

Xpert Carba-R Screening of digestive carriers of carbapenemase-producing GNB versus conventional techniques



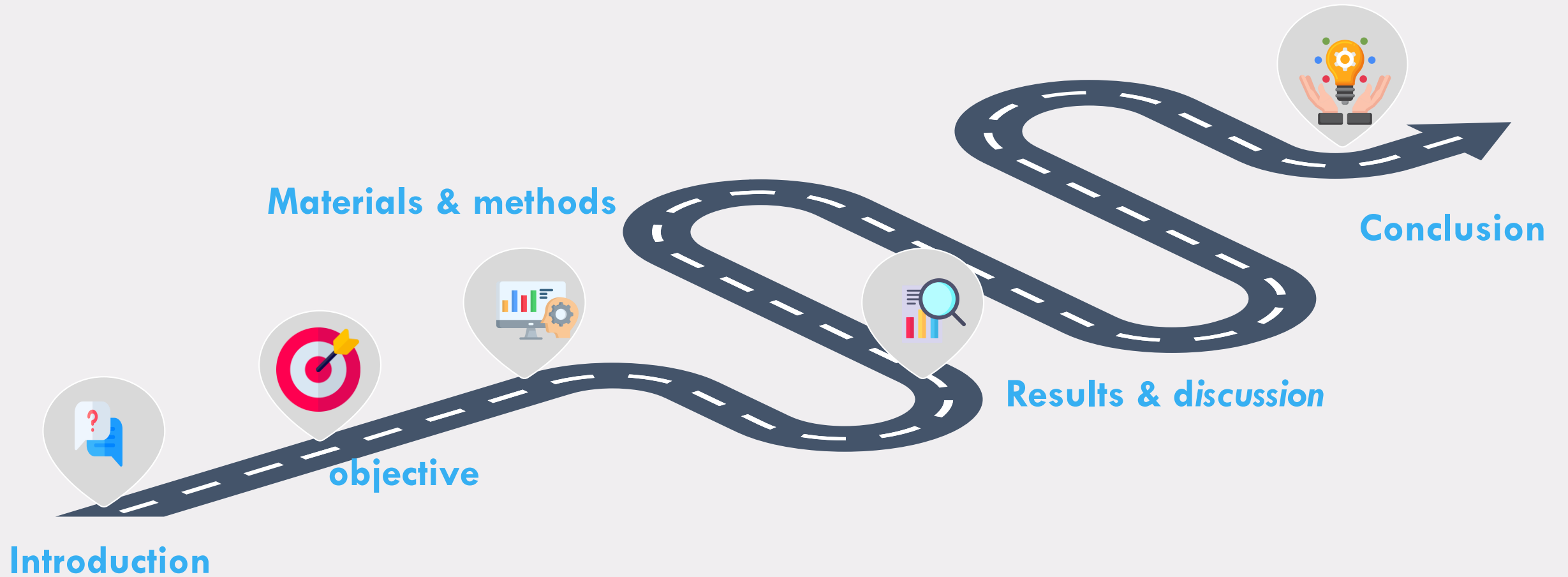
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Presented by :
Dr. C.ZERROUKI

