

A POCKET GUIDE TO ANTIBIOTICS

**PHARMACY DEPARTMENT
SARAWAK GENERAL HOSPITAL**

1st edition (2015)

Acknowledgement

The completion of this pocket guide could not have been possible without the contributions of the following individuals from Sarawak General Hospital:

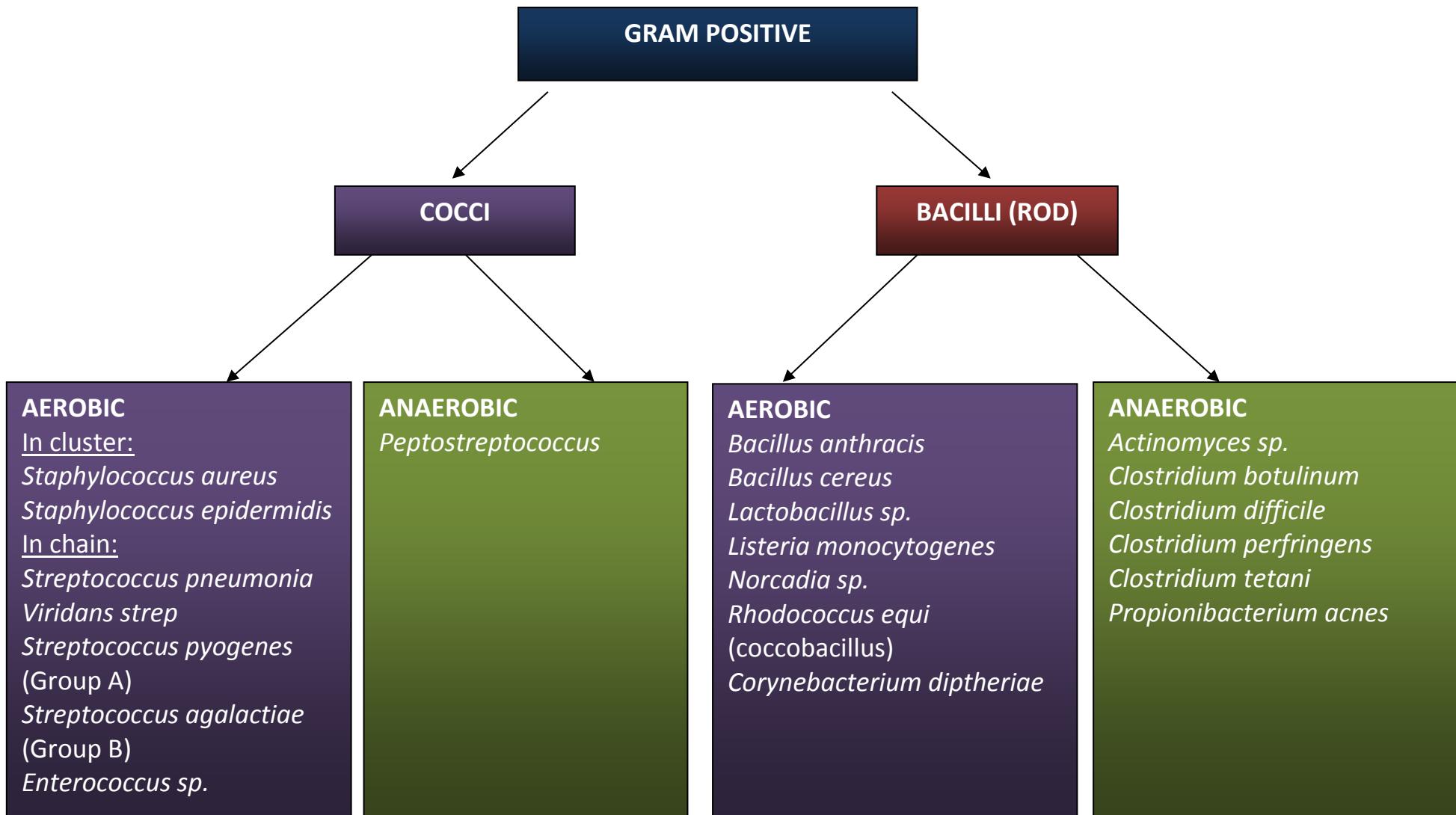
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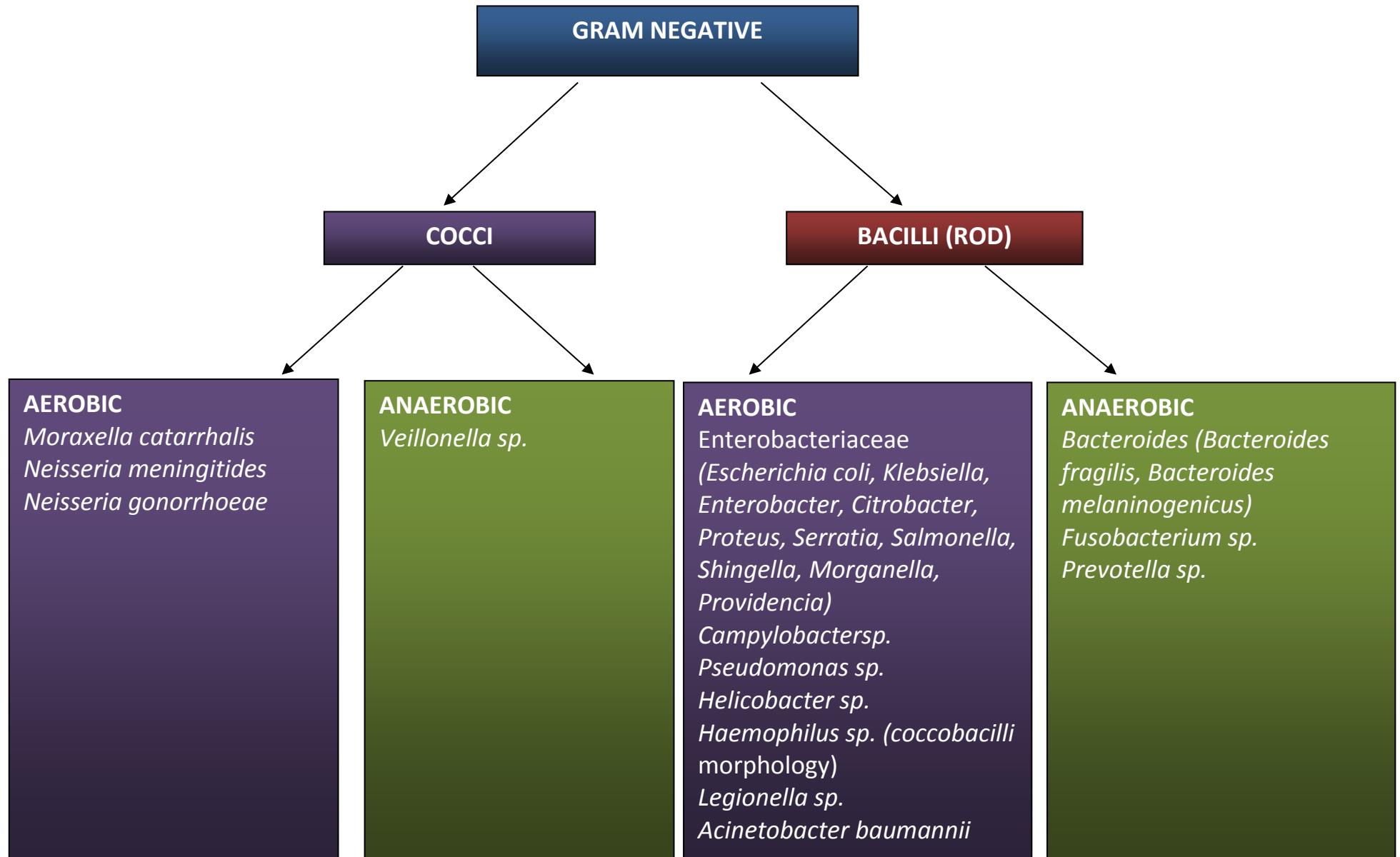
Their contributions are sincerely appreciated and gratefully acknowledged.

