

External Quality Assessment for Screening of Multidrug-resistant Bacteria

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Expert on Labquality MDR-screening rounds

Screening for MDR bacteria: what and how?

- **MRSA**

- Surveillance cultures
- Molecular screening

- **VRE**

- Surveillance cultures
- Molecular screening (*vanA*, PPV low with *vanB*)

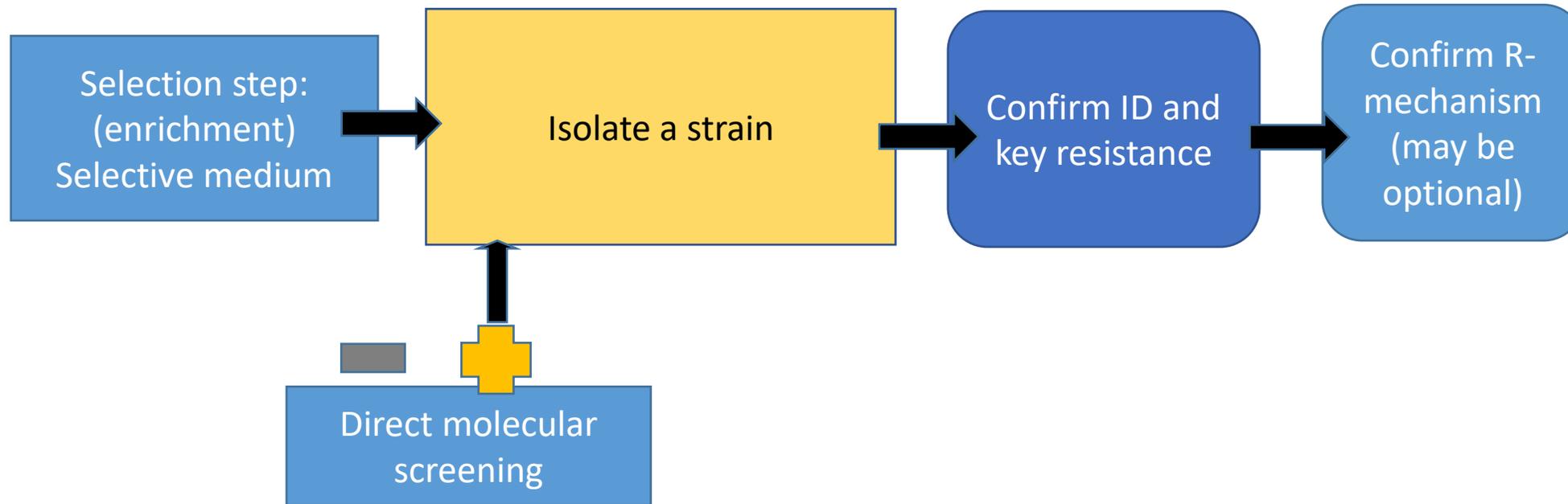
- **MDR-Gramnegative rods**

- Surveillance cultures
 - ESBL-producing Enterobacterales
 - **Carbapenemase-producing Enterobacterales**
 - MDR -*P. aeruginosa*
 - MDR -*Acinetobacter*
- Molecular screening (mostly CPE)

Screening MDR Bacteria

≠AST

*Separate EQA by Labquality since 2014



Which aspects are assessed (1)?

- Selective screening
 - The strains with important resistance mechanisms should be found, even if present in small amounts among many less important bacteria
 - True sample types for screening contain complex microbiota
 - nares, throat, perineum, rectum or faeces, wounds...
 - EQA samples are artificial mixes
- Species identification
 - Often important for significance regarding infection control
 - E.g. *S. aureus* vs. cns, *E. faecalis*/*E. faecium* vs other enterococci
 - Consider also the traditional methods that may be used, e.g. rapid coagulase tests for *S. aureus*

Which aspects are assessed (2)?

