Faecal carriage of multidrug-resistant bacteria (MDR) during a non-outbreak situation in Habib Bourguiba university hospital Sfax-Tunisia

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&
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Introduction

- Controlling the spread of multidrug-resistant (MDR) bacteria:
  - Reduction of antibiotic use
  - Adherence to infection control strategies
  - Early detection of colonisation

- Early detection of colonisation : establish contact precautions before transmission of MDR pathogens to other patients

- Carriage of MDR bacteria :
  - important reservoir for dissemination of MDR bacteria in the hospital
  - important risk factor for nosocomial infection

- Gram negative MDR bacteria : digestive tract

Objective

a point-prevalence survey, 18-22 February 2012, to determine the prevalence of digestive colonisation of hospitalized patients with MDR bacterial species :

- **ESBL-E:extended-spectrum-beta-lactamase-producing *Enterobacteriaceae***
- **CPE : carbapenemase-producing *Enterobacteriaceae***
- **IMP-R-Aba : imipenem resistant *Acinetobacter baumannii***
- **MRSA : methicillin-resistant *Staphylococcus aureus***

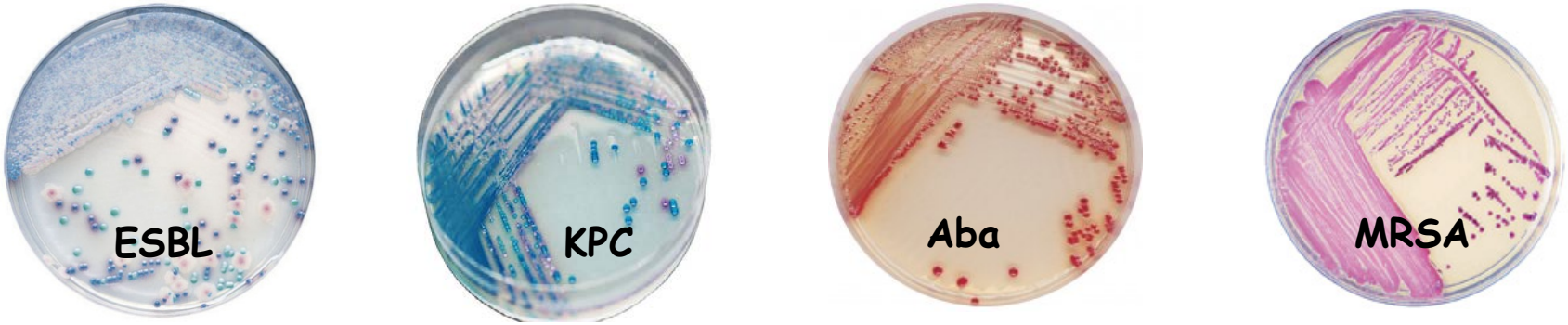
Setting

Habib Bourguiba Hospital Sfax Tunisia

- 450-bed university-hospital
- Different surgical wards : ophtalomology, ENT, general surgery, cardiovascular surgery, urology, orthopaedics, neurosurgery,
- ICUs, emergency room
- Oncology, neurology

Methods

- Rectal swab culture from hospitalized patients : chromogenic agar: ESBL CHROMagar(®), KPC CHROMagar(®), AbaCHROMagar(®) and MRSA CHROMagar(®)