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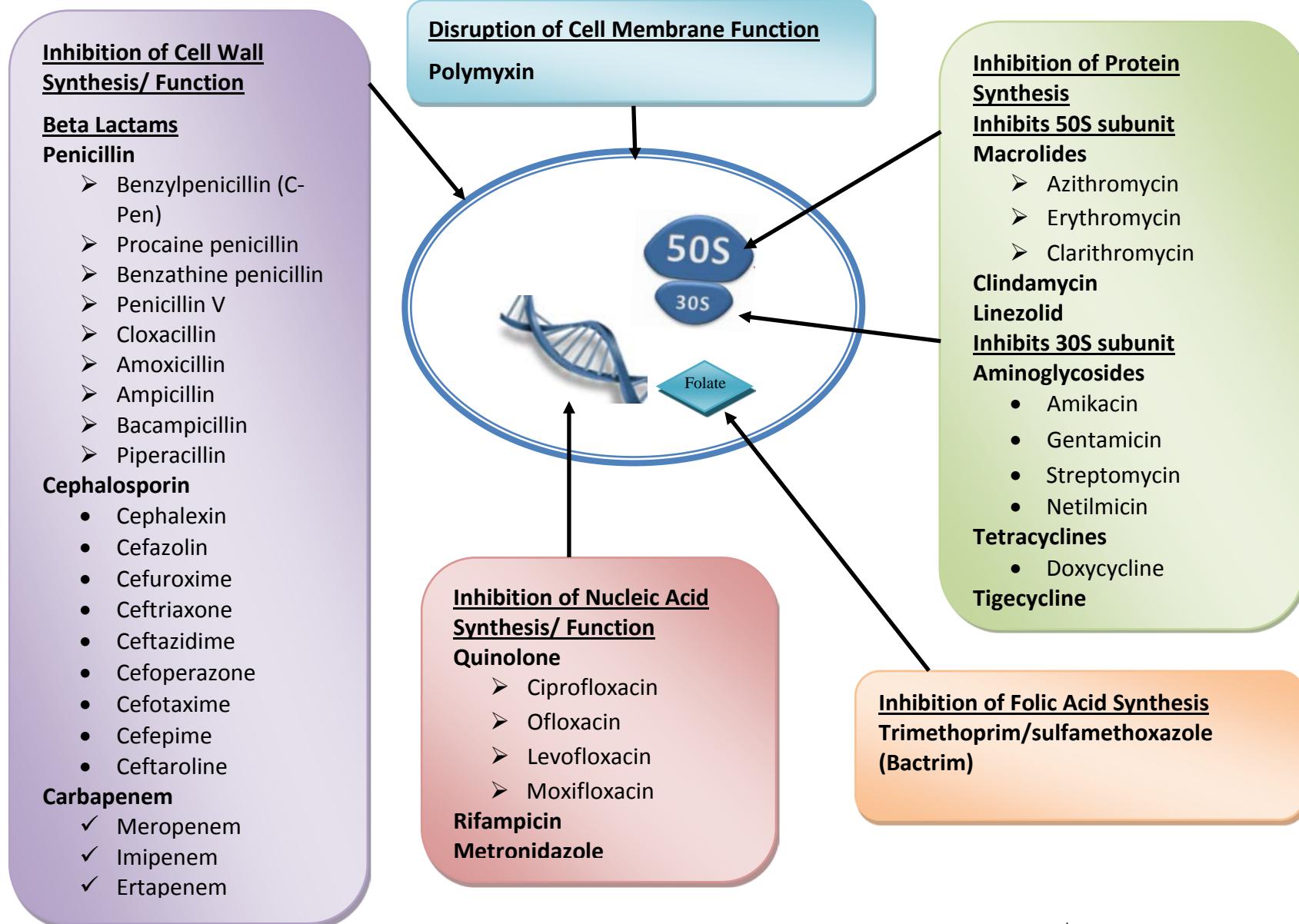
1. Bacterial Classification





Reference: Mary Anne Koda-Kimble et al. Applied Therapeutics. The Clinical Use of Drugs. 9th Edition. Lipincott Williams & Wilkins; 2009.

2. Pharmacology and Mechanism of Action



Reference: Paul H.Axelsen. Essentials of Antimicrobial Pharmacology: A Guide to Fundamental Practice. 1st edition. Springer Science and Business Media; 2002.

3. Activity Spectra

Organisms		Penicillins							Carbapenems		Quinolones			
		Piperacillin-Tazobactam	Ampicillin-Sulbactam	Amoxicillin-Clavulanate	Amoxicillin	Cloxacillin	Ampicillin	Penicillin V	Penicillin G	Ertapenem	Imipenem	Meropenem	Oflloxacin	Levofloxacin
GRAM POSITIVE	<i>Strep. Group (A, B, C, G)</i>	+	+	+	+	+	+	+	+	+	+	+	+	+
	<i>Strep. pneumoniae</i>	+	+	+	+	+	+	+	+	+	+	+	+	+
	<i>Viridans Strep.</i>	±	±	±	±	±	±	±	±	+	+	+	0	0
	<i>Enterococcus faecalis</i>	+	+	0	+	+	+	+	+	0	+	±	±	+
	<i>Staph. aureus (MSSA)</i>	0	0	+	0	0	+	+	+	+	+	+	+	+
	<i>Staph. aureus (MRSA)</i>	0	0	0	0	0	0	0	0	0	0	0	0	±
	<i>Staph. epidermidis</i>	0	0	+	0	0	0	0	+	+	+	+	+	+
GRAM NEGATIVE	<i>N. gonorrhoea</i>	0	0	0	0	0	+	+	+	+	+	+	+	+
	<i>N. meningitidis</i>	+	0	0	+	+	+	+	+	+	+	+	+	+
	<i>M. catarrhalis</i>	0	0	0	0	0	+	+	+	+	+	+	+	+
	<i>H. influenza</i>	0	0	0	±	±	+	+	+	+	+	+	+	+
	<i>E. coli</i>	0	0	0	±	±	+	+	+	+	+	+	+	+
	<i>Klebsiella sp.</i>	0	0	0	0	0	+	+	+	+	+	+	+	+
	<i>E. coli/Klebs sp ESBL+</i>	0	0	0	0	0	0	0	±	+	+	+	/ / / / / / / / / / / / / / / /	
	<i>Enterobacter sp.</i>	0	0	0	0	0	0	0	+	+	+	+	+	+
	<i>Serratia sp.</i>	0	0	0	0	0	0	0	+	+	+	+	+	+
	<i>Salmonella sp.</i>	0	0	0	±	±	+	+	+	+	+	+	+	+
	<i>Shigella sp.</i>	0	0	0	±	±	+	+	+	+	+	+	+	+
	<i>Proteus mirabilis</i>	0	0	0	+	+	+	+	+	+	+	+	+	+
	<i>Citrobacter sp.</i>	0	0	0	0	0	0	0	+	+	+	+	+	+
	<i>Acinetobacter sp.</i>	0	0	0	0	0	0	0	+	±	0	+	±	±
	<i>P. aeruginosa</i>	0	0	0	0	0	0	0	+	0	+	±	±	±
ANAE-ROBES	<i>Bacteroides fragilis</i>	0	±	0	0	0	+	+	+	+	+	0	0	0
	<i>Clostridium difficile</i>	+	/ / / / /					+	/ /		+	0	/ /	
	<i>Clostridium (not difficile)</i>	+	+	/ /		+	+	+	+	+	+	±	±	±