Outline





Introduction



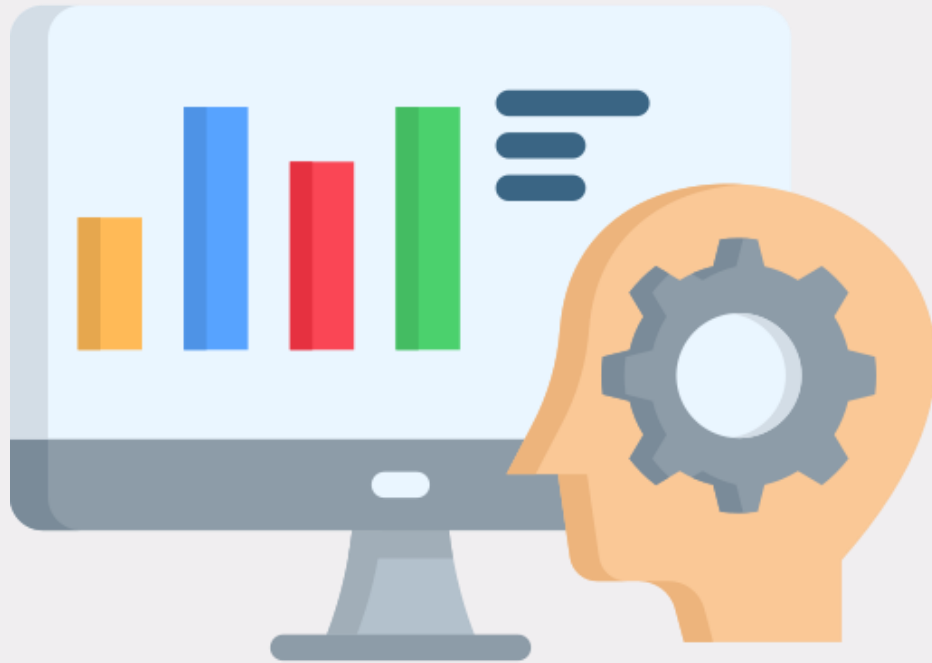
- Detection of carbapenemase-producing Gram-negative bacilli (CP-GNB) requires methods that are sensitive, specific, and rapid to support timely infection control.
- Traditional culture-based methods are limited by low sensitivity and slow turnaround.
- Molecular techniques, such as the Xpert CarbaR® test, allow for fast and accurate detection of key resistance genes (blaKPC, blaNDM, blaVIM, blaOXA-48, blaIMP-1) directly from rectal swabs.
- In Algeria, efforts have mostly focused on molecular characterization from clinical isolates. However, until now, no study had assessed the direct use of molecular screening techniques on clinical samples.



Objective



To demonstrate the contribution of the Xpert CarbaR® test in the molecular detection of digestive carriage of CP-GNB, in comparison with conventional techniques.



Materials et methods



1. Study design and population :

Prospective study on the molecular detection of **digestive carriage** of CP- GNB using the Xpert Carba-R® test, conducted in different department of the Mustapha University Hospital of Algiers, between February and June 2024.



Inclusion criteria

- Hospitalized patients at Mustapha University Hospital of Algiers who received ≥ 7 days of **Imipenem**



Non inclusion criteria

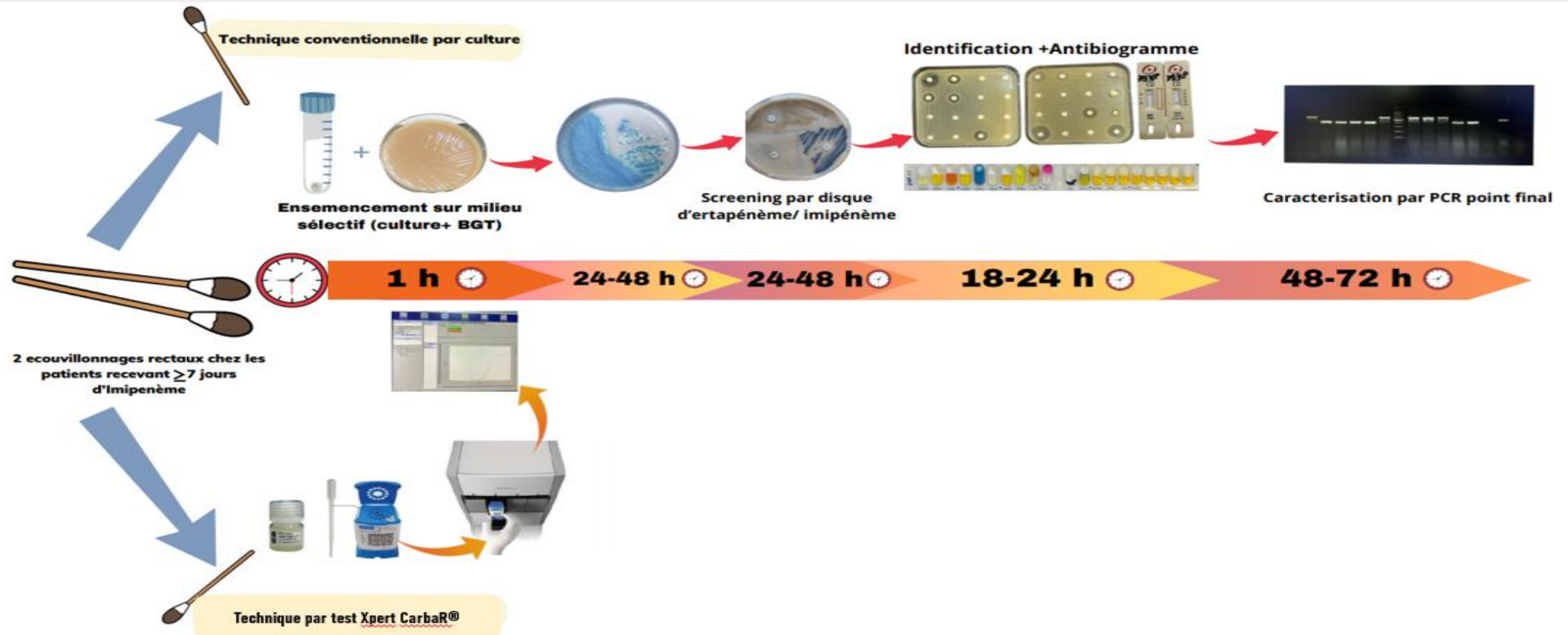
- Patients **not admitted** at Mustapha University Hospital of Algiers
- Patients who received ≤ 6 days of **Imipenem**
- Patients who received **other types of antibiotics**