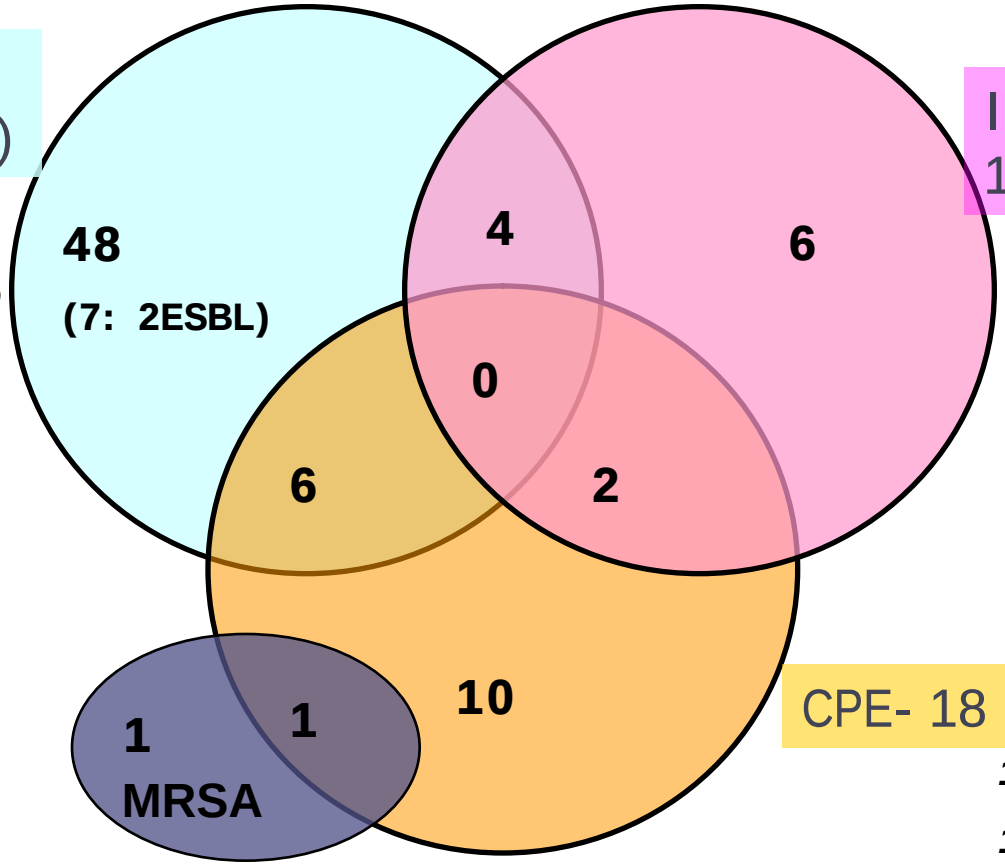


- ESBL production : double disk diffusion assay
  Carbapenemase production : Hodge test
- Characterization of ESBLs and carbapenemases : PCR.
- Molecular epidemiology: ERIC-PCR, PFGE.
- Clinical and epidemiologic data = medical records.
- statistic analysis : X2 or Fisher'exact test. Statistical significance $p<0.05$

Results

Carriage prevalence

284 patients → **76 colonized (26,7%) with 97 MDR strains**



ESBL-E-
58 (20,4%)

33 E. coli

25 K. pneumoniae

7 E. cloacae

IMP-R-*A. baumannii*–
12 (4,2%)

CPE- 18 (6,3%)

16 K. pneumoniae

1 E. coli

1 P. stuartii

Results

Molecular characterization : ESBLs and carbapenemases

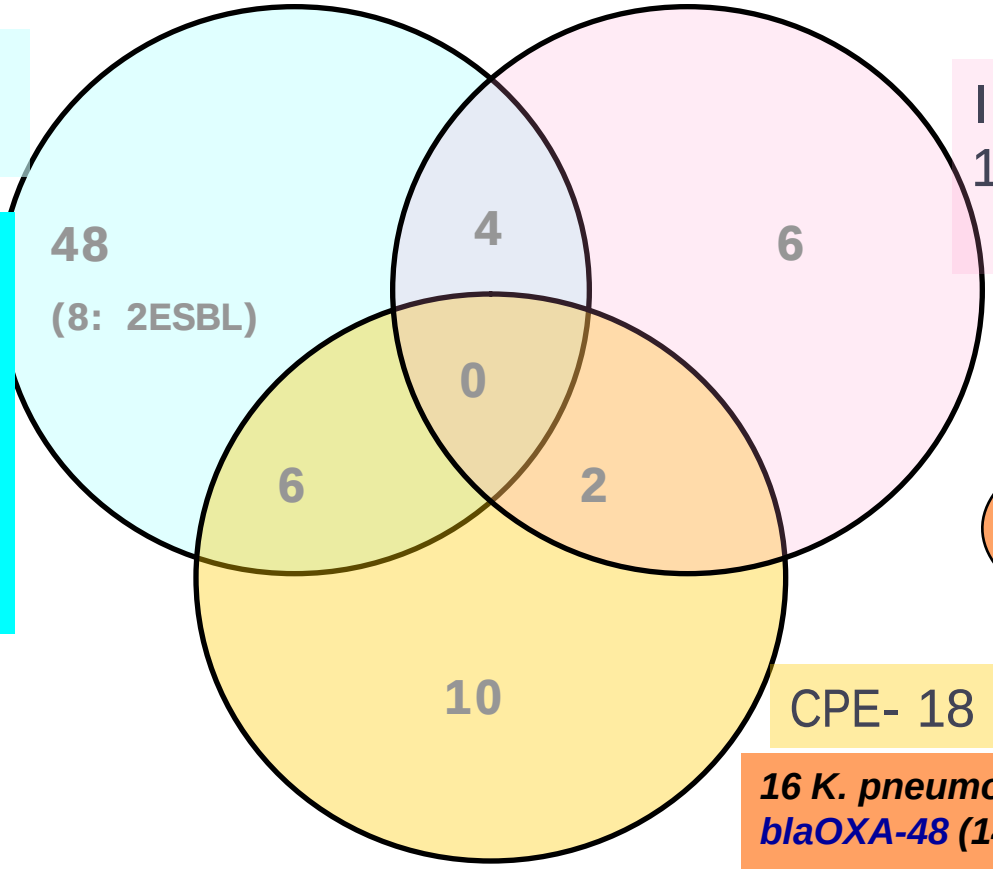
CTX-M gp 1

ESBL-E- 58 (19,3%)