- Resistance
 - Especially the important screening agents
 - Cefoxitin
 - Vancomycin (teicoplanin for resistance mechanism)
 - Meropenem
 - Distributions of AST results given for comparison
- Underlying resistance mechanism
 - Confirmation by phenotypic or genotypic methods
 - Educated guess is accepted
- Direct molecular detection
 - Not scored but commented in feedback

Sample plan 2018

distrib	MRSA	VRE	MDR gramnegative rods
	Staph. aureus IH256369 (MRSA, mecC) 1000 cfu/sample	Ent. faecium Tyks63086 (VRE, vanA)	Pseud. aeruginosa THL 1653 (VIM-2), 10 000 cfu/sample
1	<i>Ent. faecalis</i> ATCC© 29212™	<i>Ent. faecalis</i> ATCC® 29212™	<i>E. coli</i> ATCC© 35218™ (TEM-1 pos.)
	<i>Proteus mirabilis</i> ATCC© 12453™	<i>E. coli</i> ATCC® 25922	<i>Proteus mirabilis</i> ATCC© 12453™
	<i>Staph. lugdunensis</i> KSKS-2922	Ent. faecium UKNEQAS 2425 /C110914 (VRE, vanB)	Escherichia coli 2347/THL (ESBL, CPE+, NDM)
2	<i>Staph. aureus</i> ATCC© 29213™	<i>Ent. faecalis</i> ATCC® 29212™	Klebs. pneumoniae ATCC BAA 2343 (KPC)
	<i>Staph. epidermidis</i> ATCC© 14990™	<i>E. coli</i> ATCC® 25922	<i>E. coli</i> ATCC© 35218™ (TEM-1 pos.)
	Staph. aureus Tyks_59107 (spa t172) 10 000 cfu/sample	Ent. faecalis ATCC 51299 (VRE, vanB)	Klebs. variicola 50878013 (OXA-48, LEN-16) 100'000cfu/sample
3	<i>Staph. epidermidis</i> ATCC© 14990™	<i>Ent. faecalis</i> ATCC 29212	<i>Escherichia coli</i> ATCC 35218
	<i>Ent. faecalis</i> ATCC© 29212™	<i>E. coli</i> ATCC 25922	<i>Enterobacter aerogenes</i> C021003
	S. aureus Tyks-27455 (spa t067)	<i>Ent. faecium</i> Tyks-63895 (VRE, vanA)	P. mirabilis 50664164 (NDM)
4	<i>Staph. epidermidis</i> C090609	<i>Ent. faecalis</i> ATCC® 29212™	<i>E. coli</i> ATCC© 25922™
	<i>Staph. intermedius</i> KSKS 2872	<i>E. coli</i> ATCC® 25922	<i>Ent. faecalis</i> ATCC© 51299™

Sample plan 2018

year	distrib	MRSA	VRE	MDR gramnegative rods
2018	1	Staph. aureus IH256369 (MRSA, mecC) 1000 cfu/sample	Ent. faecium Tyks63086 (VRE, vanA)	Pseud. aeruginosa THL 1653 (VIM-2), 10 000 cfu/sample
		Ent. faecalis ATCC© 29212™	Ent. faecalis ATCC® 29212™	E. coli ATCC© 35218™ (TEM-1 pos.)
		Proteus mirabilis ATCC© 12453™	E. coli ATCC® 25922	Proteus mirabilis ATCC© 12453™
	2	Staph. lugdunensis KSKS-2922	Ent. faecium UKNEQAS 2425 /C110914 (VRE, vanB)	E. coli 2347/THL (ESBL, CPE+, NDM)
		Staph. aureus ATCC© 29213™	Ent. faecalis ATCC® 29212™	Klebs. pneumoniae ATCC BAA 2343 (KPC)
		Staph. epidermidis ATCC© 14990™	E. coli ATCC® 25922	E. coli ATCC© 35218™ (TEM-1 pos.)
	3	Staph. aureus Tyks_59107 (spa t172) 10 000 cfu/sample	Ent. faecalis ATCC 51299 (VRE, vanB)	Klebs. variicola 50878013 (OXA-48, LEN-16) 100'000cfu/sample
		Staph. epidermidis ATCC© 14990™	Ent. faecalis ATCC 29212	E. coli ATCC 35218
		Ent. faecalis ATCC© 29212™	E. coli ATCC 25922	Enterobacter aerogenes C021003
	4	S. aureus Tyks-27455 (spa t067)	Ent. faecium Tyks-63895 (VRE, vanA)	P. mirabilis 50664164 (NDM)
		Staph. epidermidis C090609	Ent. faecalis ATCC® 29212™	E. coli ATCC© 25922™
		Staph. intermedius KSKS 2872	E. coli ATCC® 25922	Ent. faecalis ATCC© 51299™

