Updated CPE screening document

-experience from Karolinska UH with an additional CPE-screening agar

Anna-Karin Smekal, Karolinska University Hospital

NordicAST workshop 12-13 May 2026

EUCAST

NordicAST

NAC: SRGA/RAF

LOCAL laboratory

EUCAST EUROPEAN COMMITTEE ON ANTIMICROBIAL SUSCEPTIBILITY TESTING
European Society of Clinical Microbiology and Infectious Diseases

Public Consultation

Proposed addition of a comment for carbapenemase-produ
Enterobacterales

July 2025

1. If a carbapenemase is detected, the clinical response to treatment with carbapenems may be impaired, even if categorised S or I. Other antimicrobials are preferred, especially for complicated infections. If other antimicrobials are unavailable, carbapenems can be used at high exposure in combination with a second active agent. For carbapenemase screening, a meropenem screening cut-off of >0.125 mg/L (zone diameter <28 mm) is recommended.

Carbapenems	Kommentarer
	Meropenem bör alltid ingå vid screening för karbapenemaser. Isolat som har meropenem zondiameter <28 mm och/eller meropenem MIC >0.125 mg/L bör av vårdhygieniska skäl alltid undersökas avseende överförbara karbapenemaser och skickas till referenslaboratorium enligt nationella rekommendationer. Se flödesschema för ESBL CARBA-testning.
	Om ett karbapenemas påvisats kan den kliniska effekten av karbapenembehandling vara otillräcklig, även om isolatet kategoriseras som S eller I. Använd därför andra preparat i första hand, särskilt vid komplicerade infektioner och lägg till följande kommentar: "Karbapenemasproduktion påvisad. Behandling med karbapenemer (meropenem, imipenem och ertapenem) bör undvikas. Konsultera infektionsläkare eller klinisk mikrobiolog."
Ertapenem	Om ett karbapenemas påvisats, se kommentar ovan.
Imipenem, *Enterobacterales* except *Morganellaceae*	Om ett karbapenemas påvisats, se kommentar ovan.

Referensgruppen för antibiotikafrågor RAF

Rekommendationer för utsvarning av karbapenemer hos Enterobacterales med påvisad karbapenemasproduktion ($ESBL_{CARBA}$)

RAF och svenska delen av NordicAST rekommenderar att de svenska mikrobiologiska laboratorierna bör göra följande då karbapenemasproduktion påvisats.

1. Rapportera vilka karbapenemaser som påvisats (OXA-48, NDM, KPC, VIM, etc.)
2. Om meropenem, imipenem och/eller ertapenem utfaller R: rapportera R
3. Om meropenem, imipenem och/eller ertapenem utfaller S/I: Rapportera INTE S/I. Svara endast med följande kommentar:
   "Karbapenemasproduktion påvisad. Behandling med karbapenemer (meropenem, imipenem och ertapenem) bör undvikas. Konsultera infektionsläkare eller klinisk mikrobiolog."

För OXA-48 producerande isolat lägg till följande kommentar:

"Ceftazidim-avibactam är förstahandsmedel för OXA-48 producerande isolat som kräver intravenös behandling".

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Remember! Different regions in the Nordics are in different stages of the AMR pandemic (the marathon to Harmageddon) We have to learn from the one in the front…

Image: ChatGPT

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Län/Regioner	2026	2025	2024	2023	2022	2021	2020
Norrbotten	**4** / *1,61*	**11** / *4,42*	**6** / *2,41*	**5** / *2,01*	**4** / *1,61*	**1** / *0,40*	**2** / *0,80*
Skåne	**19** / *1,33*	**44** / *3,07*	**54** / *3,78*	**38** / *2,67*	**25** / *1,77*	**15** / *1,07*	**16** / *1,15*
Stockholm	**87** / *3,50*	**180** / *7,24*	**153** / *6,19*	**129** / *5,25*	**109** / *4,47*	**53** / *2,19*	**43** / *1,80*
Södermanland	**4** / *1,33*	**8** / *2,66*	**9** / *2,98*	**8** / *2,65*	**4** / *1,32*	**3** / *0,99*	**3** / *1,00*
Uppsala	**14** / *3,41*	**17** / *4,14*	**18** / *4,41*	**9** / *2,22*	**7** / *1,75*	**5** / *1,27*	**9** / *2,32*
Värmland	**3** / *1,06*	**12** / *4,24*	**5** / *1,76*	**5** / *1,76*	**3** / *1,06*	**1** / *0,35*	**3** / *1,06*
Västmanland	**4** / *1,42*	**15** / *5,34*	**15** / *5,34*	**3** / *1,07*	**5** / *1,78*	**2** / *0,72*	**4** / *1,44*
Västra Götaland	**22** / *1,24*	**80** / *4,50*	**68** / *3,84*	**47** / *2,66*	**41** / *2,33*	**22** / *1,26*	**18** / *1,04*
Örebro	**1** / *0,32*	**12** / *3,89*	**13** / *4,22*	**9** / *2,92*	**3** / *0,97*	**1** / *0,33*	**6** / *1,96*
Östergötland	**3** / *0,63*	**8** / *1,69*	**7** / *1,48*	**8** / *1,69*	**6** / *1,27*	**5** / *1,06*	**0** / *0*
Totalt	**191** / *1,80*	**487** / *4,59*	**410** / *3,87*	**314** / *2,98*	**240** / *2,28*	**137** / *1,31*	**128** / *1,23*

