Study of the Sale and Consumption of Banh Chung, Banh Tet, and Moon Cakes

Report to the Legislature
The Asian Traditional Food Act
AB 2214, Chapter 610, Statutes of 2006

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BACKGROUND

Assembly Bill (AB) 2214 (Tran, Chapter 610, Statutes of 2006) directed the California Department of Public Health (CDPH) to conduct a study of the sale and consumption of three traditional Asian foods: Banh Tet, Banh Chung, and Moon Cakes. These three products, traditionally consumed at cultural events and during traditional ceremonies, have been produced and consumed in varying forms. Based on information obtained from the community, the products are traditionally held and consumed at room temperature for varying time periods. Enforcement actions by local jurisdictions to require refrigeration of these products under existing law (Health and Safety [H&S] Code, Section 113871 et seq.) resulted in complaints from the manufacturers and community that the products are unpalatable when refrigerated.

The Asian Traditional Food Act requires CDPH to determine if the products could be safely held at room temperature for a period of time greater than four hours, so that operators would not be required to discard the products at the end of the four hour period, as required by existing law.

EXISTING LAW

The H&S Code states that foods capable of supporting the growth of infectious or toxigenic microorganisms (potentially hazardous foods) meet specific temperature control requirements to ensure safety. Specifically, H&S Code Section 113871 defines a potentially hazardous food as a food that is natural or synthetic and requires temperature control because it is in a form capable of supporting the rapid and progressive growth of infectious or toxigenic micro-organisms. This definition also includes foods of animal origin that are raw or heat-treated, a food of plant origin that is heat-treated or consists of raw seed sprouts, cut melons, and garlic-in-oil mixtures that are not acidified or otherwise modified at a food processing plant to reduce or eliminate the growth of pathogenic organisms.

The law also provides for exclusion of foods from a classification of potentially hazardous if it has been shown by appropriate microbial challenge studies not to support the rapid and progressive growth of infectious or toxigenic micro-organisms. For example, foods that have a water activity of 0.85 or less, a pH that is below 4.60, or other barriers or combination of barriers that inhibit the growth of micro-organisms could be excluded from this classification after a review of the scientific information provided by the firm or industry.

H&S Code Section 113996 provides that potentially hazardous food shall be maintained at or above 135°F, or at or below 41°F except during preparation, cooking, cooling, or transporting to or from a retail food facility for a period of less than 30 minutes. H&S Code Section 114000 further provides that potentially hazardous foods shall be cooked and served, served if ready-to-eat, or discarded

within four hours from the time when the food is removed from temperature control.

Statutory language for the H&S Code sections identified above is attached.

STUDY

Each year, new and modified food products are developed in the United States, with many of these meeting the statutory definition of potentially hazardous. Clearly, no regulatory agency has the resources to conduct necessary safety studies on these products to be exempted from time and/or temperature controls enacted to reduce the risk to consumers. Additionally, anecdotal reports that "these products have not been associated with an outbreak" are not sufficient to bypass existing scientifically-based requirements. These safety studies for exemptions of time and temperature controls are the responsibility of the manufacturers. Numerous private, academic laboratories exist to provide these services. CDPH and the U.S. Food and Drug Administration review the challenge studies and laboratory data submitted by individual firms as objective, science-based supportive arguments for exemptions to food safety requirements. CDPH evaluates the study parameters and methods and reviews the analytical findings to determine whether or not the procedures utilized are acceptable and whether or not the findings support the product being excluded from classification as a potentially hazardous food.

Following the passage of AB 2214, CDPH contacted the University of California Laboratory for Research in Food Preservation (UCLRFP), and requested they evaluate Banh Chung, Banh Tet, and Moon Cakes to determine whether or not they could safely be held and consumed at room temperature for a period of time greater than four hours.

Because microbial challenge studies would have required significant resources to complete and no funding was provided to support this study, UCLRFP staff monitored and recorded data during actual processing and used established microbiological models to estimate the ability of selected pathogens and toxins to survive or grow in these products. The firms that volunteered were contacted and arrangements were made to observe Banh Chung and Moon Cakes during production, and monitor the thermal treatment received by the products.

CDPH worked with Assemblyman Tran's office to identify producers of the three products who would be willing to 1) provide information about the preparation and processing of the products, and 2) provide product samples that could be analyzed. Numerous contacts with the industry were made to solicit their cooperation. However, only a few firms agreed to cooperate, and none of the firms that ultimately participated in the study produced Banh Tet. As a result, CDPH could not conduct the study on Banh Tet due to the lack of information regarding the preparation of the product.

The findings from UCLRFP are attached.

