بسم الله الرحمن الرحيم

MONA MAGHRABY

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

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جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
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MONA MAGHRABY

Cairo University

Faculty of Veterinary Medicine

Department of Zoonoses

Public health hazard of antibiotic resistant bacteria isolated from poultry

Thesis presented by

Fatma Karam Abdel kader

(B.V.Sc., 2011, M.V.Sc 2015)

Fac. Vet. Med. Cairo University

For degree of Ph.D. (Zoonoses)

Under The Supervision of

Prof. Dr. **Maha Ahmed Sabry**

Professor and Head of Zoonoses Dept.
Faculty of Veterinary Medicine,
Cairo University.

Prof. Dr. **Khaled Abd El-Aziz Abd El-Moein**

Professor of zoonoses,
Faculty of Veterinary Medicine,
Cairo University.

Dr. **Eman Aly El- Ghareeb Hamza**

Assistant Professor of zoonoses,
Faculty of Veterinary Medicine,
Cairo University.

2020

Cairo University
Faculty of veterinary medicine
Zoonoses Department

Supervision sheet

Prof. Dr. Maha Ahmed Sabry

Professor and head of Zoonoses department

Faculty of Veterinary Medicine,
Cairo University.

Prof. Dr. Khaled Abd El-Aziz Abd El-Moein

Professor of zoonoses,
Faculty of Veterinary Medicine,
Cairo University.

Dr. Eman Aly El- Ghareeb Hamza

Assistant Professor of zoonoses,
Faculty of Veterinary Medicine,
Cairo University.

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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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Cairo University.
Faculty of Veterinary Medicine.
Department of Zoonoses.

-Name: Fatma Karam Abdel kader
-Nationality: Egyptian.
-Degree: PhD of Veterinary Science. **-Specialization**: Zoonoses.

-Title of thesis: Public health hazard of antibiotic resistant bacteria isolated from poultry.

- Supervisors:

Prof. Dr. Maha Ahmed Sabry

Prof. Dr. Khaled Abd El- Aziz Abd El- Moein

Dr. Eman Aly El- Ghareeb Hamza

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 extended-spectrum β-lactamases (ESBL), cephalosporinase (AmpC), and/or 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 Qalyubia governorates. These were cultured for *Salmonella*, serotyped, and examined for susceptibility to ESC and 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-ESBL-producing isolates carry the AmpC *bla*$_{\text{CMY-2}}$. Interestingly, the ESCR isolate not confirmed to be ESBL-producing, harbors *bla*$_{\text{CMY-2.}}$ The 20 isolates were carbapenem-susceptible and did not carry any of the tested carbapenemase (*bla*$_{\text{KPC}}$, *bla*$_{\text{NDM}}$, *bla*$_{\text{OXA48}}$). 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 $bla_{\text{CMY-2}}$ and ESBL genes, but did not carry carbapenemases. The 6 ESCR non-ESBL CR strains harbored ESBL genes, with 5 of them carried also $bla_{\text{CMY-2}}$ and bla_{KPC}. However, the 2 non-ESBL-producing carbapenem-susceptible carried ESBL-genes and $bla_{\text{CMY-2}}$. Regarding the examined water, *Salmonella* was isolated from 2 samples. Both samples were ESCR non-ESBL-producing CR harbored ESBL genes and bla_{KPC}; while only one isolate carried $bla_{\text{CMY-2}}$. 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, $bla_{\text{CMY-2}}$, *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
CEPH	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