Through April

CPE in different counties in Sweden

Total number of cases per year/*Number of cases per 100,000 inhabitants per year*

Source: Folkhälsomyndigheten

Updated CPE screening document

-experience from Karolinska UH with an additional CPE-screening agar

Anna-Karin Smekal, Karolinska University Hospital

NordicAST workshop 12-13 May 2026

NordicAST Method Document

Screening for carbapenemase-producing Enterobacterales ($ESBL_{CARBA}$)
First published 30-01-2017
Revised 30-04-2026

Screening for carbapenemase-producing Enterobacterales ($ESBL_{CARBA}$)

Scope of the document. This document gives recommendations on laboratory methods for screening patients for colonisation with carbapenemase-producing Enterobacterales (CPE). Enterobacterales with ESBLCARBA is the alternative nomenclature for CPE used in some of the Nordic countries.

Indications for screening, the number and interval of screening samples and the consequences of a positive or negative result are outwith the scope of this document and should be determined by local or national infection control policies.

Major changes:

- Introduction and confirmatory tests paragraphs shortened,with reference to "Detection of CPE" document
- Screening algorhithm: According to current epidemiology, "General CPE media" and optional "Specific OXA-48 media" replaced by "A media with the selective carbapenemase at ECOFF-level" and an optional more selective medium. Confirmation refers to Detection of CPE document. Optional use of nonselective medium to confirm the representativeness of the sample removed.
- Table with studies comparing different selective agars replaced by a short text and a new summary table with special emphasis on detecting OXA-244-producing strains

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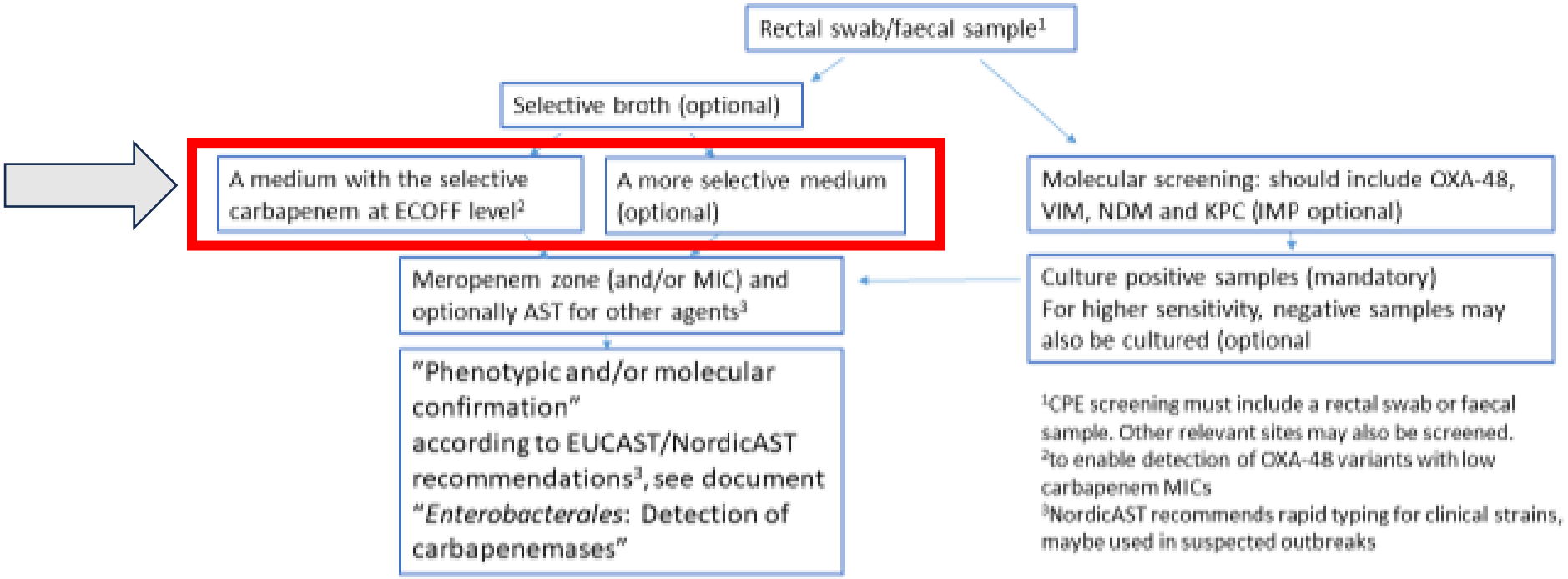
Screening for CPE ($ESBL_{CARBA}$)



