

Determination of Borax in Sausage Sold in Bangkok, Thailand

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Abstract: Excessed levels of borax in food can cause a lot of health effects such as nausea, vomiting, diarrhea, and skin irritation. Moreover, borax can affect many body organs including stomach, bowels, liver, kidney, and brain, and may even lead to death. Borax was detected in various types of meat products in previous studies. Objective is to determine the borax in samples of sausage products sold in Bangkok. Method have Borax contamination in samples of sausage products were determined by using Borax test kit produced by Pharmacy Organization Thailand. The result is from 29 sausage samples which consisted of 13 samples of chicken sausage, 3 samples of pork mixed chicken sausage, 2 samples of meat sausage, 7 samples of mixed meat sausage and 4 samples of pork sausage. Borax was detected in 6 samples of chicken sausage, 1 sample of pork mixed chicken sausage, 1 sample of meat sausage, 4 samples of mixed meat sausage, and 3 samples of pork sausage, in total, borax were detected in 18 samples (62.07%). And conclusion is Borax was detected in sausage products sold for consumers 62.07% of total samples studied.

Keywords: Borax, sausage, food safety.

1. INTRODUCTION

Background

At low concentrations, borax can be converted to boric acid in the body prior to absorption. In humans, it is believed that adverse reactions associated with low doses of boric acid per day are unlikely to occur. However, exposure to large amounts of boric acid over a short period of time can affect the stomach, bowels, liver, kidney, and brain, and may even lead to death. Animal studies indicated that excessive ingestion of boric acid over a prolonged period of time may cause adverse developmental and reproductive effects. Testicular lesions and impaired fertility have been observed in experimental animals given boric acid in the diet. However, there is no evidence that boric acid is toxic to the genes or carcinogenic [1]. Borax can cause nausea, vomiting, and diarrhea if you ingest it by itself, and large amounts can lead to shock and kidney failure. It's banned in U.S. food products. It also can irritate your skin and eyes, and it can hurt your nose, throat, and lungs if you breathe it in. If you're around it often, it can cause rashes and might affect male reproductive organs [2]. Excessed levels of borax in food can cause a lot of health effects such as nausea, vomiting, diarrhea, and skin irritation. Moreover, borax can affect many body organs including stomach, bowels, liver, kidney, and brain, and may even lead to death. A study about Quantity analysis of Borax in Meat and Meatballs Sold in Trang province, Thailand by Malinee Chinanon. The sample was digested with 1% sodium carbonate and colored with curcumin solution. UV-Visible Spectrophotometer was used for borax analysis and boric acid was used as standard. The results showed that 100% of pork in the samples detected borax. The borax content of pork were in the ranged from 2.039 ppm to 5.340 ppm, while borax content of meatball were in the ranged from 1.608 ppm to 2.572 ppm. Borax is a substance that is harmful to health if consumed. Borax is prohibited substances in food, according to a notification from the Ministry of Public Health (No.151) [3]. A study about Levels of borax in food and urine of primary school students in Changwat Nakhon Si Thammarat were investigated by Mrs. Jiraporn Intarasompong, using Nakhon Si Thammarat Na Nakhon Utit Kindergarten as a case study site. The study was conducted by collecting food samples from canteens and vendors at the front of the school. Borax was analyzed by a colorimetric

method. It was found that 9 samples of 37 samples (24.32 %) from canteens and 48 samples of 57 samples (84.21 %) from vendors were contaminated with borax at average levels of 25.48 and 90.24 mg/kg respectively. These levels are below the World Health Organization acceptable daily intake (99.72 mg/kg). Fish balls had the highest concentration of borax in both cases. Levels of borax in samples from vendors were significantly higher than samples from canteens [4]. A study about the Sanitary Conditions of Food Service Establishments in the University Samut -Prakan Province by Nuttawee Changchai, Anyarin Pithapakdeesatith, Jirisuda Sinthusiri, Varangkana Visedmanee Lee, Saovalug Luksamijarulkul, and Kunika Changwichan. This cross-sectional survey study was performed. Food sanitary conditions of 28 FESs were surveyed by using cafeteria surveying form of the Department of Public Health, Ministry of Health, and 84 samples of food were collected in order to determine Borax, Salicylic acid, Formalin, Free mineral acid, Sodium hydrosulfite and synthetic color by using Test Kits. The results showed that 3.57% of all samples were found Borax. This study revealed that food sanitary conditions and contaminated chemicals in food are important factors of food safety for FSEs [5]. Among the subgroups of ultra-processed foods, the estimated percentage of energy from consumption of ready-to-heat and -eat mixed dishes increased from 2.2% to 11.2% (difference, 8.9% [95% CI, 7.7% to 10.2%]) and from consumption of sweet snacks and sweets increased from 10.7% to 12.9% (difference, 2.3% [95% CI, 1.0% to 3.6%]), but the estimated percentage of energy decreased for sugar-sweetened beverages from 10.8% to 5.3% (difference, -5.5% [95% CI, -6.5% to -4.5%]) and for processed fats and oils, condiments, and sauces from 7.1% to 4.0% (difference, -3.1% [95% CI, -3.7% to -2.6%]) (all $P < .05$ for trend) [6]. Nowadays, people can access to ultra-processed food easier than unprocessed or minimally processed food. Due to the fact that ultra-processed foods broadly widespread and can be bought easily from supermarket especially among juveniles who mostly spend their time with their friends, activities, and learning so they have less time in look after their health care and end up with buying some ultra-processed food to eat.