SUMMARY OF FINDINGS

Banh Chung

There are two commonly used processes for the production of Banh Chung, one using immersion in boiling water and another using a steam cooker. Both processes were evaluated. Results from the study suggest that Banh Chung produced by immersing wrapped products in a boiling water bath for a period of ten hours would likely destroy all vegetative pathogens and a large population of *C. botulinum*. If the product is produced under the above conditions, is packaged securely, and is not recontaminated during cooling, packaging, and distributing, these results suggest that the product could be held safely at room temperature (70°F) for a maximum of 48 hours. Once the package is opened and subject to recontamination, or if the product is held at higher temperatures, the product would require refrigeration or must be discarded as required under existing law.

The results of this study suggest that the Banh Chung processing method utilizing an atmospheric steam cooker was not adequate to destroy *C. botulinum*. Banh Chung produced in this manner would be considered a potentially hazardous food and must follow current statutory requirements for time and temperature control.

Moon Cakes

Moon Cakes are commonly produced with a variety of fillings that vary in water activity. Moon Cakes with four different fillings were evaluated utilizing the common practice of baking the product for at least 28 minutes at 400°F.

Results of this study suggest that baking Moon Cakes at this time and temperature does not generate sufficient heat to destroy *C. botulinum* spores. The effectiveness of the heat process on vegetative pathogens is reduced because of the lower water activity of the filling. Because of the low water activity in the product, *C. botulinum* will likely not grow. *Staphylococcus* is capable of growing at these low water activities, however, production of toxin is reduced at these water activities.

The laboratory determined that Moon Cakes could be held at room temperature (70°F) for a maximum of 48 hours if they are produced under sanitary conditions and are not recontaminated after removal from the oven. At the end of the 48 hours, or if the products are held at temperatures higher than 70°F, the product must either be refrigerated or discarded.

CONCLUSION/RECOMMENDATION

Microbial challenge studies, using accepted industry and academic methods to introduce likely pathogens onto foods and monitor their ability to survive, grow, and/or produce toxins at several points in time, are considered the gold standard for assessing whether food products are classified as a potentially hazardous food. The models used in this study are considered generally reliable indicators, but are not as definitive as well designed and implemented microbial challenge studies.

Laboratory challenge studies on the Banh Chung and Banh Tet products and other similar products were authorized by the Orange County Environmental Health Agency and were completed by the National Food Laboratory in 2004. The findings from this study revealed that these types of products were capable of supporting the growth of pathogenic organisms. However, specific times, temperatures, processing steps, and interim results from these challenge studies were not provided in reports available to the Department.

Bahn Chung

Although the findings in the UCLRFP study suggest that under certain conditions and processing steps Bahn Chung could be consumed with minimal risk after 48 hours at 70°F, many situations in which these products are sold (religious festivals, cultural fairs) are not limited to 70°F. Frequently, ambient temperatures in California can exceed 90°F for extended periods of time. Additionally, these temporary events pose unique challenges in ensuring no contamination after cooling, packaging, shipment, and distribution and pose similar challenges in ensuring time tracking and proper disposal of products after certain time periods.

The processing and handling conditions that must occur so the product can reasonably be held at ambient temperatures for up to 48 hours will likely prove too elusive to practically implement. For example, it will not be possible for regulatory staff to confirm or determine if Banh Chung products have been subjected to ten hours of boiling or whether a shorter time period was used given the current equipment and methods used by the industry. Additionally, maintaining the facilities in a sanitary condition and handling the products aseptically after processing will likely be elusive in many facilities. Without the ability to confirm critical parameters are met, CDPH recommends that Banh Chung not be excluded from being considered a potentially hazardous food.

Moon Cakes

The UCLRFP study on Moon Cakes found that the water activity of the fillings was below 0.85. Foods with water activities of 0.85 or less are exempted from being considered a potentially hazardous food and, thus, not subject to temperature controls. Because the preparation and ingredients of these products

varies from manufacturer to manufacturer, CDPH recommends that any facility storing Moon Cakes outside of temperature control should periodically submit each variety of Moon Cakes to a private laboratory for a water activity evaluation, and maintain and follow a thoroughly documented standard operating procedure (SOP) with specific ingredients, amounts, times, and temperatures for each step in the process. Water activity evaluations are relatively inexpensive and will provide presumptive evidence that the products are not potentially hazardous foods.

HEALTH AND SAFETY (H&S) CODE

H&S Code Section 113871 (a) "Potentially hazardous food" means a food that is natural or synthetic and that requires temperature control because it is in a form capable of supporting the rapid and progressive growth of infectious or toxigenic micro-organisms, the growth and toxin production of Clostridium botulinum, or, in raw shell eggs, the growth of salmonella enteritidis.

(b) "Potentially hazardous food" includes a food of animal origin that is raw or heat-treated, a food of plant origin that is heat-treated or consists of raw seed sprouts, cut melons, and garlic-in-oil mixtures that are not acidified or otherwise modified at a food processing plant in a way that results in mixtures that do not support growth as specified under subdivision (a).

(c) "Potentially hazardous food" does not include any of the following:

(1) A food with an aw value of 0.85 or less.