33 E. coli :
31 CTX-M gp1
1 CTX-M gp 9

25 K. pneumoniae :
24 CTX-M gp1
1 CTX-M gp 9

7 E. cloacae :
5 CTX-M group1



bla_{OXA-23}

IMP-R-*A. baumannii* – 12 (4,2%)

8 blaOXA-23

bla_{OXA-48}

CPE- 18 (6,3%)

16 K. pneumoniae :
blaOXA-48 (14 + CTX-M gp1)

1 E. coli : bla-OXA-48 + CTX-M gp1)

1 P. stuartii : blaOXA-48

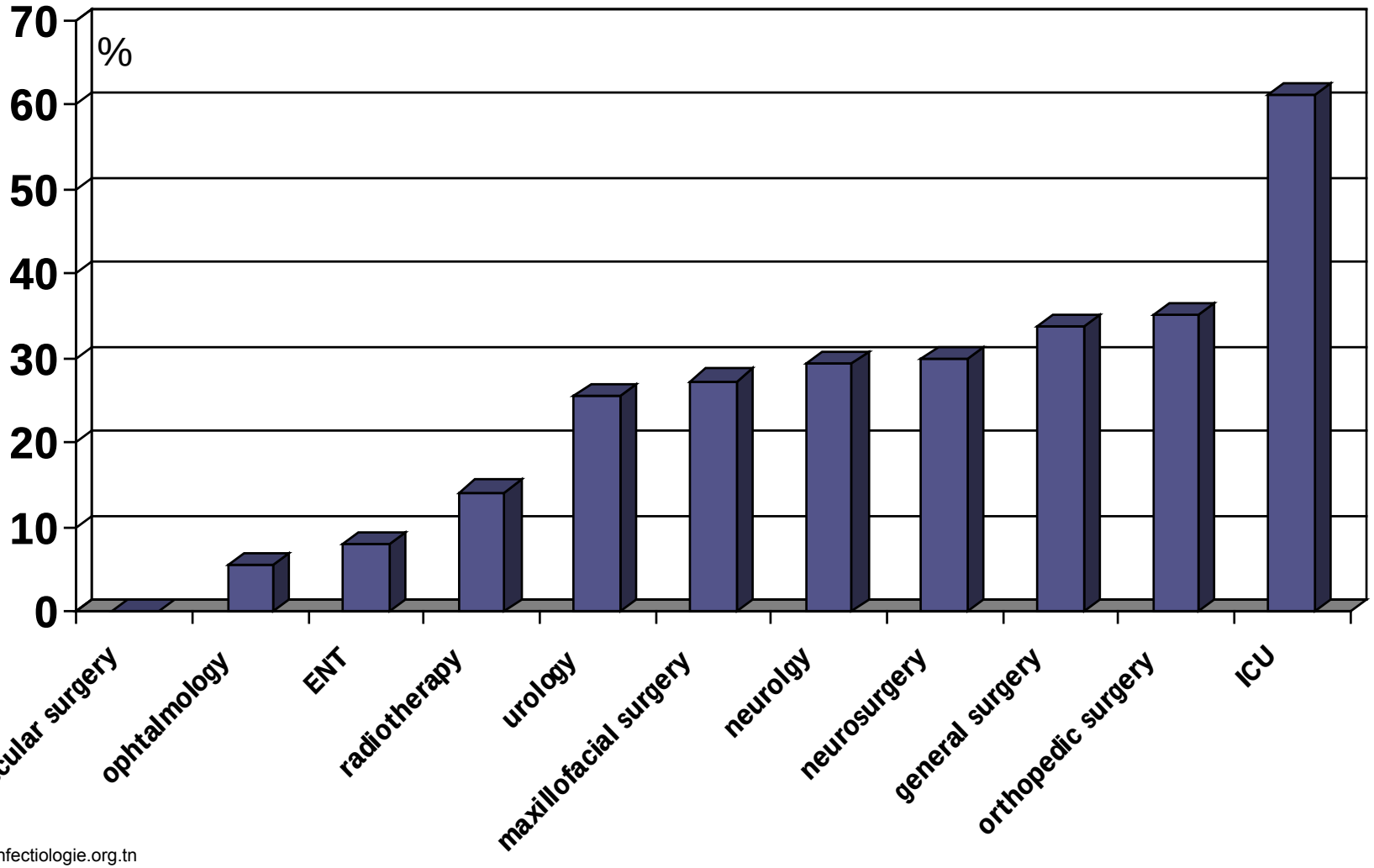
Results

Risk factors for faecal colonization with MDR bacteria

	Colonized patients 76	Non colonized Patients 208	p
Mean age (years)	**47,7**	**48,3**	**0,85**