MRSA 1.2018

55 laboratories
from 11 countries

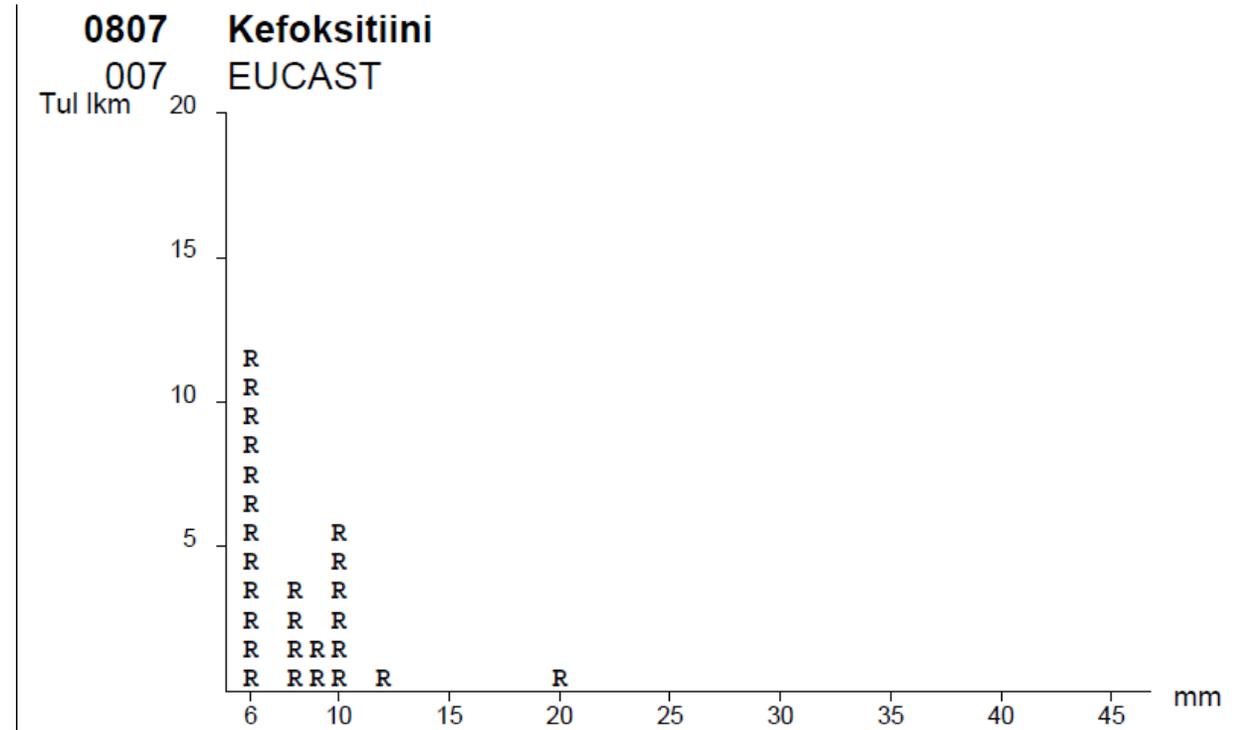


Challenge: a rather small amount of *mecC*-positive MRSA

- 3/55 (5 %) laboratories reported the culture as negative
 - 2 Finnish, despite use of enrichment broth(?)
- 23 (42 %) laboratories were able to confirm the presence of *mecC* (or *mecA/C*) in the strain by a molecular test
 - All Finnish and Swedish who reported as positive for MRSA
- MRSA-agglutination tests yielded variable results

MRSA 1.2018 continued

- Once the strain was isolated, resistance to cefoxitin was easily detected
- 5 laboratories reported a positive direct detection of MRSA (with a test covering also *mecC*), 4 a negative result (with *mecA*-PCR)



