appropriate.

METHODS

The study is a qualitative research with a case study design. This proposal was constructed as the AQNS, AQPG and CGTR, as follows:

1. Identification, in the scientific literature, of the critical points of salt and sodium use during meal preparation, especially of dishes with moderate or high sodium contents;
2. Creation of a pilot method for systemizing the criteria for controlling salt and sodium, and selection of instruments for data collection (protocols);
3. Administration of the pilot method for meal preparation to a previously selected establishment;

4. Review of the pilot method after administration;

5. Preparation of recommendations for the administration of the new method.

Steps 1 and 2 led to the development of three analysis variables: (a) nutritional and sensory planning of the menus; (b) meal preparation process and (c) dish preparation process. These variables are described below:

(a) *Nutritional and sensory planning of the menus*: planning criteria (number of dishes containing salt, salt-based seasonings, commercial beef bases and meat tenderizers, and other moderate- and high-sodium ingredients); standardization (classification of the dishes into food groups or subgroups); standardized recipe cards (creation of standardized recipe cards listing amount of salt or reformulation of the existing cards); dish replacement scheme (having a list of replacements for planned or emergency replacements and criteria for the use of salt and/or moderate- and high-sodium products).

(b) *Meal preparation process*: supplier selection (determine the brands with the lowest sodium content and work with suppliers from those brands); food acquisition (verify the sodium content in products); receipt and storage (verify the sodium content in products, control the amount of high-salt/sodium foods sent to the food preparation area - salt, salt-based seasonings, processed sauces, commercial beef bases and meat tenderizers); pre-preparation and preparation (list seasoning products and methods for tenderizing and preparing meats and other dishes); meal decoration and distribution (list products used for decoration, replace dishes according to food group or subgroup and avoid replacing with dishes containing a higher sodium content, and make salt, grated parmesan cheese, sauces, seasonings and condiments readily available for the customers).

(c) *Dish preparation process*: identify ingredients with moderate and high sodium content, identify the preparation methods that can increase sodium content and control the

prescribed use of salt and the sodium content of the dish.

Sodium content was classified according to the criteria used by the United Kingdom's Food Standard Agency (FSA), which uses traffic lights on food labels to reflect sodium content. According to this classification system, foods with moderate sodium content are those with 100mg to 600mg of sodium (or 0.3g to 1.5g of salt) per 100g of food; foods with high sodium content are those with more than 600mg of sodium (or more than 1.5g of salt) per 100g of food³⁰.

The pilot method was used in a commercial food service located in *Florianópolis*, Brazil. Data were collected from May to June of 2010. The following criteria were used for selecting an establishment: it would have to serve at least one buffet meal (lunch or supper) and one small buffet meal (breakfast or afternoon snack) per day, from Monday to Friday; the person responsible for the establishment would need to agree to participate in the study and sign a free and informed consent form (in addition, the establishment would remain anonymous and the results would be disclosed to the person in charge); it would agree with a dietician's supervision, menu planning and use of standardized recipe cards. These instruments are essential for changing the use of salt and ingredients with high-sodium content during food preparation.

Data collection included the analysis of technical documents, direct observation and estimated salt use. The documents consisted of lunch menus, standardized recipe cards, list of dish replacements according to groups and/or subgroups and a manual of good practices.

The instruments used for direct observation were the three protocols. They were constructed with questions corresponding to previously determined indicators and a digital camera. A digital scale was used for estimating the amount of salt and quantifying the sodium content of the preparations. The scale (GURAL EGI-15, *São José dos Pinhais, Paraná*, Brazil) has a capacity of 15kg and an accuracy of 5g.

RESULTS

The technical cards and recipes of 1,260 preparations were analyzed. Of these, 294 were salads, 210 were cold side dishes, 588 were hot side dishes and 168 were meats. They corresponded to the menu of 42 days with 30 preparations per day. From this sample, 22 preparations with ingredients high in sodium were selected. The sodium content was determined by weighing these ingredients and getting the concentration from the nutritional facts table. For fresh ingredients, sodium content was taken from the Brazilian Food Composition Table (TACO)³¹. Preparations served daily were also followed to compare the amount of sodium added with the amount listed in the technical cards (white rice, whole rice, red sauce, white sauce and pasta). Hence, a total of 27 preparations were followed.

