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Genetic diversity among selected ESBL and Carbapenem-producing *Klebsiella pneumoniae* isolates from urocultures in a portuguese hospital

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MicroART

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Antibiotic resistance – A public health problem

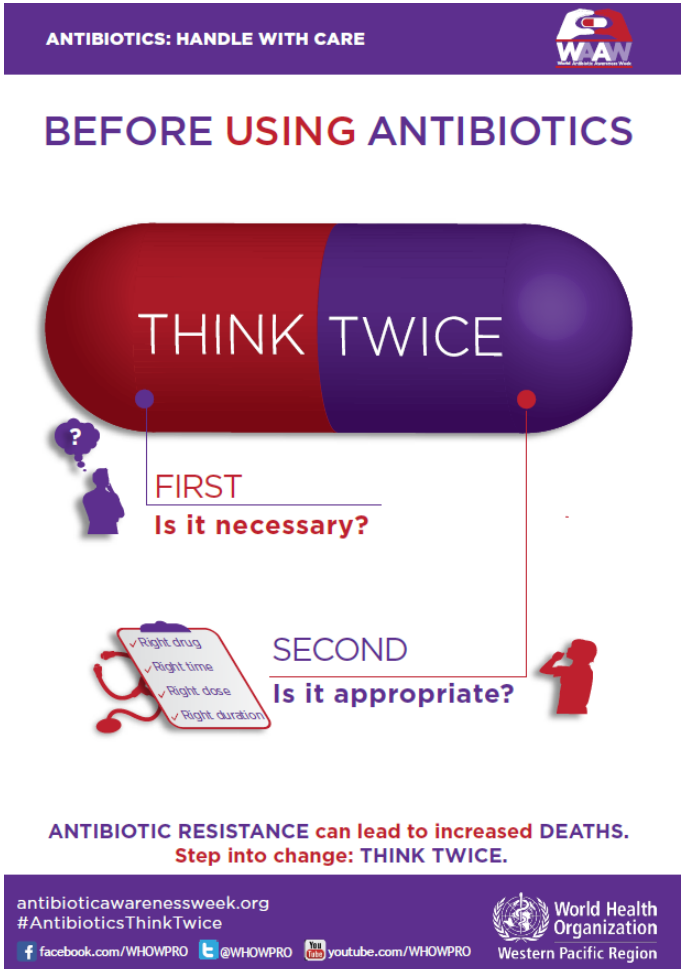
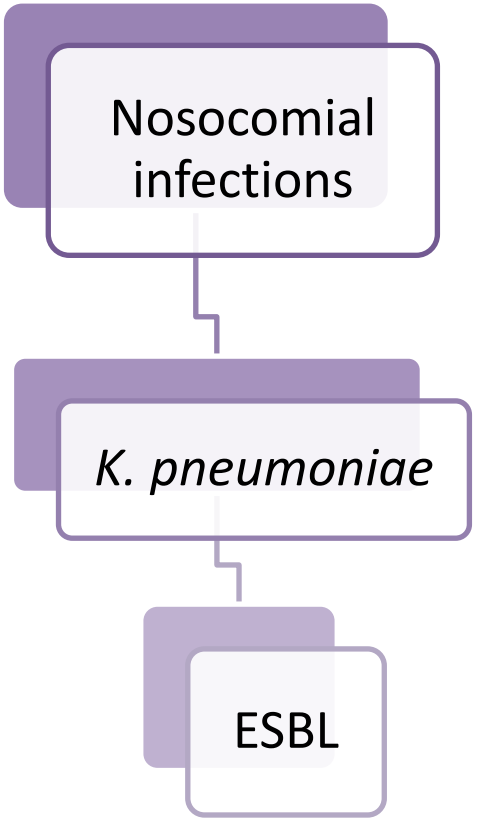


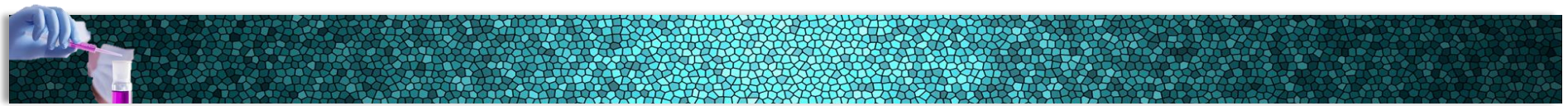
Fig. 1 and 2 – Campaigns related to the two main factors for antibiotic resistance: overuse and misuse of antimicrobials **(WHO, 2018)**

Klebsiella pneumoniae

- Major pathogen implicated in nosocomial infections that is known to spread easily;
- Frequently associated with resistance to the highest-priority critically important antimicrobials.



