Surveillance data in Community Acquired Respiratory tract Infections

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OBJECTIVES

- Overview of S. *pneumoniae* importance as surveillance pathogen
- Surveillance data-SOAR
- Factors to consider in optimal management *using-Application of local susceptibility data*

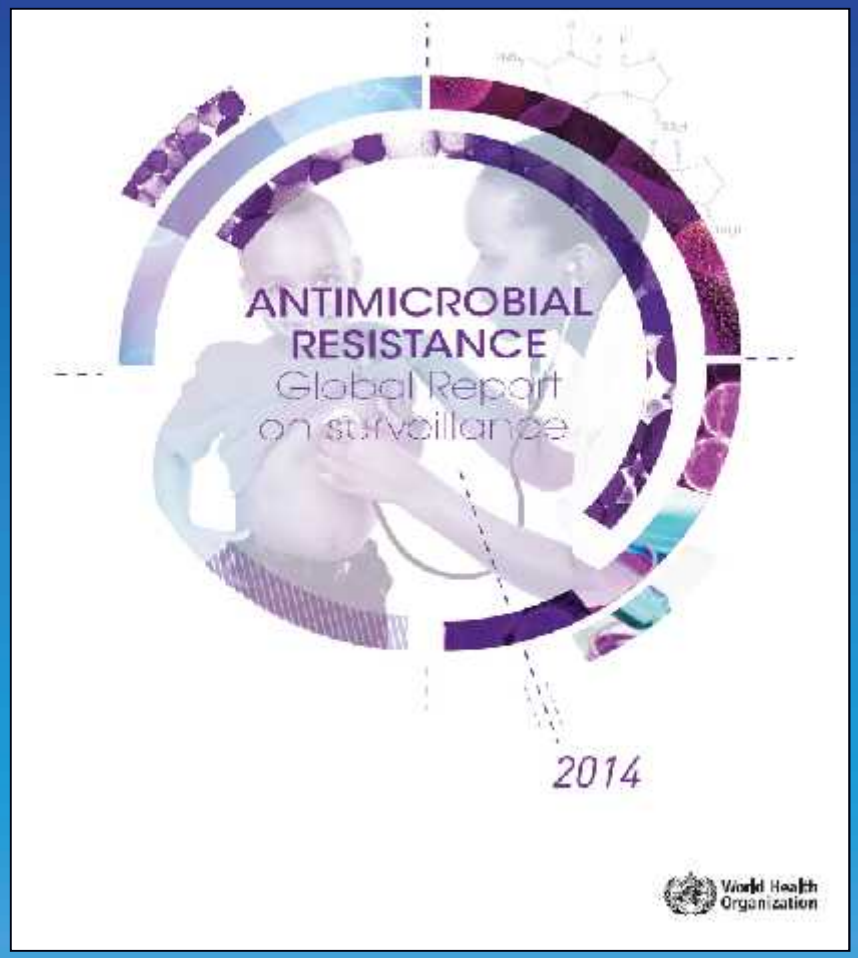
ANTIBIOTIC RESISTANCE

"Arguably the greatest risk…to human health comes in the form of antibiotic resistant bacteria. We live in a bacterial world where we will never be able to stay ahead of the mutation curve.

A test of our resilience is how far behind the curve we allow ourselves to fall."

Global Risk 2013, 8th Ed; An Initiative of the Risk Response Network, World Economic Forum 2013

WHO Global Report on surveillance (2014) and recommended priority pathogens



- Escherichia *coli*
- Acinetobacter *baummanni*
- Klebsiella *pneumoniae*
- ***Staphylococcus aureus***
- **Streptococcus *pneumoniae***
- Salmonella spp
- Shigella *spp*
- ***Neisseira gonorrhoeae***

World Health Organization. Antimicrobial Resistance. Global report on surveillance, 2014.

