Safety of meat served at a university hostel

Amani M. Salem1, Marionette Nassif and Bashayer Mohammed3

1 Department of Food Hygiene and Control, Faculty of Veterinary Medicine, Benha University, Egypt
2 Animal Health Research Institute, Department of Food Hygiene, Benha branch.
3 Veterinarian in Shoubra student hostel, Benha University, Egypt.

ARTICLE INFO

Keywords

APC
Beef
Chicken
Coliform
Enterobacteriaceae

ABSTRACT

This study aimed to evaluate the hygienic status of served chicken meat and beef in a university hostel. About one hundred random of chicken and beef meat samples before and after cooking (about 120g) were collected from a university student hostel, Egypt. Samples were examined bacteriologically. The average values (cfu/g) of Aerobic plate count (APC), Enterobacteriaceae & Coliform counts were 4.10x10±0.01x10⁴, 6.2x10±0.02x10⁵, 2.4x10²±0.02x10², 6.2x10±0.02x10⁵, 6x10²±0.02±0.02x10² & Less than 10 in raw chicken thigh, 2.47x10²±0.02x10², 2x10²±0.02x10² & 4.3x10²±0.01x10² in raw chicken breast, 2.6x10²±0.03x10³, Less than 10 & Less than 10 in cooked chicken thigh, 5.3x10³±0.02x10³, Less than 10 & Less than 10 in cooked chicken breast, 4x10²±0.02x10², 1x10⁴±0.03x10¹ & 1x10⁴±0.01x10⁴ in raw beef and 4x10²±0.03±0.01x10², 2.2x10²±0.02x10² & Less than 10 in cooked beef, respectively. Moreover, the incidence of E.coli was 73.33%, 33.33% and 35% in raw chicken thigh, cooked chicken breast and raw beef, while the mean valued of Staph. aureus were 5.3x10¹±0.02x10, 2.3x10²±0.01x10, 6.2x10±0.02x10, 6.9x10⁴±0.02x10, 3.9x10²±0.01x10⁴ and less than 10 in raw chicken thigh, raw chicken breast, cooked chicken thigh, chicken breast, raw beef and cooked beef, respectively. All samples were accepted based on their APC, Enterobacteriaceae, Coliform & Staph. aureus counts.

1. INTRODUCTION

The risk of bacterial food borne diseases increases when meat meals were prepared in kitchens, as in hospitals, students` accommodation, youth hotels and shared homes. This increase is due to the high number of individuals using the kitchen, the lack of responsibility and the difference in the hygienic standard for the users of these kitchens (Sharp and Walker, 2003). Meat constitutes the most important item of human food, because of its palatability and nutritional value. It is also a highly desired food and the center of the meal (Hui, 2001). For this high nutritional value, it offers a highly favorable environment for the growth of pathogenic microorganisms. Cross-contamination from raw to cooked food, inadequate cooking food handlers may also be asymptomatic carrier of food poisoning organisms (Ravishankar et al., 2010). Meanwhile, insufficient cooking may result in survival of E.coli and subsequently causes food poisoning to consumers (Cruz et al., 2005). The bacterial contamination and hygienic measures during meat production can be measured using the aerobic plate count and three Gram - negative indicator groups viz: Enterobacteriaceae, Coliforms and Escherichia coli which is the most important indicator for faecal contamination (Paulsen et al., 2006). Staph. aureus, E. coli and Salmonellae are ones of important bacteria causing food poisoning those leading to gastroenteritis and other health complications (CDC, 2015). The frequency of several types of food poisoning infections climbed, but that the increases could be the result of new diagnostic tools that help identify more cases. Overall, the agency believes food poisoning rates have remained largely unchanged. It highlights the difficulty in understanding food poisoning when so many cases go un-reported, diagnostic methods are inconsistent, and production practices and eating habits are constantly changing (CDC, 2019). Therefore, this study was conducted to evaluate safety of meat meals served in a university student hostel.