- ✓ Determine the carriage rate of ESBL-producing *K. pneumoniae* in a hospital in Portugal;
- ✓ Analyze the type of enzymes implicated;
- ✓ Determine the genetic diversity (MLST) among selected carbapenem-and ESBL-producing *K. pneumoniae* isolates from human urinary infections.



Sampling

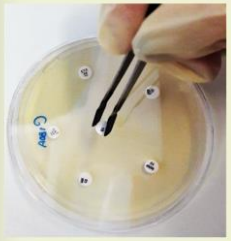
49 CTX/CAZ-resistant *K. pneumoniae* isolates obtained aleatory from patients' urocultures in a Portuguese hospital; December 2016-September 2018.

Bacteria isolation

MacConkey agar and BHI agar

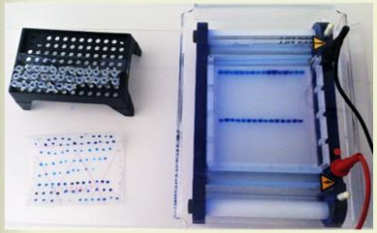
Maldi-TOF

Matrix-Assisted Laser Desorption/ Ionization



13 different antibiotics according to CLSI, 2019[6]

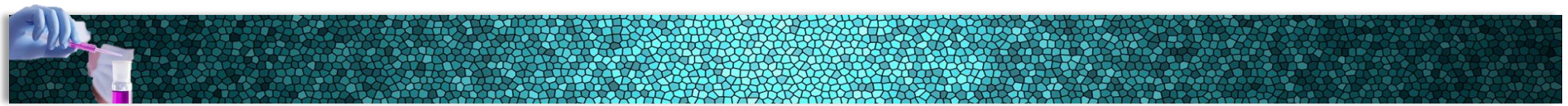
PCR and sequencing



Presence of bla_{CTX-M} (different groups), bla_{SHV}, bla_{TEM}, bla_{KPC}, bla_{NDM}, bla_{VIM}, *tet*A *and tet*B genes

General resistance phenotype

- ESBL-production was detected in 26.5% of the isolates (13/49);
- Most of them carried the gene of CTX-M-15 enzyme (n=10);
- It is important to note that all ESBL-positive and negative isolates carried the $KPC_{2/3}$ gene and showed carbapenem resistance.

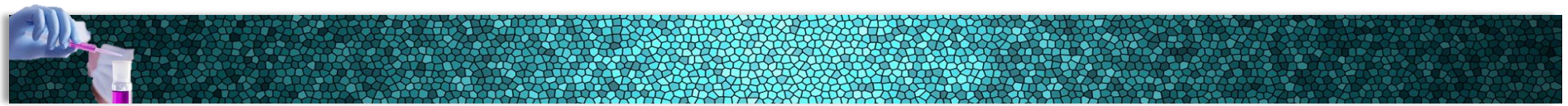


Resistance phenotype

Table 1 – Resistance phenotype and genotype associated with different sequence types (ST) for selected *K. pneumoniae* isolates from urocultures in a Portuguese hospital.

Sample	Date	ESBL[b]	Resistance phenotype[a]	Resistance genotype	MLST[c]
X2142	15/12/2016	P	AMC, FOX, CTX, CAZ, CHL, CIP, CN, SXT, S, IMP, MRP, ERT	KPC-2/3, SHV-12, TEM	ST147
X2143	15/12/2016	P	AMC, FOX, CTX, CAZ, CIP, CN, SXT, S, TET, IMP, MRP, ERT	CTX-M-15, KPC-2/3, SHV-27, TEM, *tet*A	ST280
X2157	27/04/2017	P	AMC, FOX, CTX, CAZ, CHF, CIP, CN, SXT, S, IMP, MRP, ERT	CTX-M-15, KPC-2/3, SHV-28, TEM	ST15
X2165	25/05/2017	P	AMC, CTX, CAZ, CIP, CN, SXT, IMP, MRP, ERT	KPC-2/3, SHV-28, TEM	ST15
X2175	10/06/2018	P	AMC, CTX, CAZ, CIP, SXT, S, IMP, MRP, ERT	CTX-M-15, KPC-2/3, SHV-12, TEM	ST15
X2232	20/01/2017	P	AMC, CTX, CAZ, CIP, CN, SXT, S, TET, IMP, MRP, ERT	KPC-2/3, SHV-27, TEM, *tet*A	ST280
X2168	20/05/2018	N	AMC, CTX, CAZ, CN, SXT, S, IMP, MRP, ERT	KPC-2/3, SHV-11, TEM	ST348
X2173	20/05/2018	N	AMC, FOX, CTX, CAZ, IMP, MRP, ERT	KPC-2/3, SHV-26, TEM	ST34

