Isolation of Bacteria from Bovine Meat Obtained from Backyard Slaughter in Kelantan

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ABSTRACT
The objective of this study is to determine the degree of superficial bacterial contamination in superficial and deeper layers of raw bovine meat sold to customers at backyard meat stalls and open wet markets. A total of 150 meat samples were obtained from various meat stall and wet market in Kota Bharu, Kelantan. The meat surface were scrapped and cut to a deeper layer (2cm deep) to screen the bacteria. The total plate count (TPC) was taken. Several potential pathogenic bacteria were found mainly on the surface of the meat. The deeper layers of the meat showed less bacterial contamination especially in the next morning. The TPC also showed that the surface bacteria in the morning or afternoon was significantly (\( P < 0.05 \)) higher than the deeper layers of the meat. The results reflect the poor conditions in slaughtering and handling of cattle carcasses, as well as hygiene deficiencies within the area of Kota Bharu. The high prevalence of potential pathogenic bacteria represents a real danger and is a threat to public health.

Keywords: bovine meat, backyard slaughter, bacteria isolation.

1. Introduction

Bacteria are one of the main etiological agents of foodborne diseases. If there are numerous bacteria in the food that we consume, they may continue to grow in the intestines and cause illness. Salmonella, Campylobacter, hemorrhagic E. coli and Listeria are examples of common bacteria that can cause intestinal infections (Kendall, 2008). There are substantial economic losses caused by foodborne diseases; for example Salmonella spp. causes an average of 40,000 cases yearly and affects thousands of people around the globe (Thomas, 2010). Due to the high demand for fresh meat, a lot of small farmers slaughter their animals in the backyard without proper sanitary facilities. The meat is then sold in open-air local retail shops besides (along the) main roads. These shops operate without appropriate temperature control and the meat is exposed to polluted air and dust along the road. The exposure of fresh meat to such adverse environment can assist in disease outbreak occurring and promote bacteria transmission. Due to the above reasons, this study was conducted to determine the
degree of superficial bacterial contamination in raw beef obtained from backyard slaughter in Kelantan and its effect on public health.

2. Methodology

Bovine meat samples were taken randomly from selected meat stalls and wet markets in Kota Bharu. Most of the beef were taken from the Siti Khadijah Market, Berek 12 Market and Pengkalan Chepa Market. The meat stalls were located in Setapang, Beris Jambu and Pengkalan Chepa area. Each day, two beef samples were collected. One sample was collected at 9 a.m and another at 2 p.m.

Scrapings from the surface and deeper layer of the beef samples were streaked onto nutrient agar and incubated at 37°C for 24 hr. Based on the colony colour and shape, the bacteria colony was sub-cultured. Gram stain was performed to differentiate the gram positive and gram negative bacteria. Several selective (EMB, Macconkey, Brilliant Green) and differential media (Blood agar, Simmon citrate) were used. Batteries of biochemical test (TSI, SIM, and Urea), oxidase and catalase were also performed to identify the bacterial species.

2. Results and discussion

The TPC count was found to be significantly different (P<0.05) between the meat surface and deep layer of the meat (Figure 1). There was significantly (P<0.05) lower TPC in the deep layer sample in the morning compared to the deep layer sample in the afternoon. The results also revealed that some of the TPC counts were above the maximum limits (<1.0 x 10⁶ cfu/g) as required by Malaysia regulatory standards under the Food Regulation Act (1985).

Fig.1. The average TPC of meat samples collected in the morning and in the afternoon
The result of the TPC from morning meat surface sample was lower than the afternoon meat surface sample. This result was observed because of the meat was exposed to the favorable environment for bacterial to grow and multiply in the meat stalls or in the wet markets. The deep layer bacterial colony units were less forming probably because the bacteria need longer time to produce enough protease enzymes to be able to penetrate the meat.

The frequency of bacteria isolated in meat is shown in Table 1. The most common bacteria isolated from the surface of the meat were *Staphylococcus aureus* followed by *Streptococcus spp.* These bacteria species are common in the meat industry in the country (Hee et al., 2008). Enteric bacteria such as *Escherichia coli* were also isolated probably due to poor sanitary practices followed at the meat stalls (Hassan et al., 2010). Other bacteria, *Proteus mirabilis* which generally originates from the urinary tract was isolated probably due to cross contamination from other sources, such as unwashed hands or unclean slaughtering equipment.

Table 1: The frequency of bacteria found on meat

<table>
<thead>
<tr>
<th></th>
<th>Morning sample (N=75)</th>
<th>Afternoon sample (N=75)</th>
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<tbody>
<tr>
<td></td>
<td>Surface (n=37)</td>
<td>Deep (n=37)</td>
</tr>
<tr>
<td><em>Staphylococcus aureus</em></td>
<td>16%</td>
<td>8%</td>
</tr>
<tr>
<td><em>Escherichia coli</em></td>
<td>5%</td>
<td>5%</td>
</tr>
<tr>
<td><em>Klebsiella spp</em></td>
<td>-</td>
<td>3%</td>
</tr>
<tr>
<td><em>Salmonella typhimurium</em></td>
<td>5%</td>
<td>3%</td>
</tr>
<tr>
<td><em>Streptococcus spp</em></td>
<td>14%</td>
<td>-</td>
</tr>
<tr>
<td><em>Mannheimia haemolytica</em></td>
<td>11%</td>
<td>8%</td>
</tr>
<tr>
<td><em>Proteus mirabilis</em></td>
<td>3%</td>
<td>-</td>
</tr>
</tbody>
</table>

These bacteria mainly will cause food poisoning and food borne diseases. Cross contamination was the most frequent way to contaminate fresh meat (Usha et al., 2010). To prevent the public health problem, the beef should be properly stored. A good and cleaned kitchen utensil should be used to prepare the beef.

4. Conclusion

The result illustrates the high level of superficial bacterial contamination of the meat. This may be due to poor conditions of slaughtering of cattle and the handling of their carcasses, as well as the deficiencies in the practice of hygiene within Kota Bharu. The high prevalence of potential pathogenic bacteria represents a potential health hazard to the people and the society.

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