

# The choice of Mueller-Hinton agar significantly affects the penicillin MIC of pneumococci

Helga Erlendsdóttir MSc.

clinical professor

Dept. of Microbiology, Landspítali University and  
University of Iceland

# Susceptibility to penicillin

- Determined by measuring the MIC often by using the E-test on Mueller-Hinton (MH) agar with horse blood
- Using this method and MH agar from Oxoid we noticed that strains falling into the intermediately resistant category could have lower penicillin MIC than expected



# Quality Control at the lab.

- Both internal and external quality control
- Internal QC
  - Pneumococcal ATCC strain 49619 each week
- External QC
  - International Circumpolar Surveillance, Interlaboratory Streptococcus pneumoniae Serotyping and Antibiotic Susceptibility Testing Quality Control Program)  
National Centre for Streptococcus, Edmonton, Alberta  
Twice a year
  - UK NEQAS for Microbiology  
Every now and then



# The aim of our study

- To find the reason for lower MIC results of beta-lactams on pneumococci compared to results from other labs participating in the same QC programs



# Material and methods

- Eleven penicillin non-susceptible clinical isolates
- Pneumococcal reference strains ATCC-49619 (penicillin MIC 0.25-1 mg/L)
- Tested for penicillin MIC using the E-test
- Mueller-Hinton agar from two manufacturers
  - Becton Dickinson (BBL Mueller-Hinton II Agar) and
  - Oxoid (Mueller-Hinton Agar).

Both agars were supplemented with horse blood

- CLSI breakpoints



Strain no.	BBL-MH	SIR	Oxoid-MH	SIR
IS 1	1.5	R	0.75	I
IS 2	1.5	R	0.75	I
IS 3	1.5	R	0.5	I
IS 4	3	R	1	I
IS 5	1.5	R	0.5	I
IS 6	1.5	R	0.75	I
IS 7	3	R	0.75	I
IS 8	2	R	0.75	I
IS 9	2	R	0.5	I
IS 10	2	R	0.5	I
ATCC 49619	0.5	I	0.25	I



# Results I

- Strains with penicillin MIC of 0.5-1.0 mg/l on the MH agar from Oxoid, meet the CLSI criteria for intermediate
  - are therefore considered amenable to oral treatment
- These strains often had MIC of 1.5-3 mg/l on the Becton Dickinson agar
  - should therefore be classified as resistant and not amenable to oral treatment



# Results II

- The QC (ATCC-49619) results fulfilled the quality control criteria for the strain
  - but in most instances at its lowest limit when the MH agar from Oxoid was used
- The penicillin MIC was consistently higher with the MH agar from Becton Dickinson



# Results

- Using the MH agar from Becton Dickinson the results were more in agreement with the results from other reference laboratories
  - International Circumpolar Surveillance, Interlaboratory Streptococcus pneumoniae Serotyping and Antibiotic Susceptibility Testing Quality Control Program



# Conclusion

- The choice of MH agar significantly influenced the penicillin MIC
  - May be clinically important
  - May affect the prevalence rates of penicillin resistance in surveillance studies



# BBL and Oxoid Mueller-Hinton agar

## Difco™ Mueller Hinton Agar

Approximate Formula\* Per Liter

Beef Extract Powder .....	2.0	g
Acid Digest of Casein .....	17.5	g
Starch .....	1.5	g
Agar .....	17.0	g

## BBL™ Mueller Hinton II Agar

Approximate Formula\* Per Liter

Beef Extract .....	2.0	g
Acid Hydrolysate of Casein .....	17.5	g
Starch .....	1.5	g
Agar .....	17.0	g

\*Adjusted and/or supplemented as required to meet performance criteria.

## MUELLER-HINTON AGAR

Code: CM337

*An antimicrobial susceptibility testing medium which may be used in internationally recognised standard procedures.*

Formula*	gm/litre
Beef, dehydrated infusion from	300.0
Casein hydrolysate	17.5
Starch	1.5
Agar	17.0
pH 7.4 ± 0.2	

\* modified to meet performance standards.



## MH OXOID

## MH-F BBL-II

Nr.	MIC	SIR	MIC	SIR
27	1	I	3	R
28	1	I	3	R
206	1	I	3	R
345	1	I	3	R
347	1	I	3	R
10	0,032	S	0,094	I
175	0,047	S	0,094	I
303	0,064	S	0,094	I
369	0,047	S	0,094	I
377	0,047	S	0,094	I
420	0,047	S	0,094	I



# Thank you