(2) A food with a pH level of 4.6 or below when measured at 75°F.

(3) A shell egg that is not hard-boiled but has been treated to destroy all viable salmonellae.

(4) A food in an unopened, hermetically sealed container that is commercially processed to achieve and maintain commercial sterility under conditions of nonrefrigerated storage and distribution.

(5) A food that has been shown by appropriate microbial challenge studies approved by the enforcement agency not to support the rapid and progressive growth of infectious or toxigenic micro-organisms that may cause food infections or food intoxications, or the growth and toxin production of Clostridium botulinum, such as a food that has an aw and a pH that are above the levels specified under paragraphs (1) and (2) and that may contain a preservative, other barrier to the growth of micro-organisms, or a combination of barriers that inhibit the growth of micro-organisms.

(6) A food that does not support the rapid and progressive growth of infectious or toxigenic micro-organisms, even though the food may contain an infectious or toxigenic micro-organism or chemical or physical contaminant at a level sufficient to cause illness.

H&S Code Section 113996 (a) Except during preparation, cooking, cooling, transportation to or from a retail food facility for a period of less than 30 minutes, or when time is used as the public health control as specified under Section 114000, or as otherwise provided in this section, potentially hazardous food shall be maintained at or above 135°F, or at or below 41°F.

(b) Roasts cooked to a temperature and for a time specified in subdivision (b) of Section 114004 may be held at a temperature of 130°F.

(c) The following foods may be held at or below 45°F:

(1) Raw shell eggs.

(2) Unshucked live molluscan shellfish.

(3) Pasteurized milk and pasteurized milk products in original, sealed containers.

(4) Potentially hazardous foods held for dispensing in serving lines and salad bars during periods not to exceed 12 hours in any 24-hour period or held in vending machines. For purposes of this subdivision, a display case shall not be deemed to be a serving line.

(5) Potentially hazardous foods held for sampling at a certified farmers' market.

(6) Potentially hazardous foods held during transportation.

H&S Code Section 114000 (a) Except as specified in subdivision (b), if time only, rather than time in conjunction with temperature, is used as the public health control for a working supply of potentially hazardous food before cooking or for ready-to-eat potentially hazardous food that is displayed or held for service for immediate consumption, the following shall occur:

(1) The food shall be marked or otherwise identified to indicate the time that is four hours past the point in time when the food is removed from temperature control.

(2) The food shall be cooked and served, served if ready-to-eat, or discarded within four hours from the point in time when the food is removed from temperature control.

(3) The food in unmarked containers or packages or marked to exceed a four-hour limit shall be discarded.

(4) Written procedures shall be maintained in the food facility and made available to the enforcement agency upon request, that ensure compliance with this section and Section 114002, for food that is prepared, cooked, and refrigerated before time is used as a public health control.

(b) Time only, rather than time in conjunction with temperature, may not be used as the public health control for raw eggs in the following food facilities:

(1) Licensed health care facilities.

(2) Public and private school cafeterias.

Assembly Bill 2214, Chapter 610, Statutes of 2006

INTRODUCED BY: Assembly Member Tran
(Coauthor: Assembly Member Daucher)

LEGISLATIVE COUNSEL'S DIGEST

AB 2214, Tran, Asian food: study.

Existing law, the California Uniform Retail Food Facilities Law (CURFFL), provides for the regulation of health and sanitation standards for retail food facilities by the State Department of Health Services, and is primarily enforced by local health agencies.

Existing law also contains various provisions governing food labeling and safety. This bill would require the department to conduct a study in connection with these standards and their effect on the sale and consumption of specified food at traditional Asian ceremonies and cultural events. This bill would require the department to present its findings to the Legislature no later than January 1, 2008.

THE PEOPLE OF THE STATE OF CALIFORNIA DO ENACT AS FOLLOWS:

SECTION 1. This act shall be known and may be cited as the Asian Traditional Food Act.

SECTION 2. (a) The Legislature finds and declares both of the following:

(1) Given the rich heritage and traditions of Asian-Americans, a process must be considered to allow for foods tied to traditional Asian ceremonies to be sold and consumed according to those traditions.

(2) Requiring food retailers to follow health and sanitation standards is necessary to preserve public health.

(b) (1) The State Department of Health Services shall conduct a study of the sale and consumption of Banh Chung, Banh Tet, and moon cakes, as a means of finding methods that may permit the sale and consumption of these foods at traditional Asian ceremonies and cultural events while providing adequate health and sanitation standards that protect public health.

(2) The department shall submit this study to the Legislature no later than January 1, 2008.

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THERMAL PROCESSING OF TRADITIONAL ASIAN FOODS

UNIVERSITY OF CALIFORNIA LABORATORY
FOR
RESEARCH IN FOOD PRESERVATION
(UCLRFP)

JANUARY 9, 2008

Prepared by:
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ABSTRACT

The University of California Laboratory for Research in Food Preservation (UCLRFP) was requested to review the processing procedures of two products, Banh Chung and Moon Cakes to evaluate the ability of these products to be produced for sale and consumption at room temperature (70°F) while still maintaining public health and safety.