VRE 3.2018

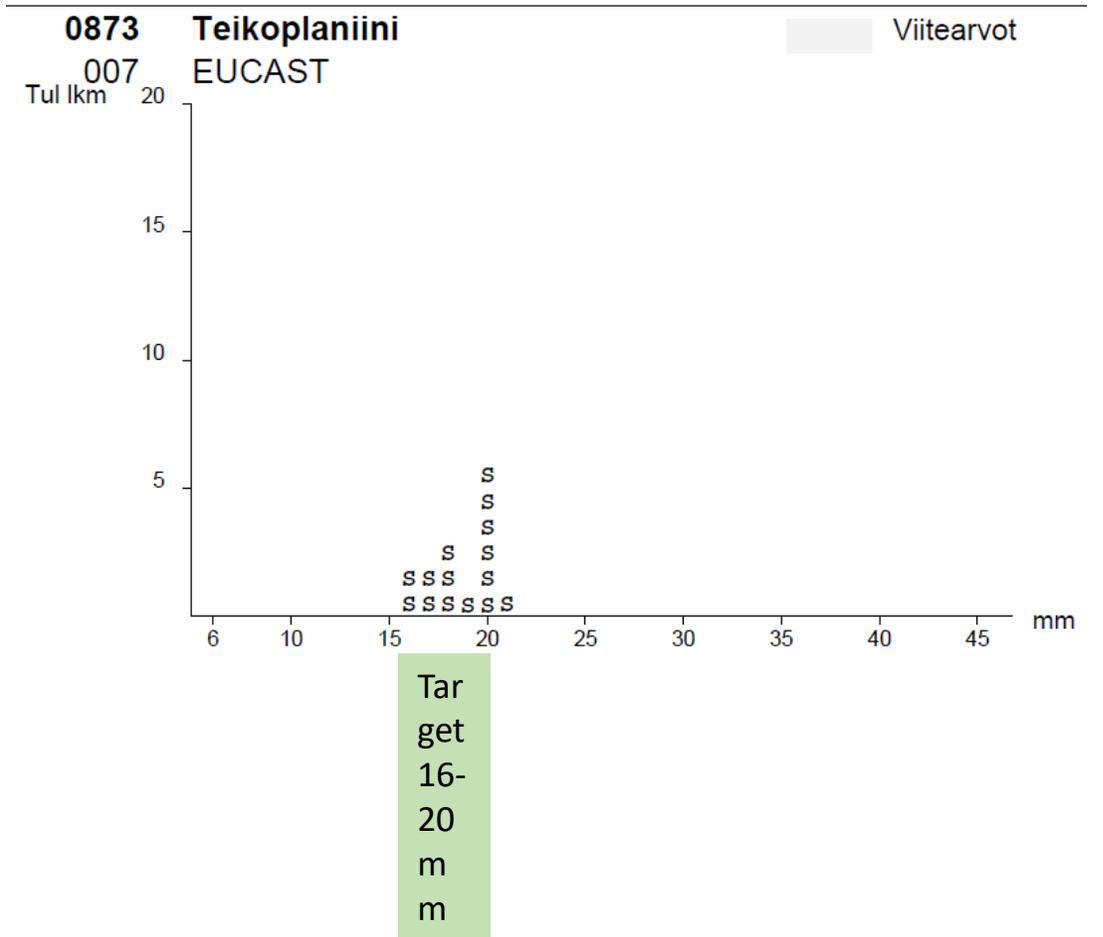
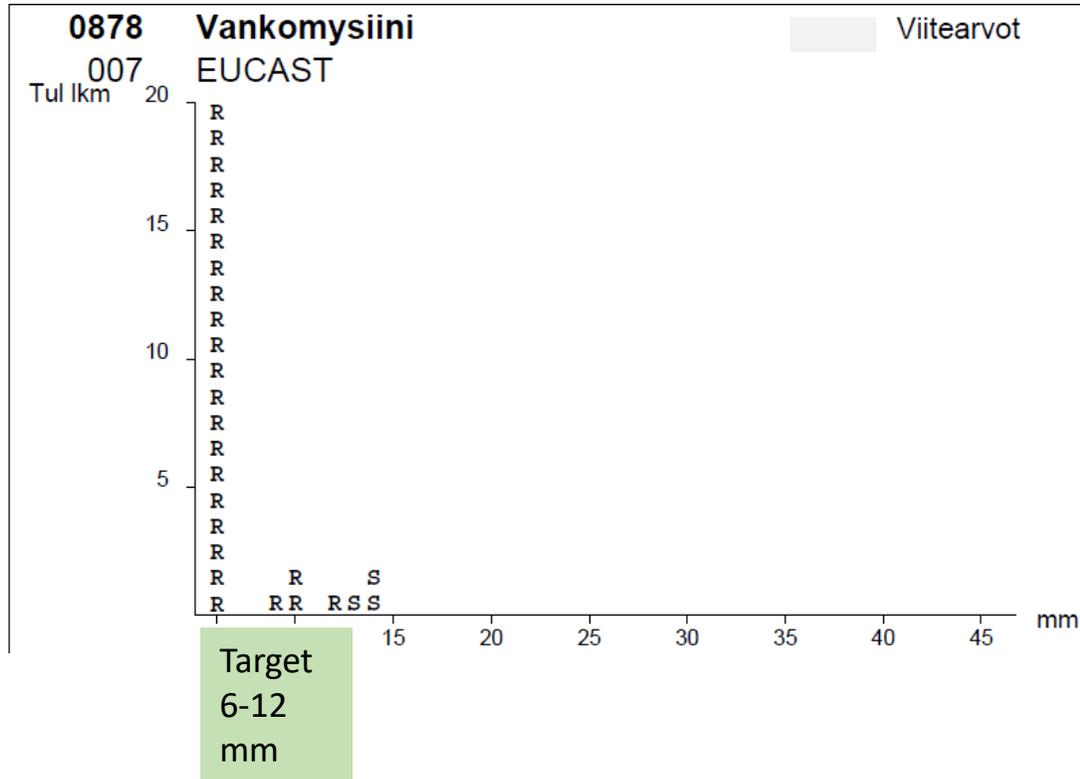
64 labs from
12 countries



