Assessment of bacterial evaluation of imported frozen meat

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ABSTRACT

One hundred random samples of American, Brazilian, Indian and Sudanese imported frozen meat (25 of each) were collected from different shops and supermarkets at Cairo province to evaluate their bacteriological quality. The obtained results indicated that the mean values of APC of the examined imported frozen meat samples were 7.25x10⁴, 1.53x10⁵, 1.54x10⁵, and 2.35x10⁵ in American, Brazilian, Indian and Sudanese, respectively. The mean count of psychrotrophic of the examined samples was 1.02x10⁴, 1.42x10⁵, 3.57x10⁵ and 1.50x10⁹, respectively. The mean values of staphylococci count in the same samples were 2.41x10⁵, 1.50x10⁵, 1.87x10⁵, and 2.62x10⁶, respectively. For the incidence of Aeromonas species in examined frozen meat, A. hydrophila was present in 20%, 28%, 40% and 32% of American, Brazilian, Indian and Sudanese meat, respectively. In the meantime, A. salmonicida was present in 21%, 24%, 20% and 20% in the same samples, respectively. On the other hand, A. putida was present in 8%, 16%, 8% and 12% of the examined samples, respectively. A. sorbia also present in 8%, 20%, 4% and 8% of the same samples, respectively. Finally, A. cavia was present in 8%, 16%, 4% and 4% of the examined samples, respectively.

1. INTRODUCTION

Meat constitutes the most important items of human food, because of its palatability and nutritional value. It is a highly desired food (Hui et al., 2001). Frozen meat is often more heavily contaminated due to the presence of spoilage microorganisms responsible for objectionable changes or pathogens leading to either food infection or intoxication (Tauxe et al., 2002). Although muscles of healthy animals do not contain microorganisms, meat tissues get contamination during the various stages of slaughter and transportation (Ercolini et al., 2006). Total aerobic bacterial count is used as an indicator of bacterial population in meat. It is not a measure of the entire bacterial population, but as its name implies, it is a generic test for microorganisms that grow aerobically at mesophilic temperature (APHA, 2001). Storage of meat for long period at low temperature is responsible of several quality problems to meat industry. These problems related to growth of psychrotroph microorganisms (Nasser and Fathi, 1997). Staphylococcus can be carried on hands, nasal passage or throats. Most food borne illness outbreaks are result of contamination from food handlers and production of heat stable toxins in food. The symptoms of staphylococcal food poisoning are abdominal cramps, nausea, vomiting, sometimes followed by diarrhea (never diarrhea alone). The onset of symptoms remission is observed after 24 hrs (Le Loir, 2003).

Moreover, recent food surveys confirmed that Aeromonas species were considered as re-immersing enteric pathogens which responsible for several food epidemics (Ghenghesh et al., 2008). A. hydrophila, A. caviae and A. veronii biovar sorbia are responsible for 85% of human gastrointestinal disorders. Aeromonas veronii biovar sorbia and A. caviae provoke enteritis with watery diarrhea and most commonly isolated from so-called travelers’ diarrhea cases. Enteritis caused by A. hydrophila and A. jandaei is characterized by loose stools. A. caviae prevails in juvenile diarrheal cases (Parker and Shaw 2010).

A lack of attention to the hygienic design of slaughtering hall and cleaning and sanitation procedures can lead to bacterial contamination of meat, care must be taken to ensure that equipment such as storage chillers, and other product contact surfaces are adequately sanitized (Betts 2014).

Therefore, the goal of this research is assessment of bacterial load especially Aeromonas species in imported frozen meat sold at different shops and supermarkets at Cairo province, Egypt.

2. MATERIAL AND METHODS

2.1. Collection of samples

One hundred random samples of different cuts of American, Brazilian, Indian and Sudanese imported frozen meat (25 of
each) were collected from different shops and supermarkets in Cairo province. The collected samples were kept in separate plastic bags and transferred directly to the laboratory in an insulated ice box under complete aseptic conditions without undue delay to evaluate their bacteriological quality.

