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# Detection of Pork Contamination on Meat-Based Foods at Public Elementary School In Bandung

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**Abstract.** The foods containing pork ingredients are ubiquitous in Indonesia. Besides forbidden for Muslims to consume, pigs are animals that contain diseases because of their greedy and dirty. Currently there are many adulterated products between beef and pork sold in the market. One of the food products that potentially contaminated with pork is processed children's food. Children are the most vulnerable segments to consume non-halal food, most of them less selective to choose some of the food than adults. This research aims to provide a general description of the distribution and detection of pork contamination on meat-based food at public elementary schools in Bandung city. This research was conducted in December-March 2019 at the Genetic and Molecular Laboratory of the Faculty of Science and Technology of UIN Sunan Gunung Djati, Bandung. The study began by taking 8 samples of children's food from 30 districts in Bandung using the technique of free random sampling. The sample is tested under laboratory tests including DNA extraction, amplification of pig-specific DNA fragments using PCR and electrophoresis. The results of this study are the distribution of snacks for elementary school children in 30 districts of Bandung. They are diverse and classified as processed foods made from meat (a critical point). Food children of Public Elementary Schools in Bandung negatively contain pork contamination with the proportion of children's food containing 0% of pork.

**Keywords:** Contamination, Meat-Base Food, Pork

## 1 Introduction

Halal and haram are Arabic identities of Muslims, halal means permitted and haram means prohibited [1], [2]. Halal is a comprehensive scope used for various aspects including food, acts, actions, and interaction. The various aspects of halal and haram that must be considered include those related to clothes, jewelry, rules of sale and purchase, raising animals, marriage, family life issues, beliefs, traditions, *muamalah*, entertainment, social relations among Muslims and non-Muslims, and especially in food consumption [3].

The halal food product is an important thing in recent issues and studies [4], [5]. As addressed in the Quran for Muslims to consume halal food and prohibits from consuming

haram food as stated in Surah Al-Baqarah:168. Based on Quranic verse on Surah Al-Maidah: 3 and Al-Baqarah:173. There are some substances forbidden for consuming, such as blood and pork, anything dies by self, as well as consecrated beside Allah and whatever has been strangled, beaten to death, trapped in a pit, gored, and what some beast to prey has begun to eat unless you give it the final flow, and what has been slaughtered in the name of idol. In addition to the Quran and Hadith, the instructions of the Indonesian Department of Ulama (fatwa MUI) becomes a reference in answering issues related to halal and haram food consumed by Indonesian Muslim communities.

The recent problem that occurs in the Indonesian Muslim community is ignorance of adulterated food. In recent studies, there are a lot of adulterated products between beef and pork sold in the market. Srihanto et al., [6] and Rachmawati [7] reported that DNA pig contamination was detected in several food-based meats spread around the country. According to Kulsum [8] about the instruction of MUI about determination for choosing processed foods which are based on the *Qaidah Fiqhiyyah* explains that “While adulterated between halal and haram, the winner is haram”.

The research on pork contamination in food products has been widely carried out. Fabriano et al. [9] reported contamination of pork found in meatball snacks at Salatiga. Pahlavi [10] reported the contamination of pork found in meatball grinding at Bogor. Safety and Agustin's [11] reported the contamination of pork in bulk sausage products at Malang. Winarsih et al. [12] reported the contamination of pork contamination in instant noodles at Surabaya. Getting greater profits is one of reason who adulterated beef with pork.

Too many food products non-Halal certification are still widely circulated around the public. One food product that potentially contaminated with pork is the home-made meatball, sausage, burgers and many kinds of meat-based food. Children are the most vulnerable segments to consume non-halal food, most of them are less selective to choose some of the food than adults. Therefore, meat-based food products which marketed to children should receive more attention to prevent Muslim children from consuming non-halal food.

There are several general scientific procedures are used for detecting non-halal contamination in a food product, such as HPLC, ELISA, and IEF. This method uses specific proteins that mark the presence or absence of contamination. Protein-based detection is less effective for testing foodstuffs that have undergone processing. These proteins will undergo denaturation during the processing of causes in an inaccurate result [13]. DNA-based testing is one of the solutions to this problem. Unlike proteins, DNA has a more stable structure and tends to be conserved despite being exposed in a high temperature. One DNA-based testing technique that is used for the detection of DNA pork contamination is Polymerase chain reaction (PCR) [14], [15].

An analysis of the availability of pig DNA in a food product is important information in determining halal products. According to Supriyatna et al. [16], the benefits of a scientific-based approach can be used as a clear reference both by advanced researchers and the general public.

A lack of researches on halal food for the detection of pig DNA contamination in children's snacks in the market of the State Elementary School in Bandung city has made this research significantly important to undertake. The results of this study are expected to be scientific evidence in determining policies related to consumer protection, especially Muslim children in Bandung city from the threat of non-halal food circulating in the school environment.

