

## Extended quality control as recommended by EUCAST<sup>1</sup>

Version 1.0, valid from 2013-01-01

<i>Escherichia coli</i>	ATCC 35218 <sup>2</sup>
<i>Klebsiella pneumoniae</i>	ATCC 700603 <sup>3</sup>
<i>Staphylococcus aureus</i>	NCTC 12493 <sup>3</sup>
<i>Enterococcus faecalis</i>	ATCC 51299 <sup>3</sup>
<i>Haemophilus influenzae</i>	ATCC 49247 <sup>3</sup>

### Notes

1. EUCAST quality control strains for extended QC are complementary to the EUCAST routine quality control strains.
2. *E. coli* ATCC 35218 (TEM-1  $\beta$ -lactamase-producing strain) is recommended specifically to control the inhibitor component of inhibitor-combination disks. This QC test should be performed with each new batch of disks. The active component is controlled by routine QC as recommended in the EUCAST Routine QC Tables.
3. Strains recommended for detection of specific resistance mechanisms (ESBL, MRSA, VRE & HLGR, PBP mutations) are used to validate that the routine susceptibility testing methods will result in the correct S, I and R categorisation. This validation should be performed with every change in the susceptibility testing system (with each new batch of disks or medium) and/or monthly.

## Quality control strains for testing of the activity of inhibitor-combination disks on MH agar

Mueller-Hinton agar, McFarland 0.5, air, 35±1°C, 18±2h. Read zone edges as the point showing no growth viewed from the back of the plate against a dark background illuminated with reflected light.

### *Escherichia coli* ATCC 35218

(NCTC 11954, CIP 102181, DSM 5923, CCUG 30600, CECT 943)

TEM-1 β-lactamase-producing strain (non-ESBL)

Antimicrobial agent	Disk content (µg)	Target <sup>1</sup> (mm)	Range <sup>2</sup> (mm)	Comments
Amoxicillin	10	<b>6</b>	-	
Amoxicillin-clavulanic acid	20-10	20	17-22	Ignore growth that may appear as a thin inner zone on some batches of Mueller-Hinton agar.
Ampicillin	10	6	-	
Ampicillin-sulbactam	10-10	16	13-19	Ignore growth that may appear as a thin inner zone on some batches of Mueller-Hinton agar.
Piperacillin	30	<b>12</b>	<b>9-15</b>	
Piperacillin-tazobactam	30-6	<b>24</b>	<b>21-27</b>	

<sup>1</sup> Calculated by EUCAST.

<sup>2</sup> From Clinical and Laboratory Standards Institute, M100-S22: 32:3, 2012, except ranges in bold/italics established by EUCAST. All ranges have been validated by EUCAST.

## Quality control strains for detection of resistance mechanisms on MH agar

Mueller-Hinton agar, McFarland 0.5, air, 35±1°C, 18±2h. Read zone edges as the point showing no growth viewed from the back of the plate against a dark background illuminated with reflected light.

### *Klebsiella pneumoniae* ATCC 700603

(NCTC 13368, CCUG 45421, CECT 7787)

SHV-18 ESBL producer

Antimicrobial agent	Disk content (µg)	Target susceptibility <sup>1</sup>	Range <sup>2</sup> (mm)	Comments
Aztreonam	30	R	9-17	
Cefotaxime	5	I or R	<b>12-18</b>	
Cefpodoxime	10	R	9-16	
Ceftazidime	10	I or R	<b>6-12</b>	
Ceftriaxone	30	I or R	<b>16-22</b>	

### *Staphylococcus aureus* NCTC 12493

Methicillin resistant (MRSA), *mecA* positive

Antimicrobial agent	Disk content (µg)	Target susceptibility <sup>1</sup>	Range <sup>2</sup> (mm)	Comments
Cefoxitin	30	R	<b>14-20</b>	

### *Enterococcus faecalis* ATCC 51299

(NCTC 13379, CIP 104676, DSM 12956, CCUG 34289)

High-level gentamicin resistant (HLGR)

Vancomycin resistant (VRE), *vanB* positive

Antimicrobial agent	Disk content (µg)	Target susceptibility <sup>1</sup>	Range <sup>2</sup> (mm)	Comments
Gentamicin	30	R	<b>6</b>	
Teicoplanin	30	S	<b>16-20</b>	
Vancomycin	5	R	<b>6-12</b>	Examine zone edge with transmitted light (plate held up to light). Inhibition zones with fuzzy zone edges are interpreted as resistant, even if the zone diameter is above the susceptible breakpoint.

<sup>1</sup> Targets comply with EUCAST clinical breakpoints and are set to ensure that resistance mechanisms are correctly detected. Interpretation according to EUCAST clinical breakpoints: S=Susceptible, I=Intermediate, R=Resistant.

<sup>2</sup> From Clinical and Laboratory Standards Institute, M100-S22: 32:3, 2012, except ranges in bold/italics established by EUCAST. All ranges have been validated by EUCAST.

## Quality control strains for detection of resistance mechanisms on MH-F agar

Mueller-Hinton agar + 5% horse blood and 20 mg/L  $\beta$ -NAD, McFarland 0.5, 5% CO<sub>2</sub>, 35±1°C, 18±2h. Read zone edges as the point showing no growth viewed from the front of the plate with the lid removed and with reflected light.

### *Haemophilus influenzae* ATCC 49247

(NCTC 12699, CIP 104604, DSM 9999, CCUG 26214)

$\beta$ -lactamase negative, ampicillin resistant (BLNAR)

Antimicrobial agent	Disk content ( $\mu$ g)	Target susceptibility <sup>1</sup>	Range <sup>2</sup> (mm)	Comments
				Inhibition zone diameters are particularly affected by variation in medium, inoculum and incubation conditions. Inhibition zones with growth of small colonies within the zone are interpreted as 6 mm (no zone).
Ampicillin	2	R	<b>6-12</b>	
Benzylpenicillin	1 unit	R	<b>6-9</b>	

<sup>1</sup> Targets comply with EUCAST clinical breakpoints and are set to ensure that resistance mechanisms are correctly detected. Interpretation according to EUCAST clinical breakpoints: S=Susceptible, I=Intermediate, R=Resistant.

<sup>2</sup> Established and validated by repeated testing by EUCAST.