THE EFFECT OF DIFFERENT MEAT SHOP ON MEAT PHYSICAL CHARACTERISTICS AND BACTERIA POPULATION

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ABSTRAK

Penelitian dilakukan untuk mempelajari pengaruh dari tempat penjualan daging yang berbeda terhadap sifat fisik daging dan populasi bakteri. Enam belas karkas sapi PO digunakan dalam penelitian ini yang menggunakan rancangan acak lengkap pola searah dengan 4 perlakuan tempat penjualan daging (pasar tradisional, kios daging, supermarket dan rumah potong hewan). Parameter yang diukur adalah pH daging, daya ikat air, susut masak dan jumlah total mikroba. Hasil penelitian menunjukkan bahwa rata-rata pH 5,25-6,03; daya ikat air adalah 17,07-38,87%, susut masak adalah 33,15-48,20% dan jumlah total mikroba adalah 1.48x106-10.75x10^6 CFU/g. Disimpulkan bahwa jumlah total mikroba di rumah potong hewan dan pasarkhusus (kios daging dan supermarket) lebih rendah dari pasar tradisional.

Kata Kunci: populasi bakteri, fisik daging, toko-daging

ABSTRACT

An experiment was conducted to study the effect of different meat shops on meat physical characteristics and bacteria population. Sixteen PO carcasses were used in the experiment which was arranged in a completely randomized design with 4 treatments of different meat shops (traditional market, meat shop, supermarket and slaughter house). Parameters measured were meat pH, water holding capacity, cooking loss and bacterial total count. The result showed that the average of pH was 5.25- 6.03; water holding capacity was 17.07-38.87%; cooking loss was 33.15-48.20 and bacterial total count was 1.48x10^6-10.75x10^6 CFU/g. It was concluded that bacterial total count in slaughter house and special market (meat shop and supermarket) were less than those in traditional market.

Keywords : bacteria population, meat physic, meat-shop

INTRODUCTION

Meat from cattle is one of the farm commodities needed to meet animal protein which contains amino acid. However, meat is a farm product that is very susceptible to microbial contamination. This is because meat has pH and moisture that suitable for microbial growth. Microbial contamination that can damage meat can be found from cattle that are still alive and attached to the skin surface and in the rumen, and after the cattle slaughtered. The initial contamination was started in slaughterhouse, namely from the floor, a knife, skin, digestive tract contents, water and equipment used for the preparation of carcasses, meat or separation from the workers themselves. A healthy meat was influenced by environmental hygiene in slaughterhouse and places of sales (Borch and Arinder, 2002; Norrung and Buncic, 2008).

Carcasses from slaughterhouse were sent to places such as the sale of traditional markets, supermarkets and meat shop. Microbial contamination occurred during slaughtering, chilling and cutting (Gustavsson and Borch, 1993). Differences sanitation management and environmental conditions of places of meat sale suspected of contamination affecting the microbial quality of meat. Therefore this reserach was carried out to study physical quality of meat included pH, water binding capacity, tenderness, cooking shrinkage and microbial population of beef sold in the sale of meat different in the Yogyakarta City.

The study was conducted to determine the effect of different meat shops on the physical characteristics and bacterial population.

MATERIALS AND METHODS

Beef used in this study was from traditional markets, meat shops and supermarkets. Locations were selected based on strategic and legal places (Pemda, 2009).

Sixteen Ongole Crossbred (PO) carcasses were used in the experiment. Meat was taken from three places that have been determined. Meat from the slaughterhouse was used as a control. Meat was taken from the Longissimus dorsi muscle.

Samples of 4.5 kg of beef taken from the traditional markets, meat shops and supermarkets. In traditional markets, sampling was conducted at 08.00 am until 09.00 am, in the meat shop was at 8:00 to 9:00, and in the supermarket was at 10:00 to 11:00 am with the assumption that these times are a lot of buyers, but the meat is still sufficiently available. Samples were taken for control at 04:00 to 5:00 pm at RPH Giwangan Yogyakarta.

Samples were taken by using a cooling box to be analyzed at the Laboratory of Animal and Laboratory of Microbiology Faculty of Agro-Industry, University of Mercu Buana Yogyakarta.

Variables measured were pH that was measured using a pH meter, Water Holding Capacity was measured by the method of Hamm (Soeparno, 1994), cooking loss was measured by calculating the difference in weight before and after cooking, and the number of bacterial colonies were counted using a Quebec Colony Counter.

The data were analyzed by Anova and mean comparison was tested by Duncan's New Multiple Range Test (Astuti, 1980).