+ = Usually Susceptible, ± = Variably Susceptible/Resistant, 0 = Usually Resistant,  = No data

Reference: Sanford Guide

Organisms		Cephalosporins							Aminoglycosides		Macrolides		Glyco/Lipo-peptides				
		Cephalexin	Cefazolin	Cefuroxime	Cefotaxime	Ceftriaxone	Ceftazidime	Cefepime	Ceftaroline	Gentamicin	Amikacin	Erythromycin	Clarithromycin	Azithromycin	Daptomycin	Vancomycin	
GRAM POSITIVE	<i>Strep. Group (A, B, C, G)</i>	+	+	+	+	+	+	+	+	0	0	±	±	±	+	+	
	<i>Strep. pneumoniae</i>	+	+	+	+	+	+	+	+	0	0	±	±	±	+	+	
	<i>Viridans Strep.</i>	+	+	+	+	+	±	+	+	No data		No data		No data			
	<i>Enterococcus faecalis</i>	0	0	0	0	0	0	0	+	No data		0	0	0	+	+	
	<i>Staph. aureus (MSSA)</i>	+	+	+	+	+	±	+	+	+	+	±	+	+	+	+	
	<i>Staph. aureus (MRSA)</i>	0	0	0	0	0	0	0	+	0	0	0	0	0	+	+	
	<i>Staph. epidermidis</i>	±	±	±	±	±	±	±	+	±	±	±	0	0	+	+	
GRAM NEGATIVE	<i>N. gonorrhoea</i>	0	+	±	±	+	±	+	+	0	0	±	±	±	0	0	
	<i>N. meningitidis</i>	0	0	+	+	+	±	+	+	0	0	+	+	No data			
	<i>M. catarrhalis</i>	0	±	+	+	+	+	+	+	+	+	+	+	+	+	0	
	<i>H. influenza</i>	0	+	+	+	+	+	+	+	+	+	±	+	+	0	No data	
	<i>E. coli</i>	+	+	+	+	+	+	+	+	+	+	0	0	0	0	0	
	<i>Klebsiella sp.</i>	+	+	+	+	+	+	+	+	+	+	0	0	0	0	0	
	<i>E. coli/Klebs sp ESBL+</i>	0	0	0	0	0	0	0	0	+	+	0	0	0	0	0	
	<i>Enterobacter sp.</i>	0	0	±	+	+	+	+	+	+	+	0	0	0	0	0	
	<i>Serratia sp.</i>	0	0	0	+	+	+	+	+	+	+	0	0	0	0	0	
	<i>Salmonella sp.</i>	0	No data		+	+	+	+	+	No data		0	±	0	0	0	
	<i>Shigella sp.</i>	0	No data		+	+	+	No data		+	+	0	±	0	0		
	<i>Proteus mirabilis</i>	+	+	+	+	+	+	+	+	No data		No data		No data			
	<i>Citrobacter sp.</i>	0	0	±	+	+	+	+	+	No data		No data		No data			
	<i>Acinetobacter sp.</i>	0	0	0	0	0	±	±	No data		0	±	0	0	0		
	<i>P. aeruginosa</i>	0	0	0	±	±	+	+	±	+	+	0	0	0	0	0	
ANAE-ROBES	<i>Bacteroides fragilis</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	<i>Clostridium difficile</i>	No data		0	No data		0	No data		0	0	No data		No data			
	<i>Clostridium (not difficile)</i>	No data		+	+	+	+	+	No data		±	+	+	+	+		

+ = Usually Susceptible, ± = Variably Susceptible/Resistant, 0 = Usually Resistant,  = No data

Reference: Sanford Guide

Organisms		Miscellaneous										
		Doxycycline	Tigecycline	Trimethoprim	TMP-SMX	Nitrofurantoin	Clindamycin	Fusidic Acid	Rifampicin	Linezolid	Colistin	Metronidazole
GRAM POSITIVE	<i>Strep. Group (A, B, C, G)</i>	±	+	+	0	+	+	±	+	+	0	0
	<i>Strep. pneumoniae</i>	+	+	±	+	+	+	±	+	+	0	0
	<i>Viridans Strep.</i>											
	<i>Enterococcus faecalis</i>	0	+	0	0	+	0	+	±	+	0	0
	<i>Staph. aureus (MSSA)</i>	±	+	±	+	+	+	+	+	+	0	0
	<i>Staph. aureus (MRSA)</i>	±	+	±	+	+	0	+		+	0	0
	<i>Staph. epidermidis</i>	0	+	+	±		0	+	+	+	0	0
GRAM NEGATIVE	<i>N. gonorrhoea</i>	±	+	0	±	+	0	+	+		0	0
	<i>N. meningitidis</i>	+			±	+		0	+	0	0	0
	<i>M. catarrhalis</i>	+	+			+	0		+	±		0
	<i>H. influenza</i>	+	+	±	±		0		+	±		0
	<i>E. coli</i>	+	+	+	±	+	0	0	0	0	+	0
	<i>Klebsiella sp.</i>	±	+	±	±	±	0	0	0	0	+	0
	<i>E. coli/Klebs sp ESBL+</i>	±	+	±	±	±	0	0	0	0	+	0
	<i>Enterobacter sp.</i>	0	+	±			±	0	0	0	+	0
	<i>Serratia sp.</i>	0	+	0	±	0	0	0	0	0	0	0
	<i>Salmonella sp.</i>	±	+	±	±	+	0	0	0	0		0
	<i>Shigella sp.</i>	±	+	±	±	+	0	0	0	0		0
	<i>Proteus mirabilis</i>											
	<i>Citrobacter sp.</i>											
	<i>Acinetobacter sp.</i>	0	±	0	±		0	0	0	0	+	0
	<i>P. aeruginosa</i>	0	0	0	0	0	0	0	0	0	+	0
ANAE-ROBES	<i>Bacteroides fragilis</i>	±	+	+	0		±			±		+
	<i>Clostridium difficile</i>									±		+
	<i>Clostridium (not difficile)</i>	+	+				±	+		+		+

