BC Centre for Disease Control
An agency of the Provincial Health Services Authority

Environmental Health Services

Food Issue

Notes from the Field

Risk assessment of raw cocoa/carob chocolate and powder sourced from commercial suppliers

Request received from:	Regional Health Authority
Date of request:	March 21, 2014
Issue (brief description):	Farmers' market applications request use of raw cocoa/carob ingredients into products with no further heat treatment

Disclaimer: The information provided in this document is based on the judgement of BCCDC's Environmental Health Services Food Safety Specialists and represents our knowledge at the time of the request.
It has not been peer-reviewed and is not comprehensive.

Summary of search information

1. Contact suppliers of raw products.
2. Consult TFM guidelines

Background information

The risks of cocoa and carob have been reviewed in previous assessments - *Salmonella* is the principle agent of concern. As this bacteria can persist in low water activity foods, the control step occurs during the roasting of the cocoa and carob nuts before grinding and further manufacture. Home manufacture of chocolate (roasting, conching etc.) is not recommended for foods prepared for sale in farmers' markets, and would be considered a high-risk activity.

Raw foods have no heating or control step to remove the likelihood of *Salmonella* occurring. The question being asked is, can foods be prepared using raw cocoa/carob ingredients if they are purchased from a commercial supplier that can provide a certificate of analysis (COA) certifying the product was tested (and found free of) coliforms, *E. coli* and *Salmonella* (see Appendix).

When one company was contacted (SunFoods), they stated that "the carob pod is air dried for no more than a few seconds, dependent upon the humidity, and the air temperature is between 122/140°F. The carob itself remains at a lower temperature than the air, it is not roasted or toasted". They are a secondary supplier of product sourced from Italy. They receive COA's from the company themselves as assurance that the product quality is good, and these can be supplied to clients on request.

It is well known that sampling is not a reliable predictor of contamination, if a given lot was only 1% defective, 299 samples would be required to detect contamination (see following table).

Number of sample units needed to detect one or more positive per lot [1]

Percent Positives	Number of Analytical Units to be Tested (n)		
% Positive	90% Confidence	95% Confidence	99% Confidence
100	3	4	4
10	23	30	46
1	230	299	461
0.1	2,303	2,996	4,605
0.01	2,3026	29,963	46,052

The product supplier does not employ any harvesting or processing method that addresses the risk of bacterial contamination. Testing product will not mitigate or remove the risk of potential contamination. From a hazard assessment viewpoint, therefore, raw cocoa and carob powders have higher risk.

In a farmers' market setting, the sale of foods prepared in homes was intended to only include foods that were not potentially hazardous. Potentially hazardous foods must be prepared in a commercial kitchen. Where foods are prepared in this case (with raw cocoa or carob) will not make any difference, as the risk is in the source ingredient. However, risk may be amplified in the handling and downstream preparation. The recipes supplied by the vendor (and EHO) include carob brownies, no-bake bars, and carob covered macaroons.

A brownie prepared with standard chocolate or carob (that has undergone roasting and heat treatment) would be assembled, baked and considered low-risk. Brownies are specifically listed in Appendix I as a lower risk food. The recipes for the raw products received are not baked, but appear to contain low moisture and are likely of low water activity. *Salmonella* would not be able to grow in foods with an A_w<0.85. Per the Temporary Food Market (TFM) Guidelines (Apr 2014) we expect vendors would have lab test results to support the food is lower risk (see quotation from TFM at right).[2]

> Lower risk foods: *Vendors of lower risk foods are not required to contact their local Health Authority or submit an application before commencement of sales. However, it is the vendor's responsibility to ensure that all lower risk foods meet the definition of a lower risk food, namely:*
>
> ✓ *a water activity (A_w) of 0.85 or less, or*
>
> ✓ *a pH (Hydrogen ion concentration) value of 4.6 or less*

However, the choice to eat raw foods is a personal one, and people knowingly accept these risks. This becomes an ethical argument, rather than a food safety argument. Consumer disclosure and labelling of raw food products could be recommended, but it is unlikely that consumers purchasing these products will understand what this risk means. To allow consumers to make an informed choice, we recommend the labelling is clear enough to impart the risk to the consumers groups of most concern (the young, elderly, pregnant women and those with immune-compromised conditions).

Applications for raw foods that meet the definition of non-PHF foods (A_w<0.85, pH≤4.6) should still be evaluated to ensure the overall process in the recipe does not amplify any potential risk resulting from

the ingredients. While the final test for water activity or pH may meet the definition of a low-risk food, should pathogens be amplified during the raw food preparation process, foodborne illnesses may result. For example, nuts soaked in water at room temperature for several hours may result in amplification of bacteria such as *Salmonella*, and while this bacteria may not amplify further in the finished food product, there is no control point in the process to provide an adequate log reduction in bacteria. Even dehydrated foods do not confer a sufficient log reduction in bacteria.[3] Therefore, every process step in the raw food application should be reviewed to ensure no amplification of potential hazards can occur.

The TFM guidelines do not specifically address raw foods or raw food ingredients. There are two options that could be recommended to update the TFM guidelines to address this concern.

Option 1: The last revision to the TFM guidelines included a statement about chocolate supply, "**chocolate** (provided it is used for re-melted or re-molded products only and (1) not purchased from bulk bins; (2) sourced from a chocolate manufacturer that can provide a certificate of assurance that chocolate is free from Salmonella)". We could address the concern of raw food ingredients by changing this to read **chocolate/carob or raw chocolate/raw carob** and allow non-PHF tested foods made with these ingredients to be listed as an Appendix I food.