The amount of salt available during lunch was determined by estimating the amount of salt in all the foods served for lunch over three days. This was accomplished by weighing all dishes that listed salt in the ingredient list and the total salt used in their preparation. The total weight of the leftovers on the pass-through dishes and buffet table were deducted, as well as the salt they contained. The amount of salt contained in all the dishes served during lunch was transformed into a percentage by weight to facilitate comparison with the Food Standards Agency guidelines.

The amount of salt in food items boiled in salted water, such as pasta, was estimated according to Sánchez-Castillo & James³² who reported that these foods absorb roughly one-third of the salt added to the water.

The collected data were organized, described and systemized to improve the method and prepare the recommendations, including strategies, for use in food services.

In order to comply with ethical principles, the person in charge of the establishment was informed about the objectives of the study, promised anonymity and informed of the results of the study.

The method for Controlling Salt and Sodium use during Meal Preparation (CSMP) was structured in nine phases, as follows: (1) Determination of the sodium content of acquired food items; (2) Analysis of the menu planning criteria. (3) Analysis of the sodium content of the dishes; (4) Monitoring of the meal preparation process from supplier selection to distribution; (5) Estimate of the amount of salt used during preparation; (6) Listing of the dishes by group or subgroup according to their sodium content; (7) Monitoring of meal preparation; (8) Determination of the critical points and corrective actions for the use of salt and sodium during the different stages of meal preparation; (9) Preparation of recommendations for controlling the use of salt and sodium during meal preparation.

The first seven phases involve analyzing the amount of salt and sodium used during preparation and recording the information in forms. The eighth phase consists of analyzing the forms and identifying the critical points of salt and sodium use. The ninth step involves preparation of recommendations for controlling the use of salt and sodium.

In addition to forms, the CSMP method contains a glossary to help the understanding of each phase.

In order to clarify the use of the method, the results obtained in the study food service with the implementation of stage 5 (Table 1) are presented below.

The use of the seven first stages of the CSMP method in this unit contributed for the determination of possible critical points for the use of salt and sodium (Charts 1, 2 and 3).

After the identification of the critical points, the CSMP indicates the need of determining the strategies needed for implementing corrective actions. These strategies are called recommendations (stage 9) to operationalize corrective actions. For the study food service, the following recommendations were established:

Table 1. Estimate of the amount of salt used during three days, critical points identified during food preparation in the study food service and Controlling Salt and Sodium use During Meal Preparation actions. *Florianópolis (SC), Brazil, 2010.*

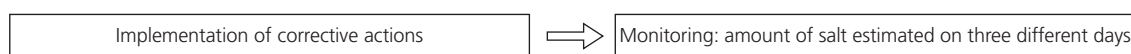
Amount of salt in 100g of the followed preparations (g):	Salt estimate for three days			Mean
	Day 1	Day 2	Day 3	
	1.01	0.65	0.83	0.83

On average, the food service uses a total of 0.83% (± 0.18) of salt in the preparations.

According to the United Kingdom classification⁽³⁰⁾ foods with low sodium content contain less than 0.3% of salt, so the average of the study food service is 277% higher than this amount.

Critical points referring to the production process

- No control when taking salt from the storage area to the preparation area;
- Absence of a standard utensil for adding salt to preparations;
- Technical cards and/or standard recipe not easily accessible;
- Absence of standard recipes for marinades;
- Preparation does not follow technical cards and/or standard recipes.

**Chart 1.** Critical points and corrective actions for the use of salt and sodium identified at the studied food service during the administration of phases 2 and 3 of the CSMP method. *Florianópolis (SC), Brazil, 2010.*

CSMP phases 2 and 3 - Menu planning and analysis	
Critical points	Corrective actions
Inexistence of standardized recipe cards for all the dishes preventing sodium content to be known.	Creation and implementation of standardized recipe cards.
No standardized recipe cards for meat marinades.	Creation and implementation of standardized recipe cards for marinades.
Moderate-and high-sodium ingredients used in various dishes on the same day.	Avoid the use of moderate- and high-sodium ingredients in various dishes on the same day; use fresh ingredients instead.
High percentage of dishes (41.2%) containing moderate-and high-sodium ingredients.	Gradually reduce the number of dishes containing moderate-and high-sodium ingredients.
No criterion for replacing dishes that takes sodium content into account.	Implement dish replacement criteria that take sodium content into account.