UCLRFP evaluated two currently used procedures for cooking the Banh Chung. The traditional method of cooking in a boiling water bath provides the ability to make a product which can be held for sale for a period of time at room temperature under specified conditions, provided that the product was not frozen or refrigerated at the initiation of the thermal process, and was processed in boiling water for a period of at least 10 hours. This process yielded a product that if not re-contaminated during post process handling could be held for a period of 48 hours outside of refrigeration, provided that it is promptly refrigerated after opening. The second process, which involved an atmospheric steam cooker did not yield results that would allow the product to be safely stored outside of refrigerated temperatures.

Moon Cakes can be produced with a variety of different low water activity fillings. These products can also be held for sale at room temperature (70°F) for a period of 48 hours provided that the product is processed in an oven preheated to 400°F and cooked for at least 28 minutes is not re-contaminated during post-process handling, and the moon cake fillings have a low water activity.

BACKGROUND

UCLRFP was requested by the State Department of Public Health, Food and Drug Branch to assist them in the evaluation of two traditional Asian foods (Banh Chung and Moon Cakes) as required under AB 2214, authored by Assembly member Tran. The Department has been tasked to determine a means by which these traditional foods could be sold and consumed while protecting the public health. UCLRFP evaluated the processing methods utilized by three facilities which produce these traditional Asian foods.

Banh Chung I

Procedures:

The first product evaluated was Banh Chung, produced at two different facilities. At the first facility, the product was cooked in a boiling water bath. Photographs showing the preparation steps of this product are shown in Attachment #1. The boiling water bath was held in a stainless steel tank about 2 feet high and 18 inches wide. The bath was loosely covered with a metal lid.

UCLRFP staff utilized 13 Ellab mini data loggers to monitor temperature in the product and in the water bath. The Ellab mini data loggers contain a temperature sensing element and a microprocessor that stores data during the test. UCLRFP staff utilized an Ellab reader to start the loggers before a test and then used the Ellab reader to download the data to a Dell laptop computer. UCLRFP staff then utilized the Ellab process evaluation software to analyze the data collected for probes outside product (temperature distribution) and for probes inside the product (heat penetration).

Two (2) data loggers were used to monitor the water bath temperature and the remaining eleven (11) data loggers were used to measure the rate of heat penetration into the product. The loggers were inserted to measure the center of the product into a chunk of meat. All product is fully immersed in the boiling water during the process. The product is packed six packages across a row with three rows per layer. There are 18 packages per layer. There is a maximum of 2 layers processed at any one time. The product at the start of the process had a minimum initial temperature of 56°F. The product is processed in boiling water for at least 10 hours. The water bath takes about 30 minutes after the start of the process to begin to boil. At the end of the cooking time, the heat was turned off and the product was cooled in the cooking water. When the product was cool enough to handle, they were removed from the hot water and air cooled.

Results:

The different layers of the cooked product were tested to determine water activity, pH and salt concentration. These results are shown in Table 1. Based on these the results, the product is a low acid food and is capable of supporting the growth of organisms of health significance. Photographs showing the appearance of raw and cooked product are shown in Attachment #2.

Table 1: Analyses of Cooked Product (Bahn Chung I)

Layer	Aw	pH	% NaCl
Rice	0.987 @ 23.1°C	6.23	0.763
Beans	0.985 @ 23.7°C	6.27	0.739
Meat	0.986 @ 25.1°C	6.28	1.061

Conclusion:
Based on the heat penetration data, the product received a minimum F_0 = 2.03 minutes. The process gave the equivalent process of 2.03 minutes at 250°F. This process would give more than an 8 log reduction of *C. botulinum*.

Bahn Chung II

Procedures:
At the second facility Bahn Chung is processed in an atmospheric steam cooker. The cooker is approximately 40 inches high, 30 inches wide and 22 inches deep. The cooker holds 7 trays and the trays hold 6 or 9 cakes per tray. There is a dial thermometer located in the door of the cooker. Laboratory personnel used 4 thermocouples to monitor the steam temperature in the cooker and 9 thermocouples were placed in the center of the cake and distributed in various trays inside the cooker. This product is placed in the freezer and is frozen until it is ready to be processed. The frozen product is placed directly in the steamer and the process is initiated. The lowest initial product temperature was 24°F. The product was cooked for at least 4 hours. Once started, the steamer takes about 10 minutes to come up to temperature. The dial thermometer in the door did not accurately track temperatures. When the cooking time was completed the heat was turned off, the trays removed from the cooker and the product was air cooled.