+ = Usually Susceptible, ± = Variably Susceptible/Resistant, 0 = Usually Resistant,  = No data

Reference: Sanford Guide

4. Antibiotics with good anaerobic coverage

ANTIBIOTICS WITH GOOD ANAEROBIC COVERAGE

1. PENICILLINS

- Amoxycillin/clavulanate
- Ampicillin/sulbactam
- Piperacillin/tazobactam
- Ticarcillin/clavulanate

2. CEPHALOSPORINS

- Cefoxitin
- Cefotetan

3. CARBAPENEMS

- Imipenem/cilastatin
- Meropenem
- Doripenem
- Ertapenem

4. CLINDAMYCIN

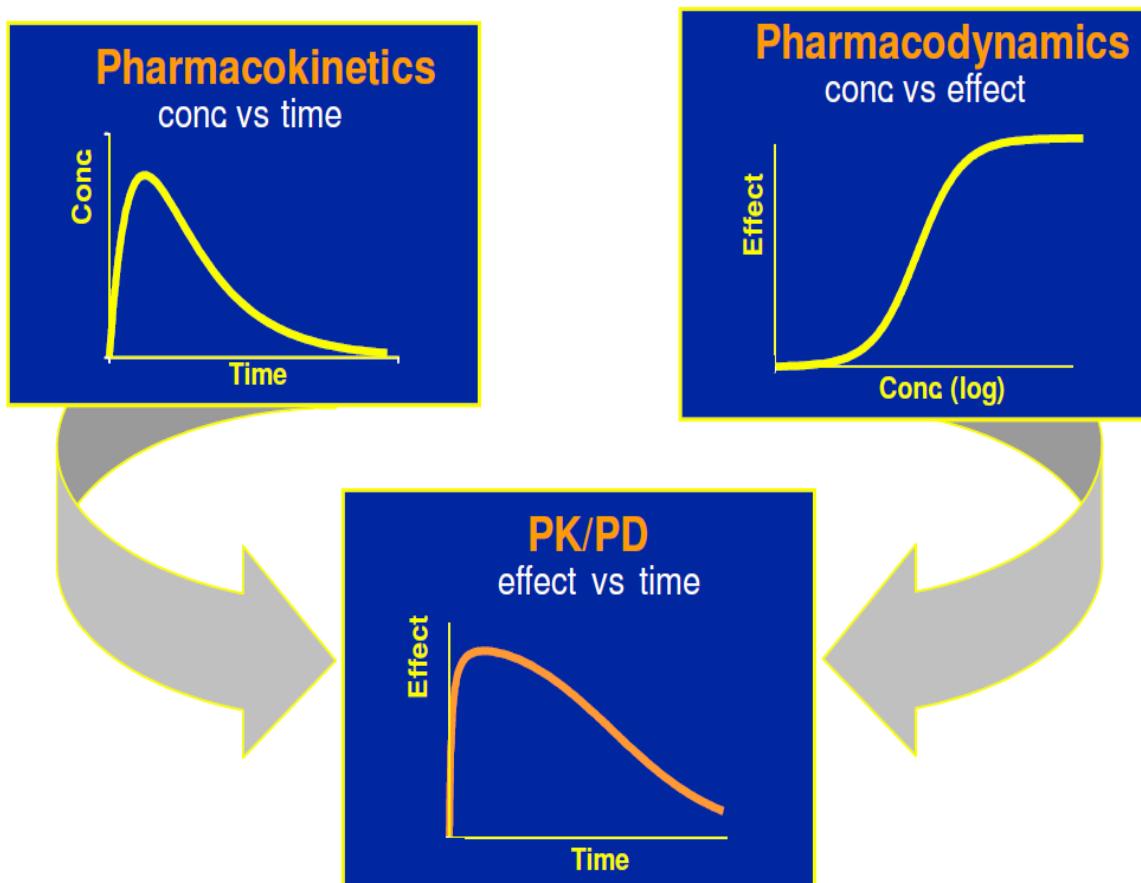
5. TIGECYCLINE

6. MOXIFLOXACIN

7. METRONIDAZOLE

Reference: The Nebraska Medical Center. Double Anaerobic Coverage: What is the role in clinical practice? Omaha, NE. 2010 [Updated June 2010; Cited 5 November 2015]. Available from: http://www.nebraskamed.com/app_files/pdf/careers/education-programs/asp/doubleanaerobiccoverage.pdf

5. The Pharmacokinetics/Pharmacodynamics (PKPD) Concept



Pharmacokinetics:

- **C_{max}** – peak serum concentration
- **C_{min}** – serum trough concentration
- **AUC** – area under the serum concentration-time curve

Pharmacodynamics:

- **MIC** – Minimum Inhibitory Concentration
- **Concentration-dependent killing**
- **Time-dependent killing**

PK/PD Index	Drugs	Bacterial killing & Persistence of killing effect	Goal of therapy
Peak/MIC AUC₂₄/MIC	<ul style="list-style-type: none"> Aminoglycosides Fluoroquinolones Metronidazole Daptomycin Ketolides 	Concentration-dependent killing with prolonged persistent effect	Aim for a adequately <u>high peak serum concentration</u> (ensure sufficient unit dose with appropriate dosing interval)
T>MIC	<ul style="list-style-type: none"> Penicillins Cephalosporins Carbapenems Monobactams 	Time-dependent killing with no persistent effect	Ensure <u>long duration</u> of exposure (prolonged or continuous infusion/short dosing interval)
AUC₂₄/MIC	<ul style="list-style-type: none"> Vancomycin Tetracyclines Macrolides Clindamycin Linezolid Tedizolid Tigecycline 	Time-dependent killing with moderate to long persistent effect	<u>Enhance amount</u> of drug (ensure sufficient total daily dose with appropriate dosing interval)

Reference: Sanford Guide: Antimicrobial Therapy (updated 22/7/2015)