RESULTS AND DISCUSSION

Meat pH

Results showed that differences in the locations of the sale resulted in significantly difference in the pH of meat ($P<0.05$), in which the meat from the traditional market has a real mean pH that lower than the meat from the meat shop, supermarkets and slaughterhouses (Table 1). Buckle *et al.* (1987) and Aberle *et al.* (2001) stated that meat has a normal pH of 5.30 to 6.0. The difference of pH value of meat in place sales due to the meat contact with microorganisms from the environment, during the slaughter process, the transportation and after meat in the place of sale. Microorganism that often contaminates meat is *Lactobacillus*. The activity of microorganisms breaks down carbohydrates into lactic acid, so pH becomes lower (Lawrie, 1997). In addition, the rate of post mortem glycolysis in beef causes breakdown of glycogen to glucose, glucose will experience a breakdown by enzymes (eg. hexokinase, phosphatase, piruvatkinase, lactate and dehidrokinase) into lactic acid. Muscle protein breakdown by enzymes can not be separated from the influence of proteolytic enzymes (neutral proteinases, serine proteinase such as trypsin, alkaline serine proteinase, katepsin). Along with increasing the pH of meat, lactic acid will decrease and cause a variety of microorganisms growing rapidly. The decreasing pH value influenced tenderness and total microbes (Komariah *et al.*, 2004). Meat with high lactic acid content will have a low pH meat. The pH value of meat sheep with different level of sucrose supplementation is lower than the pH of meat sheep that did not have sucrose (Dewi, 2007). Furthermore, pH value of meat is inversely proportional to the lactic acid content of meat, with correlation coefficient (r) = -0.83. Difference in size of meat cuts will affect the rate of microorganisms growth, in which the more cut will enlarge the sectional area of the surface of the meat, so the likelihood of contact with the microorganisms will be greater. Different pH values between sales locations was predicted to be caused by environmental differences in the

Table 1. Physical Characteristics and Bacteria Population

Parameters	Treatments			
	Slaughterhouse	Supermarket	Meat Shop	Traditional Market
pH	5.95^b	6.02^b	6.03^b	5.25^a
Water Holding Capasity	25.95^a	38.87^b	35.39^b	17.07^c
Cooking Loss	42.94^c	34.64^b	33.15^b	48.20^a
Bacterial Count	1.48^a	3.63^a	4.75^b	10.75^c

Means value at the same row with different superscript indicates differ significantly ($P<0.05$).

location of the meat sale. Burhan (2003) stated that handling of meat in the traditional markets still use a very simple handling techniques, so that the factors that cause the occurrence of contact between the meat with microorganisms is very large, ranging from transportation, the cleanliness of the tools used and the temperature of the room. The meat stall and supermarket arrange around 5°C of refrigeration temperatures, so the process goes slower postmortem glycolysis resulting in relatively equal pH meat with a pH of meat from the slaughterhouse. Lawrie (1997) suggested that glycolysis will increase with the increasing of post-external temperature above ambient temperature.

Water Holding Capacity

Water holding capacity of beef is shown in Table 1. The analysis of variance showed that the seller type affected water holding capacity of meat ($P<0.05$). There was no significant difference of meat water holding capacity of meat in traditional markets and slaughterhouse, and it was lower than those in the meat shop and supermarkets. Meanwhile, water holding capacity of meat from different meat shops were not significantly different from the supermarket.

The average water holding capacity of beef (Table 1) was significant difference between the traditional market and slaughterhouse, supermarkets and meat shop. Water holding capacity of meat from traditional markets was the lowest. Water holding capacity of meat was influenced by the pH of meat. The meat having lower pH will have a lower value of water holding capacity.

The value of water holding capacity of meat is detected by the amount of fluid that comes out of meat (drip). Yates *et al*. (1983) and Aberle *et al.* (2001) stated that if the protein denaturation did not occur, it will bind water during conversion of muscle. Juiciness and palatability of meat is influenced by the water holding capacity. Changes in water holding capacity during the conversion of muscle to meat is affected by a decrease in pH and protein denaturation (Lawrie, 1997). Water holding capacity will increase with increasing pH, in which pH of the meat that was achieved at the end of glycolysis was at 5.40 - 6.0.

Declining in the value of water holding capacity is also caused by the pH of meat. In more acidic conditions of meat caused the protein easily damage. According to Aberle *et al.* (2001), when protein denaturation of the meat has a number of weakly bound water molecules so that the amount of protein will decrease.