Results:
The different layers of the cooked product were tested to determine water activity, pH and salt concentration. These results are shown in Table 2. Based on these the results, the product is a low acid food and is capable of supporting the growth of organisms of health significance.

Table 2: Analyses of Cooked Product (Bahn Chung II)

Layer	Aw	pH	% NaCl
Rice	0.988 @ 24.4°C	6.18	0.479
Beans	0.984 @ 22.7°C	6.34	0.684
Meat	0.988 @ 24.5°C	6.34	0.714

Conclusion:
Based on the heat penetration data, the product received a minimum F_0 = 0.33 minutes. The process gave the equivalent process of 0.33 minutes at 250°F. This process would give a little more than one log reduction of *C. botulinum*.

Discussion:
Of the two processes studied, the first process in the boiling water bath provides a process, which would destroy all vegetative pathogens and a large population of *C. botulinum*. If the product was packaged securely and the product was not re-contaminated during cooling, packaging and distribution, this product could be held safely at room temperature (70°F) for up to 48 hours. Once the package is opened and subject to recontamination, it should be refrigerated. The second processing procedure would destroy all vegetative pathogens and a very small population

of *C. botulinum*. This product is potentially more hazardous than the first since it has not received as significant of a thermal process. This product should be handled as a potentially hazardous food and should only be sold as a refrigerated food.

Moon Cakes

Procedures:
The second product studied was Moon Cakes. The product was processed in a Baxter Convection Oven. Moon Cakes with different fillings were produced, with and without salted egg yolks. The fillings were mung bean paste, lotus bean paste, nut mix with pork sausage and nut mix with pork sausage and ham. Two temperature sensing elements were placed in the oven. Eight temperature sensing probes were placed in Moon Cakes with egg yolks and 8 temperature sensing probes were placed in Moon Cakes without egg yolks. The sensing element was inserted into the filling, not into the egg yolk. The oven was preheated to 400°F. The Moon Cakes were placed in four trays, one for each filling, and were placed in the oven. Each tray contained the filling with egg yolk and without. The product was placed in the oven and baking began. About 8 minutes into the process the layers were pulled to put egg wash on the top of the cakes. The layers were pushed back into the oven until baking was completed (about 28 minutes from the start of baking). The trays were removed from the oven and allowed to air cool.

Results:
Based on the heat penetration data, the product received a minimum $F_{185} = 22$ minutes. In other words, the baking process gave the product a process equivalent to 22 minutes at 185°F.

Representative samples were tested in the laboratory for pH, water activity and salt concentrations. Photographs showing the appearance of raw and cooked product are shown in Attachment #3. We were only able to measure salt concentration on two of the fillings, and these values ranged between 0.1591 and 0.2830. These values are insufficient to inhibit growth of *C. botulinum*. The remaining results are summarized in Table 3. In addition, the Food and Drug Laboratory (Richmond) conducted water activity tests on similar samples and their results are summarized in Table 4.

Table 3: Summary of Results for Fillings of Moon Cakes

Filling Description	pH Range	Aw Range
Mung Bean Paste	6.33-6.40	0.836-0.849
Lotus Bean Paste	6.41-6.43	0.874-0.891
Nut Mix with Pork Sausage	5.06-5.52	0.635-0.733
Nut Mix with Pork Sausage and Ham	4.94-5.14	0.675-0.728

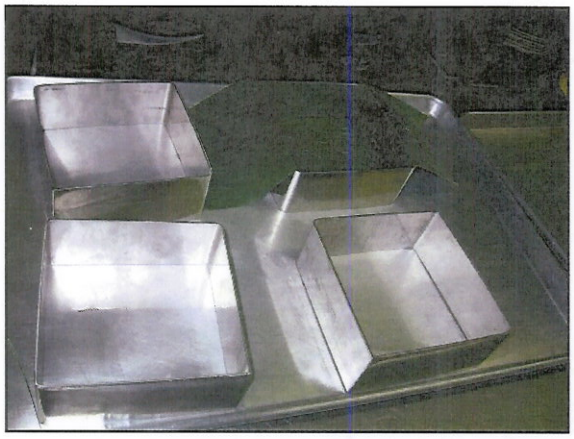
Table 4: Summary of Results of Water Activity Testing of Moon Cake Filling

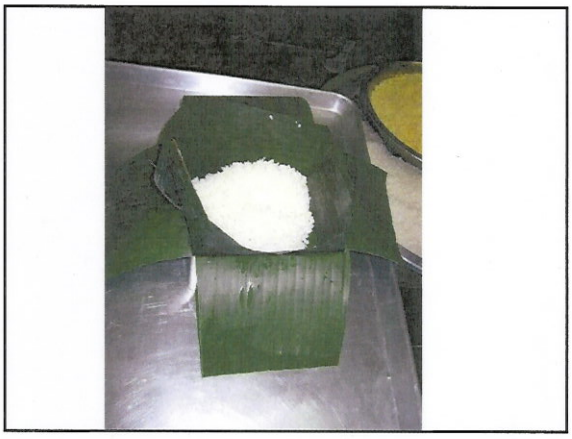
Filling Description	Aw Range
Mung Bean Paste	0.747-0.766
Mung Bean Paste with egg	0.794-0.810
Lotus Bean Paste	0.762-0.811
Lotus Bean Paste with egg	0.790-0.822
Nut Mix with Pork Sausage	0.628-0.660
Nut Mix with Pork Sausage with egg	0.658-0.666
Nut Mix with Pork Sausage and Ham	0.624-0.655
Nut Mix with Pork Sausage and Ham with egg	0.640-0.664