6. Renal / Hepatic Adjustments of Antibiotics

Antibiotics	Renal	Hepatic	Dialyzability of Drugs
PENICILLINS			
Penicillin G / Benzyl Penicillin	Yes. CrCl < 50 ml/min	No	HD C: Yes HD HP: Likely Yes PD: No
Penicillin G Benzathine	No. Use with caution	No	HD C: Yes HD HP: Likely Yes PD: No
Penicillin G Procaine	No	No	HD C: Yes HD HP: Likely Yes PD: No
Penicillin V	No	No	HD C: Yes HD HP: Likely Yes PD: No
Cloxacillin	No	No	HD C: No HD HP: No Data PD: No
Ampicillin	Yes. CrCl < 50 ml/min	No	HD C: Yes HD HP: Likely Yes PD: No
Ampicillin/Sulbactam	Yes. IV: CrCl < 30 ml/min Oral: No	No	(Sulbactam) HD C: Yes HD HP: Likely Yes PD: No
Amoxycillin	Yes. CrCl < 30 ml/min	No	HD C: Yes HD HP: Likely Yes PD: No
Amoxycillin/Clavulanic acid	Yes. CrCl < 30 ml/min	No. Use with caution	Clavulanic Acid HD C: Yes HD HP: Likely Yes PD: Yes
Piperacillin/Tazobactam	Yes. CrCl < 40 ml/min	No	HD C: Yes HD HP: Likely Yes PD: No
CEPHALOSPORINS			
Cefazolin	Yes. CrCl < 35 ml/min	No	HD C: Yes HD HP: Yes PD: No
Cephalexin	Yes. CrCl < 50 ml/min	No	HD C: Yes HD HP: Likely Yes PD: No

Cefuroxime	Yes. Oral: CrCl < 30 ml/min IV: CrCl < 20 ml/min	No	HD C: Yes HD HP: Likely Yes PD: No
Ceftriaxone	No. Max 2g/day in patient with concurrent renal and hepatic impairment	No. Max 2g/day in patient with concurrent renal and hepatic impairment	HD C: No HD HP: No Data PD: No
Cefotaxime	Yes. CrCl < 50 ml/min	No	HD C: Yes HD HP: Likely Yes PD: No
Ceftazidime	Yes. CrCl < 50 ml/min	No	HD C: Yes HD HP: Likely Yes PD: Yes
Cefoperazone	No. Caution with patient with concurrent renal and hepatic impairment	No. Caution with patient with concurrent renal and hepatic impairment	HD C: No HD HP: No Data PD: No
Cefoperazone/ Sulbactam	Yes. CrCl < 30 ml/min	Yes. Dose adjustment required in severe hepatic dysfunction	(Sulbactam) HD C: Yes HD HP: Likely Yes PD: No
Cefepime	Yes. CrCl < 60 ml/min	No	HD C: Yes HD HP: Likely Yes PD: Yes
Ceftaroline	Yes. CrCl < 50 ml/min	No	HD C: Yes HD HP: Yes PD: Likely Yes
AMINOGLYCOSIDES			
Amikacin	Yes. CrCl < 60 ml/min	No	HD C: Yes HD HP: Likely Yes PD: Yes
Gentamicin	Yes. CrCl < 60 ml/min	No	HD C: Yes HD HP: Yes PD: Yes

Tobramycin	Yes. CrCl < 60 ml/min	No	HD C: Yes HD HP: Likely Yes PD: Yes
Netilmicin	Yes. CrCl < 50 ml/min	No	HD C: Yes HD HP: Likely Yes PD: Yes
GLYCOPEPTIDES/LIPOPEPTIDES			
Vancomycin	Yes. CrCl < 50 ml/min	No	HD C: No HD HP: Yes PD: Yes
Daptomycin	Yes. CrCl < 30 ml/min	No. No data in Child Pugh class C	HD C: No HD HP: Likely Yes PD: No
MACROLIDES			
Azithromycin	No	No	HD C: Yes HD HP: Likely Yes PD: No
Clarithromycin	Yes. CrCl < 30 ml/min	No	HD C: No Data HD HP: No Data PD: No Data
Erythromycin	No	No	HD C: No HD HP: No Data PD: No
FLUOROQUINOLONES			
Ciprofloxacin	Yes Oral: CrCl < 50 ml/min IV : CrCl < 30 ml/min	No. Use with caution in severe impairment	HD C: No HD HP: No Data PD: No
Ofloxacin	Yes. CrCl < 50 ml/min	Yes. Max 400mg daily in severe liver impairment.	HD C: Yes HD HP: Yes PD: No
Levofloxacin	Yes. CrCl < 50 ml/min	No	HD C: Unlikely HD HP: No PD: No
Moxifloxacin	No	No	HD C: No Data HD HP: No Data PD: No

TETRACYCLINE			
Doxycycline	No	No	HD C: No HD HP: No Data PD: No
Tigecycline	No	Yes. Child-Pugh class C	HD C: No HD HP: No Data PD: Unlikely
CARBAPENEM			
Ertapenem	Yes. CrCl < 30 ml/min	No. Limited data	HD C: Yes HD HP: Likely Yes PD: No
Imipenem/Cilastatin	Yes. CrCl < 70 ml/min. Adjustment depends also on body weight	No	HD C: Yes HD HP: Likely Yes PD: Yes
Meropenem	Yes. CrCl < 50 ml/min	No	HD C: Yes HD HP: Likely Yes PD: No Data
Doripenem	Yes. CrCl < 50 ml/min	No	HD C: Yes HD HP: Yes PD: No Data
OTHERS			
Fusidic Acid	No	No	HD C: No HD HP: No Data PD: No
Sulfamethoxazole / Trimethoprim (Bactrim)	Yes. CrCl < 30 ml/min	No. Use with caution	HD C: Yes HD HP: Likely Yes PD: No
Nitrofurantoin	Yes. CrCl < 60 ml/min	No.	HD C: Yes HD HP: Likely Yes PD: No Data
Metronidazole	Yes	Yes. Child-Pugh Class C	HD C: Yes HD HP: Yes PD: No

Linezolid	No. Use with caution	No. No data in Child Pugh class C	HD C: Yes HD HP: Likely Yes PD: No Data
Polymyxin E (Colistin)	Yes. CrCl < 80 ml/min	No	HD C: No HD HP: No Data PD: No
Clindamycin	No	Yes. Use with caution and monitor liver enzymes in severe liver disease	HD C: No HD HP: No Data PD: No
ANTIFUNGAL			
Fluconazole	Yes. CrCl < 50 ml/min	No. Use with caution.	HD C: Yes HD HP: Likely Yes PD: Yes
Itraconazole	No. Use with caution	No. Use with caution	HD C: No HD HP: No PD: Unlikely
Voriconazole	Yes (IV only). CrCl < 50 ml/min	Yes	HD C: No HD HP: No PD: No
Amphotericin B	50% of the total daily dose if renal dysfunction is due to the drug	No	HD C: No HD HP: No PD: No
Anidulafungin	No	No	HD C: No HD HP: Unlikely PD: Unlikely
Caspofungin	No	Yes	HD C: No HD HP: Unlikely PD: Unlikely
Micafungin	No	No	HD C: Unlikely HD HP: Unlikely PD: Unlikely

ANTIVIRAL			
Acyclovir	Yes. Oral: CrCl < 25 ml/min IV: CrCl < 50 ml/min	No. Use with caution in severe impairment	HD C: Yes HD HP: Likely Yes PD: No
Ganciclovir	Yes. CrCl < 70 ml/min	No	HD C: Yes HD HP: Likely Yes PD: No Data
Valganciclovir	Yes. CrCl < 60 ml/min	No	HD C: Yes HD HP: No Data PD: No Data

HD C: Hemodialysis conventional

HD HP: Hemodialysis High Permeability

PD: Peritoneal Dialysis

References:

1. Lexi-Comp
2. Sanford Guide: Antimicrobial Therapy 2015
3. George RB and Nancy AM. 2013 Dialysis of Drugs. Renal Pharmacy Consultants; 2013.