Diabetes	**15%**	**16%**	**0,93**
Immunosuppression	**11,1%**	**12,5%**	**0,85**
Median length of hospital stay	**15,62 days**	**10,11 days**	**0,0025**
Antibiotic use prior to screening	**31,5%**	**16,4%**	**0,052**
Operation	**41,9%**	**35,3%**	**0,54**
Invasive procedures (CVCs, MV, urinary catheters, endoscopy)	**34,9%**	**30,4%**	**0,64**
Noscomial infection	**29,6%**	**8,6%**	**0,0008**

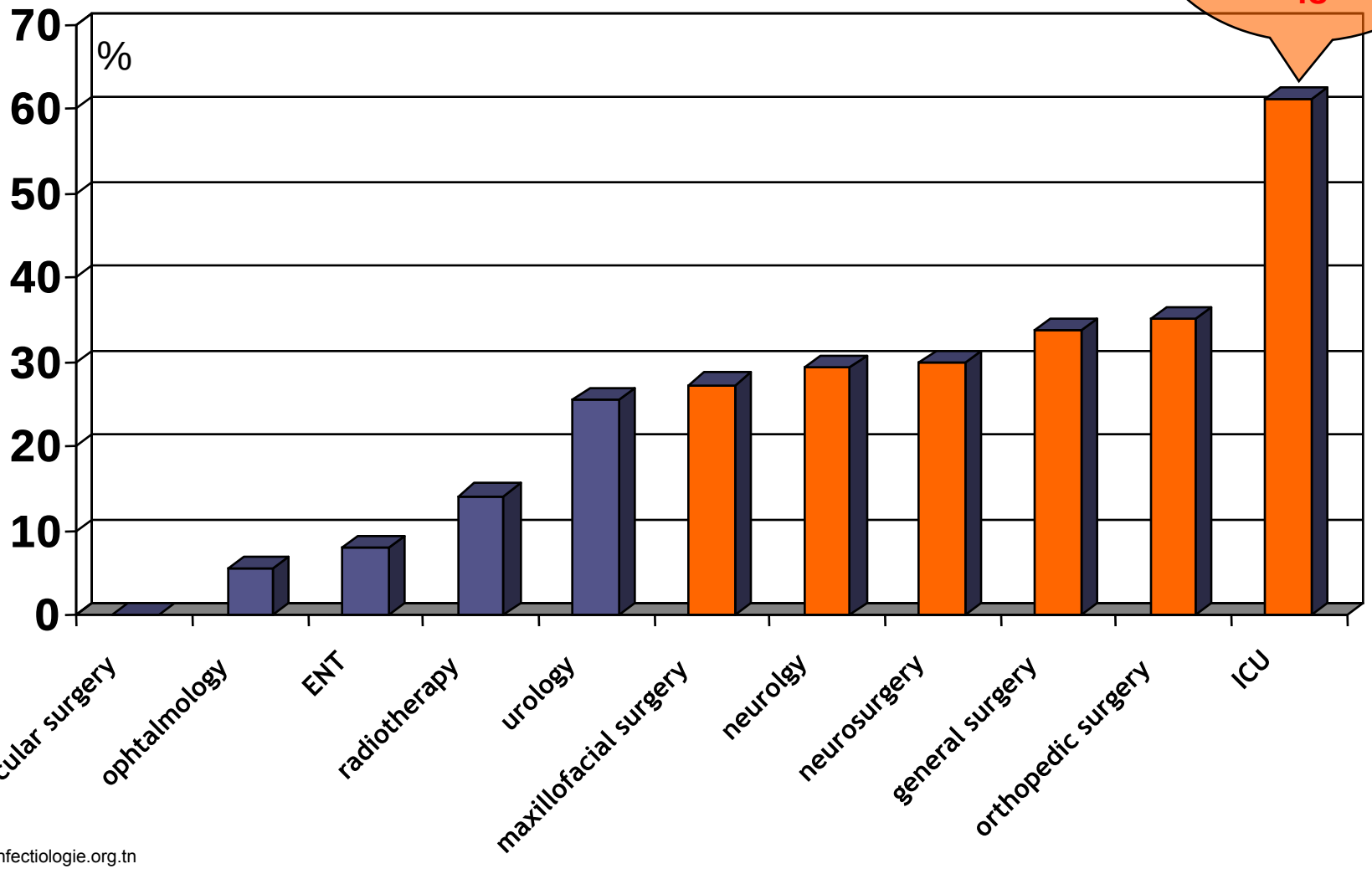
Results

Carriage rate distribution among ward (mean : 26,7%)