2. MATERIAL AND METHODS

2.1. Sampling:
A total of 100 random samples (120g of each) of raw and cooked chicken meat (60) of breast& thigh (15 each) and beef (20 of each) were collected from meals served in a university student hostel in Egypt. Each sample was examined before and after cooking. Chicken samples were fried at 190°C for 1 hr. till golden brown color appearance and meat samples were boiled in water at 100°C till full cooking then fried at 190°C for 15 min. Both raw and cooked samples were kept in separate plastic bags and transferred directly to the laboratory in an ice box under complete aseptic conditions without undue delay to be examined bacteriologically.

2.2. Preparation of samples:
The samples were prepared according to the technique by APHA (2001) as follow:

* Corresponding author: Amani M. Salem, Food Control Dept., Faculty of Veterinary Medicine, Benha University, Egypt.
Twenty-five grams of examined samples were aseptically transferred to a sterile stomacher bag and homogenized with 225 ml of 0.1% sterile peptone water for 2 min to give an initial dilution of 1/10. Tenfold serial dilution was prepared from original dilution. 

2.2.1. Aerobic Plate Count (APHA, 2001). It has been done by using standard plate count agar, The APC per gram was calculated on plates containing 30-300 colonies and each count was recorded separately.

2.2.2. Enterobacteriaceae Count (ISO, 2004). It has been done by Violet Red Bile Glucose agar medium (VRBG). All large purple suspected colonies surrounded by a purple halo were counted, The Enterobacteriaceae count / g was calculated.

2.2.3. Coliform count (ISO, 2004). By using plate of tempered melted violet red bile agar (cooled to 44-46 ºC). Suspected colonies, which showed purplish – red colonies surrounded by a red zone of precipitated bile acid, were enumerated to obtain coliforms count /g.

2.2.4. Isolation and Identification of Staphylococcus aureus (ICMSF, 1996). By using Baird parker agar medium, shiny black colonies were positive. The suspected colonies of Staph. aureus were stabbed into semi solid nutrient agar tubes for further biochemical identification.

2.2.5. Isolation and identification of E. coli (ISO 2001). By TBX media (Trypyrone bile x-glucornic), suspected colonies showed bluish green with halo zone.

2.3. Statistical Analysis: The obtained results were statistically analyzed by application of Analysis of Variance (ANOVA) test according to Feldman et al. (2003).

3. RESULTS

It is evident from the result recorded in table (1) that the mean values of APC, Enterobacteriaceae, Coliform and Staph. aureus (cfu/g) were 4.10×10^7±0.01×10^7, 4×10^2±0.03×10^2, Less than 10 and 3.9×10^5±0.01×10^5 in raw chicken thigh, 2.47×10^7±0.02×10^7, 6×10^2±0.02×10^2, 4.3×10^2±0.01×10^2 and 2.3×10^7±0.01×10^2 in raw chicken breast, 2.4×10^3±0.03×10^3, Less than 10, Less than 10 and 6.2×10±0.02×10 in cooked chicken thigh, 5.3×10^4±0.00×10^4, Less than 10, Less than 10 and 6.9×10±0.02×10 in cooked chicken breast, 4.0×10^2±0.02×10^2, 1×10^3±0.03×10^3, 1.3×10^2±0.01×10^2 and 3.9×10^2±0.01×10^2 in raw beef, 4.0×10^2±0.03×10^2, 2.2×10^2±0.02×10, Less than 10 and Less than 10 in cooked beef.

As shown in Table (1), the highest APC (cfu/g) was in raw chicken thigh followed by that in raw beef. Also, the highest Enterobacteriaceae, Coliform and Staph. aureus (cfu/g) was in raw beef followed by raw chicken thigh in Enterobacteriaceae and Staph. aureus, raw chicken breast in Coliform.