Exclusion criteria

- **Duplicate patients**

2. Screening methodology for detecting carriers of carbapenemase-producing GNB





Results et discussion



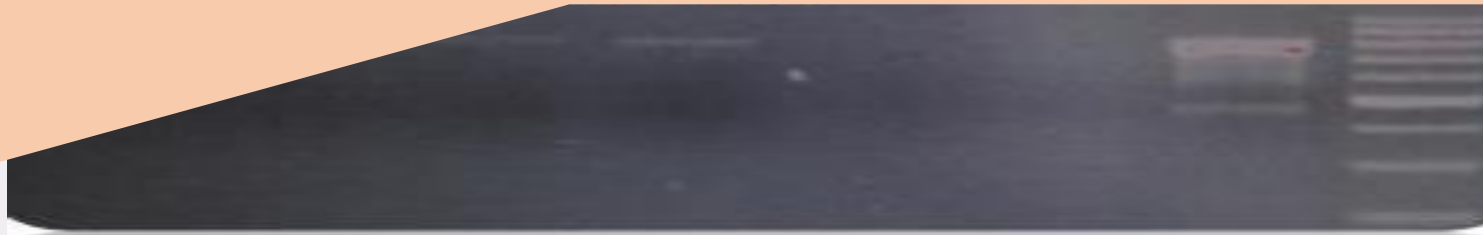
1. Carriage rate by conventional technique

- Detected carriage rate: 44% (22/50)
- Total number of isolates strains: 25 strains

Strains isolated using conventional technique

Bacterial species	Direct Culture	Enrichment	Molecular profil
<i>Acinetobacter baumannii</i>	10	2	OXA23 n=8
			OXA24 n=4
<i>Klebsiella pneumoniae</i>	5	4	NDM n=5
			OXA48 n=2
			NDM-OXA48 n=2
<i>Escherichia coli</i>	1	2	OXA48 n=2
			NMC-A n=1
<i>Citrobacter freundii</i>	1	0	OXA48 n=1
Total	17	8	

Importance of culture for the detection of non-conventional mechanisms
(Open system)