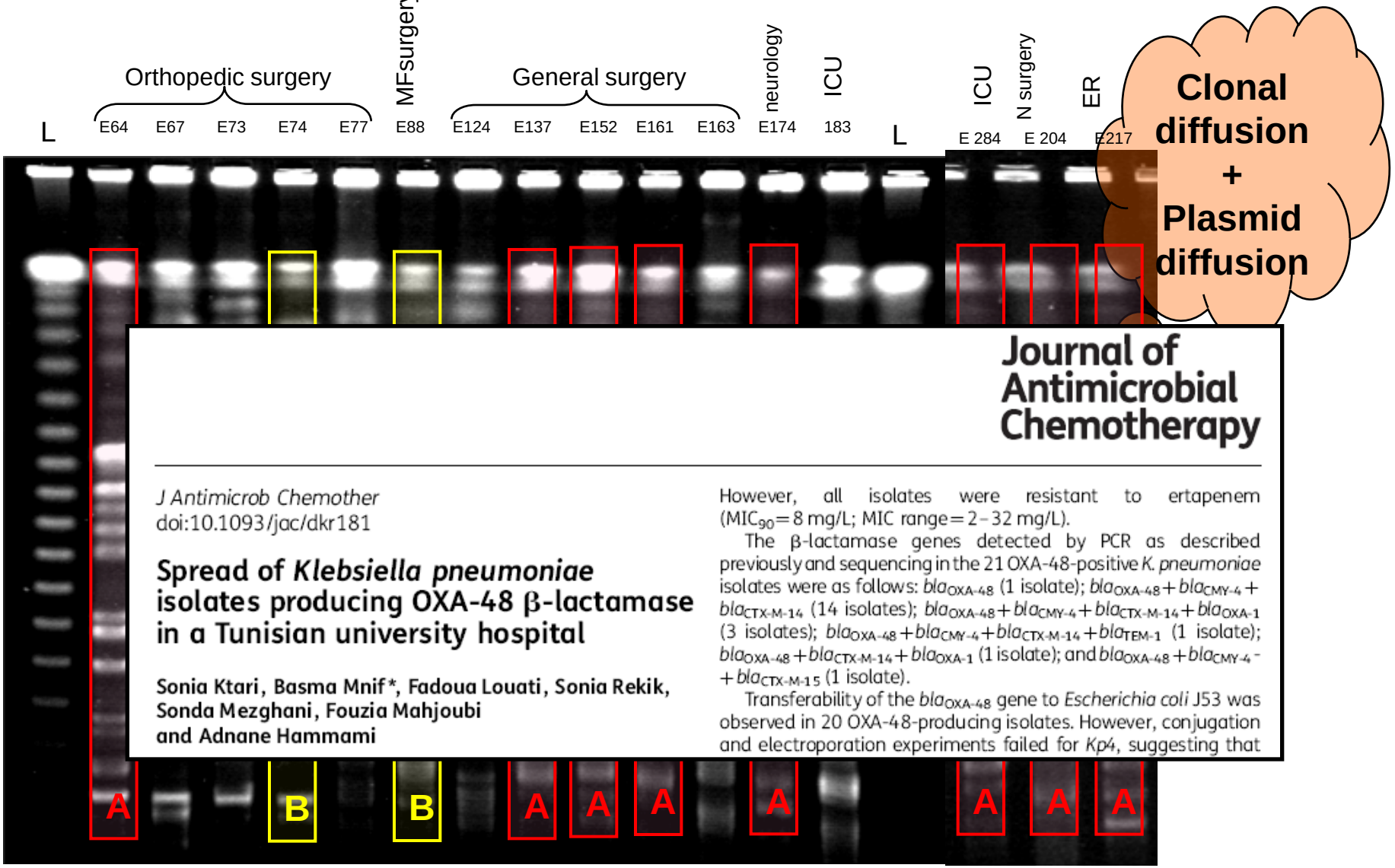


Results

Carriage rate distribution among wards



Clonal relationship among the 16 OXA-48 producing *K. pneumoniae* isolates



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doi:10.1093/jac/dkr181

Spread of *Klebsiella pneumoniae* isolates producing OXA-48 β-lactamase in a Tunisian university hospital

Sonia Ktari, Basma Mnif*, Fadoua Louati, Sonia Rekik, Sonda Mezghani, Fouzia Mahjoubi and Adnane Hammami

However, all isolates were resistant to ertapenem (MIC_{90} = 8 mg/L; MIC range = 2–32 mg/L).