2.2. Preparation of samples (APHA, 2001) Under complete aseptic conditions, samples were thawed. Twenty-five grams of the examined samples were removed by sterile scissors and forceps after surface sterilization by hot spatula, transferred to a sterile polyethylene bag, and 225 ml of 0.1 % sterile buffered peptone water were aseptically added to the content of the bag. Each sample was then homogenized in a blender at 2000 rpm for 1-2 minutes to provide a homogenate of 1/10 dilution. One ml from the original dilution was transferred with sterile pipette to another sterile test tube containing 9 ml of sterile buffered peptone water. 0.1 % mixed well to make the next dilution, from which further decimal serial dilutions were prepared. The prepared dilutions were subjected to the following examinations.

2.3 Aerobic plate count (APHA, 2001) 2.4 Psychrotrophic bacterial count (ICMSF, 1982) 2.5 Staphylococci count (FDA, 2001) 2.6 Isolation and Identification of Aeromonas species (ICMSF, 1996) 2.6.1 Microscopical examination (A.P.H.A., 1992.) 2.6.2 Biochemical identification (Baron and Finegold, 1990) 27. Statistical Analysis Analysis of Variance (ANOVA) test was applied for statistical evaluation of the obtained results from examined frozen meat samples

3. RESULTS

The obtained results in tables (1-3) indicated that the mean values of APC (CFU/g) of the examined imported frozen meat samples were 7.25±10³ ± 2.38±10³, 1.53±10² ± 4.84±10², 1.54±10³±4.14±10³, and 2.35±10³±5.59±10³ in American, Brazilian, Indian and Sudanese respectively. The current results were lower than those reported by Refai et al. (1991) who found that the mean total aerobic bacterial count of the examined frozen meat samples was 2.7±10⁶ (CFU/g), and higher than that obtained by Ghazalal (2009) who detected that the average APC of frozen meat was 13±10⁶ (CFU/g).

Table 1. Statistical analytical results of APC (CFU/g) of the examined frozen meat samples (n = 25).

<table>
<thead>
<tr>
<th>Type of Sample</th>
<th>Min.</th>
<th>Max.</th>
<th>Mean ± S.E</th>
</tr>
</thead>
<tbody>
<tr>
<td>American</td>
<td>2.3x10⁶</td>
<td>3.9x10⁶</td>
<td>7.25±10³ ± 2.38±10³</td>
</tr>
<tr>
<td>Brazilian</td>
<td>2.3x10⁶</td>
<td>8.3x10⁶</td>
<td>1.53±10² ± 4.84±10²</td>
</tr>
<tr>
<td>Indian</td>
<td>2.1x10⁶</td>
<td>6.6x10⁶</td>
<td>1.54±10³±4.14±10³</td>
</tr>
<tr>
<td>Sudanese</td>
<td>4.3x10⁶</td>
<td>8.3x10⁶</td>
<td>2.35±10³±5.59±10³</td>
</tr>
</tbody>
</table>

Means within a column followed by different letters showed significant difference (P < 0.05).

Table 2. Statistical analytical results of psychrophilic count (CFU/g) of the examined frozen meat samples (n = 25).

<table>
<thead>
<tr>
<th>Type of Sample</th>
<th>Min.</th>
<th>Max.</th>
<th>Mean ± S.E</th>
</tr>
</thead>
<tbody>
<tr>
<td>American</td>
<td>&lt; 10</td>
<td>5.2x10⁶</td>
<td>2.42±10³ ± 2.37±10³</td>
</tr>
<tr>
<td>Brazilian</td>
<td>10</td>
<td>5.6x10⁶</td>
<td>1.50±10² ± 4.70±10²</td>
</tr>
<tr>
<td>Indian</td>
<td>&lt; 10</td>
<td>6.5x10⁶</td>
<td>1.42±10³ ± 2.36±10³</td>
</tr>
<tr>
<td>Sudanese</td>
<td>&lt; 10</td>
<td>6.7x10⁶</td>
<td>2.62±10⁶ ± 5.66±10⁶</td>
</tr>
</tbody>
</table>

Means within a column followed by different letters showed significant difference (P < 0.05).