A)Culture based screening

When choosing a culture method for CPE screening the following points should be taken into account:

- For optimal sensitivity of the selective media, it is best to add ertapenem or meropenem at the ECOFF-levels - this is usually needed to detect OXA-48. It is also good to supply the agar with Zn^{2+} (to promote growth of MBL), and to add cloxacillin (to inhibit AmpC) and potentially vancomycin and amphotericin B (to inhibit gram-positives and fungi, respectively) (1-4)
- In particular, detection of strains producing OXA-48 or OXA-48-like enzymes may be problematic. Their growth may be inhibited if the selectivity of the medium is based on too high concentrations of carbapenems (designed for detection of KPC or other carbapenemases with higher MICs) or temocillin (to which OXA-244 strains often are susceptible) (3-5)
- On the other hand, a more selective agar with higher concentration of carbapenems may help detecting minority variants that might be missed with an agar that is less selective. This is at least the experience from centers where patient samples with multiple CPE-strains in one single sample are not uncommon (personal communication, Karolinska University Hospital).
- A combination of two chromogenic agars (and an ESBL agar) may thus be necessary to offer maximum sensitivity (5,6).
- Using a prolonged incubation period (from 18-24 to 48 h) does not necessarily increase sensitivity when using chromogenic media and may decrease specificity (7,8).
- Enrichment in broth prior to plating on a chromogenic CPE media seems to increase sensitivity, especially for detection of strains producing OXA-48 (7,8). Broths used in the studies have been with (8) or without (7) a selective carbapenem. A disadvantage of pre-enrichment is that an extra day is required to obtain results, but if combined with either direct culture on selective media or a molecular test, optimum speed and sensitivity can be achieved.

Challenges related to carbapenemase screening in Enterobacterales

Anna-Karin Smekal[1] & Ørjan Samuelsen[2]

[1]Senior Consultant Clinical Microbiology, Karolinska University Hospital Stockholm

[2]Norwegian National Advisory Unit on Detection of Antimicrobial Resistance, University Hospital of North Norway

REMINDER FROM WS 2024!

The OXA-244 challenge -a short reminder

- A variant of OXA-48 with a single Arg214Gln mutation
- 2012 first discovered on a plasmid of a *K. pneumoniae* isolate in Spain
- 2013 found in *E.coli* from Germany
- Since then increasing regional and national dissemination of OXA-244-producing *E. coli* in EU/EEA. Mainly ST38.
- Not resistant to temocillin
- ECDC rapid risk assessment report 2021:
  - The source and route of transmission in EU/EEA/UK is currently unclear, and there is a need for further investigation. The wide geographical dispersion of cases within countries, without cases being linked in place and time, indicates transmission in the

The OXA-244 challenge-example from Karolinska University laboratory

- During 2018 to 2022 we detected 183 isolates with OXA-48

From March 2018 to December 2022	Number
OXA-244 positive isolates	64 (35%)
• Temocillin S (≥12 mm)	38 (60%)
• Temocillin R (<12 mm)	26 (40%)
• Piperacillin-tazobactam disk diffusion	All isolates ≤ 12 mm
• Ertapenem disk diffusion	All isolates below the R-breakpoint <25 mm
• ESBL positive isolates	2020-2021: 85% (16/19) ESBL-A: 74%, ESBL-M: 11%

Considerations/recommendations

➢ Always include a CRE specific agar when screening for CPE colonisation! Do not rely only on an ESBL agar alone.

