Metallo-B-Lactamase and Carbapenemases Producing Bacteria Isolated from Animals and Their Environment at Epidemiology Laboratory of Indian Veterinary Research Institute

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Abstract

Over last six years (April 2011 to August 2017), of the 2968 bacterial isolates from different clinically sick animals and their environment tested for their antimicrobial sensitivity (by disc diffusion assay and E-test as per CLSI), 480 were resistant to carbapenem drugs (meropenem or imipenem or ertapenem). On further characterization of the 480 carbapenem-resistant bacteria, 124 were phenotypically characterized as Metallo-B-lactamase (MBL) producers using double disc diffusion assay and E-Test (for imipenem and imipenem+EDTA) and 51 were genotypically confirmed carrying one or more known Carbapenemase genes (Figure 1). Of the 51 genotypically MBL positive 43 were confirmed to carry New Delhi Metallo-B-lactamase (NDM), one Acinetobacter lowffii carried Klebsiella pneumonias carbapenemase (KPC), two Shewanella sp. strains were positive for Verona integrom mediate carbapenemase (VIM), four strains (2 of Escherichia coli, one each of Aeromonas bestiarum and Raoultella terrigena) carried OXA beta-lactamases (OXA) and one E. coli strain had both NDM and OXA on the plasmid. Seventy-three strains were phenotypically MBL type but no MBL gene was detected using primers for reported genes (Figure 2). Rest of the 356 carbapenem-resistant but negative for any of the known carbapenemase gene either genotypically or phenotypically belonged to more than 109 species of bacteria (Figure 3, 4, 5). Sources of carbapenem-resistant bacteria are shown in figure 6 and 7.

Fig. 1: Table 1. List of bacteria (51) Genotypically positive for Carbapenemase gene(s) and Isolated at Epidemiology Laboratory of Indian Veterinary Research Institute from Different Sources (Clinical and Post-mortem Samples and Foods of Animals) from April 2011 to August 2017.
**Fig. 2:** Table 2. List of Bacteria (73) Phenotypically MBL Positive (by double disc diffusion method and E-test) but Negative with PCR for any of the known Car bacteria genes.

**Fig. 3:** Table 3a. List of Carbapenem (Meropenem or Imipenem or Ertapenem) Resistant Bacteria (356 of more than 10^9 species) isolated at Epidemiology Laboratory of Indian Veterinary Research Institute from April 2011 to August 2017 from Different Animal sources and their Environment were Phenotypically and Genotypically Negative for Metallo-beta-Lactamase and other Carbapenemases.

**Fig. 4:** Table 3b. List of Carbapenem (Meropenem or Imipenem or Ertapenem) Resistant Bacteria (356 of more than 10^9 species) isolated at Epidemiology Laboratory of Indian Veterinary Research Institute from April 2011 to August 2017 from Different Animal sources and their Environment were Phenotypically and Genotypically Negative for Metallo-beta-Lactamase and other Carbapenemases.
Fig. 5: Table 3c. List of Carbapenem (Meropenem or Imipenem or Ertapenem) Resistant Bacteria (356 of more than 100 species) isolated at Epidemiology Laboratory of Indian Veterinary Research Institute from April 2011 to August 2017 from Different Animal sources and their Environment were Phenotypically and Genotypically Negative for Metallo-lactamases and other Carbapenemases.

Fig. 6: Table 4. Carbapenem resistant bacteria from different animal sources and detection of different carbapenemases.

Fig. 7: Table 5. Carbapenem resistant bacteria associated with different affections in animals and detection of different carbapenemases.