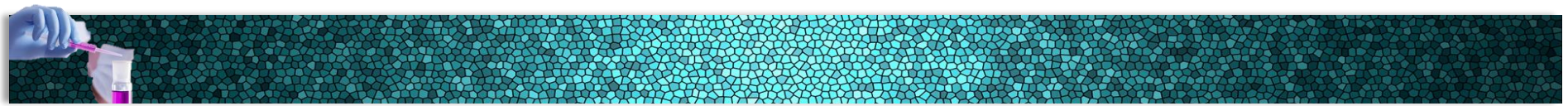
Legend: [a]AMC: amoxicillin+clavulanic acid; FOX: cefoxitin; CTX: cefotaxime; CAZ: ceftazidime; CHL: chloramphenicol; CIP: ciprofloxacin; CN: gentamicin; SXT: trimethoprim + sulfamethoxazole; S: streptomycin; TET: tetracycline; IMP: imipenem; MRP: meropenem; ERT: ertapenem;
[b]P – Positive, N- Negative;
[c]MLST - MultiLocus Sequence Typing.



✓ These findings indicate the genetic diversity among urinary infections isolates in our hospital.

✓ The KPC2/3 is the main mechanism of carbapenem resistance in *K. pneumoniae* isolates in the studied period, frequently detected together with CTX-M-15 gene.

✓ Three different ST were detected among ESBL-producing *K. pneumoniae* isolates (ST15, ST147 and ST280).



Acknowledgments

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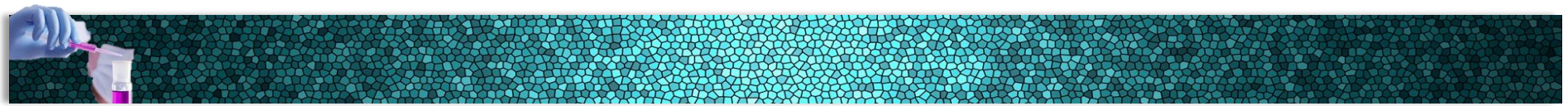
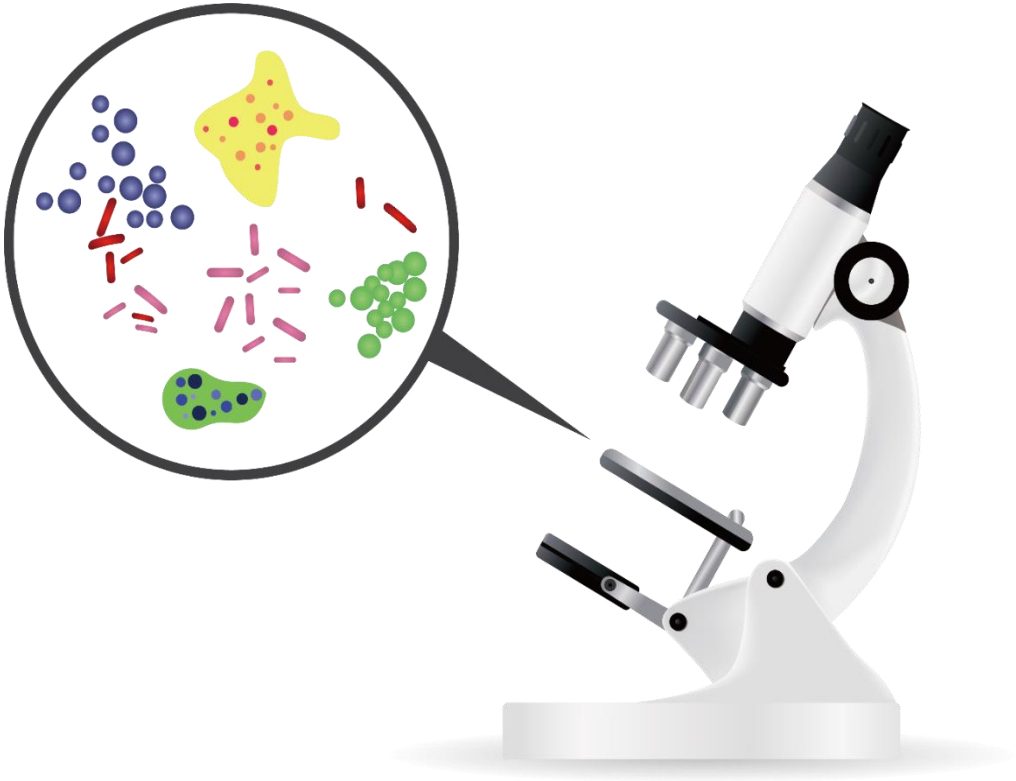


Thank you for your attention!



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