



Introduction to ESBL, AmpC and carbapenemase producing Salmonella

Phenotypic testing and interpretation of test

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FWD AMR.
RefLabCap



MIC DETERMINATION EUVSEC3 AND EUVSEC2 PANELS

❖ EUVSEC3 is generic

EUVSEC3

Color code: Red

Volume/broth: 50 µl per well / CAMHB

	1	2	3	4	5	6	7	8	9	10	11	12
A	AMP 32	AZI 64	AMI 128	GEN 16	TGC 8	TAZ 8	FOT 4	COL 16	NAL 64	TET 32	TMP 16	SMX 512
B	AMP 16	AZI 32	AMI 64	GEN 8	TGC 4	TAZ 4	FOT 2	COL 8	NAL 32	TET 16	TMP 8	SMX 256
C	AMP 8	AZI 16	AMI 32	GEN 4	TGC 2	TAZ 2	FOT 1	COL 4	NAL 16	TET 8	TMP 4	SMX 128
D	AMP 4	AZI 8	AMI 16	GEN 2	TGC 1	TAZ 1	FOT 0.5	COL 2	NAL 8	TET 4	TMP 2	SMX 64
E	AMP 2	AZI 4	AMI 8	GEN 1	TGC 0.5	TAZ 0.5	FOT 0.25	COL 1	NAL 4	TET 2	TMP 1	SMX 32
F	AMP 1	AZI 2	AMI 4	GEN 0.5	TGC 0.25	TAZ 0.25	CHL 8	CHL 16	CHL 32	CHL 64	TMP 0.5	SMX 16
G	MERO 0.03	MERO 0.06	MERO 0.12	MERO 0.25	MERO 0.5	MERO 1	MERO 2	MERO 4	MERO 8	MERO 16	TMP 0.25	SMX 8
H	CIP 0.015	CIP 0.03	CIP 0.06	CIP 0.12	CIP 0.25	CIP 0.5	CIP 1	CIP 2	CIP 4	CIP 8	POS CON	POS CON

Code	Antimicrobial agent (15)	Test range (mg/L)
AMI	AMIKACIN	4-128
AMP	AMPICILLIN	1-32
AZI	AZITHROMYCIN	2-64
FOT	CEFOTAXIME	0.25-4
TAZ	CEFTAZIDIME	0.25-8
CHL	CHLORAMPHENICOL	8-64
CIP	CIPROFLOXACIN	0.015-8
COL	COLISTIN	1-16
GEN	GENTAMICIN	0.5-16
MERO	MEROPENEM	0.03-16
NAL	NALIDIXIC ACID	4-64
SMX	SULFAMETHOXAZOLE	8-512
TET	TETRACYCLINE	2-32
TGC	TIGECYCLINE	0.25-8
TMP	TRIMETHOPRIM	0.25-16

MIC DETERMINATION EUVSEC3 AND EUVSEC2 PANELS

❖ EUVSEC2 is beta-lactams

EUVSEC2

Color code: Orange
Bacteria: ESBL suspect Gram-negative bacteria
Volume/broth: 50 µl per well / CAMHB

	1	2	3	4	5	6	7	8	9	10	11	12
A	FOX 0.5	FOX 1	FOX 2	FOX 4	FOX 8	FOX 16	FOX 32	FOX 64	FOT 0.25	FOT 0.5	FOT 1	TRM 128
B	ETP 0.015	ETP 0.03	ETP 0.06	ETP 0.12	ETP 0.25	ETP 0.5	ETP 1	ETP 2	FOT 2	FOT 4	FOT 8	TRM 64
C	IMI 0.12	IMI 0.25	IMI 0.5	IMI 1	IMI 2	IMI 4	IMI 8	IMI 16	FOT 16	FOT 32	FOT 64	TRM 32
D	MERO 0.03	MERO 0.06	MERO 0.12	MERO 0.25	MERO 0.5	MERO 1	MERO 2	MERO 4	MERO 8	MERO 16	TRM 2	TRM 16
E	TAZ 0.25	TAZ 0.5	TAZ 1	TAZ 2	TAZ 4	TAZ 8	TAZ 16	TAZ 32	TAZ 64	TAZ 128	TRM 1	TRM 8
F	FEP 0.06	FEP 0.12	FEP 0.25	FEP 0.5	FEP 1	FEP 2	FEP 4	FEP 8	FEP 16	FEP 32	TRM 0.5	TRM 4
G	F/C 0.06/4	F/C 0.12/4	F/C 0.25/4	F/C 0.5/4	F/C 1/4	F/C 2/4	F/C 4/4	F/C 8/4	F/C 16/4	F/C 32/4	F/C 64/4	POS KON
H	T/C 0.12/4	T/C 0.25/4	T/C 0.5/4	T/C 1/4	T/C 2/4	T/C 4/4	T/C 8/4	T/C 16/4	T/C 32/4	T/C 64/4	T/C 128/4	POS KON

