Isolation and identification of bacterial contamination of raw meat in Thi-Qar province markets

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Summary
Meat considers a favorite environment for bacterial growth due to rich composition with protein, fats, minerals, vitamins and other essential materials requirements for microorganism growth. Study concluded isolation and bacterial account of meat in Thiقار city markets. Study extends from November 2014- March 2015. Thirty samples of meat (10 from beef meat, 10 from sheep and 10 from poultry meat). Bacterial account shown that the highest contamination of meat samples found in sheep meat 16*10^6 CUF/g (more than standard parameters of healthy suitable meat for human consumption) while the lowest bacterial account found in poultry meat 93*10^2 CUF/g. Isolation and identification of bacteria by morphological, differential media, biochemical tests and Gram stain results showed that predominant bacteria were E.coli, Klebsella, Staphylococcus aureas, Shegilla, Salmonella spp., Bacillus cereus, Enterobacter, Proteus, Micrococcus, Pseudomonas spp. and streptococcus spp. The predominant bacteria was E. coli about 35% in all samples, Followed by staphylococcus spp. 25%. Salmonella spp. 1.2% isolated only from chicken meat samples.

Key words: raw meat, bacteria, Thi-Qar, markets
Introduction

Meat is an edible animal flesh which comprises principally the muscular tissue, and also includes internal organ called viscera such as heart, liver, kidney, intestine and bladder. [Adams and. Moss, 1999; Okala and Reedi, 2001]. Relate that the bulk of meat is derived from goat, cattle, pig, sheep, and poultry. According to Ikeme (1990) the chemical composition of meat varies considerably with age, species, degree of fatness of animal, the part of carcass involved etc. Because of the enormous value of meat in the diet, there exist large markets for meat and meat products worldwide at varying money value hence their demands increase day by day across the globe.

Meat products are obtained when raw meat or preserved meat (cured meat) are altered in form by grinding, pressing, drying and other processes then augmented in flavour by smoking, spicing or blending with other food. These meat products are subjected to combination of several basic processing steps before reaching their final form. Therefore meat products are also termed as processed meat Micro-organisms that occur in meat and meat products most times are responsible for food borne illness. These microorganisms are Bacillus sp, Clostridium spp, Escherichia coli, Salmonella sp, Shigella sp, Staphylococcus aureus, Streptococcus pyogenes, Proteus, Pseudomonas, Leuconostoc, Lactobacillus spp, Micrococcus, Mycobacterium sp, Vibrio sp etc. [Baird-Parker, 1991]. Salmonella may be transferred from raw meat to cooked meat by hands, surfaces or utensils [Jay, 2000]. Of all microorganism bacteria are the greatest importance, some bacteria are not infectious on their own, but when they multiply in food they eject toxin, that poisons human when consumption. Also processing practices can exacerbate contamination through poor hygiene (Al.Tai, 1986; Biss, and Hathaway, 1996; Galland, 1998).

The chief constituents of meat are water, protein and fat, phosphorus, iron and vitamins are also contained in meat. The major primary unit of meat is called carcass. It represents the ideal meat after head, hide, intestine, blood. The edible parts of a carcass include lean flesh, fat flesh and edible glands or organs such as heart, liver, kidney tongue and brain. Meat is considered as the most nutritive source of protein consumed by humans. Age and sex of the animal has a major influence on the quality of meat that is produced from animals (Rao et al., 2009).

Notwithstanding the major role meat play in our meals, it can also serve as a rich medium of growth for harmful microorganisms. Meat infected with microorganisms is the cause of many food-borne diseases (WHO, 1997). The source of these pathogenic microorganism may be the animals themselves or from outside. The surroundings where these animals are kept as well as the way they are processed after slaughtering can also result in contamination with microorganisms (Adyemo, 2002). Meat infected with microorganisms is normally poor in quality (Mukhopadhyay, 2009).

Methods

Thirty meat samples from the various markets of Thiqar province were collected into sterile plastic bags, stored at 4 °C in ice chest filled with ice and transported to the laboratory for immediate analysis. Samples included 10 from beef meat, 10 from sheep meat and 10 from poultry meat (5 grams for each sample). Study extended from November 2014- March 2015. Peptone water used as diluent (10⁻¹, 10⁻², 10⁻³, 10⁻⁴, 10⁻⁵) duplicate plate were culture from each dilution according to (APHA, 1986).

1-Total Viable Bacteria Count

One ml of aliquots of each dilution was transferred in septic conditions to sterile petri-plates and mixed with about 15 ml of nutrient agar tempered to 45-50°C. The cooled plate were inverted and incubated at 37°C for 48hr. Following the incubation the colonies on duplicate plates (Containing 30-300 colonies) were counted using the Quebec colony counter. The concentration of bacteria in the original sample was calculate by multiplying the number of colonies on a dilution plate by the corresponding dilution factor and the number of microbes were expressed as colony forming unites (CUF) per gram (APHA, 1985). More of 300 colony in one plate negligible.