Name of bacterium/ resistance	Examples of typical diseases	No. out of 194 Member States providing data	No. of WHO regions with national reports of 50%resistance or more
Escherichia coli/	Urinary tract infections, blood stream infections		
- vs. 3rd gen. cephalosporins		86	5/6
- vs. fluoroquinolones		92	5/6
Klebsiella pneumoniae/	Pneumonia, blood stream infections, urinary tract infections		
- vs. 3rd gen. cephalosporins		87	6/6
- vs. 3rd carbapenems		71	2/6
Staphylococcus aureus/	Wound infections, blood stream infections		
- vs. methicillin “MRSA”		85	5/6
Streptococcus pneumoniae/ - non-susceptible or resistant to penicillin	Pneumonia, meningitis, otitis	67	6/6
Nontyphoidal Salmonella/ - vs. fluoroquinolones	Foodborne diarrhoea, blood stream infections	68	3/6
Sheila species/ - vs. fluoroquinolones	Diarrhoea (“bacillary dysenteria”)	35	2/6
Neisseria gonorrhoea/ - vs. 3rd gen. cephalosporins	Gonorrhoea	42	3/6

World Health Organization. Antimicrobial Resistance. Global report on surveillance, 2014.

Breakpoints

- Represents the conc. of an antimicrobial that separates populations of micro-organisms into S/ I/ R[1]
- Used to define S/ I/ R[4]

USA

- CLSI (Formerly NCCLS) Clinical and Laboratory Standards Institute

- **Europe:** 6 active European National Breakpoint Committees: Britain ,France, Netherlands, Sweden &Norway

EUCAST (European Committee on Antimicrobial Susceptibility Testing)

1. Turnidge J, Paterson DL. *Clin Microbiol Rev* 2007;20(3): 391-408; 2. Clinical and Laboratory Standards Institute. Performance Standards for Antimicrobial Susceptibility Testing; Twenty-fourth informational supplement M100-S24, 2014; 3. The European Committee on Antimicrobial Susceptibility Testing. Breakpoint tables for interpretation of MICs and zone diameters. Version 5.0, 2015. http://www.eucast.org accessed 13 July 2015; 4. Mouton JW *et al. Clin Microbiol Infect* 2011;18:E37–E45.

Mechanisms of Resistance Among *S pneumoniae.*

- Resistance to beta-lactams - stepwise alteration in PBPs, ↓ binding affinity
- PBPs in *S pneumoniae*—1a, 1b, 2b, 2x, 2z, 3
- 1a, 2b, and 2x alteration most often associated to penicillin resistance [MICs] range 0.25 mg/L - 8 mg/L vs. 0.06 mg/L for susceptible strains)
- MICs - **S -** 0.06-0.12 mg/ml, **I -** 0.12- 1mg/ml , R >2 mg/ml

SUPPLEMENT TO **Otolaryngology–Head and Neck Surgery:** SINUS AND ALLERGY HEALTH PARTNERSHIP. **JANUARY 2004 VOLUME 130 NUMBER 1**

Global surveillance programmes

Some examples

- SENTRY:[1]
  - Antimicrobial Surveillance Program Asia-Pacific region and South Africa
- MYSTIC:[1]
  - Meropenem Yearly Susceptibility Test Information Collection
- ANSORP:[2]
  - Asian Network for Surveillance of Resistant Pathogens

GSK Surveillance Programs

- **Alexander Project: 1992-2002**[4,5]
  - The first multicentre, international longitudinal study CA-RTI pathogens
  - More than 90 journal publications and abstracts presented based on these data
- **SOAR- Survey Of Antimicrobial Resistance: 2002 onwards**[6]
  - Generates local susceptibility data for key CA-RTI pathogens such as *S.pneumoniae* and *H.influenzae*

1. Falagas ME, Karveli EA. *Clin Infect Dis* 2006;43(5):630–633. 2; Felmingham D *et al. Clin Microbiol Infect* 2002;8 (Suppl 2):12–42; 3.Karlowsky JA. *Clin Infect Dis* 2003;36(8):963–970; 4. Jacobs MR *et al. J Antimicrob Chemother*. 2003;52(2):229–246; 5. Felmingham D *et al. J Antimicrob Chemother* 2005; 56 (Suppl 2):ii3–ii21; 6. Torumkuney-O'Brien D, The SOAR group. Poster.