End point PCR result for NMC-A producing E coli

2. Overall positivity rate of the Xpert CarbaR test®

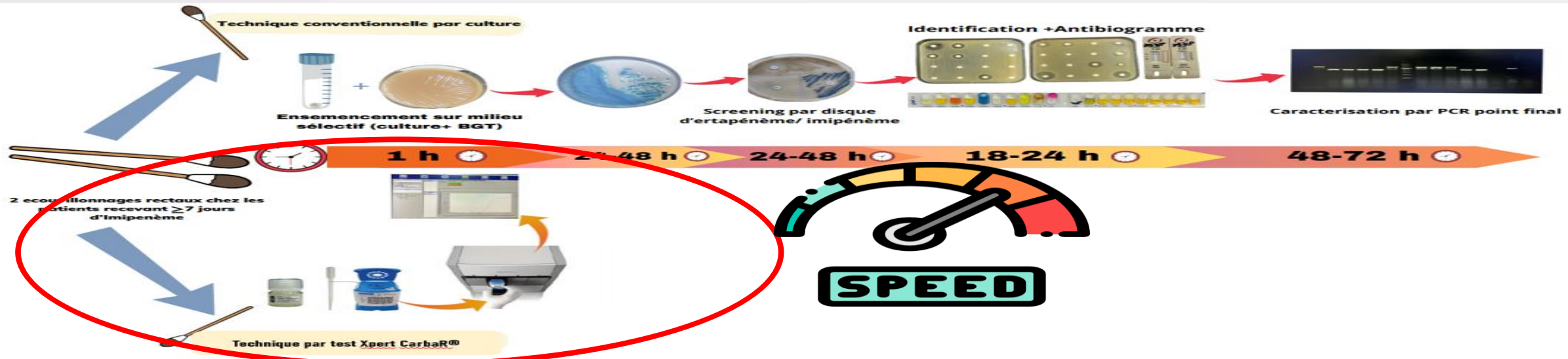
- Carriage rate by Xpert CarbaR® test : 32% (16/50)