4. DISCUSSION

Meat is not only highly susceptible to spoilage, but also frequently implicated in the spread of food borne illness. Contaminated raw meat is one of the main sources of foodborne illness, during slaughter and processing, all potentially edible tissues are subjected to contamination from a variety of sources within and outside animal. In living animals, those surfaces in contact with the environment, harbor a variety of microorganisms. The contaminating organisms are derived mainly from the hide of the animal and also comprise organisms that originate from both faces (Bhandare et al., 2007; Podpecan et al., 2007).

In table (1) The obtained results indicated that the mean values of APC of the examined imported frozen meat samples were 7.25±10³ ± 2.38±10³, 1.53±10² ± 4.84±10², 1.54±10³±4.14±10³, and 2.35±10³±5.59±10³ in American, Brazilian, Indian and Sudanese respectively. The current results were lower than those reported by Refai et al. (1991) who found that the mean total aerobic bacterial count of the examined frozen meat samples was 2.7±10⁶ (CFU/g), and higher than that obtained by Ghazalal (2009) who detected that the average APC of frozen meat was 13±10⁶ (CFU/g).
there is a general agreement that aerobic spoilage of meat becomes evident when the level of bacteria reaches 10^7 (CFU/g) (off odors) or 10^5 (CFU/g) (slime formation) (Preito et al., 1992).

In table (3) The mean values of *staphylococci* of the examined imported frozen meat samples were in 2.41x10^3 ± 2.07x10^3, in 1.50x10^3 ± 4.70x10^3, in 1.87x10^3 ± 2.94x10^3, and 2.62x10^3 ± 5.66x10^3 in American, Brazilian, Indian and Sudanese meat, respectively.

The achieved results were nearly similar to that obtained by Habeel (1999), who collected 90 samples from Alexandria markets and found that the incidence of staphylococcal was 53.33% and higher than that found by Phillips et al. (2001), who analyzed 990 samples of imported frozen beef meat recorded that coagulase positive *staphylococci* was 17.5% of the analyzed samples.

The presence of *staphylococci* may be due to contamination during dressing and evisceration in the slaughter house, contaminated equipment, butchers, hand with abrasions and wounds, slaughter of animal beside dressed one in the same area in the slaughter hall and contaminated air from workers with their aerosol which contaminate air with *staphylococci* (Bennett, 2005).

Also, exposure of Imported frozen meat to thawing and refreezing in market shops and street vendors, yielding an abundant supply of water and form an excellent media for bacterial growth and multiplication (Jay et al., 2015).

Table (4) declare the incidence of *Aeromonas* species in examined frozen meat where A. hydrophila present in 20 %, 28 %, 40% and 32% of American, Brazilian, Indian and Sudanese meat respectively. While A. *salmonicida* present in 21%, 24%, 20% and 20% in the same samples respectively on the other hand A. *pactua* were present in 8%, 16%, 8% and 12% of the examined samples respectively. A. *sorbia* also present in 8%, 20%, 4% and 8% of the same samples respectively. Finally, A. *cavia* present in 8%, 16%, 4% and 4% of the examined samples respectively the obtained results were nearly similar to that reported by (Stratev et al. 2012).

The motile mesophilic aeromonads consisting of A. *hydrophila*, A. *sorbia* and A. *cavia*, are considered causative agents of human gastroenteritis, wound infections and septicaemia (Isonhood and Drake, 2001)

### 4. CONCLUSIONS

High hygienic precaution should be followed to improve the bacteriological quality of Imported frozen meat and to prevent growth and multiplication of bacteria that may cause a serious public health hazards. From the obtained results, we found that the Sudanese frozen meat was the most contaminated samples as it had record the highest APC 2.35x10^5 ± 5.95x10^3 (CFU/g), the highest psychrotrophic count 2.42x10^4 ± 4.86x10^3 (CFU/g), also the highest staphylococcal count 2.62x10^4 ± 5.66x10^3 (CFU/g). A. hydrophila was the most isolated microorganism from most of the frozen meat samples as it was isolated from 10 samples (40%) from the Indian meat.

### 5. REFERENCES