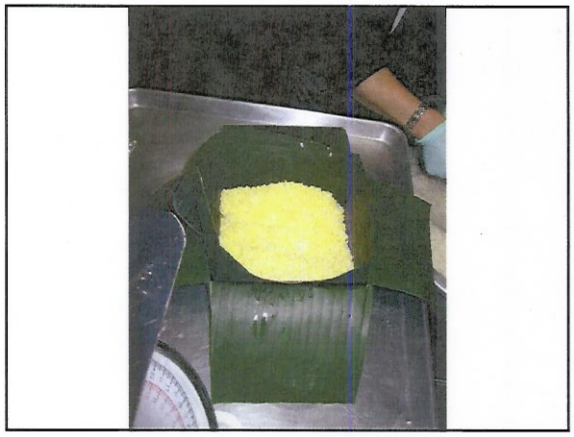
A Thermal Death Time study was conducted at UC Davis by Linda Harris and Shirin Abd. The lotus bean paste filling and the nut mix with pork sausage were inoculated with Salmonella Enteriditis Phage Type 30 (LJH608) and heated for different times at 176°F to determine the time necessary to destroy the vegetative cells in these products. These results are shown in Attachment #4. Only a 2-3 log reduction of a vegetative pathogen such as Salmonella is obtained when the product is baked for 28 minutes in the oven.

Conclusion:
Because of the short baking time, this product does not get sufficient heat to destroy *C. botulinum* spores. However, because of the low water activity in the product, *C. botulinum* will not grow in these products. The effectiveness of the heat process on vegetative pathogens is reduced because of the lower water activity of the filling. *Staphylococcus* is capable of growing at these low water activities, however, its ability to produce toxin is reduced at these water activities.

Based on these results, Moon Cakes could be held at room temperatures (70°F) for 48 hours provided they are produced under sanitary conditions and that they are not re-contaminated after removal from the oven.







PREMIUM QUALITY
FOODSERVICE FOIL

PREMIUM QUALITY
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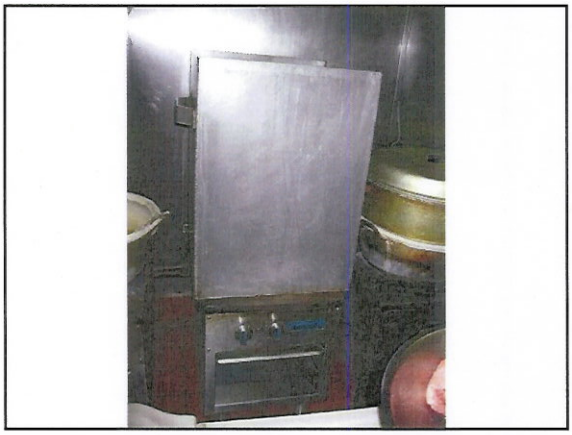
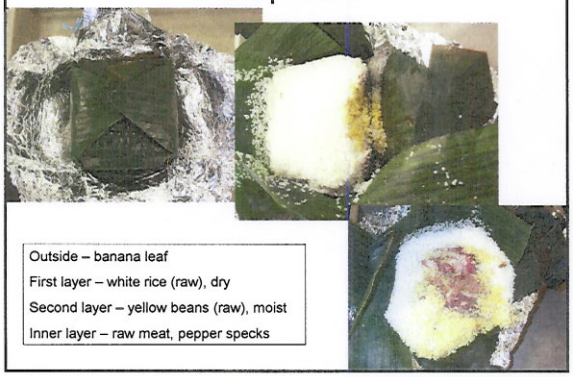


Banh Chung

Received 5 samples
2 uncooked (wrapped in foil)
3 cooked (wrapped with red ribbon)

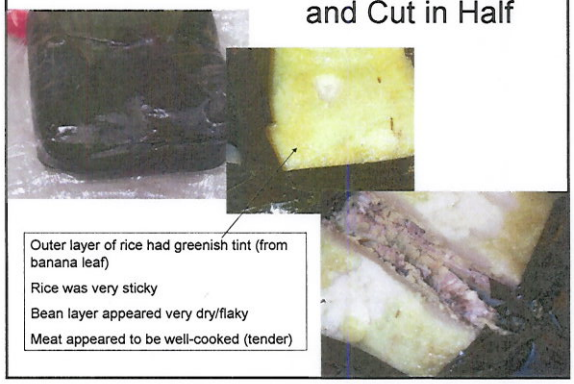
Raw product



Outside – banana leaf
First layer – white rice (raw), dry
Second layer – yellow beans (raw), moist
Inner layer – raw meat, pepper specks