Negative:
 $n= 34$

NDM:
 $n= 8$

OXA48
: $n= 4$

NDM+
OXA48:
 $n=4$

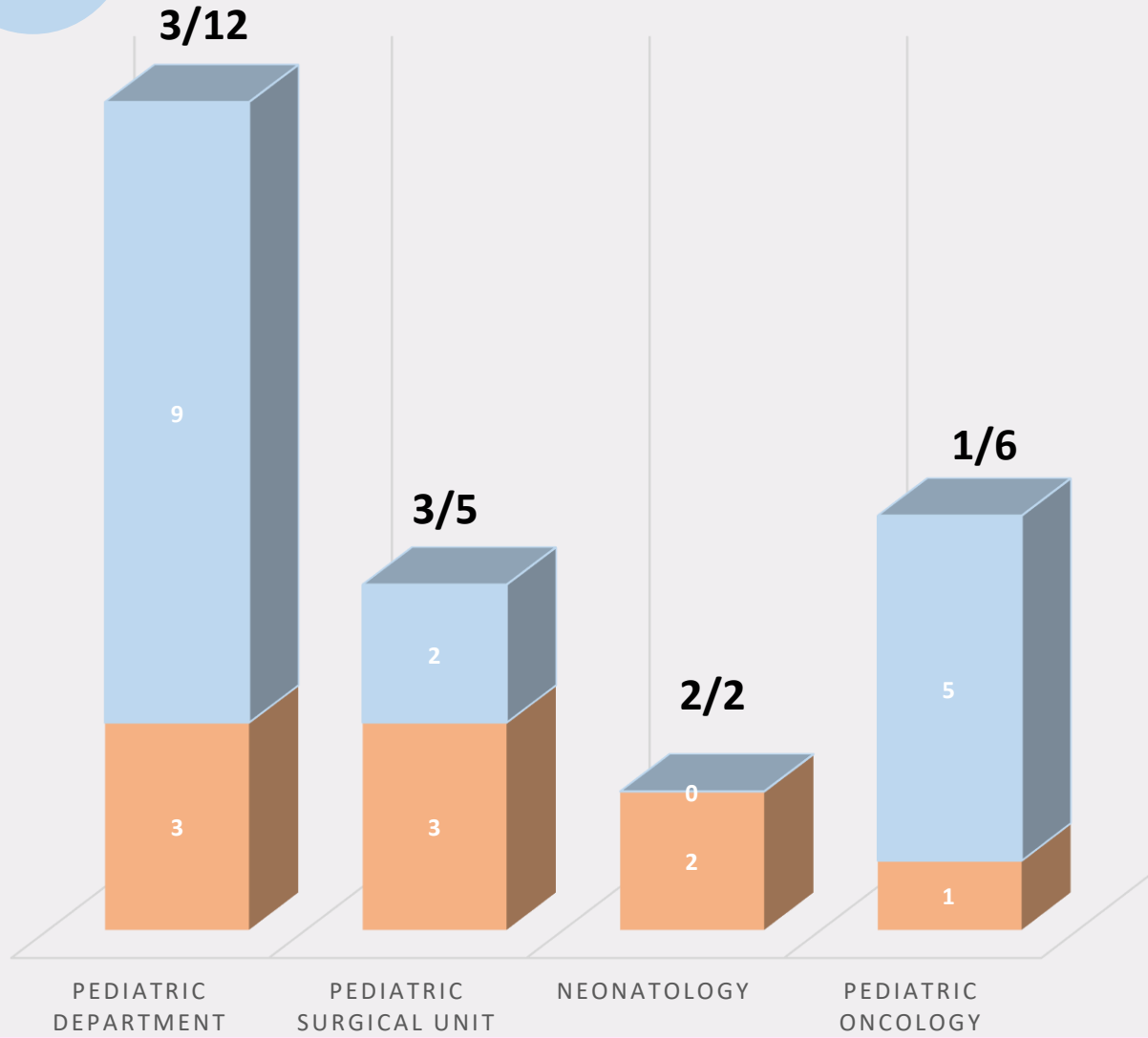


5. Carriage rate by age group and hospital department



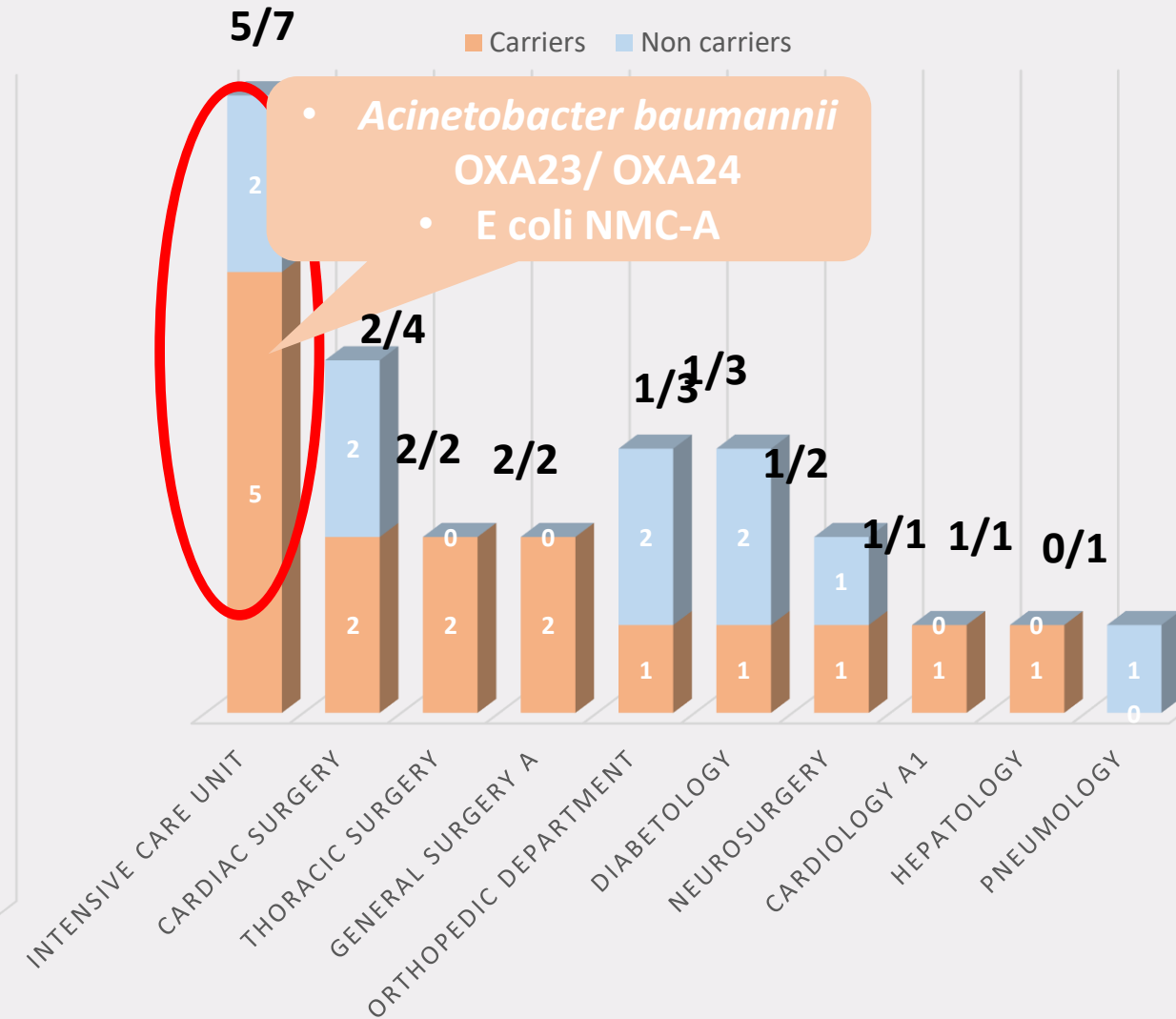
PEDIATRIC POPULATION (9/25)