Code	Antimicrobial agent (10)	Test range (mg/L)
ETP	ERTAPENEM	0.015-2
FEP	CEFEPIME (4 th gen.)	0.06 - 32
FOT	CEFOTAXIME (3 rd gen.)	0.25 - 64
F/C	CEFOTAXIME/CLAVULANIC ACID	0.06/4 - 64/4
FOX	CEFOXITIN (2 nd gen. and cephamycin)	0.5 - 64
IMI	IMIPENEM (carbapenem)	0.12 - 16
MERO	MEROPENEM (carbapenem)	0.03 - 16
TAZ	CEFTAZIDIME (3 rd gen.)	0.25 - 128
T/C	CEFTAZIDIME/CLAVULANIC ACID	0.12/4 - 128/4
TRM	TEMOCILLIN	0.5-128

INTERPRETATION FOR SALMONELLA

EUVSEC3 for Salmonella

Color code: Red

Volume/broth: 50 µl per well / CAMHB

	1	2	3	4	5	6	7	8	9	10	11	12
A	AMP 32	AZI 64	AMI 128	GEN 16	TGC 8	TAZ 8	FOT 4	COL 16	NAL 64	TET 32	TMP 16	SMX 512
B	AMP 16	AZI 32	AMI 64	GEN 8	TGC 4	TAZ 4	FOT 2	COL 8	NAL 32	TET 16	TMP 8	SMX 256
C	AMP 8	AZI 16	AMI 32	GEN 4	TGC 2	TAZ 2	FOT 1	COL 4	NAL 16	TET 8	TMP 4	SMX 128
D	AMP 4	AZI 8	AMI 16	GEN 2	TGC 1	TAZ 1	FOT 0.5	COL 2	NAL 8	TET 4	TMP 2	SMX 64
E	AMP 2	AZI 4	AMI 8	GEN 1	TGC 0.5	TAZ 0.5	FOT 0.25	COL 1	NAL 4	TET 2	TMP 1	SMX 32
F	AMP 1	AZI 2	AMI 4	GEN 0.5	TGC 0.25	TAZ 0.25	CHL 8	CHL 16	CHL 32	CHL 64	TMP 0.5	SMX 16
G	MERO 0.03	MERO 0.06	MERO 0.12	MERO 0.25	MERO 0.5	MERO 1	MERO 2	MERO 4	MERO 8	MERO 16	TMP 0.25	SMX 8
H	CIP 0.015	CIP 0.03	CIP 0.06	CIP 0.12	CIP 0.25	CIP 0.5	CIP 1	CIP 2	CIP 4	CIP 8	POS CON	POS CON

Grey range: Resistant according to the EUCAST ECOFFs at www.eucast.org per 06.01.22.

Red range: No EUCAST ECOFF available. EU surveillance ECOFF applied.

EUVSEC2 for Salmonella

Color code: Orange

Bacteria: ESBL suspect Gram-negative bacteria

Volume/broth: 50 µl per well / CAMHB



	1	2	3	4	5	6	7	8	9	10	11	12
A	FOX 0.5	FOX 1	FOX 2	FOX 4	FOX 8	FOX 16	FOX 32	FOX 64	FOT 0.25	FOT 0.5	FOT 1	TRM 128
B	ETP 0.015	ETP 0.03	ETP 0.06	ETP 0.12	ETP 0.25	ETP 0.5	ETP 1	ETP 2	FOT 2	FOT 4	FOT 8	TRM 64
C	IMI 0.12	IMI 0.25	IMI 0.5	IMI 1	IMI 2	IMI 4	IMI 8	IMI 16	FOT 16	FOT 32	FOT 64	TRM 32
D	MERO 0.03	MERO 0.06	MERO 0.12	MERO 0.25	MERO 0.5	MERO 1	MERO 2	MERO 4	MERO 8	MERO 16	TRM 2	TRM 16
E	TAZ 0.25	TAZ 0.5	TAZ 1	TAZ 2	TAZ 4	TAZ 8	TAZ 16	TAZ 32	TAZ 64	TAZ 128	TRM 1	TRM 8
F	FEP 0.06	FEP 0.12	FEP 0.25	FEP 0.5	FEP 1	FEP 2	FEP 4	FEP 8	FEP 16	FEP 32	TRM 0.5	TRM 4
G	F/C 0.06/4	F/C 0.12/4	F/C 0.25/4	F/C 0.5/4	F/C 1/4	F/C 2/4	F/C 4/4	F/C 8/4	F/C 16/4	F/C 32/4	F/C 64/4	POS KON
H	T/C 0.12/4	T/C 0.25/4	T/C 0.5/4	T/C 1/4	T/C 2/4	T/C 4/4	T/C 8/4	T/C 16/4	T/C 32/4	T/C 64/4	T/C 128/4	POS KON

Grey range: Resistant according to the EUCAST ECOFFs at www.eucast.org per 06.01.22.

