



among gram-negative bacteria recovered from Barcelona sewer rats (*Rattus norvegicus*)

Marta Mari-Almirall¹, Yaiza Vallejo¹, Maria Nieto¹, Sara Sabaté², Sandra Franco², David Perea¹, Laura Muñoz¹, Clara Cosgaya¹, Jordi Pascual²,

Tomás Montalvo^{2,3}, Jordi Vila^{1,4} and Ignasi Roca^{1,4}

¹ Department of Clinical Microbiology and ISGlobal, Hospital Clínic - Universitat de Barcelona, Barcelona, Spain ² Agència de Salut Pública de Barcelona, Barcelona, Spain ³ CIBER de Epidemiología y Salud Pública (CIBERESP), Barcelona, Spain ⁴ CIBER de Enfermedades Infecciosas (CIBERINFEC), Barcelona, Spain

Introduction

Recent reports have identified MDR bacteria from sewage samples in different parts of the world but data regarding the potential role of urban rats as reservoirs and source of antimicrobial resistant bacteria that are relevant to human health are scarce.

Materials & Methods

Culture of intra-rectal samples from 216 captured rats (*Rattus norvegicus*) from Jan – Nov 2017 on ESBL and carbapenem selective media.

Identification	Clonality	Susceptibility	Resistance genes & Plasmid studies	
MALDI-TOF MS	PFGE	Disc diffusion Gradient difusión Microdilution	PCR Sanger Sequencing	WGS with Oxford Nanopore technologies
Figure 1	Figure 2	Table AST	Figures 3-5	

Conclusions

- Overall we observed high clonal diversity between all isolates, even between those with the same resistance mechanisms.
- High resistance to cephalosporins and quinolones across all bacterial species studied were also detected.
- The presence of isolates carrying OXA-48, NDM, KPC and VIM carbapenemases is worrying and associated with vicinity to major human hospitals.
- WGS showed plasmid transmission of NDM-7 and transposon transmission of KPC-2 between human and animal isolates within same hospital.
- Our results show alarming levels of antimicrobial resistance to clinically relevant antibiotics among gram-negative bacteria colonizing the intestinal tract of Barcelona sewer rats.

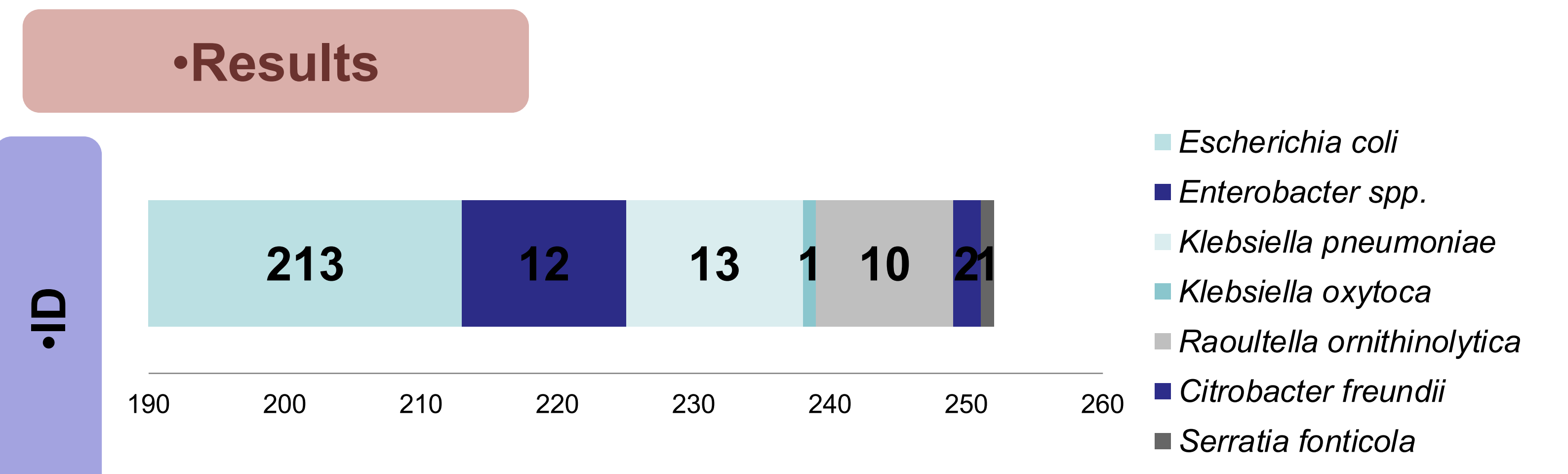


Figure 1. Distribution of isolates according to bacterial species identified by MALDI-TOF MS