Carriers Non carriers



ADULT POPULATION 16/25)

Carriers Non carriers



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N° patient	Referring department	Xpert CarbaR® results	Identified strain	Molecular characterization	Interpretation
1	ICU	Not detected	<i>Acinetobacter baumannii</i>	OXA24	Discordant negative
2	Pediatric	NDM	<i>Not isolated</i>		Discordant positive
3	Pediatric	OXA-48	<i>Klebsiella pneumoniae</i>	OXA-48	Concordant positive
4	ICU	Not detected	<i>Acinetobacter baumannii</i>	OXA-23	Discordant negative
5	Pediatric	OXA-48	<i>Citrobacter freundii</i>	OXA-48	Concordant positive
6	Cardiac surgery	NDM-OXA48	<i>Klebsiella pneumoniae</i>	OXA-48	Partially discordant
			<i>Escherichia coli</i>	OXA-48	
7	Neurosurgery	NDM-OXA48	<i>Klebsiella pneumoniae</i>	NDM-OXA48	Concordant positive
8	ICU	Not detected	<i>Acinetobacter baumannii</i>	OXA23	Discordant negative
9	Hepatology	Not detected	<i>Acinetobacter baumannii</i>	OXA23	Discordant negative
10	Neonatology	NDM	<i>Acinetobacter baumannii</i>	OXA23	Partially discordant
11	Neonatology	NDM	<i>Klebsiella pneumoniae</i>	NDM	Concordant positive
12	General surgery A	NDM	<i>Acinetobacter baumannii</i>	OXA23	Partially discordant
13	Pediatric surgery unit	NDM	<i>Klebsiella pneumoniae</i>	NDM	Concordant positive
14	ICU	Not detected	<i>Acinetobacter baumannii</i>	OXA24	Discordant negative
15	Thoracic surgery	NDM	<i>Klebsiella pneumoniae</i>	NDM	Concordant positive
16	Thoracic surgery	Not detected	<i>Acinetobacter baumannii</i>	OXA24	Discordant negative
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			<i>Escherichia coli</i>	NMC-A	
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19	Diabetology	Not detected	<i>Acinetobacter baumannii</i>	OXA23	Discordant negative
20	Cardiology A1	Not detected	<i>Acinetobacter baumannii</i>	OXA23	Discordant negative
21	Pediatric oncology	NDM-OXA48	<i>Klebsiella pneumoniae</i>	NDM-OXA48	Concordant positive
22	Pediatric surgery unit	OXA-48	<i>Escherichia coli</i>	OXA-48	Concordant positive
23	Orthopedic unit	NDM-OXA48	<i>Klebsiella pneumoniae</i>	NDM	Partially discordant
			<i>Acinetobacter baumannii</i>	OXA24	
24	Pediatric surgery unit	NDM	<i>Not isolated</i>		Discordant positive
25	Chirurgie cardiaque	OXA48	Non isolée		Discordant positif

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7	Neurosurgery	NDM-OXA48	<i>Klebsiella pneumoniae</i>	NDM-OXA48	Concordant positive
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*Acinetobacter
baumannii*
OXA23/OXA2
4