CSMP: Controlling Salt and Sodium use During Meal Preparation.

Menu planning:

- Standardize the menu by preparation group and/or subgroup.
- Include sodium content of the preparation in the standard recipe and/or technical card to facilitate menu planning.
- Reduce the number of preparations that use foods with average- and high-sodium content, always prefer fresh foods.
- Selection of suppliers, acquisition, receipt and storage;

- Specify food types according to the Quality and Identity Standard (PIQ) for sodium content during the selection of suppliers and food acquisition. The suppliers or manufacturers should be encouraged to sell and/or reduce the amount of sodium in their products and if this is not possible, the food service should find ways to replace these products, such as producing these items on site, such as condiment mixtures, for example.

Train the individuals in charge:

Chart 2. Critical points and corrective actions for the use of salt and sodium identified in the studied food service during the administration of phases 4 and 5 of the CSMP method. *Florianópolis (SC), Brazil, 2010.*

Phases 4 and 5 of the method: Preparation flow and the use of salt	
Supplier selection	
Critical points	Corrective actions
No low-sodium brands selected for the acquisition of products with lower sodium content.	Determine the brands with the lowest sodium contents for products with moderate and high sodium content.
Suppliers that carry the chosen brands were not selected.	Replace the current supplier by one that sells the chosen brands.
<i>Food Acquisition</i>	
No researching of food items to acquire those with lower sodium content.	Acquire food items with lower sodium content; Do not purchase processed meat tenderizers, beef bases and seasonings.
<i>Receipt of food items</i>	
Nutrition facts label not checked.	Check the sodium content in the nutrition facts label.
<i>Storage of food items</i>	
Products with moderate to high sodium content are sent to the food preparation area without any control.	Only allow the amounts of salt and moderate- and high-sodium products specified in the standardized recipe card to be sent to the food preparation area.
<i>Pre-preparation</i>	
No standardized recipe cards for marinades.	Create standardized recipe cards for marinades.
Location of the standardized recipe cards is inaccessible.	Make sure the standardized recipe cards are easily accessible.
- No use of a standard tool for adding salt.	Use a standard tool for adding salt.
<i>Preparation</i>	
No standard tool for adding salt.	Use a standard tool for adding salt.
Canned foods, pickles, sausages or salt-cured meats are not washed or desalted before use.	Wash or boil salt-cured or high-sodium ingredients before use.
Location of the standardized recipe cards is inaccessible.	Make sure the standardized recipe cards are easily accessible.
Standardized recipe cards are not followed during preparation.	Follow the standardized recipe cards.
<i>Decoration</i>	
Use of moderate to high-sodium processed products in decorations.	Replace moderate-and high-sodium products with fresh vegetables, fruits or herbs.
Allowing high-sodium and high-salt foods to be available to customers (salt, grated cheese, soy sauce, other sauces).	Avoid letting seasonings and sauces with average- or high-sodium content be available to customers and replace them with items with less salt, such as apple vinegar, lime, sauces with low-sodium content and olive oil, including those with added herbs.

CSMP: Controlling Salt and Sodium use During Meal Preparation.

Chart 3. Critical points and corrective actions for the use of salt and sodium identified in the studied food service during phases 6 and 7 of the CSMP method. *Florianópolis (SC), Brazil, 2010.*

Phases 6 and 7 of the method: selecting and monitoring the dishes	
Critical points	Corrective actions
Many dishes with moderate and high sodium content (above 100mg/100g of food).	Establish goals and experiment to reduce the sodium content of dishes gradually. Reformulate standardized recipe cards to reduce sodium content and implement them.

- During acquisition, by identifying the sodium content on the labels, and purchase items with preestablished PIQ.

- When receiving the items, identify the sodium content according to PIQ.

- When requesting items, verify the amount of salt and ingredients with average and high-sodium content according to the menu, technical cards and standard recipe.

- Control the amount of salt that leaves the storage area to the production area. Salt and processed items with average and high sodium content should be weighed and cleared to the production area only in the amounts recommended in the technical cards or standard recipe, according to shift (breakfast, lunch, supper).