Objective of the study

1. To determine the borax in sausage products sold in Bangkok.
2. To find the percentage of borax detection in sausage samples.

Study Methods

This study aimed to determine the borax in sausage products found in Bangkok, which the test kit used in the lab experiment was from Pharmacy Organization Thailand.

Procedure

1. Label the food samples including five sausages.
2. Cut food samples into pieces size 2mmx2mm .
3. Scoop 1 teaspoon of sample into a glass beaker.
4. Mix sample with solution thoroughly.
5. Dip the strip paper into solution.
6. Leave it dry on the ceramic plate.
7. Wait until the strip paper dries for around 20 minutes.
8. Observe and record the dried strip color.

Sampling

We use convenient sampling methods to select sausage products. The samples that were used in this lab experiment were from street food sellers, convenient stores and supermarkets in Bangkok, Thailand. Types of sausage sample brought were displayed below

Type of Sausage	Total No. of Sample
Chicken	13
Chicken & Pork	3
Meat	2
Mixed	7
Pork	4
Total	29

Instrument and tools

- 1) Plastic cup 1 piece
- 2) Dropper 1 piece
- 3) Plastic spoon 1 piece
- 4) Borax Reagent 1 bottle
- 5) Turmeric Paper 1 bottle

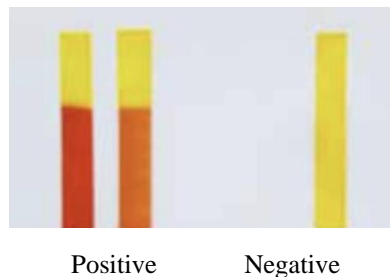
Data collection

- 1) Buy samples from street, convenient stores, supermarket and stall
- 2) Store food sample in the refrigerator and keep it for one day
- 3) Take food sample out of the refrigerator
- 4) Bring food sample to laboratory test

2. DATA ANALYSIS

Descriptive statistics; frequency, percentage, mean and standard deviation were used to analyze data collected. For data interpretation is as following

- 1. After the turmeric paper was soaked in the solution, place it on the ceramic plate and let the paper dry for 10 minutes.
- 2. if the turmeric paper turned into a color of orange to red, it can be concluded that the sample contained borax.



3. RESULTS

From all of the samples of sausages which were obtained by randomizing in bangkok, the total were 29 samples. From 29 samples, 13 were chicken sausage, which 6 samples were found to be contaminated with borax and 7 were not found. From 3 samples of chicken mixed with pork, 1 were found to be contaminated with borax and 2 were not found. From 2 samples of beef sausage, 1 was found to be contaminated with borax and 1 was not found. From 7 samples of mixed sausage, 7 were found to be contaminated with borax. Lastly, from 4 samples of pork sausage, 3 were found to be contaminated with borax and 1 was not found. These were illustrated in Table No.1.