-> Combination of both CRE + ESBL agar

➢ Make sure that your CRE agar detects OXA-48-producers including OXA-244

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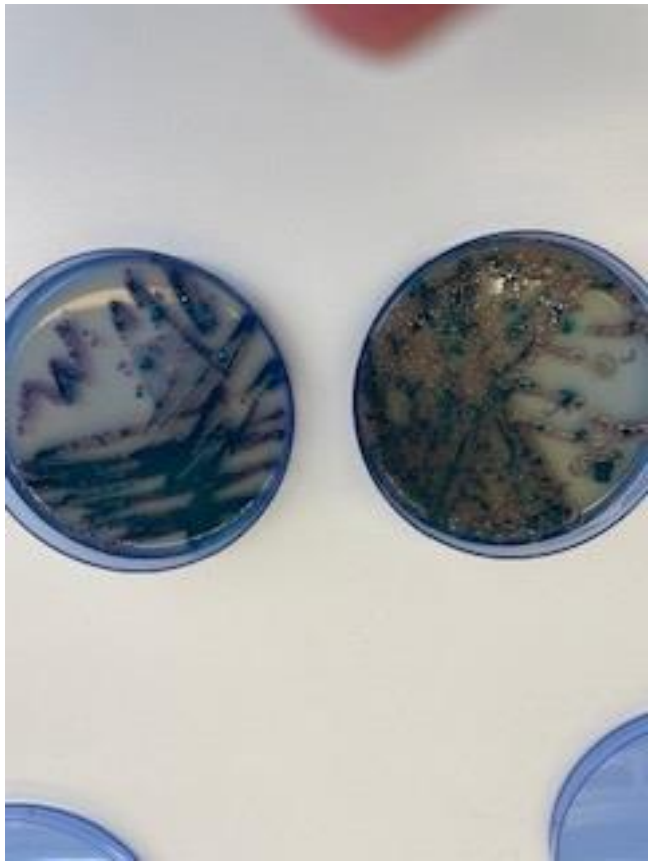
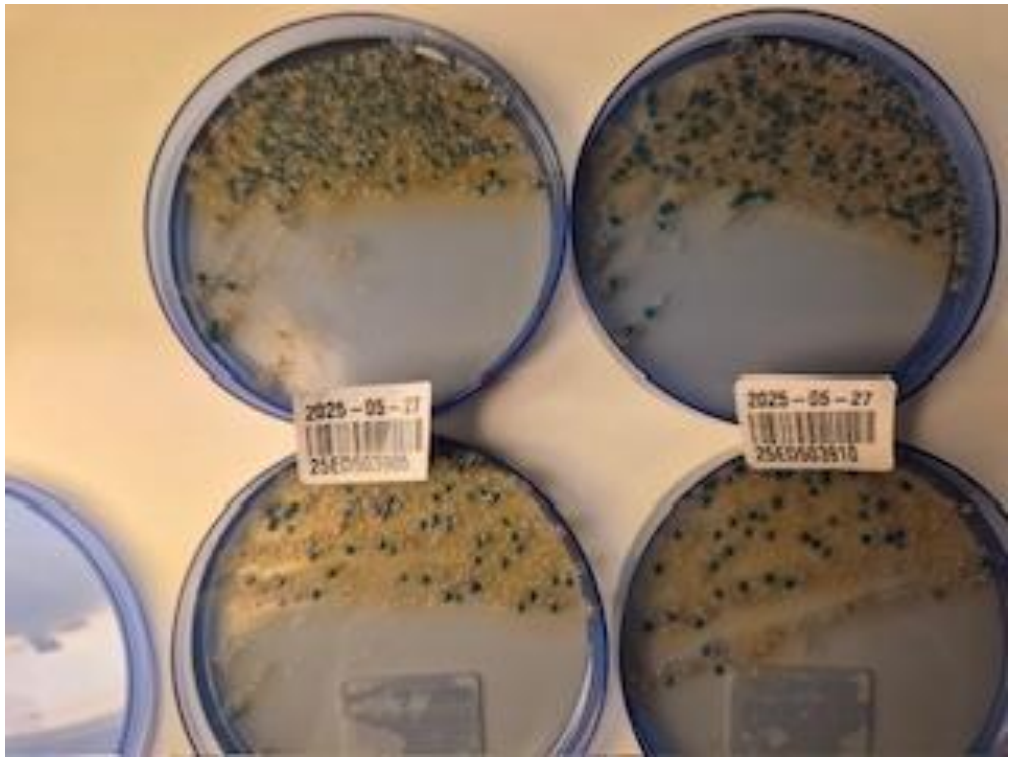
Experience from Karolinska UH