SOAR
SURVEY
OF
ANTIBIOTIC
RESISTANCE

Survey of Antibiotic Resistance (SOAR)

- *S. pneumoniae* and *H. influenzae* -
- at least 100 *Streptococcus pneumoniae* + 100 *Haemophilus influenzae*
- Multinational and longitudinal –Africa, Middle East. Latin america,Asia-Pacific (since 2002)
- Internationally recognised standardised methodology (CLSI/EUCAST/PK/PD-breakpoints)
- Not a clinical study- *in vitro* antibiotic surveillance study

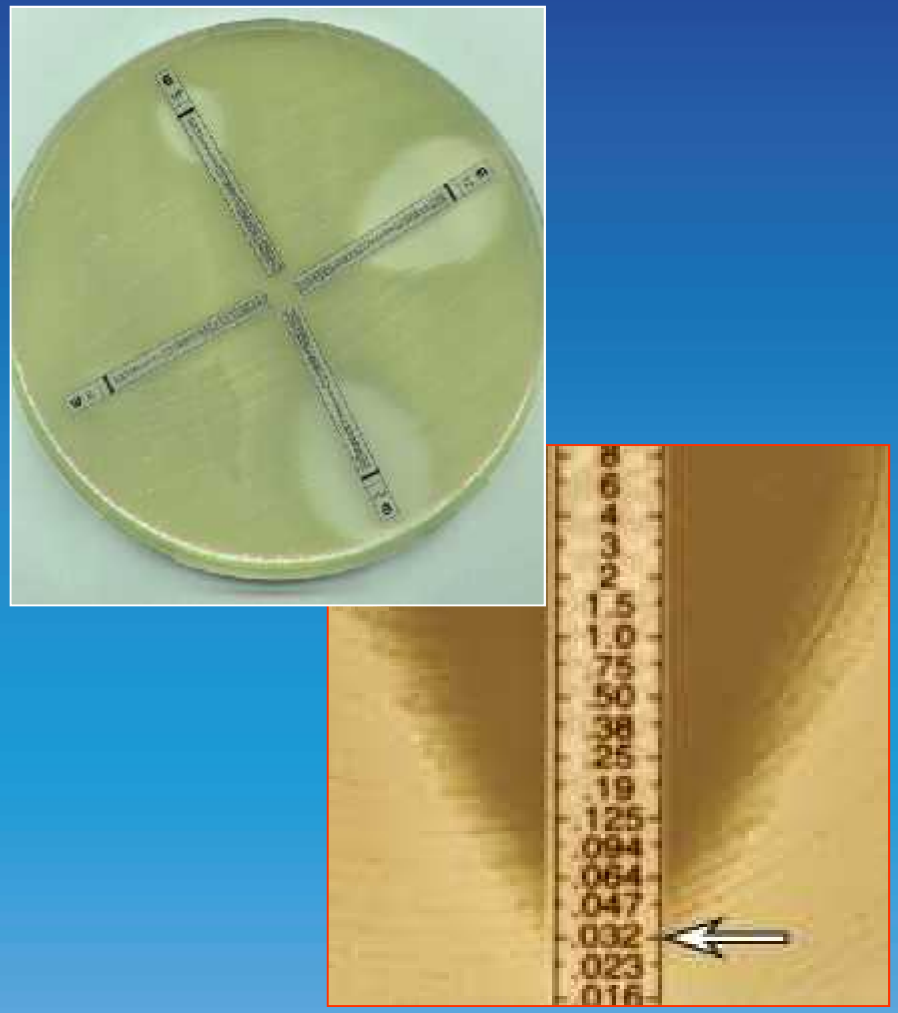
Specimen collection & patient characteristics

- Sputum -36.8%
- Middle ear effusion-18.2%
- Blood-26.8%
- Bronchoalveolar lavage-10.8%
- Pleural aspirate- 7.4%

Kenyan sites :

- -Aga Khan University hospital
- -Kenyatta National hospital.
- Outpatients
- Paediatric isolates 30%

Methodology E-test



- Cost is expensive
- Gives quantitative value i.e. ug/ml=the MIC value
- This enables the MIC50, MIC90, MIC mode to be calculated for resistance profile
- Data obtained would be useful to be applied in the PK/PD concept

→ **Numerical figure e.g. 2 mcg/mL**

→ ***'the lower the MIC the more sensitive that specific bacteria is to that specific antibiotic'***

Jogensen J *et al, Clinical Infectious Diseases* 2009; 49:1749-1755.