Table 1: The table illustrates the results obtained from 29 samples of sausages (n=29)

No.	Type of Sausage	Result	Sample detected Borax	
			Positive	Negative
1	Chicken	small pink stripe	✓	
2	Chicken	small orange stripe	✓	
3	Chicken	no change		x
4	Chicken	no change		x
5	Chicken	no change		x
6	Chicken	no change		x
7	Chicken	no change		x
8	Chicken	no change		x
9	Chicken	no change		x
10	Chicken	pale orange stripe	✓	

11	Chicken	pale orange stripe	✓	
12	Chicken	pale orange stripe	✓	
13	Chicken	pale orange stripe	✓	
14	Chicken and Pork	no change		x
15	Chicken and Pork	pale orange stripe	✓	
16	Chicken and Pork	no change		x
17	Meat	no change		x
18	Meat	small pink stripe	✓	
19	Mixed	small orange stripe	✓	
20	Mixed	pale orange stripe	✓	
21	Mixed	small pink stripe	✓	
22	Mixed	small pink stripe	✓	
23	Mixed	pale pink stripe	✓	
24	Mixed	pale pink stripe	✓	
25	Mixed	pale orange stripe	✓	
26	Pork	no change		x
27	Pork	pale orange stripe	✓	
28	Pork	pale orange stripe	✓	
29	Pork	pale orange stripe	✓	
	Total		18	11

From the result obtained from the determination of borax with 29 samples of sausages such as chicken sausage, chicken mix with pork sausage, beef sausage, pork sausage and lastly, mixed sausage, it can be concluded that out of 13 samples of chicken sausages, 6 samples were contaminated with borax (46.15%). Out of 3 samples of chicken mixed with pork sausages, 1 was contaminated with borax (33.33%). From 2 samples of meat sausages, 1 was found to be contaminated with borax (50%). From 7 samples of mixed sausages, 7 of them were found to be contaminated with borax (100%). Finally, from 4 samples of pork sausages, 3 were found to be contaminated with borax (75%). (Table 2)

Table 2: Illustrates the number of samples and percentage of samples that were contaminated in each type of sausages.

Type of Sausage	Total No. of Sample	Positive	Negative	% No. of sample detected positive
Chicken	13	6	7	46.15%
Chicken & Pork	3	1	2	33.33%
Meat	2	1	1	50.00%
Mixed	7	7	0	100.00%
Pork	4	3	1	75.00%
Total	29	18	11	62.07%

4. DISCUSSION

From Borax detection in 29 sausage samples which consisted of 13 samples of chicken sausage, 3 samples of pork mixed chicken sausage, 2 samples of meat sausage, 7 samples of mixed meat sausage and 4 samples of pork sausage. Borax was detected in 6 samples of chicken sausage, 1 sample of pork mixed chicken sausage, 1 sample of meat sausage, 4 samples of mixed meat sausage, and 3 samples of pork sausage, in total, borax were detected in 18 samples (62.07%).

This results indicated that most sausage were found to contain borax which consisted with Malinee Chinnanon ‘s study [3]. Quantity analysis of Borax in Meat and Meatballs Sold in Trang province, in this study it found that pork samples detected Borax on an average of 2.039-5.340 ppm and 1.608-2.572 ppm in meat ball samples. The result of this study in line with A Survey of Toxic Substance in Food in Songkhla by Werawath ahatthanatrakul (1980), the study detected borax in 17.3-91.2% of food samples [7]. Despite this study being conducted in 1980, it showed that borax has been used in food production consistently. However, Kusuma Puttakerd (2007) [8]. studied Determination of Borax in Foods of Dormitory Food shops in Chiangmai University and found that from a total of 255 samples, there was no borax detected in any sample. This could be attributed to the food shop being located in the university area which was regulated by the university therefore

ensuring quality of foods sold for students. A Vivat Keawdoungek conducted a study about Assessment of food hazards in local restaurants in Chiang Rai, Thailand (2019), the results showed that from a total of 78 physical sites, there were not any physical or chemical hazards in food samples sold in those sites [9]. This may be because restaurants' food raw material sourcing was aligned with food safety standards.

However, Bangkok Metropolitan Food Safety Project in 2021 reported that of 28,175 food samples sold in the Bangkok area were tested for borax, only 0.17% of samples were found to contain borax[10]. This could be attributed to more variety of food samples being tested while in this study focused on only sausage which often found to contain borax.

5. CONCLUSION

From Borax detection in 29 sausage samples which consisted of 13 samples of chicken sausage, 3 samples of pork mixed chicken sausage, 2 samples of meat sausage, 7 samples of mixed meat sausage and 4 samples of pork sausage. Borax was detected in 6 samples of chicken sausage, 1 sample of pork mixed chicken sausage, 1 sample of meat sausage, 4 samples of mixed meat sausage, and 3 samples of pork sausage, in total, borax were detected in 18 samples (62.07%).

Limitation

This study tested only 29 samples due to the limited number of choices of sausage available in Thailand, the samples may not be very diverse. Another aspect is that this test was performed using a test kit, which means that results may differ from modern laboratory testing.

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