7. Therapeutic Drug Monitoring of antibiotics in SGH

Drug	When to monitor (After initiation/ dose change)	Sampling Time	Targeted Therapeutic Range	
			Pre	Post
Vancomycin	24 hours (Pediatric) 48 hours (Adult)	Pre : 30 minutes before next dose and Post : 1 hour after the end of infusion	10 – 20µg/ml	20 – 40µg/ml
Amikacin	24 hours	OD : 2 hours and 6 hours post-dose BD/TDS: Pre (30 minutes before next dose) AND Post (1 hour post-dose)	<5 µg/ml (Pediatric) <10 µg/ml (Adult)	20 – 40µg/ml (up to 60µg/ml for Adult with OD dosing)
Gentamicin	24 hours	OD : 2 hours and 6 hours post-dose BD/TDS/36 or 48-Hrly: Pre (30 minutes before next dose) AND Post (1 hour post dose)	<1µg/ml (Pediatric) <2µg/ml (Adult)	5 – 10µg/ml (up to 20 µg/ml for Adult with OD dosing)

For enquiries, please call TDM Pharmacy at Ext: 1071

8. IV-To-Oral Switch Protocol (IVOS)

Consider IVOS if patient is on **IV antibiotics \geq 24-48 hours** and fulfills **COMS** criteria

C Clinical improvement observed

O Oral route is not compromised (vomiting, malabsorption, strict NPO, swallowing problems, unconscious, severe diarrhoea etc.) and suitable oral antibiotic option available (see *Appendix 1*)
NB: if NG/PEG feeding please D/W ward pharmacist

M Markers showing a *trend* towards normal:

Afebrile: Temp 36-38 °C for at least 24-48 hours

PLUS not more than one of

- **Heart Rate** $>$ 90 bpm
- **Respiratory Rate** $>$ 20 bpm
- **Blood Pressure** unstable
- **Total White Count** <4 or >12 (if abnormal, a trend towards normal and without neutropenia is acceptable)

S Specific exclusions (Refer *Exclusion List*)

Exclusion List

Special indication requiring high dose IV therapy

- E.g. endocarditis, meningitis, *Staph aureus* bacteraemia, immunosuppression, bone/joint infection, deep abscess, cystic fibrosis, prosthetic infection, empyema

Febrile neutropenia

Hypotension/shock

- A low blood pressure is associated with reduced blood flow to the gut and reduced/unpredictable drug absorption

For skin and soft tissue infections:

- For oral switch, it is recommended that signs and symptoms are improving, with a reduction in heat, erythema and induration

Appendix 1

***Choice should ALWAYS take into consideration of culture & sensitivity results
OR intended spectrum of microbial coverage**
(may also use antimicrobials not listed in this table)

IV Antibiotics	Suggested Oral Alternative(s)
Benzylpenicillin	Phenoxyethylpenicillin / Amoxycillin
Cloxacillin	Cloxacillin
Ampicillin	Amoxycillin
Co-amoxiclav / Ampicillin-sulbactam	Co-amoxiclav / Ampicillin-sulbactam
Cefazolin	Cephalexin
Ceftriaxone	Co-amoxiclav / Cefuroxime*
Metronidazole	Metronidazole
Fluconazole	Fluconazole
Clindamycin	Clindamycin
Ciprofloxacin	Ciprofloxacin
Azithromycin	Azithromycin
Pip-tazo / Cefepime / Ceftazidime	Ciprofloxacin (if PAE) / others*
Sulfamethoxazole-trimethoprim	Sulfamethoxazole-trimethoprim

9. Surgical Antibiotic Prophylaxis

Aim: To prevent surgical site infections (SSIs)

Class of Surgery: Clean surgery or Clean-contaminated surgery

Clean	Operations in which no inflammation is encountered and the respiratory, alimentary or genitourinary tracts are not entered. There is no break in aseptic operating theatre technique.
Clean-contaminated	Operations in which the respiratory, alimentary or genitourinary tracts are entered but without significant spillage.

*This document not applicable to contaminated or dirty surgeries in which antibiotic treatment is required.

General points:

1. Not all surgeries require antibiotic prophylaxis

- Recommendation depends on evidence of clinical effectiveness of prophylactic antibiotics in reducing incidence of SSIs.
- Antibiotic prophylaxis should be used where evidence of benefit exists and should not be considered if there is evidence of a lack of efficacy. This helps to avoid unnecessary use of antibiotics.

2. Preoperative-dose timing for antibiotic

- The antimicrobial agent should be given **within 60 minutes before surgical incision**.
- Except for fluoroquinolones and vancomycin, which require administration over 1 to 2 hours, the administration of these agents should begin within 120 minutes before surgical incision.
- This is important to ensure adequate serum and tissue concentration of the antimicrobial at the time of incision.

3. Intra-operative re-dosing

- Re-dosing is required when **duration of procedure exceeds two half-lives of the antimicrobial** or
- When there is **excessive blood loss** during procedure i.e. more than 1.5L of blood in adult or more than 25ml/kg in children.
- This is important to ensure adequate serum and tissue concentration of antimicrobial throughout surgery.

4. Duration of prophylaxis

- Generally requires only a single dose pre-op or continuation for not more than 24 hours.

5. References

- 1) Clinical practice guidelines for antimicrobial prophylaxis in surgery.
Bratzler et al. Am J Health-Syst Pharm. 2013; 70:195-283.
- 2) SIGN 104. Antibiotic Prophylaxis in Surgery 2014.

10. Bits and Pieces from Microbiology Laboratory

MAXIMUM TRANSPORTATION TIME TO MICROBIOLOGY LABORATORY

TYPES OF SPECIMEN	TIME TO THE LAB
<u>SPECIMENS WITHOUT PRESERVATIVES</u>	Within 4 hours
Urine, Sputum, Body Fluid, Tissue, etc	
<u>SPECIMENS WITH PRESERVATIVES</u>	Blood – Within 48 hours
Blood & Swabs	Swabs – Within 18 hours
Pertussis Culture	Immediately

Remember: Sending cultures **ASAP** to the microbiology lab:

- helps to reduce contamination risk and
- allows for an earlier positive growth (if any) to further guide antimicrobial therapy

LABORATORY TURN AROUND TIME (TAT) FOR NEGATIVE RESULTS

TEST	TAT
URINE	24 HOURS
WOUND, SPUTUM, TISSUE, SWABS, ASPIRATES, BAL, STOOL, RECTAL, STERILITY	48 HOURS
CSF, BODY FLUID & GENITAL	72 HOURS
BLOOD	120 HOURS (5 DAYS)
FUNGAL	14 DAYS
TB CULTURE	8 WEEKS

REJECTION CRITERIA FOR CULTURE SAMPLES

- Unlabeled Specimen
- Leakages from Specimen
- Specimen without request form
- Request form without specimen
- Patient's Name on request form differs from label on specimen
- Incorrect containers used for specimen storage