SOAR 2009 –*S. pneumoniae* Susceptibility

		Africa[1]				Middle East[1]					Asia Pacific[2,3,4]		
%		Cote d'Ivo. (n=100)	Kenya (n=123)	Seneg. (n=103)	Moroc. (n=89)	Algeri. (n=102)	UAE (n=70)	Qatar (n=101)	Egypt (n=150)	Pakist. (n=91)	Vietn. (n=204)	Thail. (n=280)	Singa. (n=65)
Penicillin	**S**	**89.0**	**33.3**	**66.0**	**82.0**	**54.9**	**40.0**	**63.3**	**61.3**	**65.9**	**20.0**	**11.5***	**60.0**
Amox/ Clav	**S**	100	100	100	97.8	100	98.6	99	96.7	100	92.0	98.7*	98.5
Erythrom	**S**	89.0	85.4	92.2	87.6	48.1	68.6	76.2	70.0	70.3	28.0	60.4	46.2
Ofloxacin	**S**	67.0	97.6	98.1	44.9	91.2	28.6	93.1	89.3	-	99	97.5	-

1. O'Brien *et al.* Poster presented at 49th Interscience Conference on Antimicrobial Agents and Chemotherapy, 12−15 September 2009, San Francisco, CA, USA.
2. Van *et al*. Presented at the 13th International Congress on Infectious Diseases (2008), Kuala Lumpur, Malaysia.
3. Khantawa *et al.* Presented at the 20th ECCMID (2010), Vienna, Austria. Abstract No: 2579.
4. O'Brien *et al*. Presented at the 8th International Symposium on Antimicrobial Agents and Resistance (2011), Seoul, Korea.

Kenya Susceptibility trends for S. Pneumoniae

	2003 N=92	**2007/2008 n=89**	**2013/2014 * (n= 84)**
Antibiotics	Sensitivity %	Sensitivity %	Sensitivity %
Penicillin	**52.5**	**33.3**	**19%**
Cefuroxime	95.0	87.8	66.7%
Erythromycin	NT	85.4	64.1%
Azithromycin	90.1	NT	65.2%
Ceftriaxone	NT	NT	96.4%

A. Kacou-Ndouba1, G. Revathi2, P. Mwathi3, A. Seck4, A. Diop5, M. J. Kabedi-Bajani6, W. Mwiti7,
M. J. Anguibi-Pokou8, I. Morrissey9 and D. Torumkuney10