Moderate
concordance

**Xpert CarbaR® positive
results/Culture negative (NDM/
OXA48): Several hypotheses**

Unusal genes
NMC-A

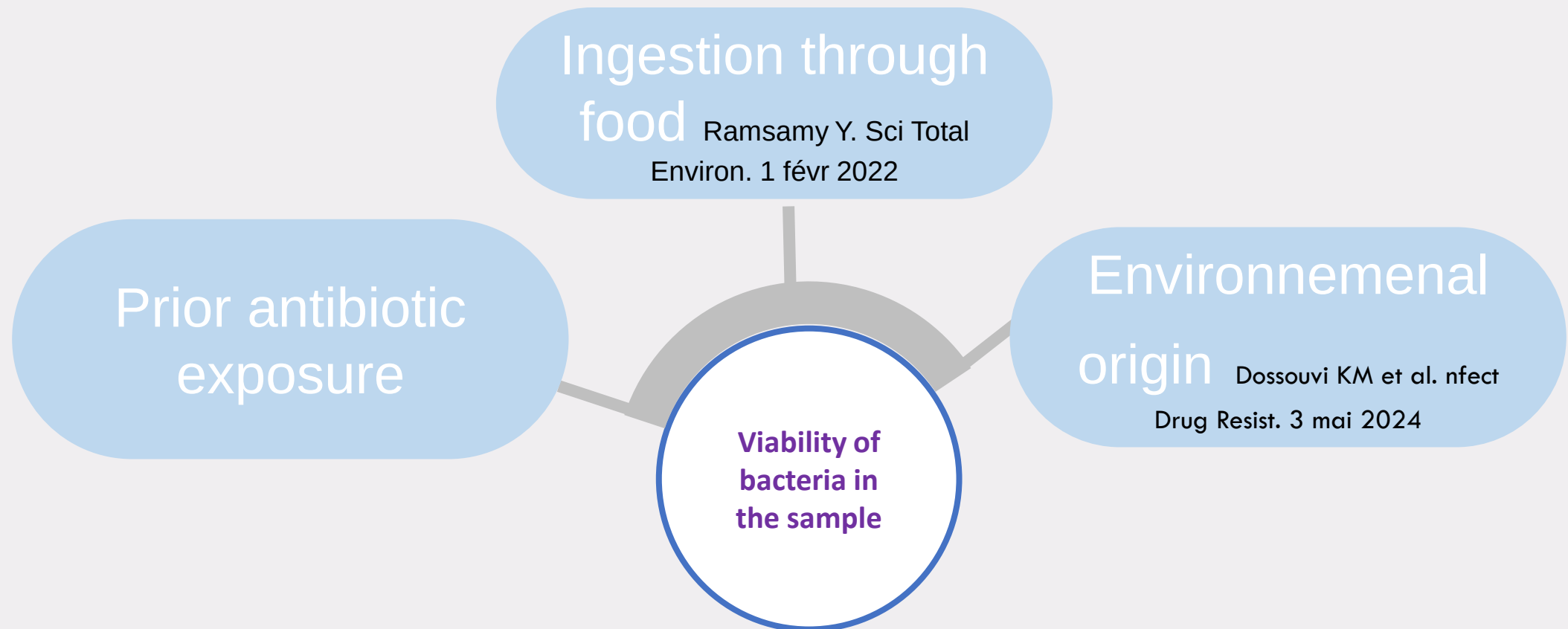
**Xperte CarbaR ® negative results
related to the limited specificity to
its targets not adapted to the local
epidemiology in Algeria**



The viability of
bacteria carrying
detected genes

Limitations of
culture

Xpert CarbaR® positive results/Culture negative (NDM/ OXA48)



Xpert CarbaR® positive results/Culture negative (NDM/ OXA48)

Fastidious
Anaerob

However, these particular cases in which the Xpert CarbaR® test may produce discordant positive results do not compromise its utility for screening, as it still ensure accurate detection of all carrier patients.

reduced
inhibited by
medium

The
carbapenemase p
anaerobic bacteri
Antibiotics (Base

not poorly
detected by culture

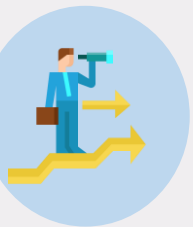
Escherichia coli OXA244

(Hoyos-Mallecot Y et al Antimicrob Agents
Chemother. 24 août 2017)