For enquiries, please call microbiology lab at Ext: 3019 or 3022

11. Do's and Don'ts In Antibiotic Prescribing

DO...	DON'T...
...ASK yourself if the patient is having bacterial infection before starting antibiotic	...PRESCRIBE antibiotic for viral infection
...CHOOSE antibiotic based on the likely bacteria you are targeting and the likely resistance pattern	...PRESCRIBE antibiotic just because patient has fever or high TWC
...TAKE appropriate culture before starting broad spectrum antibiotics	...USE broad spectrum antibiotic unnecessarily
...LABEL culture bottles and forms properly to avoid rejection	...USE antibiotic with collateral damage if possible e.g. cephalosporin and quinolone group
...SEND collected sample especially urine and body fluids to laboratory within 2 hours of collection to avoid bacteria contamination	...FORGET to stop the antibiotics when the bacterial infection has resolved or is unlikely
...TRACE culture result on daily basis especially for patient with broad spectrum antibiotics	...FORGET to ask for proper drug allergy history
...DE-ESCALATE to narrow spectrum antibiotic once culture result available	...FORGET to adjust dose of antibiotic in presence of renal or liver impairment
...CHANGE to oral antibiotics for patient who fulfil IVOS criteria	...FORGET to refer if unsure what to use or do for the patients

ABOVE ALL, ALWAYS REMEMBER to perform **5 moments of hand hygiene** and **contact precaution** to prevent spread of drug resistant organisms

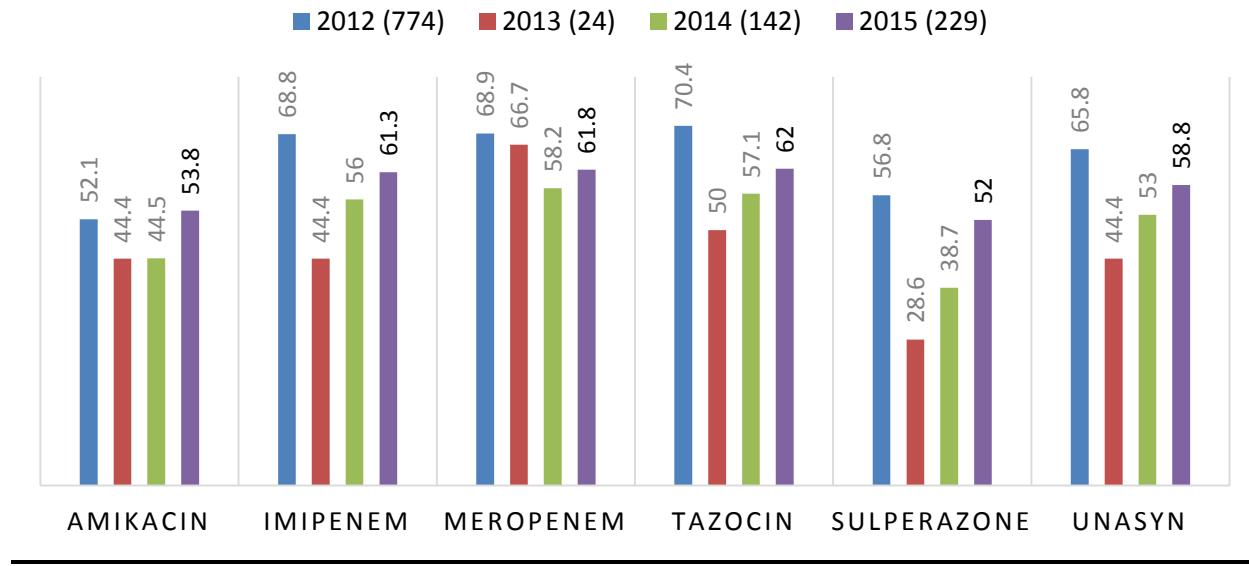
12. SGH Antimicrobial Formulary Restriction List

(updated June 2015)

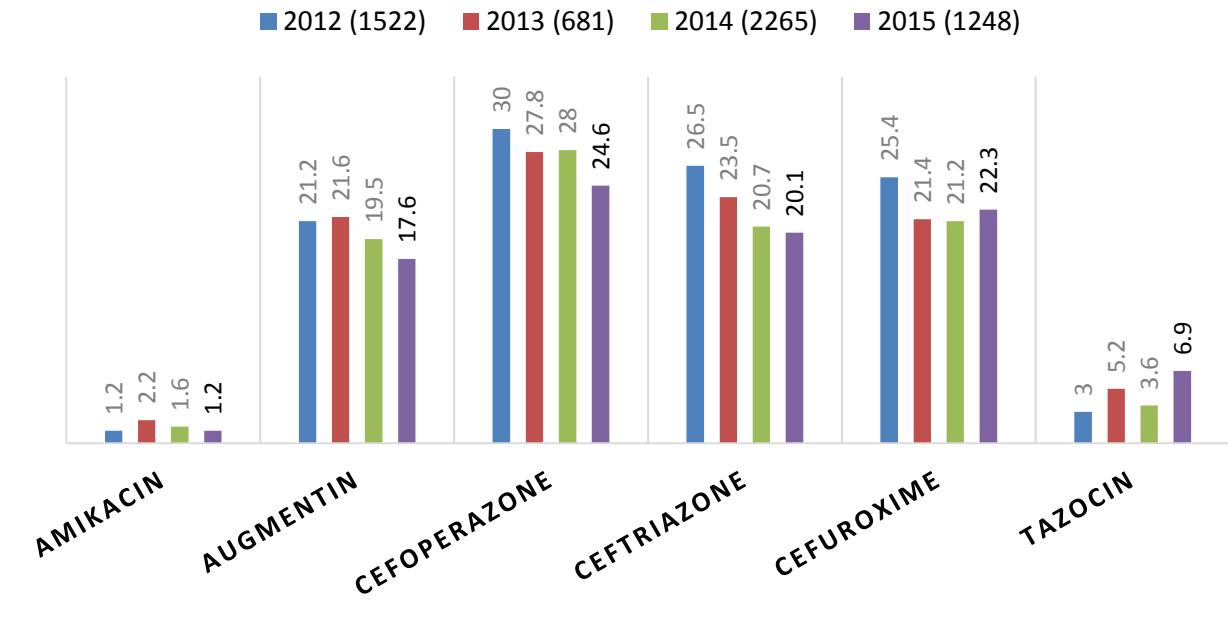
CATEGORY I PREAUTHORIZATION	CATEGORY II CONDITIONAL	CATEGORY III AVAILABLE
*All carbapenems Polymyxin B Colistin Ceftaroline Linezolid Tigecycline Daptomycin Levofloxacin Moxifloxacin Anidulafungin Caspofungin Micafungin	All carbapenems Piperacillin/ Tazobactam Cefepime Inj. Ciprofloxacin Vancomycin	All other antimicrobials
Description		
Can only be prescribed by authorized prescriber for preapproved indications. *Refer to carbapenem preauthorization and 72-hour review policy 2011	Can be prescribed only for specific indications. Will auto-generate a referral to the stewardship team which will review the patient within 3 working days.	Do not require approval