Prepreparation and preparation

- Perform culinary tests to standardize the marinated recipes according to the meats menu in an attempt to reduce their salt content by replacing some of it with aromatic herbs and spices.

- Standardize the addition of salt according to the utensil and amounts specified in the technical card or standard recipe.

- Plan the addition of salt in preparations cooked in brine such as pasta, some vegetables and salad grains, considering that these foods absorb roughly one-third of the added salt.

- Revise the standard recipes and/or technical cards with gradual reduction of the sodium content by training the kitchen staff.

Distribution

- Implement replacement lists for preparations that contain high sodium content.

- Train the kitchen staff periodically on the groups and/or subgroups of preparations according to sodium content and correct ways of replacing them.

- Make planned replacements according to the replacement list (never choose preparations with more sodium than the original preparation).

- Supply information about the sodium content of the preparations (per portion or 100 grams of preparation) for the customers.

General recommendations for CSMP implementation

- Sensitize the kitchen staff to the importance of reducing and controlling the salt and sodium content during food preparation.

- Develop the kitchen staff skills: read and understand product labels to identify and classify sodium content; proper use of technical cards and standard recipes, replacement lists and standard utensils for the addition of salt to the preparations.

- Count on the professional in charge and kitchen staff for the implementation and management of CSMP. Note that to control the use of salt and sodium successfully, it is essential to involve the staff.

In addition to the use of forms during phases 1 to 8, the CSMP method recommends monitoring of the food service during the transition period. The continuous improvement of the establishment will require periodical reassessment of food preparation, for example, at every six months or as often as the manager sees fit, to make sure the kitchen staff complies with the recommendations.

Note that the method does not include customer Nutrition Education, since the approach used is for controlling the productive process of the food service to promote health. Its objective is to offer meals with controlled salt and sodium content and options with varied flavors.

DISCUSSION

Recommendations for reducing dietary salt and sodium consumption may be found in

guidelines and documents that cover health promotion and healthy eating^{1,24}. However, as mentioned earlier, documents that suggest procedures to control the use of salt and sodium in food services are scarce. The Canadian Guide²³ is an example of a document created for this sector. The guide recommends that to reduce the sodium content of the menu, the food service must first identify the sodium sources and uses in the menu; next, quantify the sodium content of the preparations; identify the preparations that need to reduce salt and sodium content; test and implement strategies to reduce salt and lastly, reassess the use of sodium.

There are similarities between the Canadian Guide and the CSMP, which may indicate congruence between the general recommendations and the advancement of the initiatives to reduce salt and sodium by this sector. However, although similar, the CSMP method is not based only on recommendations, since it proposes a way to operationalize the implementation of this control in the productive process regardless of the production volume. The CSMP is very important in mass cooking. Generally, greater volumes require changes in the way the foods are prepared, since they are not always prepared in the healthiest of ways.

For the Controlling Salt and Sodium use During Meal Preparation, menu planning is the starting point for reducing and controlling the amount of sodium in the preparations. Hence, if the amount of salt and sodium of the preparations is considered in menu planning, the subsequent procedures must respect the established logic. One way of including these criteria in this initial stage is through the identification of the ingredients high in sodium, always preferring fresh foods. Such choices are also suggested in the literature³³, as well as in the Canadian Guide. Examples of these practices include preferring fresh vegetables instead of canned vegetables and marinating meats with olive oil and fruit juices instead of ready sauces²³.

However, sometimes it is not possible to replace certain ingredients, for example, cheese

in lasagna. In this case, it is necessary to choose products very carefully. The CSMP method recommends checking the labels to compare the sodium content of different brands since sodium content may vary widely between brands^{9,15,25,34}.

The Controlling Salt and Sodium use During Meal Preparation is based on the daily intake recommendation given by the World Health Organization¹, which is 2000mg of sodium. For lunch, 1000mg of sodium was considered, that is, half of the daily allowance. According to Philippi³⁵, lunch is the main meal of the Brazilian population, representing roughly 35% of the daily energy intake. Bearing in mind that the estimate of the consumption of sodium by Brazilians is 4500mg⁸, the intake of 1000mg during lunch already represents a reduced intake.