Target: *vanB*-positive QC strain recommended by EUCAST, present in high concentration

- Also a susceptible *E. faecalis* and *E. coli* in the sample
- 54/63 (86%) of laboratories reported the screening as positive (including all Nordic labs)
- Of those, 42 (78 %) had confirmed or suspected *vanB*

VRE 3.2018 histograms



Teicoplanin and vancomycin MICs

- Teicoplanin MICs over 5 dilutions, all S
- Vancomycin MICs over the whole scale, variable interpretations
- Target not given for MIC values
- N.B. the EUCAST warning on low MICs with E-test on *vanB*-positive *E. faecalis* and *E. faecium* given in July

A new phenomenon

- Some (non-Nordic) laboratories use culture only as a confirmation method for molecular screening
 - *vanB* detected directly from the sample
 - *E. faecalis* strain isolated and low vanko-MIC with the E-test → screening reported as negative for VRE

Table 1.

The teicoplanin and vancomycin MIC-results reported by the participating laboratories.

Antimicrobial agent	MIC-value (mg/L)	SIR-interpretation	Reported results and followed standard				Reported results in all
			EUCAST	CA-SFM	CLSI	NORDIC AST	
Teicoplanin	0.094	S	2				43
	0.125	S	5				
	0.25	S	3	2	1		
	<0.5	S	4				
	<=0.5	S	11				
	0.5	S		2		1	
	0.75	S	2				
	<1	S	1				
	1	S	3	1		1	
	1.5	S	2				
	2	S	2				
Vancomycin	<0.016	R	1				51
	>0.016	R	1				
	1	S	1				
	2	S	2				
	2	R	1				
	4	R	1	1			
	>8	R	2				
	16	R	1	1			
	32	R	1	1	1		
	>=32	R	10		1		
	>32	R	5				
	48	R		1			
	64	R	2			1	
	96	R	1	1			
	128	R	1				
256	R	6			1		
>256	R	5		1			

MDR-gram negative rods 4.2018

97 labs from
18 countries



Target: *P. mirabilis* (NDM + acquired AmpC CMY-16)

- 90 (95 %) laboratories reported the screening as positive
- 70 (73 %) reported both correct species and (a suspicion) of CPE
 - All but one of the Nordic labs
- 17/28 (61 %) of the Nordic laboratories reported NDM
- AmpC reported by three laboratories