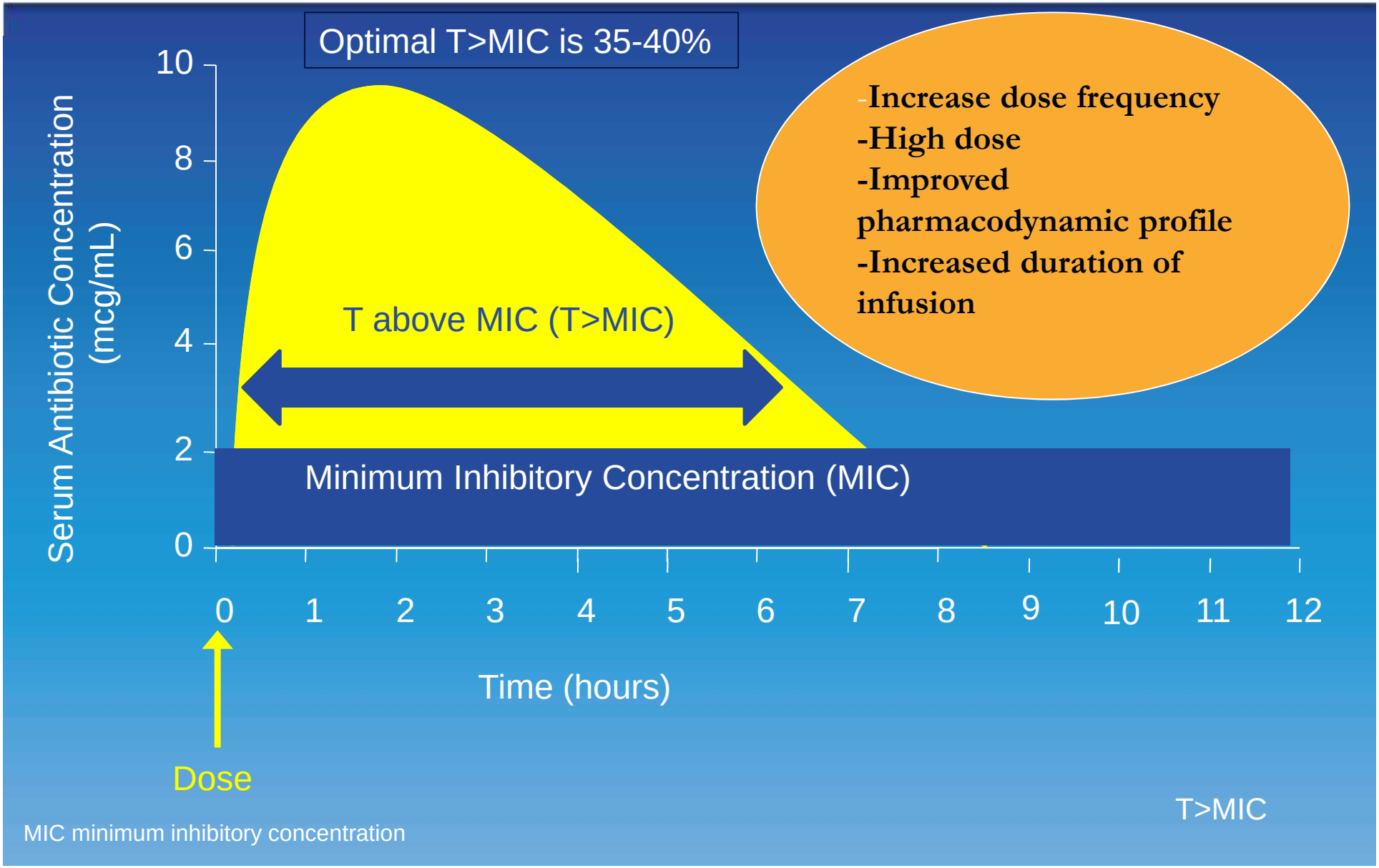
Question time

What threshold of % R indicates “This antibiotic should be used with caution”?

a)50%
b)15-20%
c)90%
d)5%
e)Have no idea

SOLUTIONS?

Time dependent killing-



MIC minimum inhibitory concentration

Staying ahead of the game !

- Penicillin resistance verses amoxicillin guideline in CAP
- Benzyl Penicillin in current guidelines for severe pneumonia- dosages optimum/use of cephalosporins?
- Macrolide role in immunomodulation and/or coverage of atypical organisms in immunosuppresion
- Surveillance –facility based, National systems , GARPEC
- Multidisciplinary approach in management of critically ill children

Acknowldgements -SOAR 2014

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Results from the Survey of Antibiotic Resistance (SOAR) 2011–14 in the Democratic Republic of Congo, Ivory Coast, Republic of Senegal and Kenya

A. Kacou-Ndouba[1], G. Revathi[2], P. Mwathi[3], A. Seck[4], A. Diop[5], M. J. Kabedi-Bajani[6], W. Mwiti[7], M. J. Anguibi-Pokou[8], I. Morrissey[9] and D. Torumkuney[10]*

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History of Medicine

2000 B.C. – Here, eat this root

1000 A.D. – That root is heathen. Here, say this prayer.

1850 A.D. – That prayer is superstition. Here, drink this potion.

1920 A.D. – That potion is snake oil. Here, swallow this pill.

1945 A.D. – That pill is ineffective. Here, take this penicillin.

1955 A.D. – Oops....bugs mutated. Here, take this tetracycline.

1960-1999 – 39 more "oops"...Here, take this more powerful antibiotic.

Presently- Here take this root?????

Anonymous

Thank you...

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