

## The Application Hazard Analysis Critical Control Points Principles for Meat Processing in the Kindergarten Kitchen

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### Abstract

The application Hazard Analysis Critical Control Points (HACCP) system for processing food is a choice which brings many advantages for children in the kindergarten. Therefore, this study aims to help kindergarten kitchen controlling hazards maybe effect on both mental and physical properties of the children. The HACCP team in the kindergarten kitchen was created components including administrator, cooks, teacher and health officer. Practice seven principles and twelve steps base on manual Food and Agriculture Organization/World Health Organization (FAO/WHO) to figure out risk factors and control them. Using Vietnam standards assess criteria about bacteria, utensils kitchen, the cook, pork product. Following the Critical Control Points (CCPs) decision tree, we have figured out three CCPs likely as "Cooking", "Dividing following the classes", and "Feeding". *Coliforms* and *E. coli* were the most popular biological hazard which was found in the cook, utensils kitchen, and table. For the air environment in the kitchen, there was an occurrence of aerobic bacteria. Analyzing pork with tomato sauces product found the bacteria over the limit such as aerobic bacteria total, *Coliforms*, *Staphylococcus aureus*, *Clostridium perfringens*. After applying the HACCP system for the full process, we did not find any bacteria hazards, and the stages have been controlled. The HACCP plan together with the evaluation results monitoring was an essential dossier which effective to the quality of the processed pork with a tomato sauce when the application of the HACCP system.

**Keywords:** CCPs; HACCP; Kindergarten Kitchen; The Pork; Tomato Sauce

### Abbreviations

HACCP: Hazard Analysis Critical Control Points; CCPs: Critical Control Points; FAO: Food and Agriculture Organization; WHO: World Health Organization; GMP: Good Manufacturing Practice; SSOP: Sanitation Standard Operating Procedure

### Introduction

Food mishandling in kitchens likely caused a significant amount of foodborne disease [1]. Widespread outbreaks of foodborne disease did not only effect on nourishes and sustain but also can be a significant threat to health especially children under the age of five [1]. Moreover, children under the age of five also had an increased risk of foodborne illness and related health complication because their immune systems are still developing. Additionally, young children produce less stomach acid that kills harmful bacteria, making it easier for them to get sick. According to the WHO, approximately 1,500 million children who below five years suffer diarrhea from food poisoning annually, among them has more 3 million children death [2]. In Vietnam, according to the Ministry of Health, the yearly average has around 250 - 500 cases of food poisoning with 7,000 - 10,000 patients, among them 100 - 200 death. Good Manufacturing Practice (GMP), Sanitation Standard Operating Procedure SSOP and HACCP are systems intended to ensure the safety of food. However, these often used in the factories with large scale. Unlike commercial enterprises, kitchen in school where provide food for a large of children, but this is the location associated with significant foodborne illness risk. Some of the pathogens have been confirmed in the kitchen include *Salmonella*, *Escherichia coli*, *Staphylococcus aureus* and *Campylobacter* which have the highest incidence rates with children young than five [3]. Thus, food safety plays an important role in the life of young children. Hence, this aim of applying HACCP principle to find out and control hazards to improve quality food for children in the kindergartens.

## Method

### Study participants

The study has progressed in the Thai Binh City kindergarten, Vietnam.

HACCP team consist of individuals who have specific knowledge and expertise appropriate to the product and process. In this study, the HACCP team is built by administrator, cooks, teacher and health officer.

Pork is both a good source of protein and also provides several essential vitamins and minerals. Tomato is high in fiber and a good source of vitamins, folate and chromium - the vitamin act as antioxidants, which neutralize free radicals to stop the condition of oxidative stress. Moreover, the minerals play important roles in ensuring the body function properly. Although both pork and tomato are high nutrients good, they have a high-risk factor exposing microorganism. Hence, pork along with tomato sauce was used to assess in the HACCP plan.

### Measurement of microorganism sampling

The seven HACCP principle was used to analyse potential hazards for pork processing. Assessment bacterial contamination was done based on Vietnam standards: to determine the aerobic bacterial concentration following TCVN 4884; *E. coli* following TCVN 6846, *Coliform* following TCVN 4882; *Staphylococcus aureus* following TCVN 4830; *Clostridium perfringens* following 3348/2001/QĐ - BYT; *Salmonella* following TCVN [4-6].

### Measurement of air

Safir and Romanovici standard assessed the quality of air in the room.

## Results

The pork with tomato sauces is a nutritional food and suitable for children’s taste. Besides, food is processed easily, quickly, and convenient in many kindergarten kitchens. The HACCP system of this processing is built by the seven principles and twelve steps based on manual FAO/WHO (Figure 1).

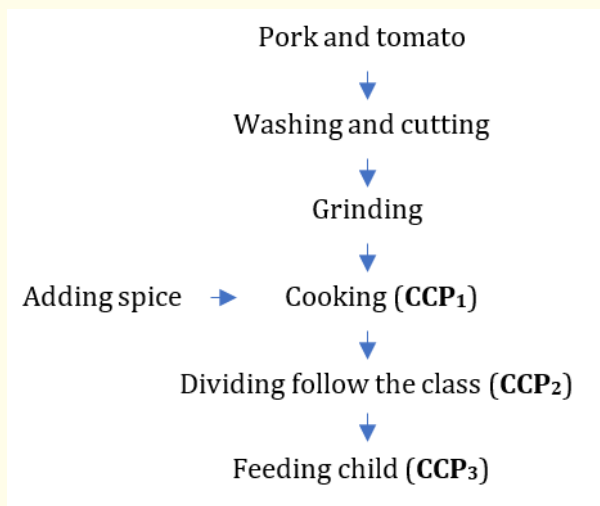


Figure 1: Diagram of pork processing.