•AST	ESBL	Carbapenemases	•
	24 SHV 5 TEM 73 CTX-M Gr-1 46 CTX-M Gr-9	13 KPC 3 NDM 2 OXA-48 1 VIM-2	

•Geographical distribution

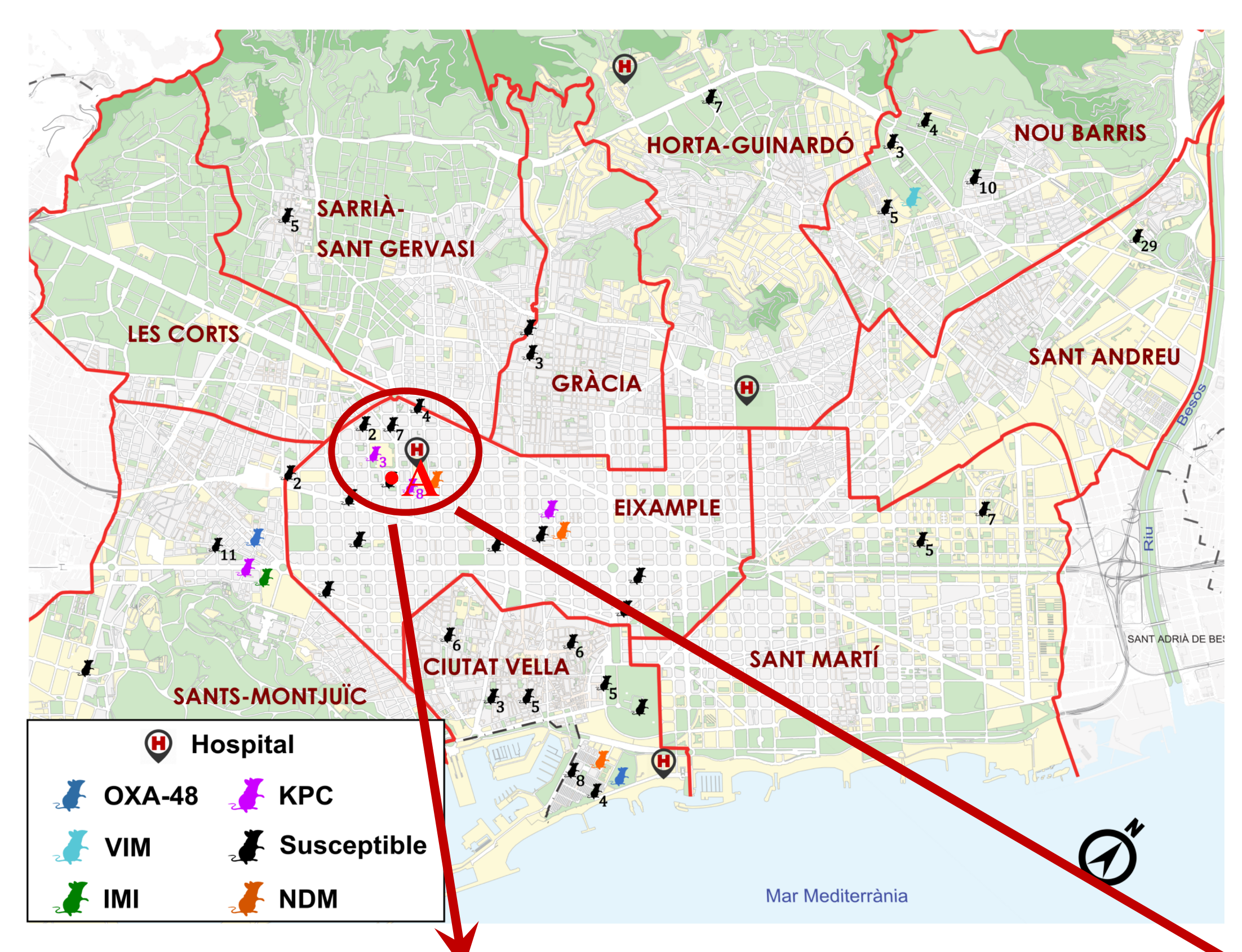
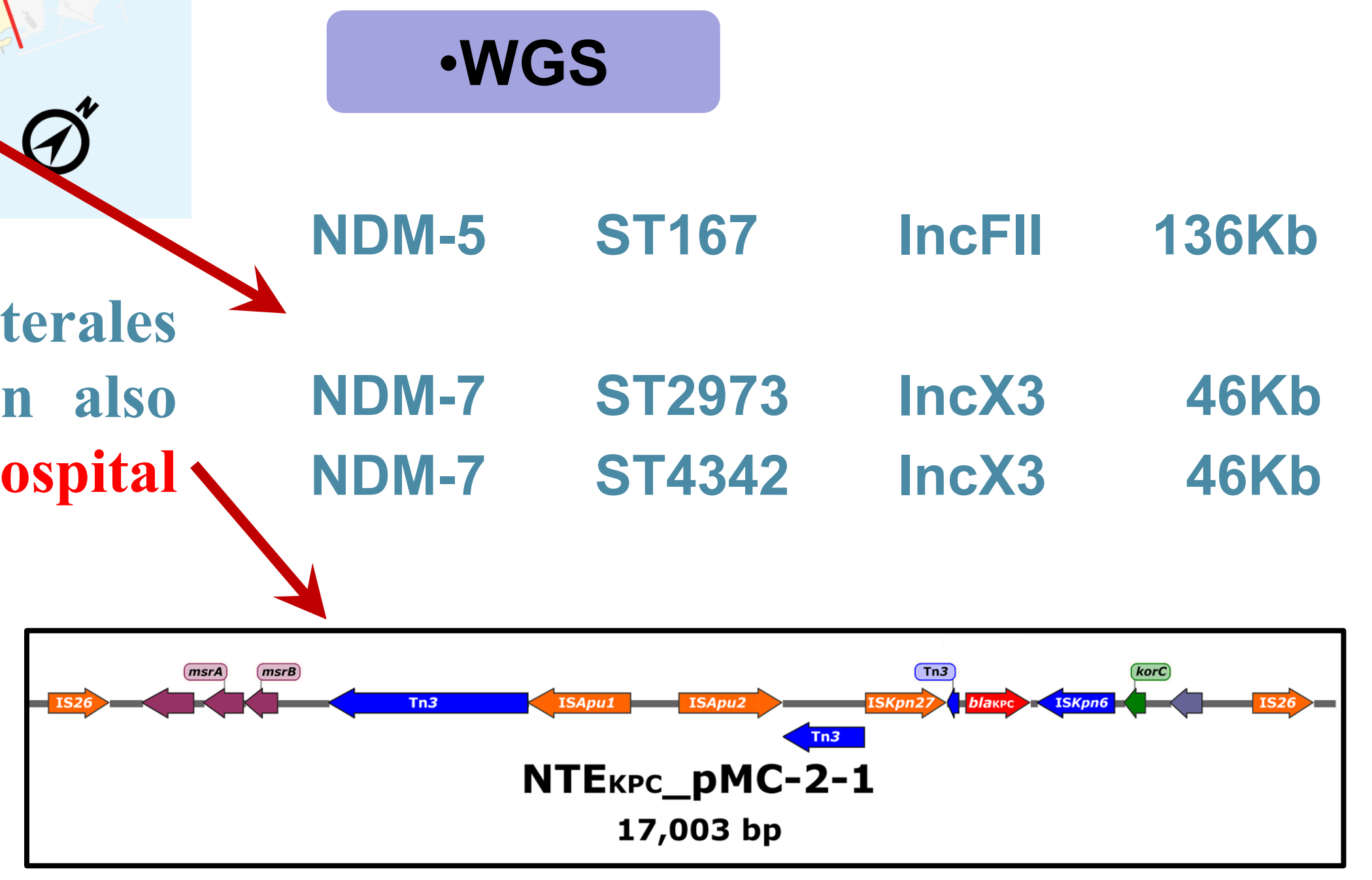


Figure 3. Map of the city of Barcelona showing the different capture points and nearby major city Hospitals. The presence of animals carrying carbapenemases is shown as well as the total number of animals captured per capture point.