Cooking Loss

Average cooking loss of beef is presented in Table 1. The results showed that there were no significant difference ($P<0.05$) between the shrinkage of cooked meat from supermarkets and meat shop. This is due to the similar environmental conditions. The value of cooking loss between the assessments are influenced by the water holding capacity of meat.

Cooking loss value from the results of the research ranged from 42.94 to 48.22%. These values were in normal condition as stated by Soeparno (1994) that the normal cooking loss at 15-40%.

Differences cooking loss value is closely linked to the value of water holding capacity of meat, the lower the binding power of water, the higher the value of meat cooking loss. Aberle *et al.* (2001) stated that the high value of cooking loss is an indicator of weakening the bonds of protein, so the ability to bind fluid weakened meat and meat out a lot of fluid due to decreased water holding capacity. The loss of weight or fluid caused by the ripening process is mostly water, proteins, fats, vitamins and other solutions.

The Number of Bacterial Colonies

The mean number of bacteria in each gram of beef from the results of this study is presented in Table 1, in which there were significantly differences ($P<0.05$) in the number of bacteria among location of sale. It can be noticed that contamination by microorganisms has occurred since from the slaughterhouses, and increased after the meat reached the location of sale. Traditional markets showed the most of the population of bacteria, however the activity of these bacteria have not caused changes to the appearance of the meat at the time of stocking for the calculation.

The total number of bacterial colonies from the results of the study ranged from 1.48×10^6 (CFU/g) up to 10.75×10^6 (CFU/g). These conditions were still suitable for human consumption because the amount has not indicated any disturbance of physical qualities. Physical quality of the meat is still within the normal range. It has been widely informed that the bacteria will die at temperature of 85°C, so the bacteria are dead at the time burned, fried or boiled. Higher number of bacteria that are potentially decay more rapidly, so it does not last much longer, so the results of this study indicated that in order to avoid spoilage, the processing of meat for consumption shall pay attention to the lag time from purchase to processing. Meat purchased in the market should be faster processed. The number and type of microorganisms that contaminate the surface of the carcass is determined by the management before slaughtering and carcass cleaning (Buckle *et al*., 1987). The number of bacterial contaminants if left alone will continue to increase during storage and during marketing at room temperature. In addition to a variety of Lactobacillus bacteria that can thrive on fresh meat are *Pseudomonas, Achromobachter, Salmonella typhimurium, Clostridium botulinum* and *Cl. Sporagenesis* (Lawrie, 1997). Microorganisms produce enzymes include hexokinase, phosphatase, piruvatkinase, lactate and glucose dehidrokinase. The resulting proteolytic enzymes include neutral proteinases, serine proteinase such as trypsin, alkaline serine proteinase, which outlines katepsin peptide bonds in proteins (Lawrie, 1997). This is what increases the acidity, weakening the water holding capacity and increase the shrinkage of meat cooking.

Dewi (2000) reported that the meat section of *Longisimus dorsi* that withered for 24 hours at 5ºC has a number of bacteria of 5.67 x 10^6 CFU/g. Although during the withering showed an increase in the number of bacteria, but the withering is commonly done to improve the aroma of meat tenderness and form.

The results revealed that the highest contaminant microorganisms in traditional markets was 10.75 X 10^6 (CFU/g), this is because the meat shop does not separate beef sales with other products such as fish or other sea products, so that there are others suspected cause of contamination in the beef marketed in the traditional markets.

Observations on the level of microorganism contamination of slaughterhouse, supermarkets, meat shop and markets in Yogyakarta meat ranged from 1.48 to 10.75 x 10^6 (CFU/g). The number of bacteria on meat in traditional market was higher than in the meat shop and supermarket, this is due to environmental differences. Meat at the supermarket was put in place with low temperature which may reduce the contaminants and the growth of microorganisms. The deep tissues of carcass quarters cooled and the temperatures of their surfaces rose during air freighting, but surface temperatures mostly remained below 7°C. In meat shop it is equipped by an closed glass cabinets and air conditioning. This was not done in traditional markets. All outlets have a higher number of bacteria per gram compared to the slaughterhouse, this is because the meat after marketed at the retail, level carcasses undergo a process of division into smaller parts when compared to the meat while still in the slaughterhouse. Smaller pieces of meat to expand contacts with the environment, so that contaminated more chance (Buckle *et al*., 1987). Meat cutting also causes contact with processing equipment as a source of contaminants (eg. cutting tools) for more, allowing the opportunity displacement microorganisms (Soeparno, 1994).

CONCLUSION

The meat in the slaughter house, meat shops and supermarkets has lower bacteria content than meat sold in traditional markets.

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