Option 2: List raw foods under Appendix II – foods that are not acceptable for home preparation and sale at a temporary food market. We would recommend the listing have an asterisk indicating these foods MAY be acceptable if certain conditions are met. The conditions for raw food applications would be made available upon request and would include the following:

Each raw food application must be evaluated individually and include the following:

- Raw ingredients must be sourced from suppliers that can provide a COA that demonstrates all ingredients are free from pathogens of concern for that ingredient
- Raw ingredients must not be purchased from bulk bins
- Recipes including quantities and process steps must be written out. We recommend all applicants chart out the food flow in a diagram and create a food safety plan for food safety assessment.
- All process steps must be designed to limit amplification of potential bacterial hazards. Examples of process steps that increase likelihood of bacterial hazards multiplying in raw foods:
    - Soaking dry ingredients in water at temperatures above 4°C
    - Dehydrating raw food mixtures in the temperature danger zone: specifically between 4°C and 55°C
    - Not providing anaerobic conditions for lactic acid fermentation to occur properly

Recommendations from BCCDC

1. Raw carob and cocoa purchased from a commercial supplier may still be higher risk. We would find these ingredients acceptable for use in products if vendors provide a COA from their suppliers. As with lower risk foods, the vendor should ensure the recipes are not potentially hazardous and result in foods with a pH <4.6 or A_w<0.85.
2. Preparation of foods with raw carob and cocoa must be done with processes that minimize any amplification of existing hazards (e.g., *Salmonella*), and must be done in sanitary and hygienic conditions so that downstream contamination is minimized. This is important as there is no critical control point such as heating that eliminate bacterial hazards in these products or associated with the ingredients.
3. We would further recommend consumer disclosure to allow consumers to make an informed choice. Warnings could take the form of signage at the vendor table or labelling of the product with a warning. Warnings should impart the food risk and provide a food safety message, such as "this food was made with raw ingredients and may contain micro-organisms that can cause disease. It may not suitable be suitable for some ages, young children, pregnant women, the elderly or persons who are immune-compromised." We would also recommend the vendors make market managers aware of the labelling requirements for these products.
4. A guideline should be created to summarize the hazards and risk associated with raw food preparation processes. This would not need to be part of the TFM guidelines, but could be supplementary. Such as guideline would help explain the issues to vendors interested in preparing these foods. BCCDC may undertake preparing these guidelines in the future.
5. Amend the TFM guidelines to include raw foods as one of the options above. We would recommend Option 2 be considered.

References

1. Jeffrey LK, Joshua BG. Incidence and control of *Listeria* in food processing facilities. In: Ryser ET, Marth EH, editors. *Listeria*, listeriosis and food safety. Boca Raton, FL: CRC Press; 2007. p. 617-53.
2. B.C. Centre for Disease Control, B.C. Ministry of Health, Five Regional Health Authorities. Guideline for the Sale of Foods at Temporary Food Markets. Vancouver: BCCDC; 2014.
3. Sunkara M. Growth inhibition challenge study for raw food diet cracker recipe. Burnaby, BC: British Columbia Institute of Technology; 2012.

Appendix: Certificate of Analysis provided by raw carob supplier (Sunfood)

DATE
CUST ID
INV #
ORD #
LOT #
MFRG
EXP

Sunfood SUPER FOODS

Certificate of Analysis & Technical Data Sheet

PRODUCT Carob Powder, Organic, Raw
SKU #
SHELF LIFE 2 Years

ANALYSIS	SPECIFICATION/RESULTS	
Botanical Name	Ceratonia siliqua	
Origin	Italy	
Parts Used	Carob (Fruit) Pods	
Product Name	Carob Powder	
Solubility	Partially Soluable	
Presentation	Hygroscopic Powder	
PHYSICAL & CHEMICAL CHARACTERIZATION I		
Color	Brown / Light Coco	
Odor	Characteristic	
Taste	Characteristic	
Aspect/Appearance	Hygroscopic Powder (Fine)	
Added Ingredients	None	
PHYSICAL & CHEMICAL CHARACTERIZATION II		
pH	Conform	5.5
GMO Status	GMO FREE	Free from GMO's
Granulometry	80 Mesh	Conform
PHYSICAL & CHEMICAL CHARACTERIZATION III		
Moisture	%	2.6
Ash	%	2.9
Protein	%	3.8
Fat	g/100g	1
Saturated Fat	%	0
Trans Fat	%	0
Total Carbohydrates	g/100g	89
Dietary Fiber	%	159
Total Sugars	g/100g	49
PHYSICAL & CHEMICAL CHARACTERIZATION IV		
Organochlorine Pesticides	%	ND
Organophorphorrus Pesticides	%	ND
PHYSICAL & CHEMICAL CHARACTERIZATION V		
Total Plate Count	840	cfu / 1g
Mold	240	cfu / 1g
Yeast	< 20	cfu / 1g
Total Coliform	Negative	/ 1g
E. Coli	Negative	/ 1g
Salmonella	Negative	/ 25g
TOXICOLOGICAL ANALYSIS VI		
Aflatoxins	Negative / 50g	
VITAMINERAL ATTRIBUTES VII		
Vitamin A	IU	14
Vitamin C	mg/100g	0.2
Calcium	mg/100g	348
Iron	mg/100g	2.94
Potassium	mg/100g	827
Magnesium	mg/100g	54
PURPOSES VII		
Food Industry	Food / Food Consumption	
CHARACTERISTICS IX		
Please see FALCPA Annex for allergen information. Vitamineral & Nutritional Analysis available upon request. Individual TDS per Lot # updated for client based on Shipment		

**ND: Not Detected **TBD: To Be Determined based on Shipment Request