13 KPC-2 isolates belonging to different Enterobacterales species. All within a particular NTE transposon also associated with KPC-2 from human outbreak at hospital A

•Figure 5. Schematic drawing showing the non-Tn4401 element (NTE) carrying bla_{KPC}.



•Clonality

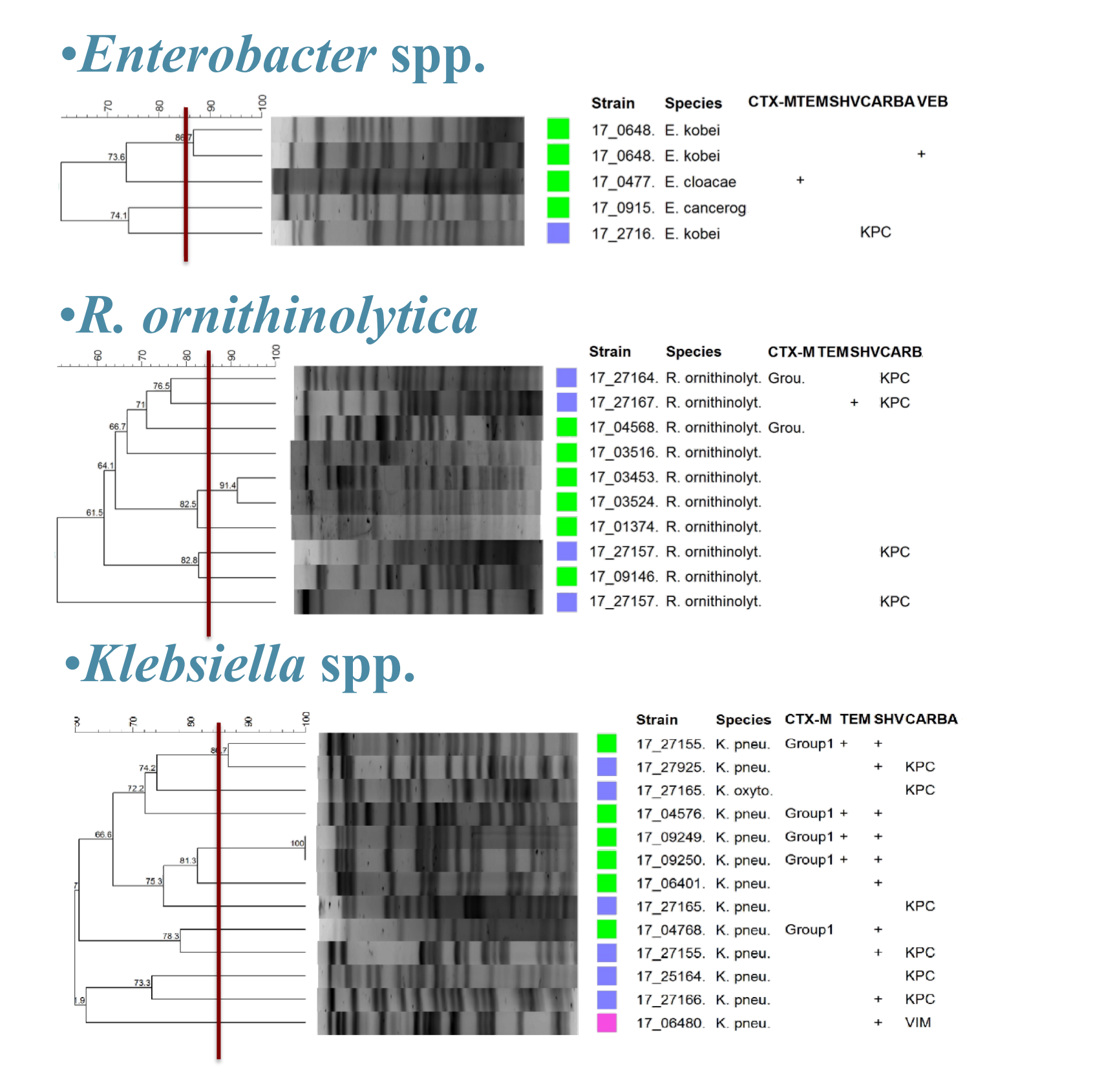
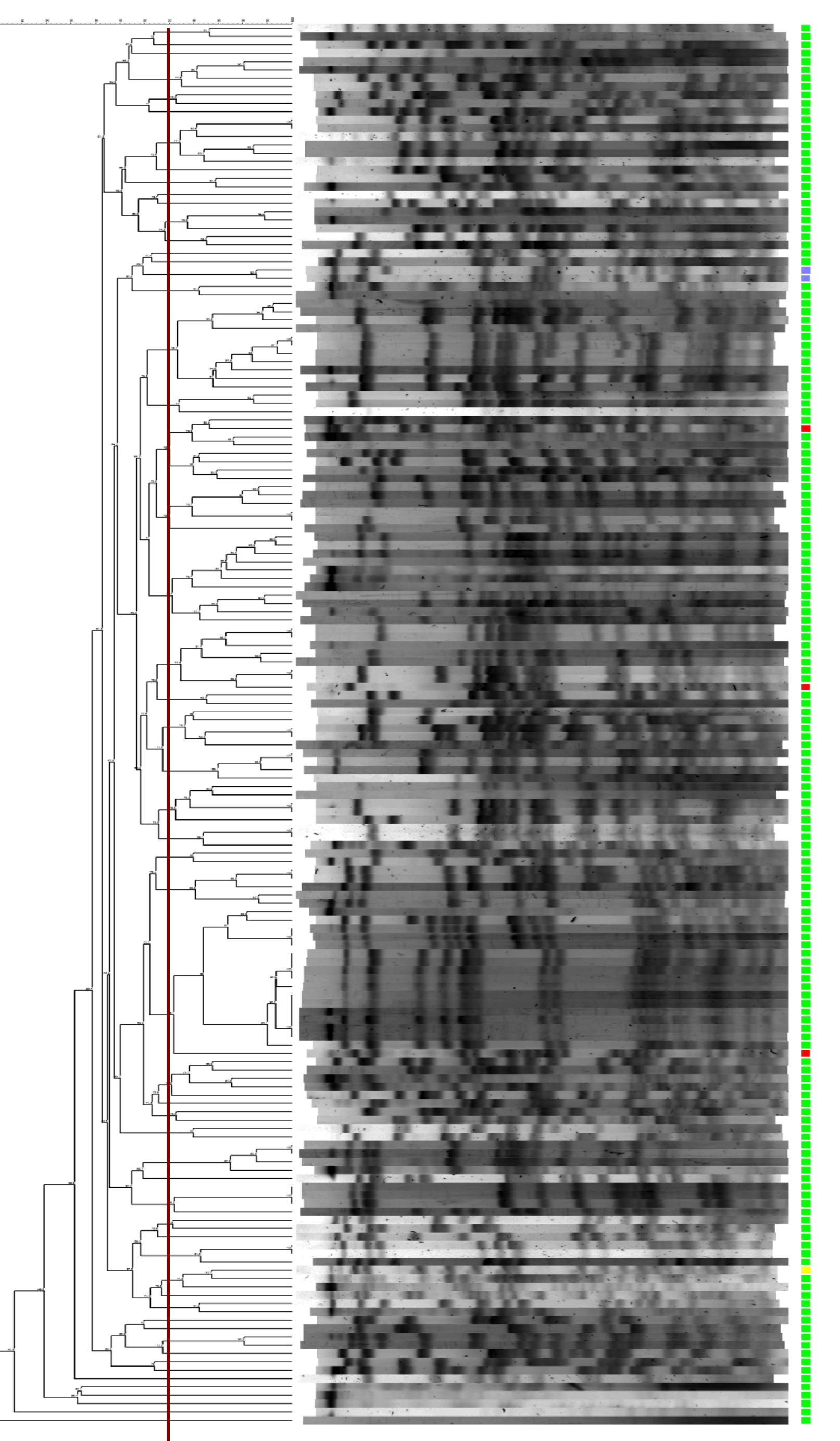


Figure 2. PFGE dendrogram of *E. coli*, *Enterobacter* spp., *R. ornithinolytica*, and *Klebsiella* spp. isolates. Isolates without carbapenemases (green), carrying KPC (blue), carrying NDM (red), carrying OXA-48 (yellow) and VIM (pink). Isolates with a Dice similarity index >86% are considered the same pulsotype (red line).



Related to IncX3 NDM-7 plasmid previously found in human patient from hospital A

Figure 4. Schematic representation of the 50 KB NDM-7 IncX3 plasmid recovered from a human isolate compared to 46 Kb NDM-7 IncX3 plasmids recovered from rat isolates.

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