Meropenem MICs

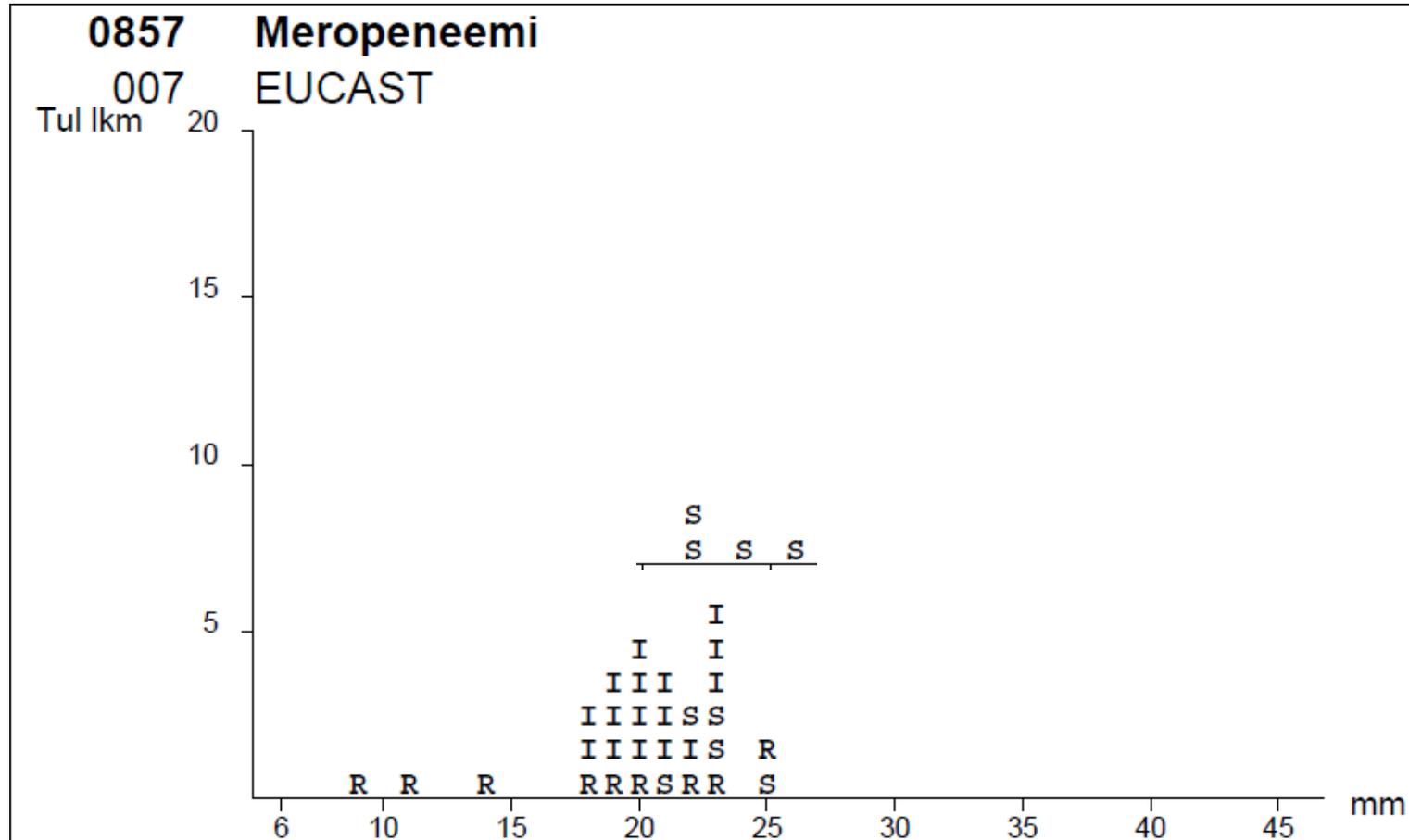
All above the screening cutoff (>0.125)!