Cooked Product
(Wrapped in Plastic Wrap)

Cooked Product was Unwrapped and Cut in Half



Outer layer of rice had greenish tint (from banana leaf)
Rice was very sticky
Bean layer appeared very dry/flaky
Meat appeared to be well-cooked (tender)

Moon Cakes

7 HOT SEN* (O Hot Vit)
(Lotus bean paste filling)

*Also spelled Hot **Xen** (in paperwork)

7 HOT SEN (O Hot Vit)
(Cross section)

8 Hot Sen (1 Hot Vit)
(Lotus bean paste filling, with egg))

10 DAU XANH (O Hot Vit)
(Mung bean paste filling)

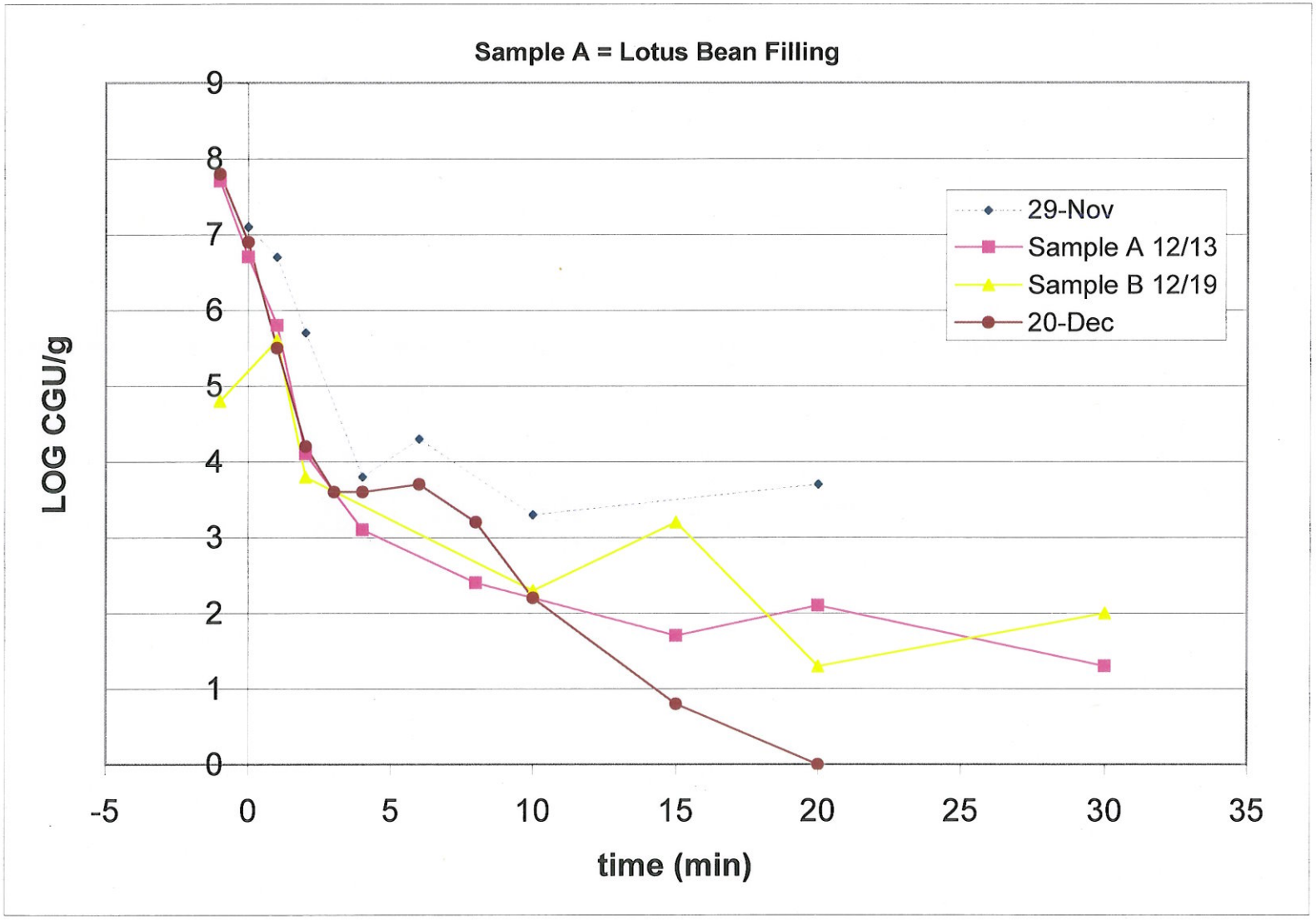
11 DAU XANH (1 Hot Vit)
(Mung bean paste filling with egg)