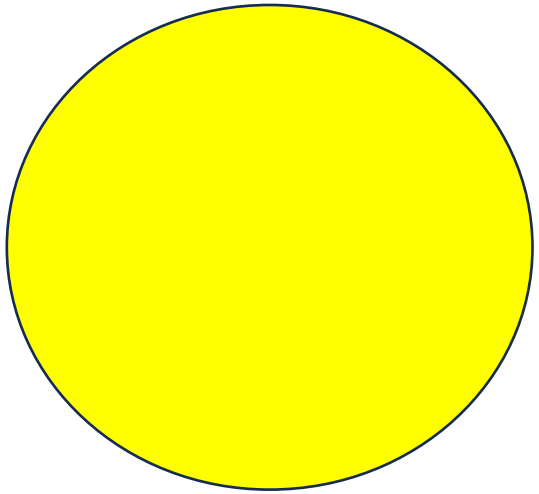
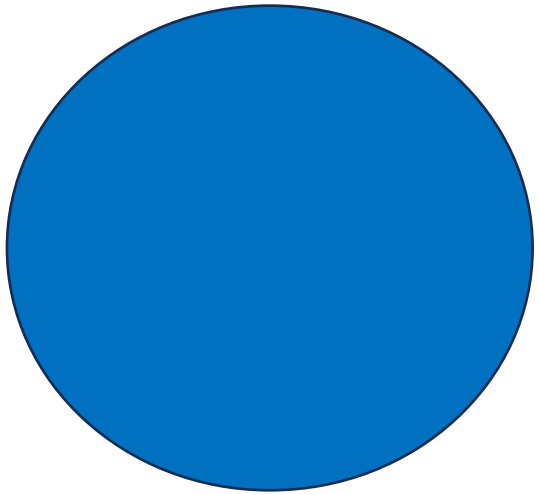
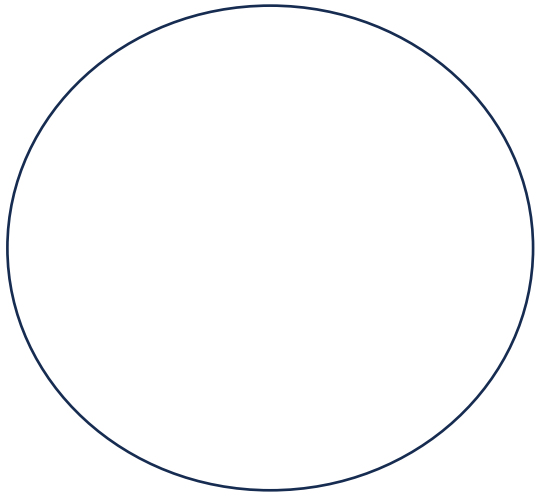
- More complex CPE/CPO screening situation after the pandemic





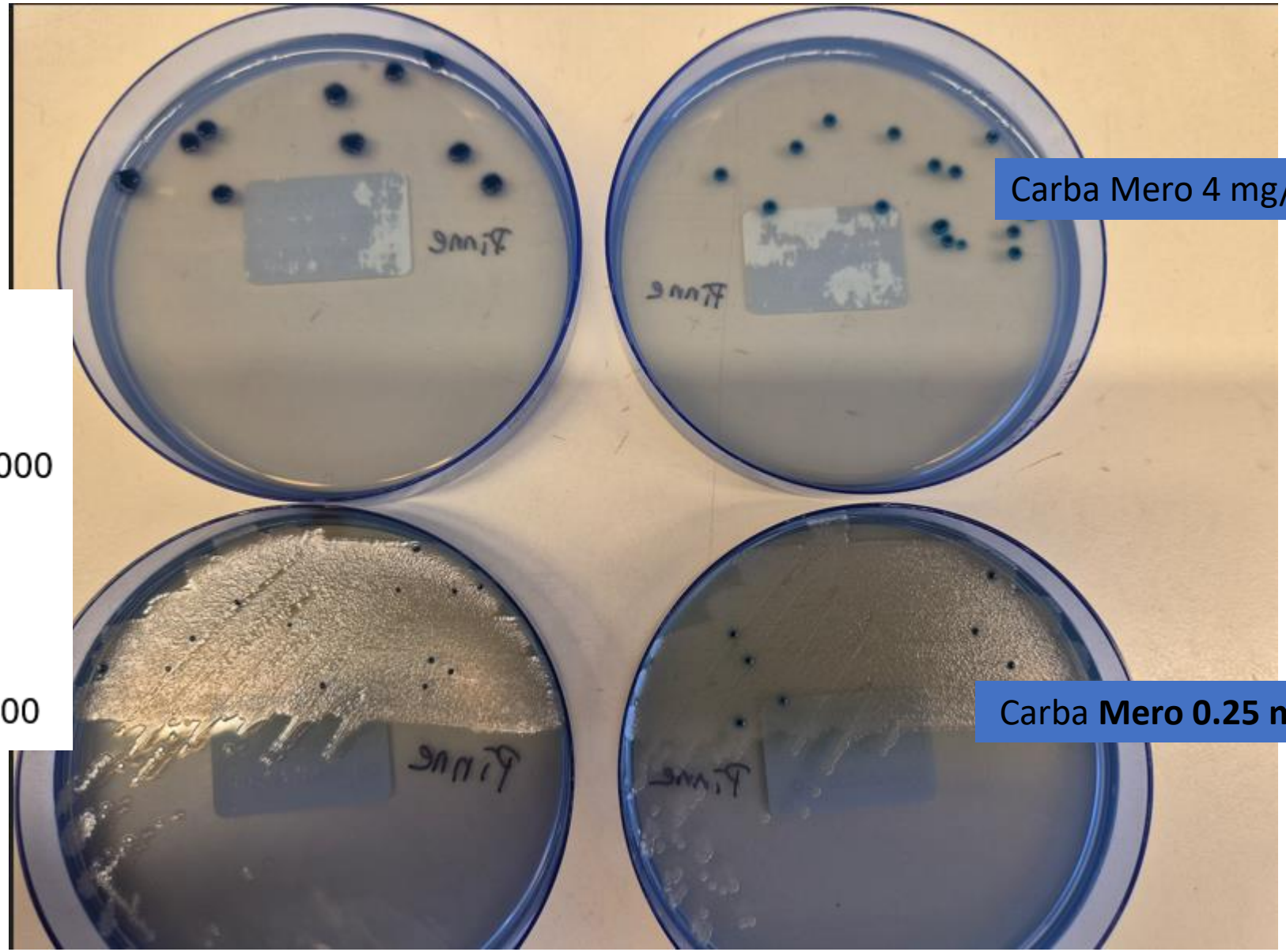
CPO: Carbapenemase producing organism (Pa, Ab)

