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Avian Pathogenic E. coli (APEC): A Potential Source of Public Health Problems in Palestine

Escherichia coli (E. coli) bacteria are common to many environments and there are over 150 different strains. Avian pathogenic E. coli (APEC) strains cause diseases in birds at various ages. The introduction of such strains to chicken respiratory tracts causes an invasive infection characterized by multi-extraintestinal disorders, collectively known as colibacillosis. It can cause extensive mortality in broiler flocks leading to great economic losses for the poultry industry worldwide.

Recent reports showed that the pathogenecity of APEC strains are associated with certain virulence genes (papC, astA, vat, and irp2) that are located within the bacterial genome and/or their CoIV plasmids (tsh, iucD, iss, and cvi). Identification and characterization of these genes are essential to implement efficient disease control and prevention systems. The aim of this study is to identify the molecular profile of a group of virulence genes that are associated with APEC strains isolated from broiler flocks in Palestine. In addition, this study aims at the identification of antibiotic resistance profiles for the isolated APEC strains.

Internal organ samples from 83 infected flocks were collected and tested for the presence of the mentioned virulence genes using an adapted and improved multiplex PCR protocol. The resistance of the isolated strains to 10 commonly used antibiotics in Palestine was studied using the disc diffusion method. The isolates were

tested for presence of Extended-spectrum b-lactamases (ESBL) antimicrobial resistance genes.

The multiplex PCR of the tested samples revealed a high prevalence of the following genes: iss and cvi 100%, astA 98.48% and iucD 78.79%. The genes vat and papC have a prevalence of 34.85% and 31.81%, respectively. To a lesser extent we identified irp2 19.70% and tsh 10.61%. The study of antibiotic susceptibility profile among identified APEC strains showed remarkably high levels of resistance against Tetracycline (TE): 100%, Ampicillin (AMP): 83.33%, Amoxicillin (AML): 83.33%, Kanamycin (K): 80.3%, Ciprofloxacin (CIP): 72.72% and Neomycin (N): 69.70%, while the lowest resistance levels were against Cephalexin (CL): 12.12% and Nitrofurantoin (F): 18.18%. This study showed that 12.12% of identified APEC strains were positive for ESBL activity.

The improved multiplex PCR has proven to be a useful and rapid assay to identify virulence factor profiles of avian pathogenic E. coli. It is possible to use this protocol in larger studies in Palestine under a structured program with direct supervision from the concerned authorities. In Palestine, the massive and indiscriminate use of antibiotics should be avoided as it increases the risk of development of drug-resistant strains of E. coli that constitute a zoonotic risk as a potential reservoir of Extended-spectrum b-lactamases (ESBL) antimicrobial resistance genes. The uncontrolled use of antibiotics in the poultry industry is a worrisome phenomenon that can have a serious impact on the public health of the Palestinian society. Therefore, we recommend programs to increase farmer's awareness about the devastating effects of antibiotic misuse. In addition, the authorities must take a more active and responsible role through the imposition of a set of regulations that would ensure a safety poultry products.