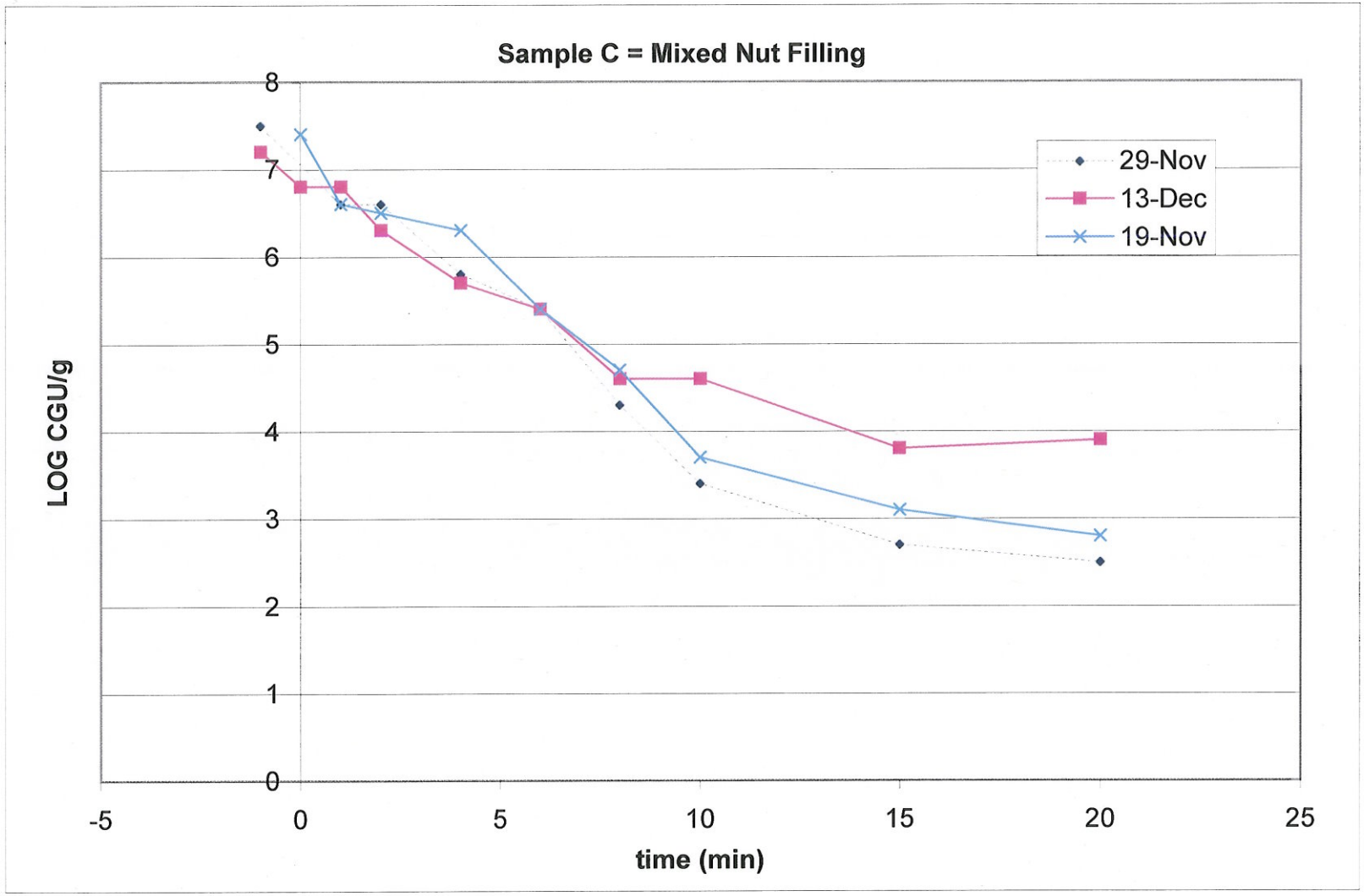
4 NGU NHAN DAC BIET (0 Hot Vit)
(Nut mix with pork sausage filling)

5 NGU NHAN DAC BIET (1 Hot Vit)
(Nut mix with pork sausage filling with egg)

33 THAP CAM DAC BIET (O Hot Vit)
(Nut mix with pork sausage and ham filling)

2 THAP CAM DAC BIET (1 Hot Vit)
(Nut mix with pork sausage and ham filling with egg)


Sample A = Lotus Bean Filling
LOG CGU/g
time (min)
29-Nov
Sample A 12/13
Sample B 12/19
20-Dec
9
8
7
6
5
4
3
2
1
0
-5
0
5
10
15
20
25
30
35



Attachment #4