Screening agars used in Karolinska UH

ESBL-agar (cefpodoxime)	Existing CARBA-agar (meropenem 0.25 mg/L)	New CARBA agar (meropenem 4 mg/L)
		
Only Enterobacterales (EBA) subjected to AST and further investigations	**Only EBA subjected to AST and further investigations** High sensitivity to find OXA-48	**EBA, *Pseudomonas aeruginosa* och *Acinetobacter* spp subjected to AST and further investigations** *High specificity, more selective in patients with multiple isolates.*

MIX 1
Pseudmonas 1:10
E. coli OXA-48 1:1000
K. pneumoniae NDM 1:100000

MIX 2
Pseudmonas 1:10
E. coli OXA-48 1:1000
K. pneumoniae KPC 1:100000



Carba Mero 4 mg/L

Carba **Mero 0.25 mg/L**

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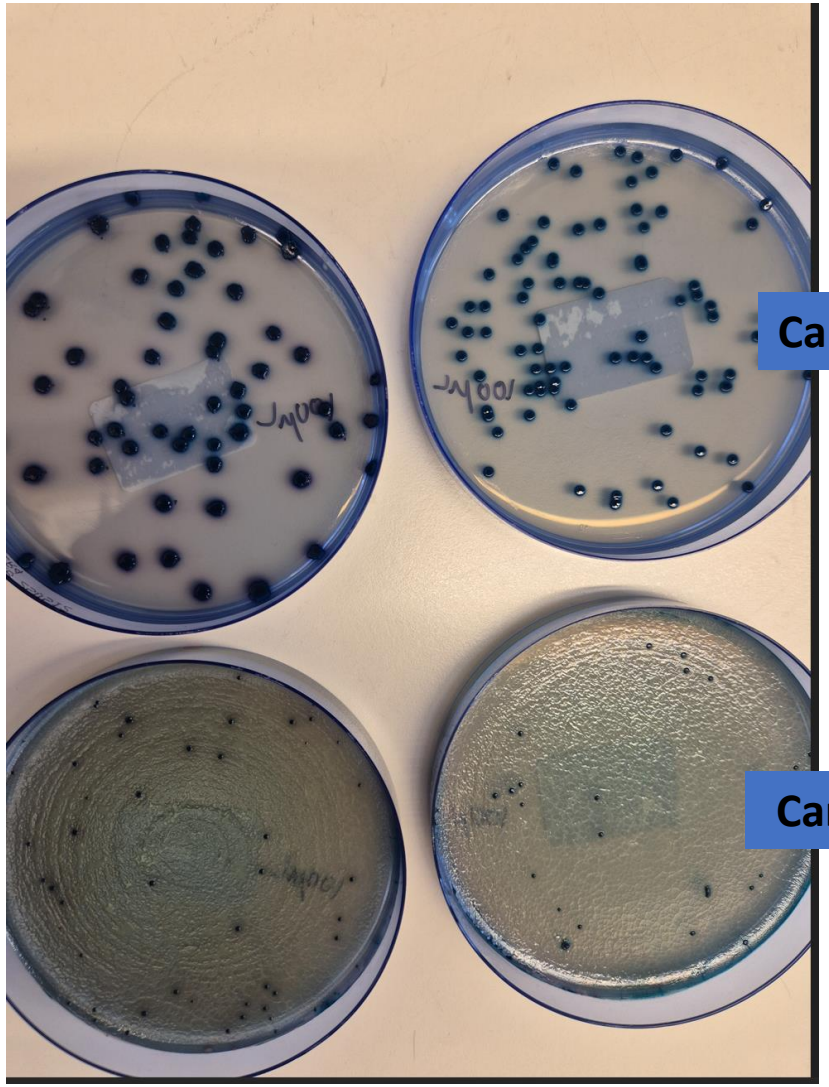

Carba Mero 4 mg/L

Carba Mero 0.25 mg/L

- WT Pseudomonas aeruginosa inhibited on the carba agar with meropenem 4 mg/L.
- The CPE isolates are easier to detect.
- Saves workload and time, no need for subculture

