Editorial

Nobel discoveries from isolates of multidrug resistant *Acinobacter baumannii* and multidrug resistant *Escherichia coli* in Nepal

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Introduction

The emergence of multidrug-resistant (MDR), extensively drug-resistant (XDR) and pandrug-resistant (PDR) become a serious global medical problem. MDR strains defines as isolates not susceptible to at least one agent in three or more antimicrobial categories; XDR strains are defined as isolates not susceptible to at least one agent in all but two or fewer antimicrobial categories; and PDR strains are defined as isolates not susceptible to all classes of agent, including aminoglycosides, antipseudomonal carbapenems, antipseudomonal fluoroquionlones, antipseudomonal penicillins β-lactam inhibitors, polymyxins and tetracycline. MDR isolates are frequently involved in nosocomial outbreaks, mainly in intensive care units. The spread of these isolates that harbor an increasing variety of resistant genes makes the treatment of this infection and their control within the hospital environment more difficult.

Nobel discoveries

Recent studies conducted in two different isolates of multidrug resistant *Acinobacter baumannii* and multidrug resistant *Escherichia coli* in the Department of Clinical Microbiology and Research Laboratory, Institute of Medicine, Maharajgunj Medical Campus, Tribhuvan University Teaching Hospital, Kathmandu Nepal led to discoveries of different novel findings on the basis of molecular microbial characterization: Studies carried out on MDR *Acinobacter baumannii* from clinical isolates of hospitalized patients showed MDR *Acinobacter baumannii* belonging to clonal complex 1 (CC1) and CC2 as well as a novel clonal complex CC149. A novel PER-type extended-spectrum beta-lactamase, PER-8, was another discoveries from MDR *Acinobacter baumannii*. The amino acid sequence of PER-8 has a substitution at position 39 (Gly to Glu) compared with that of PER-7. The k_{cat}/K_m ratio of PER-8 for aztreonam was lower than that of PER-7, while the k_{cat}/K_m ratio of PER-8 for imipenem was higher than that of PER-7. The genomic environment surrounding bla_{PER-8} was *intI1* bla_{PSE-1} *qacEDI sulI* IS*CR1*-bla_{PER-8} *gts sulI orfX* on a 100-kb plasmid. The nucleotide sequences for bla_{PER-8} and its flanking region in *A. baumannii* IOMTU442 has been deposited in the GenBank database under accession number AB985401.

Another study conducted on molecular characterization of multidrug-resistant (MDR) *E. coli* isolates led to the discoveries of two novel NDM variants out of seven variants of New Delhi Metallo-beta lactamase (NDM). Seven variants of New Delhi Metallo-beta lactamase (NDM); NDM-1, NDM-3, NDM-4, NDM-5, NDM-7, NDM-12 and NDM-13 were identified. Among these 7 NDM variants, NDM-12 and NDM-13 were novel variants that were reported first time in the world. Three kinds of 16SrRNA methylases (ArmA, RmtB and RmtC) were also detected.

In the study 7.0% XDR and 16.0% carbapenem-resistant isolates among the MDR *E. coli* were identified and findings indicated that the high prevalence of carbapenem- resistant *E. coli* with multiple NDM

variants and combination of ESBL and aminoglycoside modifying enzymes. These results strongly suggested that carbapenem-resistant *E. coli* isolates producing both NDM-type metallo-β-lactamases and 16S rRNA methylases disseminated in medical settings in Nepal.

Conclusion

Discoveries of Nobel clonal complex CC149 and a novel PER-type extended-spectrum beta-lactamase, PER-8, from MDR *Acinobacter baumannii* and another discovery of two Nobel NDM variants; NDM-12 and NDM-13 in MDR *Escherichia coli* isolates are innovative achievements of the Microbiology Department, Institute of Medicine. The Nobel discovery of these findings will contribute significant value toward molecular mechanism of drug resistance which ultimately guides clinicians to appropriate empirical therapy for the treatment. This will also provide new information in the medical sciences as well as open the door for new research.