## 2 Method

Observation is a method of data collection in this research which is carried out in 90 Public Elementary Schools from 30 Districts in Bandung city. Among 90 of Public Elementary Schools, we got 8 samples taken from 8 markets of Public Elementary Schools. Laboratory tests were carried out at the Genetic and Molecular Laboratory of the Faculty of Science and Technology, Sunan Gunung Djati Bandung.

This research uses an explorative and experimental descriptive study in 90 public elementary schools from 30 sub-districts of Bandung city to obtain samples of experimental research test materials in the laboratory. The sampling method uses the technique of free random sampling with a target sampling that represents the population of children's snacks in Bandung city. At the end of the sampling, there are eight research samples obtained from eight public elementary schools in Bandung (table 1).

Furthermore, these samples were tested by using the Genetic and Molecular Laboratory of the Faculty of Science and Technology of UIN Sunan Gunung Djati Bandung to proceed with DNA extraction procedures (GMO food DNA extraction kit), DNA purity testing, qualitative testing, and data analysis. The results of DNA extraction were continued with quantitative tests to determine the presence and purity of DNA using a nanodrop spectrophotometer. Amplified of DNA by PCR method which visualized by electrophoresis.

**Table 1.** Sample of Child Snack Research in the City of Bandung

Code of sample	Food Product	Sources (Public Elementary School)	Sub-District
A	Brown sausage	Sumbersari 245	Ciparay
B	Red sausage	Ciumbuleuit	Cidadap
C	Burger	Bojongloa 1	Bojongloa Kidul
D	<i>Sempolan</i>	Mekar Arum	Gede Bage
E	<i>Cilok</i>	256 Sukarela	Panyileukan
F	<i>Baso Imut</i>	Soka	Andir
G	Meatball 1	Merdeka 1	Sumur Bandung
H	Meatball 2	Tunas Harapan	Bandung Kulon

## 3 Result and Discussion

The population is children's food products from the market of State Elementary Schools in 30 Districts of Bandung. Many kinds of research samples are from children's snack meat-based food that spread around the Public Elementary School, such as sausage, meatballs, sausages, burgers, *sempolan* and *cilok* taken from 8 areas in Bandung. A laboratory testing process were carried out to determine a pork contamination in a sample.

### Quantitative Test and the Purity of DNA with Nanodrop Spectrophotometer Measurement

A laboratory testing process begins with DNA extraction, DNA extraction is a process purification of DNA from sample using specific reagen. In this sample, DNA is separated from protein, membranes, and others component. Nanodrop spectrophotometer is necessary to conduct quantitative test and to assess purity of DNA. Measurement of DNA quantity using spectrophotometric method is at 260 and 280 nm of wavelengths ( $\lambda$ ) [17].

The absorbance of DNA Purity molecules ranges from 1.8 to 2.0. DNA purity concentration is needed for determining a degree of contamination from the sample. The quantitative test results (table 2) has shown a number of DNA concentration and DNA purity (absorbance). DNA concentrations havea various number at each sample. The highest concentration is found in sample B (37.5 ng/ $\mu$ l) and the lowest concentration is found in beef sample (0.6 ng/ $\mu$ l). While the purity of DNA is found in beef sample (2.08), pork sample (1.902) and F sample (1.9). F sample is one of meat-base food from the market of public elementary school they called by "*baso imut*". DNA purity is necessary for detect other contamination, the result show that beef, pork and F sample has a good quality of DNA because no more contamination from other material, than the other food sample detected has many contamination from other material.

**Table 2.** Spectrophotometer Nanodrop Result

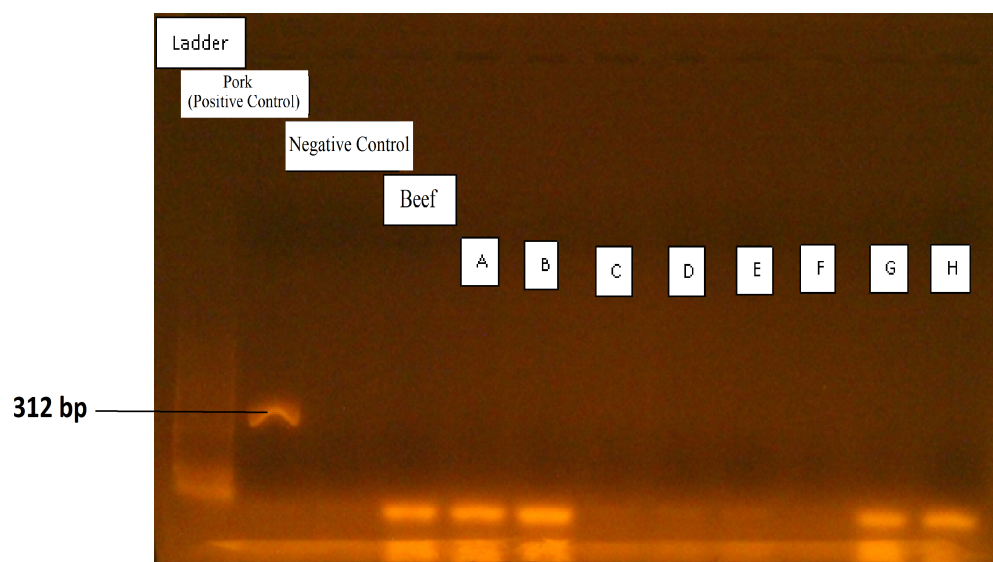
No	Code of Sample	DNA concentration (ng/ $\mu$ l)	Wavelength		Ratio of Absorbance
			A260	A280	260/280
1	Blanko	0	0	-0.007	-0.02
2	Beef	0.6	0.088	0.042	2.08
3	Pork	3.4	0.078	0.041	1.902
4	A	30	0.6	0.496	1.21
5	B	37.5	0.751	0.66	1.14
6	C	1.2	0.024	0.019	1.23
7	D	3.3	0.065	0.041	1.59
8	E	1.3	0.027	0.031	0.87
9	F	0.8	0.016	0.008	1.9
10	G	1.5	0.029	0.031	0.94
11	H	1.3	0.027	0.02	1.35