Red range: No EUCAST ECOFF available. EU surveillance ECOFF applied.

Yellow range: No EUCAST ECOFF available. EURL-AR ECOFF applied.

ESBL, AmpC , carba or neither?

	1	2	3	4	5	6	7	8	9	10	11	12
A	FOX 0.5	FOX 1	FOX 2	FOX 4	FOX 8	FOX 16	FOX 32	FOX 64	FOT 0.25	FOT 0.5	FOT 1	TRM 128
B	ETP 0.015	ETP 0.03	ETP 0.06	ETP 0.12	ETP 0.25	ETP 0.5	ETP 1	ETP 2	FOT 2	FOT 4	FOT 8	TRM 64
C	IMI 0.12	IMI 0.25	IMI 0.5	IMI 1	IMI 2	IMI 4	IMI 8	IMI 16	FOT 16	FOT 32	FOT 64	TRM 32
D	MERO 0.03	MERO 0.06	MERO 0.12	MERO 0.25	MERO 0.5	MERO 1	MERO 2	MERO 4	MERO 8	MERO 16	TRM 2	TRM 16
E	TAZ 0.25	TAZ 0.5	TAZ 1	TAZ 2	TAZ 4	TAZ 8	TAZ 16	TAZ 32	TAZ 64	TAZ 128	TRM 1	TRM 8
F	FEP 0.06	FEP 0.12	FEP 0.25	FEP 0.5	FEP 1	FEP 2	FEP 4	FEP 8	FEP 16	FEP 32	TRM 0.5	TRM 4
G	F/C 0.06/4	F/C 0.12/4	F/C 0.25/4	F/C 0.5/4	F/C 1/4	F/C 2/4	F/C 4/4	F/C 8/4	F/C 16/4	F/C 32/4	F/C 64/4	POS KON
H	T/C 0.12/4	T/C 0.25/4	T/C 0.5/4	T/C 1/4	T/C 2/4	T/C 4/4	T/C 8/4	T/C 16/4	T/C 32/4	T/C 64/4	T/C 128/4	POS KON

	1	2	3	4	5	6	7	8	9	10	11	12
A	FOX 0.5	FOX 1	FOX 2	FOX 4	FOX 8	FOX 16	FOX 32	FOX 64	FOT 0.25	FOT 0.5	FOT 1	TRM 128
B	ETP 0.015	ETP 0.03	ETP 0.06	ETP 0.12	ETP 0.25	ETP 0.5	ETP 1	ETP 2	FOT 2	FOT 4	FOT 8	TRM 64
C	IMI 0.12	IMI 0.25	IMI 0.5	IMI 1	IMI 2	IMI 4	IMI 8	IMI 16	FOT 16	FOT 32	FOT 64	TRM 32
D	MERO 0.03	MERO 0.06	MERO 0.12	MERO 0.25	MERO 0.5	MERO 1	MERO 2	MERO 4	MERO 8	MERO 16	TRM 2	TRM 16
E	TAZ 0.25	TAZ 0.5	TAZ 1	TAZ 2	TAZ 4	TAZ 8	TAZ 16	TAZ 32	TAZ 64	TAZ 128	TRM 1	TRM 8
F	FEP 0.06	FEP 0.12	FEP 0.25	FEP 0.5	FEP 1	FEP 2	FEP 4	FEP 8	FEP 16	FEP 32	TRM 0.5	TRM 4
G	F/C 0.06/4	F/C 0.12/4	F/C 0.25/4	F/C 0.5/4	F/C 1/4	F/C 2/4	F/C 4/4	F/C 8/4	F/C 16/4	F/C 32/4	F/C 64/4	POS KON
H	T/C 0.12/4	T/C 0.25/4	T/C 0.5/4	T/C 1/4	T/C 2/4	T/C 4/4	T/C 8/4	T/C 16/4	T/C 32/4	T/C 64/4	T/C 128/4	POS KON