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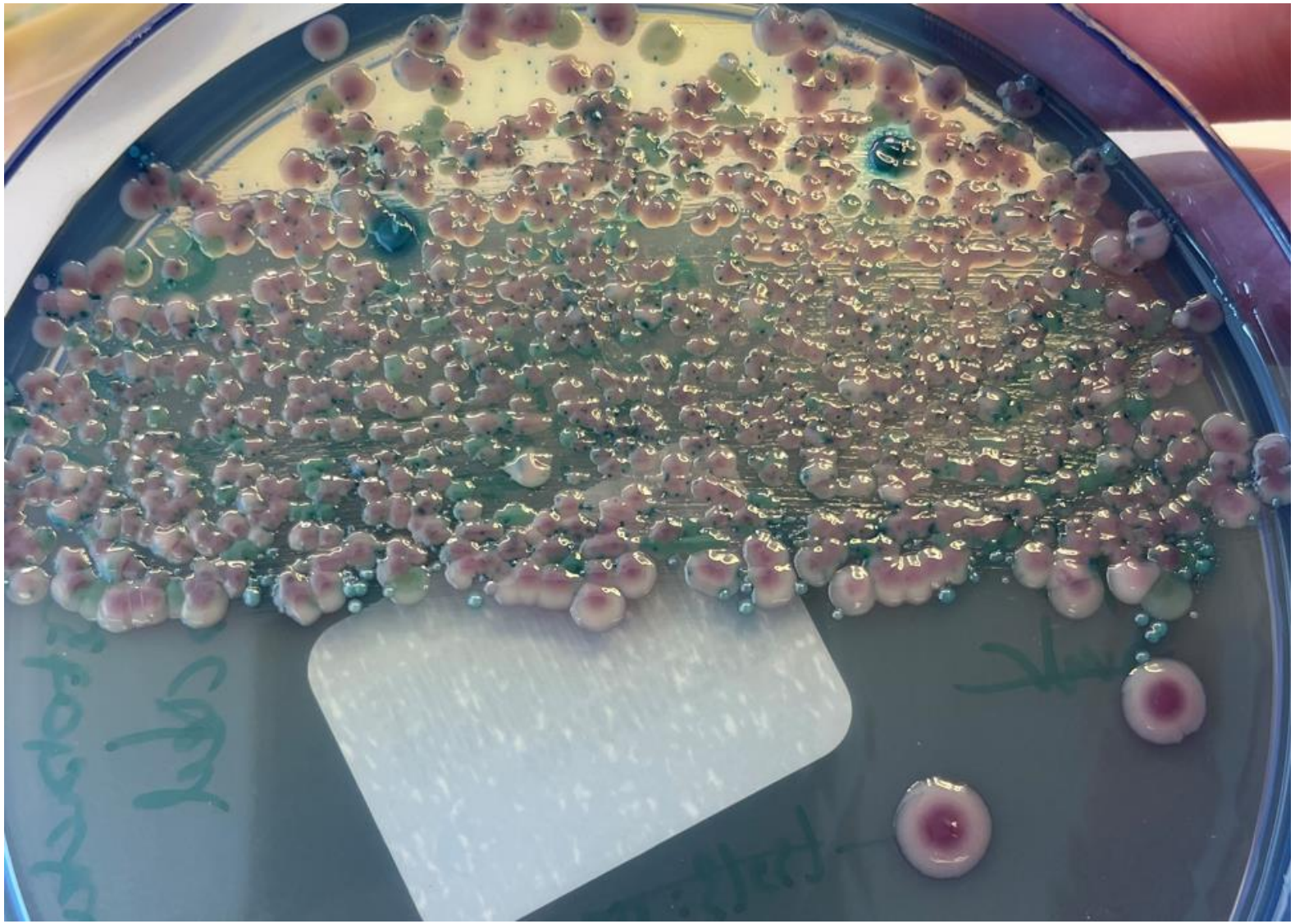
Screening case

