



Benha University
Faculty of Veterinary Medicine
Food Hygiene and Control Department

Incidence of *Bacillus* Species in Some Meat Products with Special References to Genes Responsible for Secretion of Emetic and Diarrheal Toxins of *Bacillus cereus*.

A Thesis Presented by

Fatma Hussien Ali Ahmed

(B. V. Sc., Kafr El - Shiekh University, 2006)

(M. V. Sc., Benha University 2016)

For the Degree of Ph.D.

(Meat Hygiene)

Under Supervision of

Prof. Dr. Mohamed Ahmed Hassan

Professor of Meat Hygiene and Head of Food
Hygiene and Control Department
Faculty of Veterinary Medicine
Benha University

Prof. Dr. Reham Abd El-Aziz Amin

Professor of Meat Hygiene,
Faculty of Veterinary Medicine,
Benha University

Prof. Dr. Nesreen Zakaria Eleiwa

Chief Researcher of Food Hygiene
Animal Health Research Institute, Dokki
(2020)

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7. Summary

Bacillus cereus is an ubiquitous Gram-positive, with public health hazard due to the formation of highly heat, acid, UV, and desiccation resistant endospores. It is increasingly recognized as an opportunistic pathogen causing gastrointestinal as well as local and systemic infections due to its toxins.

The obtained results revealed that, (43%) 52 isolates of *Bacillus cereus* were isolated from 120 examined meat products samples (luncheon; beef burger; sausage and rice kofta) with incidence 26.7%; 43.3%; 46.7% and 56.7%, respectively.

More over the mean of *B. cereus* count in the examined meat products samples (luncheon; beef burger ; sausage and rice kofta) were 3.73×10^3 ; 8.06×10^3 ; 1.12×10^4 and 4.39×10^4 respectively, So, the highest bacterial percentage was in rice kofta followed by sausage then beef burger and finally luncheon.

Bacillus cereus causes food poisoning due to its ability to release two core toxins, a heat-labile diarrheal enterotoxin and heat- stable emetic enterotoxin so the present study was directed mainly to recognize two virulence genes in 16 isolated *B. cereus* strains isolated from examined meat products samples (4Luncheon; 4Beef burger; 4sauge and 4Rice kofta) that may play a role in virulence of them by using one of the recent developments molecular biological techniques (PCR). These virulence genes were cytotoxic K gene (cytK) and heamolysin BL gene (hblC). The PCR results showed that, cytK virulence gene (Ces) was detected in 5 out of 16 studied strains (0Luncheon; 1Beef burger; 2sauge and 2Rice kofta) giving product of 176 bp. Meanwhile, hblC virulence gene was detected in 6 out of 16 studied

strains (1 Luncheon; 2 Beef burger; 1 sausage and 2 Rice kofta) giving product of 320 bp.

Nisin is a natural preservative for many food products. This bacteriocin is mainly used in dairy and meat products. Nisin inhibits pathogenic food borne bacteria such as *B.Cereus* regarding the studying the effect of nisin on *B.Cereus* found that nisin at (10 ppm) reduced *B. cereus* count (cfu/g) artificially inoculated into minced meat samples from $5.0 \times 10^7 \pm 0.82 \times 10^7$ to $3.12 \times 10^7 \pm 0.44 \times 10^7$, $1.39 \times 10^7 \pm 0.23 \times 10^7$, $9.02 \times 10^6 \pm 1.87 \times 10^6$, $2.46 \times 10^6 \pm 0.35 \times 10^6$ and $6.65 \times 10^5 \pm 0.76 \times 10^5$ after 1st day, 2nd day, 3rd day, 4th day and 5th day, respectively, with reduction percentages 37.6%, 72.2%, 81.9%, 95.1% and 98.6%, respectively.

Nisin at (30 ppm) reduced *B. cereus* count (cfu/g) artificially inoculated into minced meat samples from $5.0 \times 10^7 \pm 0.82 \times 10^7$ to $1.97 \times 10^7 \pm 0.30 \times 10^7$, $3.19 \times 10^6 \pm 0.45 \times 10^6$, $5.38 \times 10^5 \pm 0.69 \times 10^5$, $2.38 \times 10^4 \pm 0.31 \times 10^4$ and ND after 1st day, 2nd day, 3rd day, 4th day and 5th day, respectively, with reduction percentages 60.6%, 93.6%, 98.9%, 99.9% and 100%, respectively.

Nisin at (50 ppm) reduced *B. cereus* count (cfu/g) artificially inoculated into minced meat samples from $5.0 \times 10^7 \pm 0.82 \times 10^7$ to $9.74 \times 10^6 \pm 2.03 \times 10^6$, $7.36 \times 10^5 \pm 1.15 \times 10^5$, ND and ND after 1st day, 2nd day, 3rd day, 4th day and 5th day, respectively, with reduction percentages 80.5%, 98.5%, 99.9%, 100% and 100%, respectively.

The results in this work give information that the highest prevalence rate was recorded in case of rice kofta (56.7%). This may be attributed to several

reasons as cross- contamination during processing, storage, transportation and marketing play a major role in bacterial contamination. Additives are considered a potential risk factor can increase the number of *Bacillus* spores and hence magnitude the incidence of food poisoning.

The recent study revealed the best concentration of nisin controlling *B.cereus* is (50 ppm) reduced *B. cereus* count (cfu/g) artificially inoculated into minced meat samples with reduction percentages reached to 100% with sensory characteristics very good score of over-all acceptability over all the experimental time.