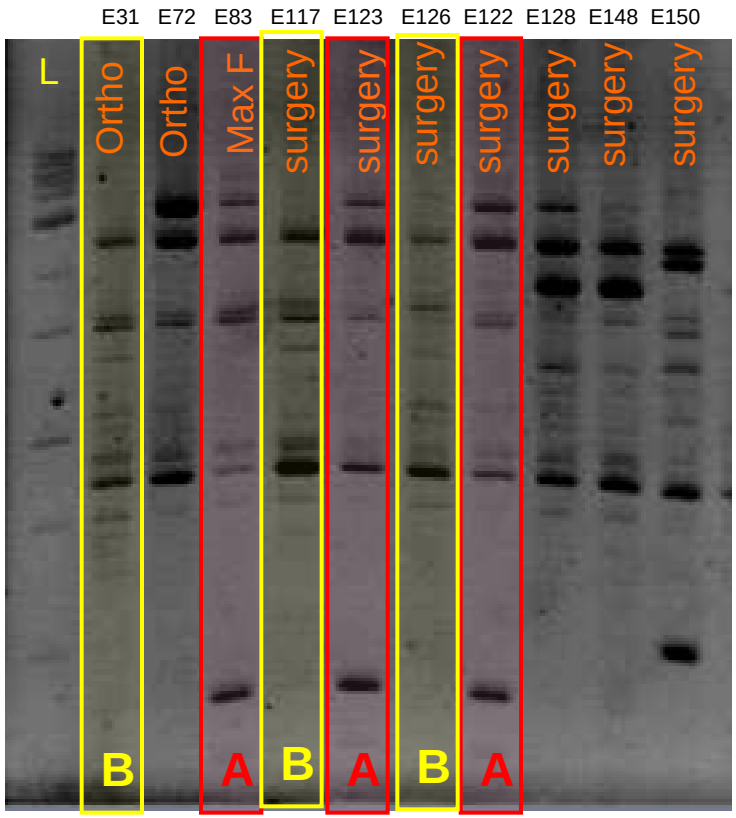
The β-lactamase genes detected by PCR as described previously and sequencing in the 21 OXA-48-positive *K. pneumoniae* isolates were as follows: bla_{OXA-48} (1 isolate); bla_{OXA-48} + bla_{CMY-4} + $bla_{CTX-M-14}$ (14 isolates); bla_{OXA-48} + bla_{CMY-4} + $bla_{CTX-M-14}$ + bla_{OXA-1} (3 isolates); bla_{OXA-48} + bla_{CMY-4} + $bla_{CTX-M-14}$ + bla_{TEM-1} (1 isolate); bla_{OXA-48} + $bla_{CTX-M-14}$ + bla_{OXA-1} (1 isolate); and bla_{OXA-48} + bla_{CMY-4} + $bla_{CTX-M-15}$ (1 isolate).

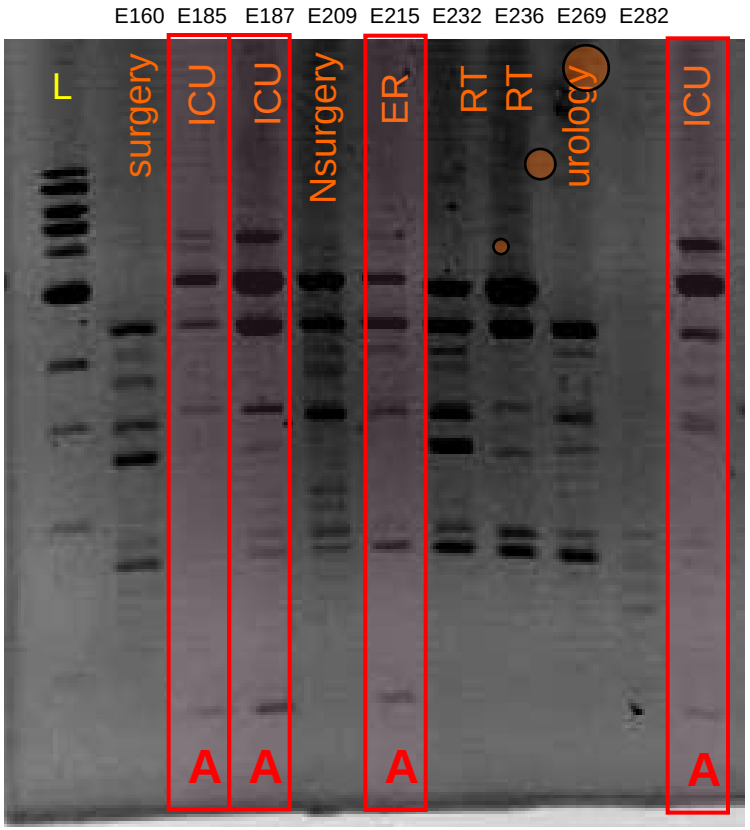
Transferability of the bla_{OXA-48} gene to *Escherichia coli* J53 was observed in 20 OXA-48-producing isolates. However, conjugation and electroporation experiments failed for *Kp4*, suggesting that