	1	2	3	4	5	6	7	8	9	10	11	12
	FOX 0.5	FOX 1	FOX 2	FOX 4	FOX 8	FOX 16	FOX 32	FOX 64	FOT 0.25	FOT 0.5	FOT 1	TRM 128
	ETP 0.015	ETP 0.03	ETP 0.06	ETP 0.12	ETP 0.25	ETP 0.5	ETP 1	ETP 2	FOT 2	FOT 4	FOT 8	TRM 64
	IMI 0.12	IMI 0.25	IMI 0.5	IMI 1	IMI 2	IMI 4	IMI 8	IMI 16	FOT 16	FOT 32	FOT 64	TRM 32
D	MERO 0.03	MERO 0.06	MERO 0.12	MERO 0.25	MERO 0.5	MERO 1	MERO 2	MERO 4	MERO 8	MERO 16	TRM 2	TRM 16
E	TAZ 0.25	TAZ 0.5	TAZ 1	TAZ 2	TAZ 4	TAZ 8	TAZ 16	TAZ 32	TAZ 64	TAZ 128	TRM 1	TRM 8
F	FEP 0.06	FEP 0.12	FEP 0.25	FEP 0.5	FEP 1	FEP 2	FEP 4	FEP 8	FEP 16	FEP 32	TRM 0.5	TRM 4
G	F/C 0.06/4	F/C 0.12/4	F/C 0.25/4	F/C 0.5/4	F/C 1/4	F/C 2/4	F/C 4/4	F/C 8/4	F/C 16/4	F/C 32/4	F/C 64/4	POS KON
H	T/C 0.12/4	T/C 0.25/4	T/C 0.5/4	T/C 1/4	T/C 2/4	T/C 4/4	T/C 8/4	T/C 16/4	T/C 32/4	T/C 64/4	T/C 128/4	POS KON

DISK DIFFUSION

Antimicrobial		Strain																																						
Disk diffusion results for the <i>Salmonella</i> strains tested / mm																																								
	Strain	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40				
Cefotaxime	S21.0003												1			3	4	6	1				1		2															
	S21.0004																				1	1	4	5	1	1	2		1	2										
	S21.0005	18																																						
	S21.0006	17			1																																			
	S21.0007	2				1		4	1	4	2	2		1					1																					
	S21.0008																				1	3	1	4	4	4				1										
Meropenem	ATCC 25922																						1	1		3	3	4	2	1							1			
	S21.0001																									3	2	4	5	1	3									
	S21.0002	1					1	2	1	3		2	3		3		1		1																					
	S21.0003																	1		1				1	1	1	4	4	2	3			1							
	S21.0004																									1	2	3	5	4	2					1				
	S21.0005																							1	1	3	6	1	1	3	2									
	S21.0006																								1	2	3	4	1	4	1	2								
	S21.0007																										1	2	7	6	2									
	S21.0008																											2	4	5	3	4								

❖ http://www.liofilchem.net/login.area.mic/technical_sheets/MTS27.pdf

© Liofilchem® - MIC Test Strip Technical Sheet MBL - MTS27 - Rev.3.1 / 13.04.2016



MIC Test Strip Technical Sheet **MBL**

Imipenem/Imipenem+EDTA (IMI/IMD) and Meropenem/Meropenem+EDTA (MRP/MRD)
For *in vitro* detection of Metallo Beta-Lactamases.

INTENDED USE

MIC Test Strip MBL strips consisting of Imipenem (IMI)/Imipenem+EDTA (IMD) or Meropenem (MRP)/Meropenem+EDTA (MRD) are designed to detect Metallo Beta-Lactamases (MBL).
Positive phenotypes should be sent to a reference laboratory for confirmation with genotypic methods.

COMPOSITION

MIC Test Strip MBL strips are made of special featured paper carrier.

In the Imipenem/Imipenem+EDTA strips IMI code indicates the imipenem (4-256 µg/mL or 0.125-8 µg/mL) gradient and IMD code indicates the imipenem (1-64 µg/mL or 0.032-2 µg/mL) plus a constant level of EDTA.

In the Meropenem/Meropenem+EDTA strips MRP code indicates the meropenem (0.125-8 µg/mL) gradient and MRD code indicates the meropenem (0.032-2 µg/mL) plus a constant level of EDTA.

