

شبكة المعلومات الجامعية التوثيق الإلكتروني والميكروفيلو

بسم الله الرحمن الرحيم





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جامعة عين شمس التوثيق الإلكتروني والميكروفيلم قسم

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Public health hazard of antibiotic resistant bacteria isolated from poultry

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Dedication

To

My Mother

(Asking Allah accept her in his paradise)

My father and My Brother Ahmed
All My friends

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Abstract

Continuous emergence of resistant bacteria become a significant global health issue. It poses a threat for treatment of infectious diseases in animals and humans. The present study investigated the occurrence of Salmonella resistant to extended-spectrum cephalosporins (ESCR) and to carbapenems (CR) in farmed chickens as well as in retailed chicken giblets and the surrounding environments. Furthermore, this study examined two important questions. First, whether, resistance to ESCR in Salmonella is mediated by extendedcephalosporinase spectrum **B-lactamases** (ESBL). (AmpC), carbapenemases. Second, whether, resistance to ESC and carbapenems in Salmonella is associated with presence of the outer membrane protein A-(ompA) and absence of the outer membrane porin F- (ompF) encoding genes. Cloacal swabs (n = 301) were collected from chickens raised in poultry farms located in Cairo, Giza, and Al Oalyubia governorates. These were cultured for Salmonella, serotyped, and examined for susceptibility to ESC carbapenems. Salmonella were isolated from 20 chickens, which belong to serotypes with public health significance like Typhimurium, Kentucky, and Infantis. The 20 isolates were ESCR, among them 16 were ESBL-producing, 3 were non-ESBL-producing, 1 was not tested for ESBL production as it shows resistance only to cefpodoxime. The 16 ESCR ESBL-producing isolates carry predominantly the ESBL "bla_{TEM} and bla_{SHV}"; whereas, the 3 ESCR non-ESBLproducing isolates carry the AmpC bla_{CMY-2}. Interestingly, the ESCR isolate not confirmed to be ESBL-producing, harbors bla_{CMY-2}. The 20 isolates were carbapenem-susceptible and did not carry any of the tested carbapenemase $(bla_{\rm KPC}, bla_{\rm NDM}, bla_{\rm OXA48})$. All the 20 isolates carried the virulence genes invA,

stn, and svpC. Partial stn sequencing of the ESCR ESBL-producing isolates revealed high genetic relatedness to Salmonella strains from patients in Egypt and Asia. This raised the question to whether ESCR and CR Salmonella strains can occur in retailed chicken products and poultry shops. Samples were obtained from chicken giblets (n=129), water used for cleaning the chicken carcasses (n=7), and workers at poultry shops (n=16) located in Giza governorate. Salmonella was isolated from 13 giblets, the isolates belong to different serotypes and were all ESCR. Of them, 4 were ESBL-producing CR; 1 ESBL-producing carbapenem-susceptible; 6 non-ESBL CR; 2 non-ESBL producing carbapenem-susceptible. All the 5 ESCR ESBL-producing isolates carried bla_{CMY-2} and ESBL genes, but did not carry carbapenemases. The 6 ESCR non-ESBL CR strains harbored ESBL genes, with 5 of them carried also bla_{CMY-2} and bla_{KPC}. However, the 2 non-ESBL-producing carbapenemsusceptible carried ESBL-genes and bla_{CMV-2} Regarding the examined water, Salmonella was isolated from 2 samples. Both samples were ESCR non-ESBLproducing CR harbored ESBL genes and bla_{KPC} ; while only one isolate carried bla_{CMV-2}. Interestingly, Salmonella were isolated from two workers and the isolates showed similar resistance phenotype and genotype as the isolates from water. All the Salmonella strains isolated from the tested chicken farms and the retailed poultry shops carried *ompF*, with predominant presence of *ompA*. In conclusion, isolation of virulent ESCR ESBL-producing Salmonella from farmed chickens. They carry ESBL genes as well as chromosomal and plasmid virulent genes. Those isolates genetically relate to human strains and belong to serotypes incriminated in food outbreaks. Occurrence of ESCR- and CR-Salmonella in retailed poultry shops, pose a risk of wide dissemination of such strains in the food chain and the surrounding environment. The presence of ompA might play a role in the resistance of Salmonella to β-lactam antibiotics. In contrast to studies in E. coli and Acinetobacter baumanni, the current study could not confirm a role of ompF in susceptibility of Salmonella to β-lactam antibiotics.

Keywords: ESCR, carbapenemases, *bla*_{CMY-2}, *Salmonella serovars*, chicken, public health, Egypt.

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List of abbreviation

Abbreviation	Full name
ATM	Aztreonam
BLAST	Basic Local Alignment Search Tool
bp	Base pair
CAZ	Ceftazidime
CDC	Center for Disease Control and Prevention
СЕРН	Cephalosporins
CLSI	Clinical and Laboratory Standards Institute
CP-CRE	Carbapenemase-producing carbapenem-resistant Enterobacteriaceae
CPD	Cefpodoxime
CPM	Cefepime
CR	Carbapenem-resistance
CRE	Carbapenem-resistant Enterobacteriaceae
CRO	Ceftriaxone
CTX	Cefotaxime
ESBL	Extended-spectrum β-lactamases
ESBL-E	Extended-spectrum β-lactamases producing Enterobacteriaceae
ESBL-PE	Extended-spectrum β-lactamases producing Enterobacteriaceae
ESCR	Extended-spectrum cephalosporins-resistant
ETP	Ertapenem
FAO	Food and Agriculture Organization
FDA	Food and Drug Agency
FOX	Cefoxitin