27th ECCMID Vienna, Austria 22 – 25 April 2017

The congress of ESCMID

Session: OS096 Molecular biology of Gram-negative resistance

Category: 3d. Resistance mechanisms

23 April 2017, 16:24 - 16:34
OS0489

The conjugative ability of E.coli bla-CTX-M plasmids from returning travellers

Matthew John Powell*[1], Bevan Edward[2], Peter M. Hawkey[3]

[1]*University of Birmingham; Institute of Microbiology and Infection*

[2]*University of Birmingham; Institute of Microbiology & Infection, W112, Biosciences Building*

[3]*Public Health England; Public Health Laboratory*

Background: Bacteraemia due to extended spectrum beta lactamase-producing *Eschericia coli* (ESBL-EC) are associated with increased mortality. Travel to the Indian subcontinent is associated with high rates of acquisition of ESBL-EC as colonisers of the gastrointestinal tract. Returning travellers therefore represent an infection control hazard to hospitals in countries where ESBL prevalence is low. Horizontal gene transfer of plasmids carrying bla_{CTX-M} has been reported. However, the conjugative potential of such plasmids isolated from the faecal *E.coli* of returning travellers has not been determined. We therefore aimed to determine the conjugative ability of *E.coli* bla_{CTX-M} plasmids from faecal samples of returning travellers.

Material/methods: Conjugation was carried out at 37^{o}C overnight on sterile filters. A rifampicin-resistant non-lactose fermenting J53 *E. coli* strain was used as the plasmid recipient. Luria-Bertani agar plates containing 100µg/ml rifampicin and 8µg/ml cefotaxime were used to select putative transconjugants. Serial dilutions of the original LB broths containing donor and recipient organisms were spread to identical plates, representing negative controls. Putative transconjugants were confirmed bla_{CTX-M}-positive by multiplex PCR and by noting non-lactose fermenting status after subculture to MacConkey agar. The identity of transconjugants and their plasmids was confirmed using whole genome sequencing (WGS) and MIC testing was done using VITEK2.

Results: 67% (8/12) of travellers who acquired bla_{CTX-M} during travel carried plasmids which were successfully transferred *in-vitro* after overnight conjugation. 32% (20/62) of lactose-fermenting traveller isolates conjugated successfully. An incidental finding was that in 50% of travellers, we isolated non-lactose fermenting CTX-M-producing *E.coli.* WGS confirmed the presence of transferred plasmids in recipients. We also determined plasmid replicons and resistance gene content of strains after WGS and analysis. MIC testing of transconjugants confirmed resistance to cefotaxime. Moreover, two transconjugant strains were resistant to trimethoprim and fluoroquinolones.

Conclusions: To our knowledge, this is the first study to demonstrate horizontal gene transfer of conjugative plasmids which were acquired after travel. There are case reports of plasmid conjugation occurring within the human gut; however this has not been shown in healthy individuals. We show that the conjugation of newly acquired plasmids in healthy volunteers occurs easily *in-vitro*, and thus *in-vivo* transfer in colonised humans is a real possibility. Worryingly, the co-transfer of resistance determinants to trimethoprim and fluoroquinolones also occurred. Our results are relevant to other, less common, plasmid mediated genes such as *MCR-1* and bla_{NDM-1}, and bla_{KPC-2}. Increased human travel and migration in recent decades means that the acquisition of conjugative plasmids bearing antimicrobial resistance genes via travel presents an ongoing threat to the efficacy of antibiotics worldwide.