PRINCIPLE

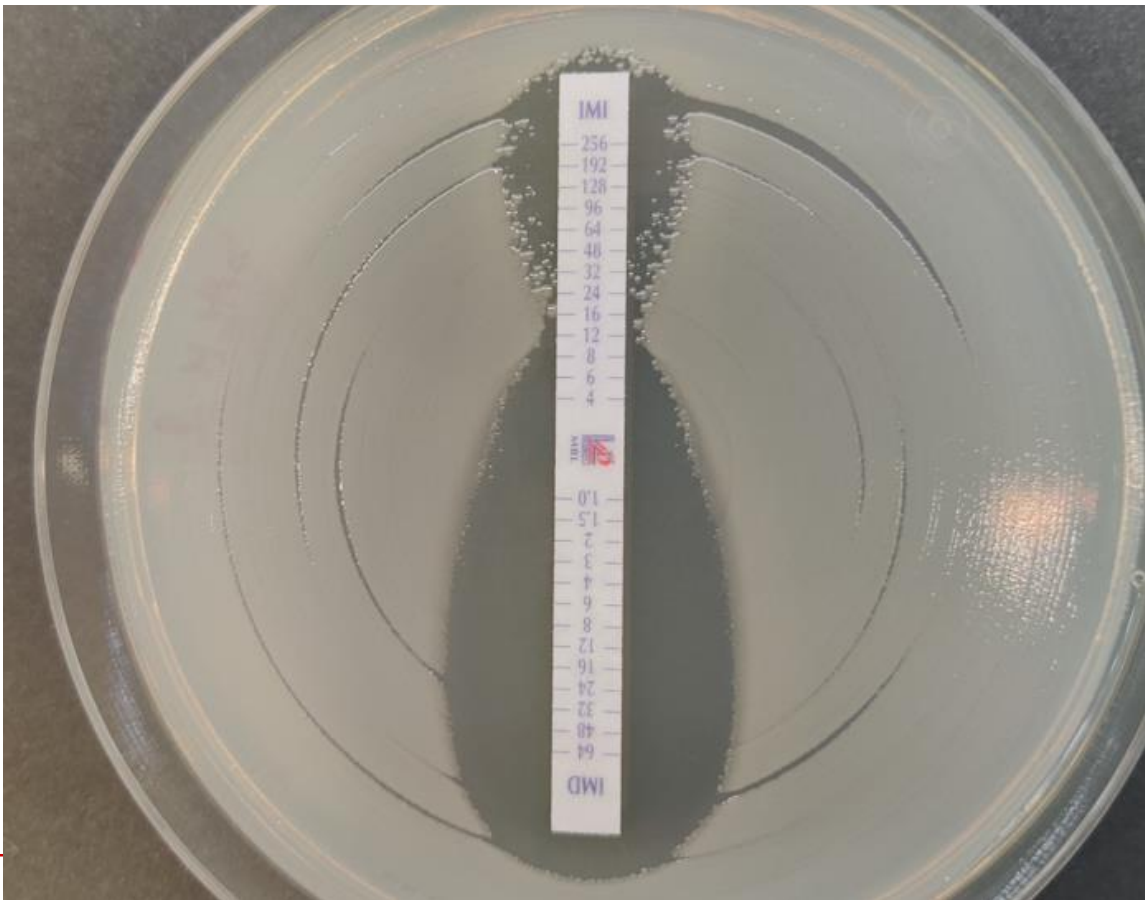
The test is set up using a standard MIC Test Strip procedure. The presence of MBL is indicated by a reduction of the IMI or MRP value by ≥ 3 log₂ dilutions in the presence of EDTA or the appearance of a phantom zone or deformation of the IMI or MRP ellipse.

Interpretation

Ratio of IMI/IMD or MRP/MRD of ≥ 8 or $\geq 3 \log_2$ dilutions indicates MBL production. Phantom zone or deformation of the ellipse is also positive for MBL regardless of the IMI/IMD or MRP/MRD ratio. Send all MBL positive strains to a reference laboratory for confirmation with genotypic testing.

Examples of how to interpret results and ratios for IMI/IMD and MRP/MRD:

IMI/IMD	$128/12 = 10.7$	= MBL +	MRP/MRD	$4/0.25 = 16$	= MBL +
IMI/IMD	$>256/<1 = >256$	= MBL +	MRP/MRD	$>8/0.032 = >250$	= MBL +
IMI/IMD	$64/<1 = >64$	= MBL +	MRP/MRD	$2/0.032 = 62.5$	= MBL +
IMI/IMD	$64/>64 = <1$	= MBL -	MRP/MRD	$<0.025/<0.032 = 0.78$	= MBL -
IMD	$>256/>64$ or $<4/<1$	= Non Determinable	MRP/MRD	$>8/>2 = 4$	= Non Determinable



IMI: 64
 IMD: < 1
 Ratio: >64
 = MBL +



INTERPRETATION?