Over 8 dilutions

Clinical breakpoints 2/8

Agent	MIC (mg/l)	SIR	CA-FSM	CLSI	EUCAST	Nordic AST	n
S	>0.125	S			1		
	0.25	S			3		
	0.5	S			2		
	0.5	I			3		
	0.5	R			1		
	0.75	S		1			
	1	S			3		
	1	I			1		
	1.5	S			2		
	<=2	S			1		
I	2	S			1		
	3	I			1		
	4	I			4		
	6	I			1		
	8	I			4		
R	8	R		1			
	>8	R			3		
	16	R		1			
	>=16	R		3	18		
	>16	R		1	5		
	24	R			1		
	32	R		1			63

Meropenem disk diffusion



EUCAST Screening cutoff <28 mm

Go to confirmation if mero zone diameter

<25 mm

or 26-27 mm and PIPTAZO R

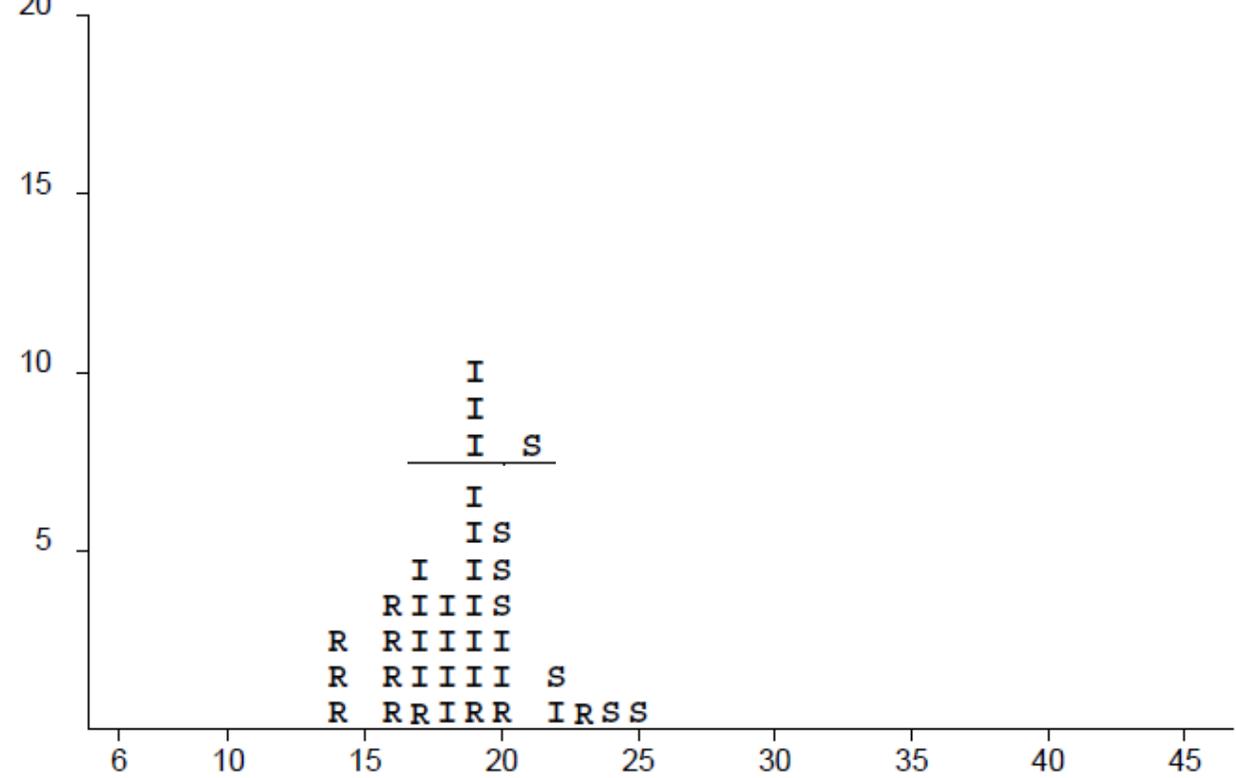
Clinical breakpoints 22/16 mm

The confusion in interpretation seems to come from non-Nordic laboratories

0853 Pipera/Tatsobaktaami

EUCAST

007
Tul lkm 20



Clinical breakpoints 20/17 mm

Conclusions

- In general, the Nordic laboratories have appropriate methods for MDR-screening and the knowhow to use them
- Quantification of the level of resistance?



An invitation for good EQA strains



A good strain collection should

- Help the laboratories detect possible problems in their processes
 - Reagent evaluations may be useful :Some strains may grow weakly on certain media or not produce colourful colonies on all
- Be representative temporarily and geographically
- If you had problems with a certain strain which turned out to be important, you may share it with others
 - Contact: kaisu.rantakokko-jalava@tyks.fi



Tak
Tack
Thank you
pakka pér
Kiitos
Takk