

Microbial contamination on beef trade in wet markets of Lambaro, Sigli, and Meureudu, Aceh Province, Indonesia

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Abstract. Food animal origin such as beef is one of the basic needs for our society. Some cases of disease caused by microbial contaminated livestock product have been reported in Indonesia. It means that food safety has to obtain serious attention. Some efforts by observation and examination of the number of microbial contamination on beef in three wet markets were considered important to assess the extent of microbial contamination compared with the threshold set by the Indonesian government through the National Standards. The results of beef sample examination and assessment by the Veterinary Public Health Laboratory of the Faculty of Veterinary Medicine of Syiah Kuala University on the number of microbial contamination of Total Plate Count (TPC) from the wet markets of Lambaro (Aceh Besar District), the Sigli (Pidie District), and Meureudu (Pidie Jaya District) showed that microbial contamination is below the threshold set SNI-3932-2008. In general, the results showed that the quality of food products of animal origin, particularly beef from wet markets in three districts, have levels of contamination that are still reasonable. Nevertheless, good hygiene and sanitation supervision of pre-production to distribution and circulation of supervision should be maintained.

Key words: Microbial Contamination, Total Plate Count, Wet Meat Market.

Introduction

Nowadays, increasing the society income has also increased the demand for food animal origin as one source for protein. For the community in Aceh Province, their demand for livestock product getting increased every year, as it can be seen from the increased production of meat. In year 2010, there was 8.4 million kg of meat produced, and then increased to 9.4 million kg in year 2011 (Aceh Dalam Angka, 2012). In particular, the meat production in three Districts those located close to the capital of Aceh Province, they are Aceh Besar, Pidie, and Pidie Jaya, were also high of 1.2 million kg, 783.9 thousand kg and 514.8 thousand kg, subsequently in year 2012 (Aceh Dalam Angka, 2012).

Wet market or also called traditional market is one of location for trading meat, such as poultry meat and beef. The product traded in this market are vulnerable and high risk for contamination by microbial, both pathogen and non-pathogen. Sanitation and the cleanness of surrounding market area needs attention from the traders or related service authority to reduce the level of microbial contamination. The existence of wet markets of Lambaro in Aceh Besar District, Sigli in Pidie District, and Meureudu in Pidie Jaya District are very helpful for the surrounding community to fulfill their need for fresh meat.

It is suggested that the beef that trade in the market should not contain any microbes or, if any, they must be below the standard of maximum level of microbial contamination. This condition is expected to fulfill the requirement for beef that safety, healthy, intact, and halal. The beef is accepted as safety if the amount of total colony of bacterial (*Total Plate Count/TPC*) less than 1×10^6 *Coloni Forming Unit* per gram (CFU/gram) (Standar Nasional Indonesia, 2008). Based on Indonesian National Standard No. 3932 (2008) the standard of maximum level of microbial contamination (CFU/gr) that allowed in foods of animal origin are as follow:

No	Types of Microbe	Unit	Level of maximum
1	Total Plate Count	cfu/gr	maximum 1×10^6
2	Coliform	cfu/gr	maximum 1×10^2
3	<i>Staphylococcus aureus</i>	cfu/gr	maximum 1×10^2
4	<i>Salmonella</i> sp	per 25 gr	Negative
5	<i>Escherichia coli</i>	cfu/gr	maximum 1×10^1

The objective of this study is to (1) provide the understanding and increasing society knowledge for the quality of foods of animal origin, especially related to the microbial contamination; (2) provide an understanding that strategic efforts is needed to produce a good quality and safe condition of foods of animal origin.

Materials And Methods

This study was conducted in two months, from Mei to June 2010, in wet markets of Lambaro in Aceh Besar District, Sigli in Pidie District, and Meureudu in Pidie Jaya District. The sample was evaluated in Laboratory of Veterinary Public Health of Faculty of Veterinary Medicine of Syiah Kuala University.

The sample collected was beef from the three wet markets above. Other materials used in this study for TPC and Salmonella tests were aquadest, *Buffered Pepton Water* (BPW), *Plate Count Agar* (PCA), and SSA agar (based on SNI 2897:2008). The tools used in this study were analytic weighing scale, stomacher incubator, measurement glass, petridisc, pH meter, autoclave, sterile scissors. A survey method was conducted in this study to collect samples (based on SNI 2897:2008). For this purpose a questionnaire was distributed to selected tradesman to obtain information of the source of origin area of beef. The beef sample was collected from wet markets of Lambaro, Sigli and Meureudu District. Samples was collected using purposive sampling at 06.00-07.00 AM. It was also referenced as the number of sample population.

The physical quality of beef was evaluated based on color and odor. The evaluation for any contamination by microbes was conducted using bacteriological test of *Total Plate Count* (TPC). The result was compared to the standard of maximum level of microbial contamination (based on SNI 2897:2008). The parameters observed were the physical quality of beef was evaluated based on color and odor, test of Total Plate Count (TPC) and Salmonella.

Test of physical condition (color and odor)

The test of physical condition for color and odor was conducted based on SNI 2897:2008, they are: a) Color test, beef sample was observed on the color. Normal beef is concluded when they color showing red or light red, which is specific for beef; b) Odor test, a piece of beef sample was collected using thumbs and finger and then smelled. Normal beef is concluded when they show aromatic odor, which is specific for beef.

TPC test was aimed to identify the microbes in food product by counting the bacterial colony growth in agar media.

Preparation of Media

a. Preparation of media of *Buffered Pepton Water* (BPW).

