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Carriage trends and fitness cost of MDROs in Lebanese nursing homes

Caren Challita[1], Nourhan Hafza[2], Elias Dahdouh[3], Michel Attieh[1], Iman Dandachi[1], Ziad Daoud[1]

[1] Faculty of Medicine, Clinical Microbiology Lab, University of Balamand, Lebanon
[2] Faculty of Sciences, University of Balamand, Lebanon
[3] Faculty of Veterinary, Department of Animal Health, Complutense University of Madrid, Madrid, Spain

Abstract

Introduction: Nowadays, medical treatments efficiency is challenged by multi drug resistant organisms (MDROs). Lebanese nursing homes' residents revealed high fecal carriage rates of MDR *Enterobacteriacea*. Previous studies claim that bacteria with resistant genes experience fitness cost. This study assesses the competitive growth of MDR *Escherichia coli* and *Klebsiella pneumoniae*.

Methodology: Fecal swabs were collected, during six consecutive months, from ten elderly residing in a Lebanese nursing home. All isolates were subject to API 20E (bioMerieux, Marcy L' Etoile, France) and antimicrobial susceptibility (Kirby–Bauer method) testing. Phenotypically, ESBL (extended spectrum β-lactamase), MBL (metallo β-lactamase), AmpC and KPC (*Klebsiella pneumoniae* carbapenemase) were detected using EDTA, PBA, cloxacillin, and DDSTs (Biorad, Hercules, USA). Selected ESBL producing *E. coli* and *K. pneumoniae* underwent multiplex PCR analysis. Intra and inter-species *in-vitro* competition assays were conducted in multiple combinations.

Results: Among 117 collected isolates, *E. coli* was predominant (71.8%); 7.7% were ESBL and 5.1% AmpC producers. With *E. coli* intra-species assays, sensitive isolates out-competed all others, followed by ESBL, AmpC, and OXA-48 (oxacillin) producers. Inter-species assays, demonstrated a decreased fitness of ESBL producing *K. pneumoniae* in presence of sensitive *E. coli*. While out-competing ESBL producing *E. coli* required 2 sensitive *K. pneumoniae* isolates.

Conclusion: This study highlights resistant *E. coli* and *K. pneumoniae* frequency decrease in presence of sensitive isolates, endorsing the fitness cost hypothesis. Hence, competing supplementary species reproducing gut flora, would ensure further steps in the fight against MDROs.

Key words: fecal carriage; fitness cost; multidrug-resistant; nursing home.

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Corresponding author

Dr. Ziad Daoud
Faculty of Medicine and Medical Sciences, Clinical Microbiology Laboratory, University of Balamand
PO Box 33, Amioun, Beirut, Lebanon
Phone: 009613729927
Fax: 009616931956/7 Ext: 3818
Email: ziad.daoud@balamand.edu.lb

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