4. DISCUSSION

As shown in Table (1), the highest APC (cfu/g) was in raw chicken thigh followed by that in raw beef. Also, the highest Enterobacteriaceae, Coliform and Staph. aureus (cfu/g) was in raw beef followed by raw chicken thigh in Enterobacteriaceae and Staph. aureus, raw chicken breast in Coliform.
Thorough cooking can generally destroy most bacteria on raw meat, including pathogenic ones. In addition, pathogenic bacteria may be introduced into the ready-to-eat cooked meat through cross-contamination and multiply to larger amounts as a result of time and temperature abuse of the food, causing foodborne illness in consumers (CFS, 2017). The obtained results were higher than that recorded by Ruban and Fairoze (2011) who found (chicken thigh and breast meat were 2.18 × 10^4, 6.7 × 10^1, 1.78 × 10^3 cfu/g, respectively) and nearly similar to that reported by Vural et al. (2006) (1.48 × 10^3, cooked chicken breast) and lower than that recorded by Saad (2011) (4.78×10^3±0.96×10^2, cooked chicken meat) and nearly similar to El-Taher Amna(2009) (9.05×10^1±2.51×10^0 cooked chicken meat), while APC of cooked beef samples was lower than that recorded by Kirralla-Ghada (2007) (2.20×10^1 cfu/g), also lower than that recorded by Abd EL-Raheem (2013) (5.4×10^2±0.33×10^0 cfu/g), while the result was similar to that recorded by Arab (2010) (3.85×10^1±1.27×10^0 cfu/g). Enterobacteriaceae count used to assess the general hygienic status of a food product and their presence in heat treated food indicates inadequate cooking or post processing contamination (CFS, 2014). It is also could indicates time/temperature abuse during handling or inadequate storage. As these microbial groups are safety indicators, the presence of high counts may indicate possible presence of pathogens (Jay, 2005).

The current results were lower than those obtained by Vural et al. (2006) (6.03 × 10^1 cfu/g, raw chicken breast) also lower than that obtained by Capita et al. (2002) (1.9×10^1 cfu/g) and it is shown that there is no Enterobacteriaceae count in cooked chicken thigh & breast. Coliform bacteria are associated with the intestinal tracts of humans and animals. Their presence out-side the intestines may be an indication of contamination with the fecal discharges of humans or animals (Worobo, 1999). Moreover, the highest Coliform count (cfu/g) in raw beef which indicate fecal contamination which may be due bad personal hygiene. There is coliform in cooked samples and also in raw thigh, while coliform count in raw breast was lower than that recorded by Vural et al. (2006) (8.32 × 10^1 cfu/g, raw chicken).

On the other hand, *Staph. aureus* is more incident in raw beef which may due to improper handling during slaughtering, evisceration and receiving. Cooked samples of chicken showed counts, and this is because recontamination of cooked meat by pathogens such as salmonella or staphylococci comes from the hands of the workers or from the equipment or utensils (Bryan, 1990). *Staph. aureus* failed to be detected in cooked beef samples and this agree with Mohamed (2000) who failed to isolate and detect *Stap. aureus* from any of the finished heat-treated beef products (ready-to-eat). Moreover, the incidence of Enterobacteriaceae, Coliform, *Staph. aureus* and *E.coli* as shown in Table (2) was 80%, failed to be detected, 60, 73.33 in raw chicken thigh, 86.7, 80, 60 , failed to be detected in raw chicken breast, failed to be detected, failed to be detected, 33.33, failed to be detected in cooked chicken thigh, failed to be detected, failed to be detected, 33.33, 33.33 in cooked chicken breast, 75, 75, 20, 35 in raw beef and 35, failed to be detected, 20, failed to be detected in cooked beef. These results agreed with Mohamed-Amany (2014) and Eid and El sheikh (2007) who found that, the effect of boiling and frying as cooking methods reduce the initial count of *E. coli*.

### 5. CONCLUSION

In conclusion, some served meat in university hostel may exposed to bacterial contamination as well as presence of some pathogens during different stages of preparation. Therefore, raw samples were the most contaminated ones and *Staph. aureus* was the most contaminant. So, to improve the hygienic status and safety of served food, certain policies must be applied for public health safety.

### 6. REFERENCES