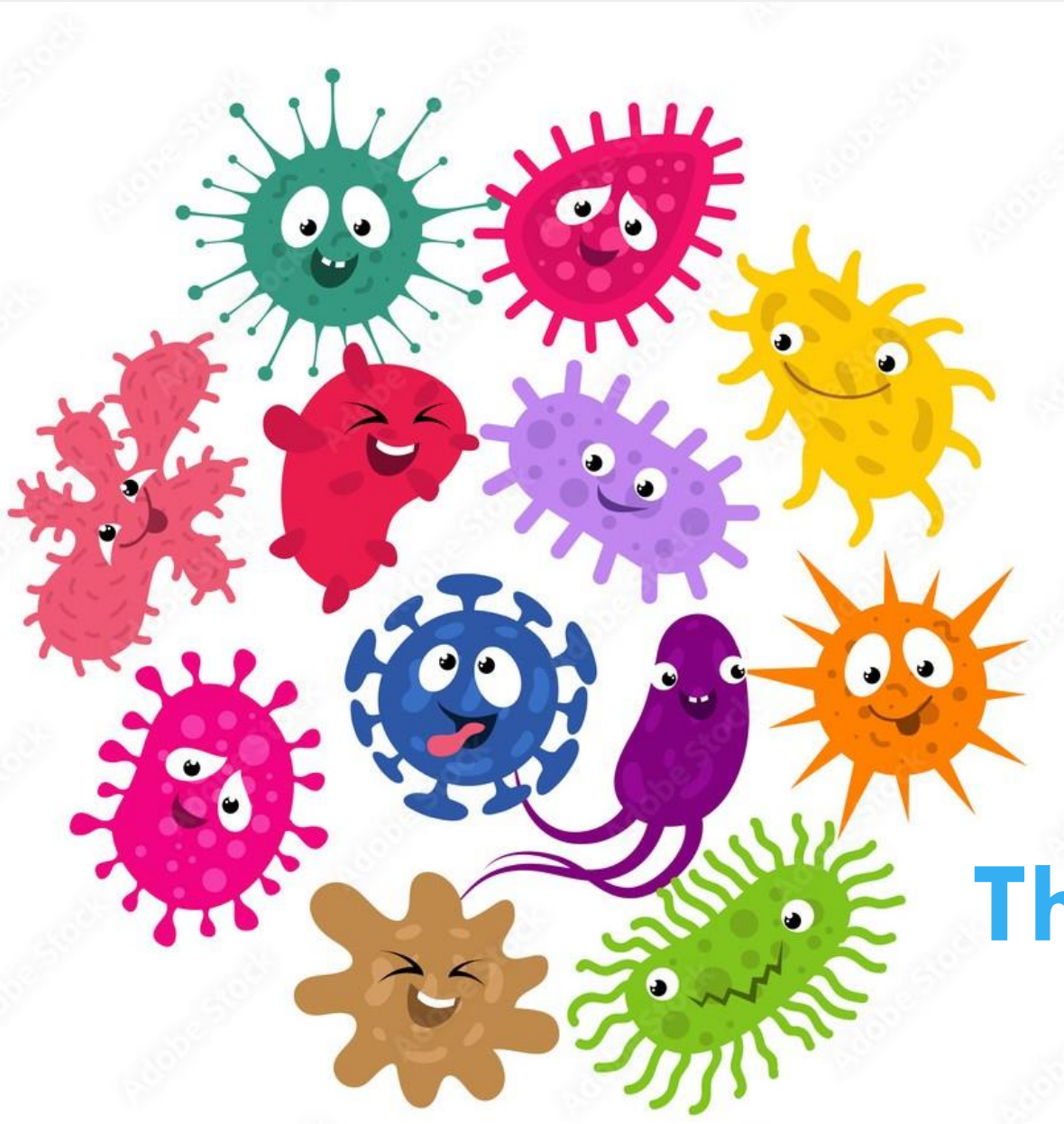


Conclusion

- This preliminary study demonstrates that the Xpert Carba-R® test can rapidly detect the majority of carrier patients in a short time.
- However, in countries such as *Algeria*, where colonization by carbapenemase-producing *A.baumannii* – *particularly strains harboring blaOXA23 and blaOXA24-* is prevalent, conventional techniques still have their place. Being in an open system, they remain valuable for detecting rare carbapenemases like NMC-A.



Improving detection of CP-GNB in Algeria may require adapting tests to better identify locally prevalent enzyme variants.



Thanks for your attention

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