BPW was weighed at 20 gram, then filled into the tube and homogenated with aquadest of 1000 ml. Next, it was heated until boiled. The solution, then, was leaved for cold and moved into a tube of 1 ml. Finally, it was sterilized using autoclave at the temperature of 121° for 15 second.

b. Preparation of media of *Plate Count Agar* (PCA) and SSA.

PCA and SSA were weighed at 22.5 gram, then filled into the tube and homogenated with aquadest, next it was heated until boiled. The solution, then was leaved for cold and

moved into a tube of 1 ml. Finally, it was sterilized using autoclave at the temperature of 121⁰ for 15 second.

Preparation of Sample

A piece of beef of 10 g was keep aseptic, and filled into a sterile plate. Then it was added with 90 ml of sterile 0.1% BPW solution into a sterile plastic bag contained of beef. Finally, it was homogenated using stomacher for 1-2 minutes, which resulted as suspension of dilution of 10⁻¹.

Method of Evaluation

An amount of 1 ml suspension of dilution of 10⁻¹ above was moved using a sterile pipette into a solution of 9 ml BPW to obtain a dilution of 10⁻². Then, it was continued to obtain the dilution of 10⁻³, 10⁻⁴, 10⁻⁵ and so on as needed using the same method. Then, 1 ml of suspension from each dilution was filled into a petridisc as duplo. Next, it was added with 15-20 ml PCA, which was left to cold to the temperature of 45⁰C into each petridisc filled in with suspension. In attempt to make all sample solution and media PCA mixed very well, then it was rotated of petridiscto front and back side or formed an eighnumber of rotation. Then, it was left until it solid. Finally, it was incubated at the temperature of 34⁰C-36⁰C for 24-48 hours by placing the petridisc in up-side down position.

Data analysis

The data of TPC and Salmonella contamination were analyzed and interpreted. The calculation was compared to SNI: 2897: 2008, which is 1 x 10⁶ CFU/gram for maximum level of TPC and negative for *Salmonella* sp. When the microbial contamination reaches above maximum level, it means high contamination and vice versa. Then, the microbial contamination was associated with any factors affected the contamination in each wet markets.

Results and Discussion

The results of our survey and laboratory evaluation on microbial contamination on beef sample collected from wet markets of Lambaro, Sigli, and Meureudu as seen in Table 1.

Table 1. Results of test of physical beef quality based on color and odor evaluation.

No	Location of sample	Sample quantity	Color	Odor
1.	Lambaro	20	Red (specific for beef)	Aromatic (specific for beef)
2.	Sigli	10	Red (specific for beef)	Aromatic (specific for beef)
3.	Meureudu	10	Red (specific for beef)	Aromatic (specific for beef)

Based on the above results, the beef obtained from the three wet markets showed that their still fulfill the criteria for normal meat, since the color and odor were specific for good quality meat. Perhaps, the normal condition from all of sample because they were collected during the morning time from each wet market. So, all of them were still in fresh and good quality condition. Leo and Fidel (2012) suggested that microbes could destroy the meat. The lack of quality of meat is indicated by a change in odor and the existence of mucous when the amount of microbes increased to million or even to hundred of million cells or more in 1 cm of the size of meat surface. The low quality of meat condition is the result of the increased activity of rotten bacteria. The result of TPC test on the number of microbial contamination and the test of *Salmonella* sp is presented in Table 2.

Based on the data in Table 2, it showed that the beef sample collected from wet markets of Lambaro, Sigli and Meureudu, have a microbial colony below the standard of maximum level of microbial contamination. The average of result of colony of TPC test was found below 25. It was obtained from the colony average of 25-250. The beef samples were collected during the morning time at 06.00-07.00 AM. The result of colony evaluation from

the sample obtained from all the wet markets less than the standard level. The same result was also obtained when the beef sample tested for *Salmonella* sp. contamination. All of sample was showed a negative result.

Tabel 2. TPC test on the number of microbial contamination and the test of *Salmonella* sp based on location of sample collection and the population of tradesman.

No	Location of sample	Sample quantity	Type of Microbes		Note	% > BMCM
			TPC	<i>Salmonella</i> sp		
1	Lambaro	20	$3,5 \times 10^4$	negatif	< BMCM	0
2	Sigli	10	$6,3 \times 10^4$	negatif	< BMCM	0
3	Meureudu	10	$7,2 \times 10^5$	negatif	< BMCM	0

Ket: BMCM: (*Batas Maksimum Cemaran Mikroba*= Max. level of microbial contamination)

Based on the result of survey, Lambaro is a wet market with a larger number of beef tradesman as compared to Sigli and Meureudu wet markets. Lambaro wet market has 20 beef tradesman. On the other hand, in Sigli and Meureudu wet markets there only 10 beef tradesman each. However, in all those three markets was found a similar situation. They were sell the beef in an open air area without any cold storage. This condition is very vulnerable for the infection by microbes. In addition, the buyer is allowed to touch the meat. In turn, the meat can result in microbial contamination and soft texture, which is an indication of low quality. Another source of infection is from the meat transportation from Abattoir to the wet markets. Most of methods of transportation to the wet markets were used three wheels vehicle (becak) or a small pick-up truck. As a result, the meat could be contaminated from the surrounding environment and increases the amount of microbes, including the infection by pathogen types of them.

Conclusions

Based on the results above, it is can be concluded that:

1. The physical quality (color and odor) of beef obtained from the wet markets of of Lambaro in Aceh Besar District, Sigli in Pidie District, and Meureudu in Pidie Jaya District is in good and normal condition.
2. The beef from the three wet markets fulfilled the standard of maximum level of microbial contamination. The microbial contamination of TPC is below the standard.
3. Nevertheless, good hygiene and sanitation supervision of pre-production to distribution and circulation of supervision should be maintained.

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