#### Qualitative Test of pork DNA on food samples using PCR technique

Qualitative test of pork DNA will be done using Polymerase Chain Reaction (PCR) techniques. This method is an in-vitro DNA amplification technique that works to multiply the DNA target to prove the presence of pork DNA in a food sample. This method using a specific primer for replication of DNA, the primary arrangement specifically for detection of pig DNA content is 5 'AACCCTATGTACGTCGTGCAT3'(forward) and 5'ACCATTGACTGAATAGCACCT3'(reverse). A food sample amplified by PCR can be seen qualitatively with the electrophoresis method to see the band of DNA samples (figure 1).

Qualitative test results by electrophoresis using 1% of agarose show the quality of DNA extracted by this method is quite good. DNA bands are seen clearly in pork samples (as

positive control) but none other band samples have a row in line with the pork band. It means that no food is adulterated with pork in this result. While a beef sample (as additional control) with another sample such as A, B, G and H sample shows the clear band in a row which explains that the food is made from beef. And the last samples C, D, E, and F are made from a chicken.



**Fig. 1.** The band of DNA samples: A (brown sausage); B (red sausage); C (burger); D (*sempolan*); E (*cilok*); F (*baso imut*); G (meatball); H (meatball).

### Halal Study of Meat-based Food Products

The result of a laboratory test (Table 3) has shown that there are no samples contaminated by pork. The food for children marketed in public elementary schools in Bandung City is clean from pork contamination. This process of laboratory testing provides an answer to us about the unrest. There is no indication of children's food public elementary school in Bandung containing pork contaminants.

According to the result, that street vendors in this city are concerning in processing the products, but the problem is the impurity of a food product. This reason has shown in table 2 about DNA purity result, the purity of DNA is only shown at beef, pork and F sample of meatball, and other samples are impurity. Many impurities from samples is a mixture of food ingredients, the food products are too many additional ingredients such as flavor, starch, coloring, flour, enhancer or another food additive in high concentration.

The concept of halal in food products is more than a haram ingredient because it includes complex issues. As discussed before in Surah Al-Maidah: 3 and Al-Baqorah: 173, halal food is far away from food additives and ingredients which causes sickness. Halal food must be hygiene and has sanitation principles of safety for consumption and free from material which causes a negative effect if consumed continuously.

Eating halal food for Muslim is an obligation in which the process is worthy of worship, a manifestation of gratitude to Allah for all the blessings of His giving, giving a lot of good

thing for other Muslim in the world and the hereafter, and is an implementation of a pledge to achieve His pleasure.

**Table 3.** The result of detection meat-based food from pork contamination

Code of sample	Food Product	Laboratory test
Positive control	Pork	+
Negative control	DdH <sub>2</sub> o	-
<b>Beef</b>	Beef	-
<b>A</b>	Brown sausage	-
<b>B</b>	Red sausage	-
<b>C</b>	Burger	-
<b>D</b>	<i>Sempolan</i>	-
<b>E</b>	<i>Cilok</i>	-
<b>F</b>	<i>Baso Imut</i>	-
<b>G</b>	Meatball 1	-
<b>H</b>	Meatball 2	-

Food is a fundamental need with some effects on those who consume it both physically and psychologically. A food digested a digestive system into our bodies, then absorbed the nutrition, and the results will be circulated throughout the human body for the metabolism of the body. It explains the food was eaten and processed in the digestive system will spread and flow from the head for energy and used to carry out human activities [18].

#### 4 Conclusion

Based on the results of this research, it can be concluded that foods of a public elementary school in Bandung are clean from pork contamination, with the proportion of children's food containing 0% pork. However, the mixture of materials in food such as food additive should be considered.

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