Following the application of the steps in the methods section and the decision tree, we have figured out three Critical Control Points (CCPs) likely as “Cooking”, “Dividing follows the classes”, and “Feeding”. Stringent standards were set in a step by step to ensure adequate delivery, cooking and keeping temperatures (Table 1).

Step	Hazard	Control measure	Monitoring
Cooking	Biology	Temperature and cook time	Boiling cook within one hour
Dividing follow the classes		<ul style="list-style-type: none"> <li>- Personal hygiene of the processor, feeding persons</li> <li>- Hygiene of the kitchen utensils</li> <li>- Environmental sanitation</li> <li>- Time</li> </ul>	<ul style="list-style-type: none"> <li>- These people have to wear the uniform and wash their hand follow the standard [7]</li> <li>- The utensils have to clean washing</li> <li>- The location where divided food has no flies [7]</li> <li>- Time dividing food is not over 30 minutes</li> </ul>
Feeding child		<ul style="list-style-type: none"> <li>- Personal hygiene of the processor, feeding persons</li> <li>- Hygiene of the utensils</li> <li>- Environmental sanitation</li> <li>- Hygiene of the children hands</li> <li>- Time</li> </ul>	<ul style="list-style-type: none"> <li>- These people have to wear uniform</li> <li>- The utensils have to clean washing</li> <li>- The environment has to clean and no flies.</li> <li>- The children have to clean washing the hand before eating</li> <li>- Time feeding is not over one hour after cooking</li> </ul>

Table 1: Summary of hazard analysis and critical control points.

Before application HACCP system, kitchen environment has the number of bacteria over the limit. All of the cooking, utensils kitchen, table have found *Coliform* and *E. coli*. Pork with tomato sauces product has figured out total aerobic bacterial count, *Coliforms*, *Staphylococcus aureus*, *Clostridium perfringens*. However, after applying the HACCP system for whole processing, the bacteria did not occur (Table 2).

	Before	After
<b>The Air in kitchen</b>		
Microorganism total	+	-
Coccus	-	-
<b>Water</b>		
Aerobic bacteria total	-	-
<i>Coliforms</i>	+	-
<i>E. coli</i>	-	-
<b>Hands</b>		
<i>Coliforms</i>	+	-
<i>E. Coli</i>	+	-
<b>Kitchen utensil</b>		
<i>Coliforms</i>	+	-
<i>E. Coli</i>	+	-
<b>Bowls, spoons</b>		
<i>Coliforms</i>	-	-
<i>E. Coli</i>	-	-
<b>Table</b>		
<i>Coliforms</i>	+	-
<i>E. Coli</i>	+	-
<b>Pork with tomato sauces</b>		
Aerobic bacteria total	+	-
<i>Coliforms</i>	+	-
<i>E. Coli</i>	-	-
<i>Staphylococcus aureus</i>	+	-
<i>Clostridium perfringens</i>	+	-
<i>Salmonella</i>	-	-

Table 2: Compare sampling following before and after identification of hazards and CCPs.

“+”: Positive; “-”: Negative.

## Discussion

HACCP has been described likely as a principle, philosophy, and tool to practice [7]. The HACCP also criteria for the catering industry and food manufacturing [8]. Hence, the HACCP approach is becoming increasingly accepted as a valuable means of ensuring quality and safety in food production services. It offers some advantages over conventional end-point testing, which include the identification of potential hazards before they occur, its proactive approach to prevention and its application to the whole process rather than just the areas sampled [9]. Although there is no legal requirement to introduce HACCP, many organizations see the introduction of an effective HACCP system as an essential step in the development. The method as a logical, step by step approach to the analysis of potential hazards and to control them. Various areas of infection control would benefit from a systematic exploration of hazard points, and an analysis of preventive measures. The application HACCP system cannot practice with all of the food, only maybe a focus on typical food with high risk of contamination. Based on this point of view, we choose the subjects are young children who study in the kindergarten and kind of food product is pork which has high-risk contamination by bacteria [10], as well as typical food. During the application HACCP, we have been controlling the significant hazards in "Cooking", "Dividing follows the classes", and "Feeding". We also have been controlled measures at the process to guarantee the safety of food. This is an advantage dominant in the field of food safety management of the HACCP system. After applying the HACCP system, all indicators of microbiology for the air, utensils, hand processor and pork product have been significantly improved. Thus, the HACCP not only controls the critical points but also has to practice good cleaning procedures throughout the production [11].

## Conclusion

The present study provides essential information about the hygienic levels of HACCP implemented pork processing in tomato sauce in kindergarten kitchen. *Coliform* and *E. coli* are bacteria which was found the most commonly before applying the HACCP system. Further study should be required for microbiological assessment of meat cut at all operational stages such as the slaughterhouse, processing line, and retail outlets.

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