To reach this goal, the lunch menu of the location where the CSMP will be used must be analyzed. In the case of the study food service, the menu consisted of the following groups of preparations: salads; rice/pasta; legumes; hot side dishes, such as pies, a preparation with vegetables or eggs; cold side dishes such as potatoes, pasta or grains served cold with some sauce; and meat. Salads were made without salt or ingredients with average- and high-sodium content, therefore they were not considered in the calculation of the sodium content of the meal.

Lunch in Brazil generally consists of rice and beans, meat, which is considered the main item in the meal, a side dish like potatoes, eggs or cooked vegetables served hot and a salad consisting of vegetables, served cold. These items compose a single dish which may or may not be followed by a dessert. This pattern is commonly found in the menus of companies, schools and hospitals³⁶.

To calculate the total sodium in the menu, five groups of preparations were considered, except salads. To reach 1000mg of sodium, each preparation must contain a maximum of 200mg of sodium per portion. Hence, preparations with amounts above this amount should be reformulated. Note that the value of 200mg of

sodium per preparation applies to the example of the study food service. Another amount may be established according to the characteristics of the menu of the food service where CSMP is implemented. Furthermore, the amount of 1000mg of sodium must be considered as an initial goal, and the unit may reduce it even further. However, the recommendation of the Worker's Food Program (PAT) is of 720 to 960mg of sodium per meal, whether lunch or supper³⁷.

The World Health Organization¹ recommends that the amount of sodium in dishes be reduced gradually to give customers a chance to adapt to the milder flavor. It takes an average of three months for the taste buds to adapt to the taste of low-sodium foods^{24,38,39}. According to the Canadian guide for the food industry, consumers will hardly notice a sodium reduction of 10% to 25%⁴⁰.

Because of this, the CSMP proposes a gradual reduction of the sodium content by performing culinary tests to maintain the sensory quality of the preparations. Note that the initial reduction should be of 10%.

Contrary to the CSMP method, the Canadian guide recommends that salt be reduced until an acceptable taste is achieved containing as little sodium as possible, reducing added salt slowly and gradually (5 to 10%) and subsequently submitting the dishes to consumer testing²³. This guide recommends the use of herbs and spices but does not specify a rate for salt reduction.

The literature lists a number of alternatives for reducing the amount of salt and sodium in dishes without compromising taste to any significant degree, such as: using herbs, spices, acid seasonings (lime, vinegar), bulbs (onion, garlic) and herbal salt, marinate and tenderize meats mechanically or enzymatically (papain or bromelain). It also recommends avoiding high-sodium products (ketchup, pepper sauce, chili powder, beef bases, barbecue bases, soy sauce and processed meat tenderizers); washing canned vegetables and pickles before use; use fresh foods or minimally processed foods^{2,41,42}. Therefore,

there are many alternatives for the use of salt and food services are free to choose which ingredients and amounts can be used for dish reformulation.

Some of the alternatives listed above are included in the corrective actions suggested by the CSMP method, for example, marinating meats, washing canned foods and pickles before use, abolishing the use of processed meat tenderizers and beef bases, and preferring fresh ingredients.

It should be emphasized that the construction of the CSMP was limited to a specific type of food service: commercial and self-service. For this reason, future studies should consider the possibility of broadening the use of CSMP by using tests that include differences according to service type.

CONCLUSION

The Controlling Salt and Sodium use During Meal Preparation is a tool created to help dietitians and cooks to control the use of salt and sodium and offer nutritionally and sensorially appropriate meals. It presents specific recommendations for the preparation of meals in each of its various stages with consequent impact on operationalization, regardless of production volume.

The Controlling Salt and Sodium use During Meal Preparation may contribute to the implementation of the global recommendations for the reduction of salt and sodium intakes. Furthermore, the method may serve as basis for the creation of booklets for reducing sodium by the food service sector, as done by the Canadian Guide, and culminate with the creation of good nutritional practices. Another important point is the need of discussing labeling systems of processed foods so that individuals may identify the sodium content clearly, facilitating the control of the use of these products in meal production.

CONTRIBUTORS

CB FRANTZ, AA SOUSA, MB VEIROS and RPC PROENÇA worked to conceive the project, develop a collection instrument, interpret data and write and review the article.