PFGE profiles of XbaI-digested whole-cell DNA of *K. pneumoniae* isolates

Clonal relationship among ESBL *K. pneumoniae* isolates

Clonal diffusion



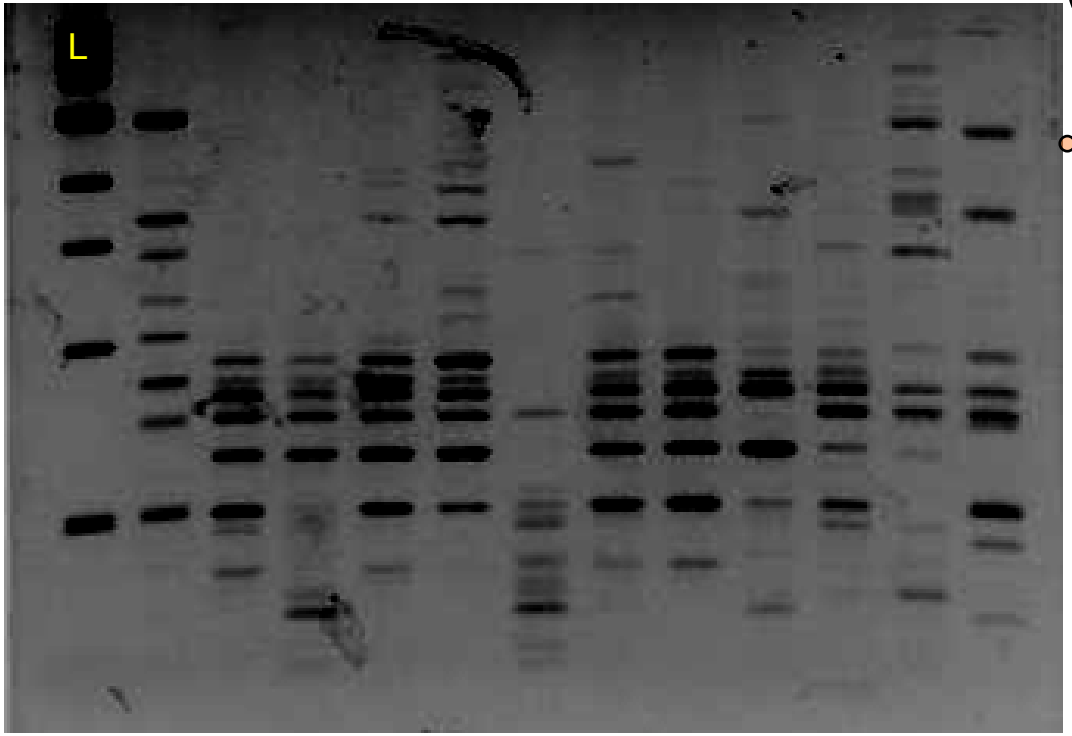


ERIC profiles of ESBL *K. pneumoniae* isolates.

Results

Clonal relationship among ESBL *E. coli* isolates (33/284 : 11,6%)

High diversity



ERIC profiles of ESBL *E. coli* isolates.

The clone *E. coli* O25b:H4-ST131 was detected in 5 isolates (15%)

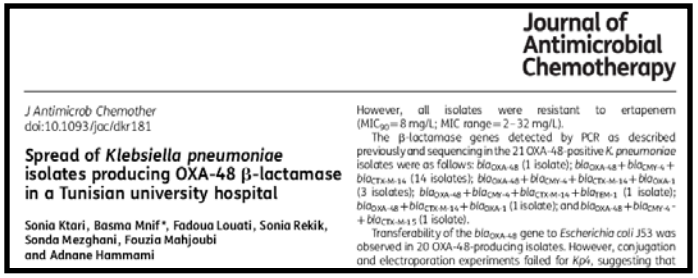
Comments

- ESBL *E. coli* carriage : **(33/284 : 11,6%)**
  - Polyclonal dissemination
  - Possible community carriage (≃ 7,1%)

Ben Sallem R et all Eur J Clin Microbiol Infect Dis. 2011 .
Prevalence and characterisation of extended-spectrum beta-lactamase (ESBL)-producing Escherichia coli isolates in healthy volunteers in Tunisia.