- Patient hospitalized in Vietnam for 2 weeks
- ESBL agar with cefpodoxime

26 ED 503769

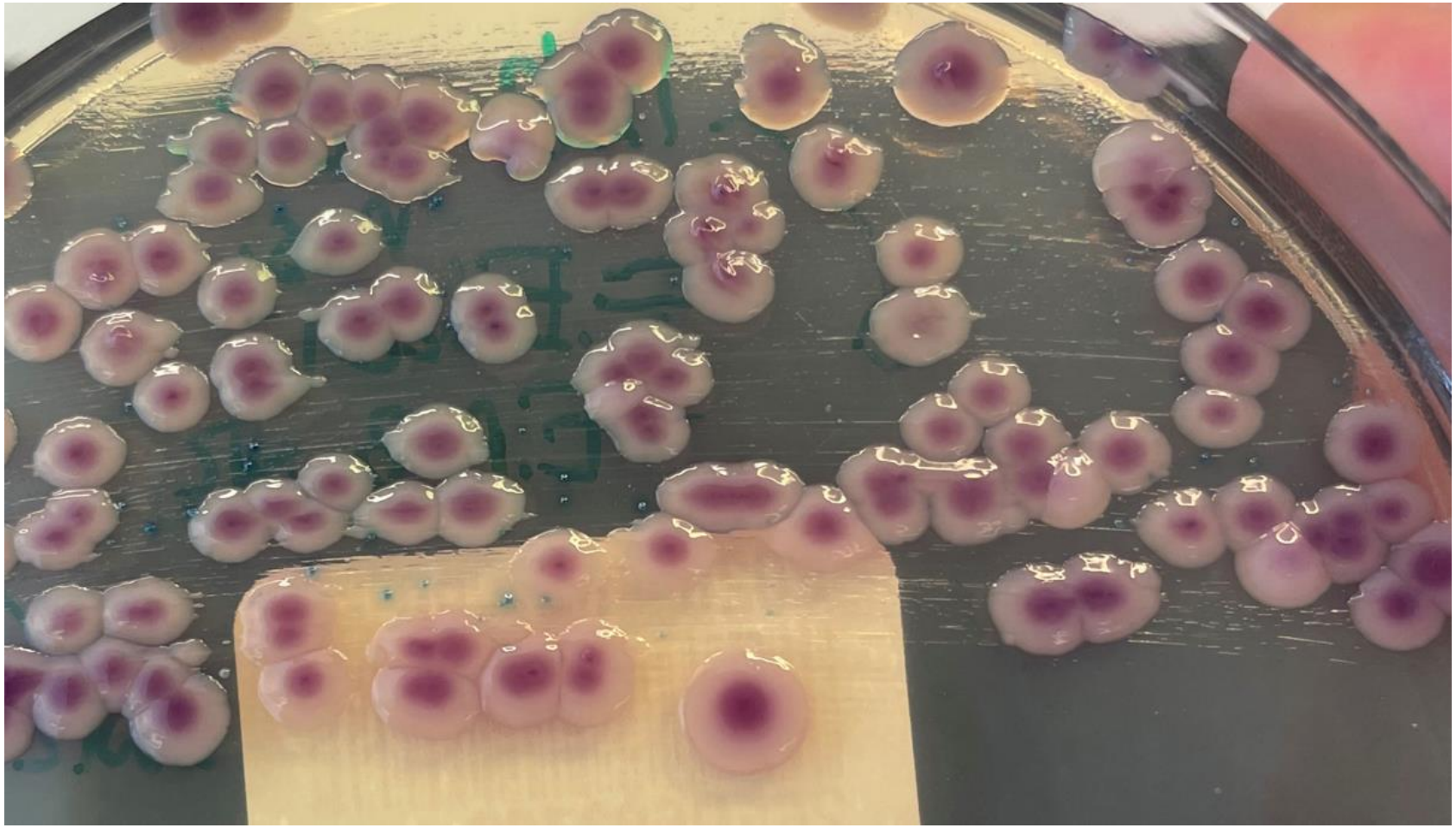
Screening agar

- Carba agar
- 0.25 mg/L MEM



Screening case

- Carba agar 2
- 4 mg/L MEM



Screening case, final results

- E.coli NDM producer
- Citrobacter freundii NDM producer
- K. pneumoniae NDM producer

All 3 only S to AZT-AVI

- E.coli ESBL-A
- K. pneumoniae ESBL-A

- Another 5 isolates of EBA identified and AST performed without beta-lactamase production detected

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Conclusion after 5 months

The introduction of the CARBA Mero4 plate in parallel with the CARBA Mer0.25 plate:

- Increased specificity with preserved sensitivity
- Faster and more effective work-saving screening for *P. aeruginosa* (Pa) and *A.baumannii/species* (Ab) with carbapenemases since WT isolate do not grow on the CARBA 4 agar
- Well equipped for a war/crisis situation with a fast and effective screening for healthcare/military. In such situations, fast CPO/CPE screening is required
- Not for every laboratory

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Regarding the NordicAST BLBLI document and its context - which of the following statement(s) is/are correct?
(several answers possible)

- Purpose: guide laboratories in performing AST, interpreting results, and clinical consultation
- The document provides clinical treatment guidelines
- β-lactamase hyperproducing strains pose greater challenges for BLBLI combinations based on clavulanic acid compared to those based on avibactam

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Which statement(s) are true about the carbapenem-breakpoints and reporting revision?
(several answers possible)

- Many breakpoints were removed
- In general, the breakpoints were lowered
- Clinical breakpoints are now the same as ECOFFs
- CPE which test carbapenem S/I should be reported with comment

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What are the most important properties for a CPE/ESBL-CARBA screening agar?
(several answers possible)

- Highest possible specificity
- Simultaneous detection of ESBL-A and ESBL-CARBA
- Highest possible sensitivity
- The concentration should reflect new carbapenem breakpoints
- Temocillin in the agar to always detect OXA-48 group enzymes
- The concentration should reflect carbapenem ECOFF

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