REFERENCES

- World Health Organization. Reducing salt intake in populations: report of a WHO Forum and Technical Meeting. 5-7 October 2006, Paris, France, 2007 [cited 2011 Nov 30]. Available from: <http://www.who.int/dietphysicalactivity/reducing_saltintake_EN.pdf>.
- Trading Standards Institute. The salt reduction toolkit, 2008. United Kingdom. [cited 2011 Nov 30]. Available from: <<http://www.tradingstandards.gov.uk/policy/policy-saltreductiontoolkit.cfm>>.
- Institute of Medicine. Dietary references intakes for water, potassium, sodium, chloride and sulfate. Washington (DC): The National Academies Press; 2005.
- Brown IJ, Tzoulaki I, Candeias V, Elliott P. Salt intakes around the world: implications for public health. *Int J Epidemiol*. 2009 [cited 2009 Apr 22]; 38(3): 791-813. Available from: <<http://www.ije.oxfordjournals.org>>. doi: 10.1093/ije/dyp139.
- Chisholm A, Mann J. Reducing salt intake: action beyond the label. *N Z Med J*. 2006 [cited 2009 Mar 10]; 119(1232):1-3. Available from: <<http://www.nzma.org.nz>>.
- Institute of Medicine. Strategies to reduce sodium intake in the United States. Washington (DC): National Academies Press; 2010 [cited 2011 Nov 30]. Available from: <<http://www.iom.edu/Reports/2010/Strategies-to-Reduce-Sodium-Intake-in-the-United-States.aspx>>.
- Canada. Sodium reduction strategy for Canada, Recommendations of the Sodium Working Group. Ontario: Minister of Health; 2010 [cited 2011 Nov 30]. Available from: <<http://www.healthcanada.gc.ca/sodium>>.
- Sarno F, Claro RM, Levy RB, Bandoni DH, Ferreira SRG, Monteiro CA. Estimativa de consumo de sódio pela população brasileira, 2002-2003. *Rev Saúde Pública*. 2009 [acesso 2009 ago 3]; 43(2):219-25. Disponível em: <<http://www.scielo.br>>. doi: 10.1590/S0034-89102009005000002.
- Brasil. Ministério da Saúde. Informe Técnico n. 42/2010. Perfil nutricional dos alimentos processados. 2010. Brasília: MS; 2010 [acesso 2011 nov 30]. Disponível em: <http://portal.anvisa.gov.br/wps/wcm/connect/c476ee0047457a6e86efd63fbc4c6735/INFORME+T%C3%89+CNICO+n++43+-+2010-+PERFIL+NUTRICIONAL+_2_.pdf?MOD=AJPERES>.
- Guthrie JF, Lin B, Frazao E. Role of food prepared away from home in the American diet, 1977-78 versus 1994-96: changes and consequences. *J Nutr Educ Behav*. 2002 [cited 2009 Mar 5]; 34(3):140-50. Available from: <<http://www.jneb.org>>.
- Briefel RR, Johnson CL. Secular trends in dietary intake in the United States. *Annu Rev Nutr*. 2004 [cited 2009 Jun 19]; 24:401-31. Available from: <<http://www.annualreviews.org>>. doi: 10.1146/annurev.nutr.23.011702.073349.
- Instituto Brasileiro de Geografia e Estatística. Pesquisa de orçamentos familiares 2008-2009. Rio de Janeiro: IBGE; 2010 [acesso 2011 nov 30]. Disponível em: <http://portal.saude.gov.br/portal/arquivos/pdf/pof_2008_2009_enca.pdf>.
- He FJ, MacGregor GA. Reducing population salt intake worldwide: from evidence to implementation. *Prog Cardiovasc Dis*. 2010 [cited 2011 Jan 20]; 52(5): 363-82. Available from: <<http://www.onlinepcd.com>>. doi: 10.1016/j.pcad.2009.12.006.
- Monteiro CA, Levy RB, Claro RM, Castro IRR de, Cannon G. Increasing consumption of ultra-processed foods and likely impact on human health: evidence from Brazil. *Public Health Nutr*. 2010 [cited 2011 Jan 20]; 14(1):5-13. Available from: <<http://www.journals.cambridge.org>>. doi: 10.1017/S1368980010003241.
- Jacobson MF, Emami J, Grasmick S. Salt assault: brand-name comparisons of processed food. Washington (DC): CSPI; 2005 [cited 2011 Nov 30]. Available from: <<http://www.cspinet.org/new/pdf/saltupdatedec08.pdf>>.
- Salas CKTS, Spinelli MGN, Kawashima LM, Ueda AM. Teores de sódio e lipídios em refeições almoço consumidas por trabalhadores de uma empresa do município de Suzano, SP. *Rev Nutr*. 2009 [acesso 2009 ago 15]; 22(3):331-9. Disponível em: <<http://www.scielo.br>>. doi: 10.1590/S1415-5273200900300003.
- Consensus Action on Salt and Health. Research reveals hidden salt content of popular restaurant meals. United Kingdom: CASH; 2009 [cited 2011 Nov 30]. Available from: <http://www.publicanalyst.com/CASH_SALT_media_release.pdf>.
- Johnson CM, Angell SY, Lederer A, Dumanovsky T, Huang C, Bassett MT, et al. Sodium content of