- ESBL *K. pneumoniae* carriage : **(25/284 : 8,8%)**
  - Clonal dissemination
  - Cross-transmission in the hospital

- CPE carriage : **(18/284 : 6,3%)**
  - emerging extremely drug-resistant pathogens
  - $bla_{\text{OXA-48}}$: the predominant carbapenemase in Tunisia
  - Large dissemination of $bla_{\text{OXA-48}}$ among ESC-resistant *K. pneumoniae* in our hospital :
    - **2009-2010 : 14%**
    - **2011 : 32%**



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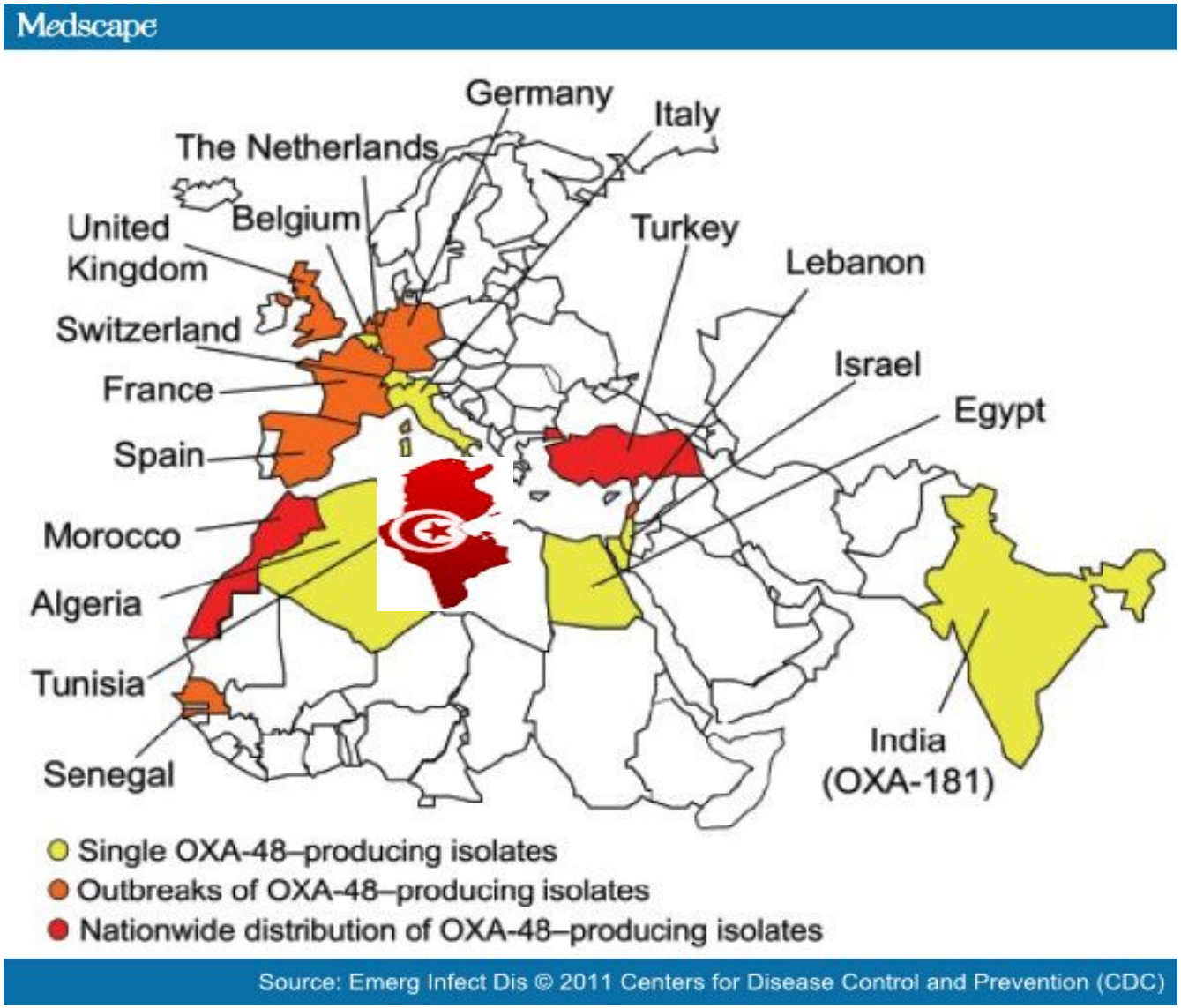
Transferability of the $bla_{\text{OXA-48}}$ gene to *Escherichia coli* J53 was observed in 20 OXA-48-producing isolates. However, conjugation and electroporation experiments failed for *Kpn*, suggesting that

North African countries, the Middle East, Turkey : the most important reservoirs of OXA-48 carbapenemase



Conclusion

- **Wide dissemination of MDR bacteria, including carbapenemase producers, in Habib Bourguiba Tunisian hospital during a non-outbreak situation (faecal carriage rate = 26,7%)**

- **Carbapenemase producing *Enterobacteriaceae* :**
  - worldwide problem
  - predicted to increase
  - our findings raise the concern that the scenario of endemicity of CTX-M may be replicated in the future by carbapenemase, mainly OXA-48

- **Clonal diffusion : strict adherence to isolation procedures**
- **Polyclonal dissemination : reduction of antibiotic prescribing**

→ **containment of further spreading among patients**

Thank you for your attention