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Carriage trends and fitness cost of MDROs in Lebanese nursing homes

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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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