- lunchtime fast food purchases at major US chains. *Arch Intern Med.* 2010 [cited 2010 Nov 12]; 170(8): 732-4. Available from: <<http://www.archinte.jamanetwork.com>>.
19. World Health Organization. Global strategy on diet, physical activity and health: fifty-seventh World Health Assembly A57/9, 2004 Abr 17. Geneva: WHO; 2004 [cited 2011 Nov 30]. Available from: <<http://www.who.int/hpr/ga.all.docs.shtml>>.
 20. World Health Organization. Dropping the salt: practical steps countries are taking to prevent chronic non-communicable diseases through population-wide dietary salt reduction. Geneva: WHO; 2009 [cited 2011 Nov 30]. Available from: <<http://www.paho.org/English/AD/dpc/nc/salt-mtg-phac-paper.pdf>>.
 21. He FJ, MacGregor GA. A comprehensive review on salt and health and current experience of worldwide salt reduction programmes. *J Hum Hypertens.* 2009 [cited 2010 Jan 5]; 23(6):363-84. Available from: <<http://www.nature.com>>.
 22. Federal Office of Public Health. Salt strategy for 2008 - 2012: paper on a strategy for reducing salt consumption. Bern: FOPH; 2009 [cited 2011 Nov 30]. Available from: <http://www.bag.admin.ch/themen/ernaehrung_bewegung/05207/05216/index.html?lang=en>.
 23. DiFrancesco L. How to reduce sodium in menu items: a user's guide for foodservice operators. Toronto: CRFA; 2010 [cited 2011 Nov 30]. Available from: <http://www.crfa.ca/pdf/sodium_guide.pdf>.
 24. Brasil. Ministério da Saúde. Guia alimentar para a população brasileira: promovendo alimentação saudável. Brasília: MS; 2008 [acesso 2011 nov 30]. Disponível em: <http://bvsms.saude.gov.br/bvs/publicacoes/guia_alimentar_populacao_brasileira.pdf>.
 25. Brasil. I Seminário de Redução de Sódio nos Alimentos Processados. 2010. Organização Pan Americana da Saúde e Organização Mundial de Saúde [acesso 2011 nov 30]. Disponível em: <http://new.paho.org/bra/index.php?option=com_content&task=view&id=1359&Itemid=576>.
 26. Bryan FL. Hazard analysis and critical control point evaluations: a guide to identifying hazards and assessing risks associated with food preparation and storage. Geneva: WHO; 1982.
 27. Hering B, Proença RPC, Sousa AA, Veiros MB. Evaluation of nutritional and sensorial quality in meal production - NSQE system. *J Foodservice.* 2006 [cited 2009 Mar 2]; 17(4): 173-181. Available from: <<http://www.onlinelibrary.wiley.com>>. doi: 10.1111/j.1745-4506.2006.00033.x.
 28. Uggioni PL, Proença RPC, Zeni LAZR. Assessment of gastronomic heritage quality in traditional restaurants. *Rev Nutr.* 2010 [cited 2012 Jan 10]; 23(1):7-16. Available from: <<http://www.scielo.br>>. doi: 10.1590/S1415-52732010000100002.
 29. Hissanaga VM, Block JM, Proença RPC. Development of a method for controlling trans fatty acids in meals - MCTM. *J Culinary Sci Technol.* 2012 [cited 2012 Mar 20]; 10(1):1-18. Available from: <<http://www.tandfonline.com/loi/wcsc20>>. doi: 10.1080/15428052.2012.650601.
 30. United Kingdom. Food Standards Agency. Salt: the facts. 2009 [cited 2011 Nov 30]. Available from: <<http://www.eatwell.gov.uk/healthydiet/fss/salt/checkinglabelforsalt/>>.
 31. Universidade Estadual de Campinas. Núcleo de Estudos e Pesquisas em Alimentação. Tabela Brasileira de Composição de Alimentos - TACO: versão II. 2ª ed. Campinas: Unicamp; 2006.
 32. Sánchez-Castillo CP, James WP. Defining cooking salt intakes for patient counselling and policy making. *Arch Latinoamer Nutr.* 1995 [cited 2009 Jun 5]; 45(4):259-64. Available from: <<http://www.ncbi.nlm.nih.gov>>.
 33. Folsom AR, Parker ED, Harnack LJ. Degree of concordance with DASH diet guidelines and incidence of hypertension and fatal cardiovascular disease. *Am J Hypertension.* 2007 [cited 2012 Jul 10]; 20(3):225-32. Available from: <<http://www.ncbi.nlm.nih.gov>>. doi:10.1016/j.amjhyper.2006.09.003.
 34. Webster JL, Dunford EK, Neal BC. A systematic survey of the sodium contents of processed foods. *Am J Clin Nutr.* 2010 [cited 2010 Mar 20]; 91(2): 413-20. Available from: <<http://www.ajcn.org>>. doi: 10.3945/ajcn.2009.28688.
 35. Philippi ST. Pirâmide dos alimentos: fundamentos básicos da nutrição. São Paulo: Manole; 2008.
 36. Poulain J, Proença RPC. Reflexões metodológicas para o estudo das práticas alimentares. *Rev Nutr.* 2003 [acesso 2009 abr 24]; 16(4):365-86. Disponível em: <<http://www.scielo.br>>. doi: 10.1590/S1415-52732003000400001.
 37. Brasil. Portaria Interministerial nº 66, de 25 de agosto de 2006. Altera os parâmetros nutricionais do Programa de Alimentação do Trabalhador - PAT. Brasília: MTE [acesso 2011 nov 30]. Disponível em: <http://189.28.128.100/nutricao/docs/legislacao/portaria66_25_08_06.pdf>.
 38. Bertino M, Beauchamp GK, Engelman K. Long-term reduction in dietary sodium alters the taste of salt. *Am J Clin Nutr.* 1982 [cited 2009 Ago 5]; 36(6): 1134-44. Available from: <<http://www.ajcn.org>>.