2- Bacterial identification was conducted by standard morphological and biochemical characters of isolates (MOCM, 2002).

Results

Outcomes of bacterial accounts in different serials of samples concentrations shown in table 1. Which reveal that the highest contamination of meat samples occur in sheep meat 16*10⁶ CFU/g, while the lowest bacterial account found in beef meat 54*10².
The isolates were identified as Staphylococcus aureus, streptococcus, shegilla, Klebsiella, Enterobacter spp, Escherichia coli, Salmonella spp, Pseudomonas spp, Bacillus cereus and Proteus spp. The predominant bacteria of all samples was E. coli about 35%. Salmonella spp. were isolated only from chicken sample, they about 2.5% only. Percentage of bacteria in different samples revealed in table 2.

### Table (1) bacterial account in different serials of dilutions

<table>
<thead>
<tr>
<th>Sample</th>
<th>Mean of Total Bacterial Count (CFU/g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beef meat</td>
<td>76 *10^2, 52 *10^5, 54 *10^2, 62 *10^4</td>
</tr>
<tr>
<td>Sheep</td>
<td>16 *10^6, 77 *10^5, 51 *10^5, 81 *10^5</td>
</tr>
<tr>
<td>Poultry</td>
<td>1.5 *10^6, 1.5 *10^5, 93 *10^2, 57 *10^4</td>
</tr>
</tbody>
</table>

### Table (2) percentages of bacteria genera in different meat samples

<table>
<thead>
<tr>
<th>Samples origin</th>
<th>Bacteria isolates</th>
<th>Percentage of bacteria related to other isolates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beef, sheep and poultry</td>
<td>E. coli</td>
<td>35%</td>
</tr>
<tr>
<td></td>
<td>Staphylococcus</td>
<td>25%</td>
</tr>
<tr>
<td></td>
<td>Enterobacter</td>
<td>11.2%</td>
</tr>
<tr>
<td></td>
<td>Klebsiella</td>
<td>5.6</td>
</tr>
<tr>
<td></td>
<td>Streptococcus</td>
<td>5.4</td>
</tr>
<tr>
<td></td>
<td>Shegilla</td>
<td>4.9%</td>
</tr>
<tr>
<td></td>
<td>Microoccus</td>
<td>4.3%</td>
</tr>
<tr>
<td></td>
<td>Pseudomonas, Bacillus cereus, Proteus</td>
<td>5.4%</td>
</tr>
<tr>
<td>isolated from poultry meat only</td>
<td>Salmonella spp</td>
<td>1.2</td>
</tr>
</tbody>
</table>

### Discussion

The presence of bacteria in meat has been widely reported from different parts of the world (Holds, 2007; Kinsella et al., 2008). Some groups recognized the presence of viable bacteria, especially Gram-negative organisms from 10^6 to 10^9, as an indication of open-air meat spoilage (Eribo and Jay, 1986), while others argued this assertion and considered the presence of a high number of background organisms as a pathogen-reduction strategy due to the organisms’ antagonistic effect against pathogenic bacteria and thus safer for meat quality. Therefore, it is considered that fresh meat that contains 10^5 – 10^6 of background organisms are inherently safer than those that contain less bioload; however, this hypothesis applies only to harmless bacteria (Jay, 1996). In order to address the issue in the view of our local scenario, the organisms were identified. Results indicated the predominance of Gram-negative organisms such as Salmonella, Shigella, and Escherichia coli as reported by other groups (Zweifel, 2008). These organisms are already involved in various infectious disease outbreaks in Karachi (Luby et al. 1993; Nasim and Vahidy, 1998; Nasir, Shah and Rashid, 1999). The presence of zoonotic bacteria such as Brucella and Listeria indicates poor ante-mortem inspection of the animals as well as unhygienic meat processing (Lacerda et al. 1997; Barros et al. 2007). In one Iraqi study that compared imported meat to local meat, the demonstrated that predominant bacteria were E. coli then Staphylococcus spp. also study revealed the count of bacterial contamination near the standard Iraqi values, this agreed with our study. (Samir, et al. 2013). Incidences of E. coli, Enterobacter spp and other index of poor sanitary quality found in this study are in agreement with previous studies. E. coli O157 outbreaks due to plants and animal produce have become increasingly common (Schroeder et al., 2005). While half of produce associated outbreaks were due to kitchen-level cross-contamination, which calls for further prevention efforts targeting food preparers, the other half were due to produce already contaminated with E. coli O157 before purchase (Schroeder et al., 2005). Salmonella spp. are poorly isolate from beef and sheep meat while it is easy to isolate from poultry meat. Chicken meat consider main sources of infection for human and animals. In previous Iraqi research no isolates of Salmonella from local and imported beef and sheep meat. (Samir, et al. 2013). The total number of bacterial account in chicken meat was very low this may related to easy freezing and treating with poultry meat due to small size of carcasses compare to beef and sheep meat.

### References