39. Health.gov. Dietary guidelines for Americans 2005. Department of Health and Human Services, U. S. 2005 [cited 2011 Oct 10]. Available from: <<http://www.healthierus.gov/dietaryguidelines/>>.
40. Conseil de la Transformation Agroalimentaire et des produits de Consommation, CTAC. Reformulation of products to reduce sodium: salt reduction guide for the food industry. Saint-Lambert: Édikom; 2009. [cited 2011 Nov 30]. Available from: <<http://www.foodtechcanada.ca/siteimages/Salt%20reduction%20guide%20for%20the%20food%20industry.pdf>>.
41. Brinkman P, Syracuse CJ. Modifying a recipe to be healthier. Extension Fact Sheet. Family and Consumer Sciences. Columbus (OH): The Ohio State University Extension; 2006 [cited 2011 Nov 30]. Available from: <<http://ohioline.osu.edu/hyg-fact/5000/pdf/5543.pdf>>.
42. Harvard School of Public Health. Tasting success with cutting the salt. Boston (MA): HSPH; 2011 [cited 2011 Nov 30]. Available from: <<http://www.hsph.harvard.edu/nutritionsource/salt/tasting-success-with-cutting-salt/index.html>>.

Received on: 19/1/2012
Final version on: 6/9/2012
Approved on: 2/10/2012