13. SGH Antibiogram (data till September 2015)

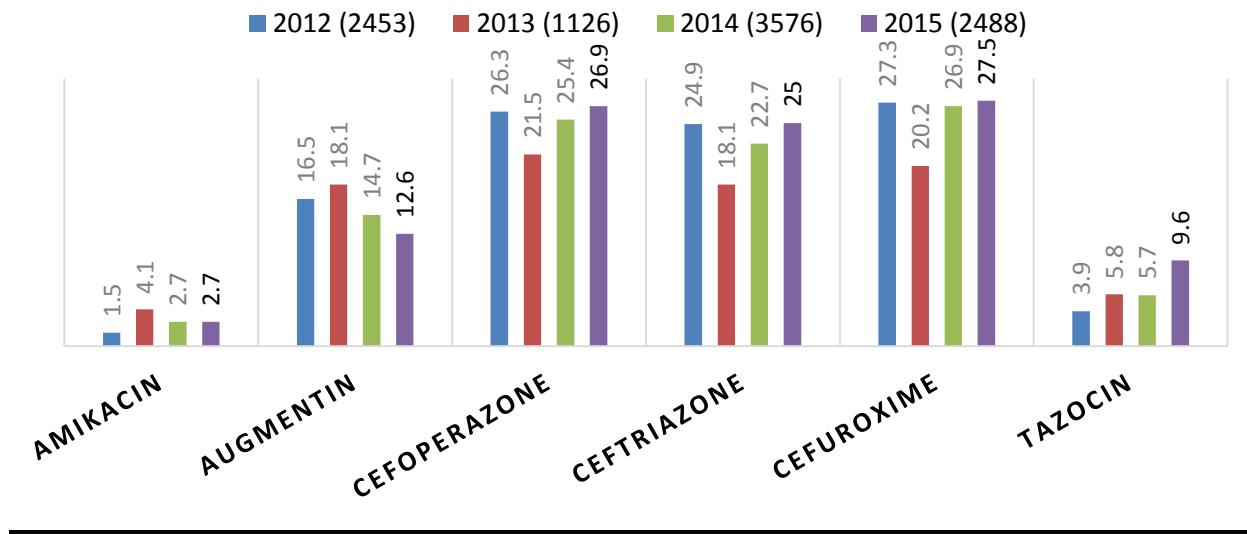
% RESISTANCE OF *ACINETOBACTER BAUMANNII* - SGH



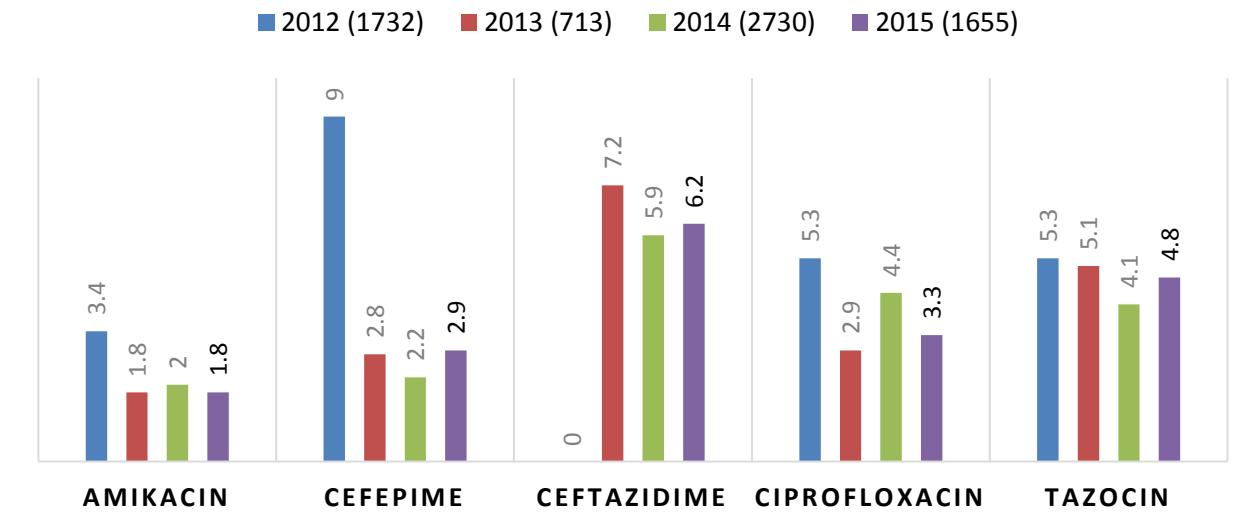
% RESISTANCE OF *ESCHERICHIA COLI* - SGH



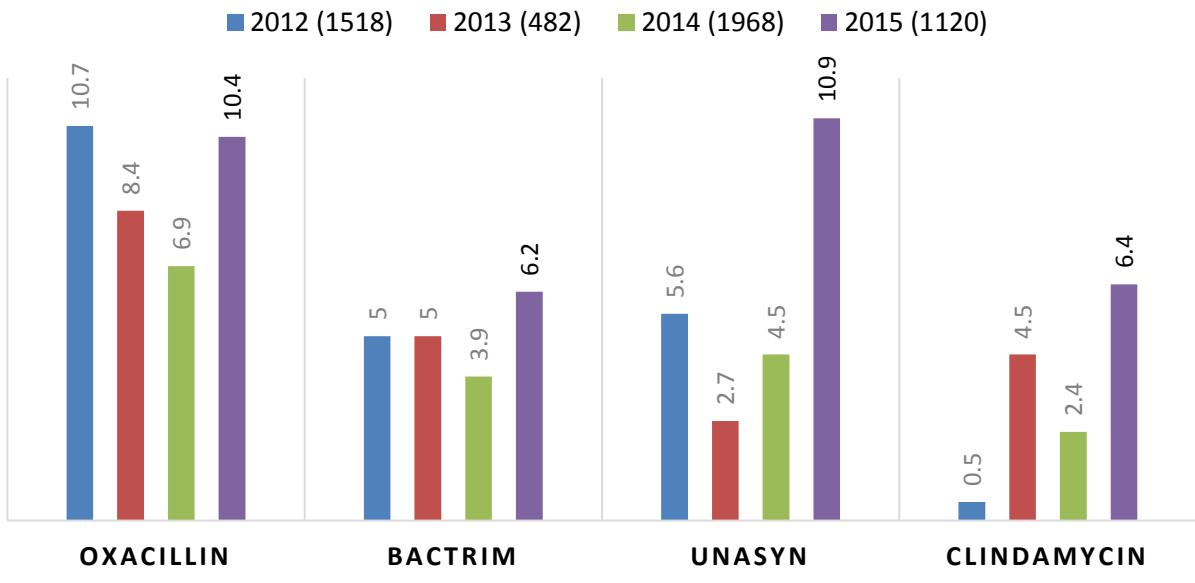
% RESISTANCE OF *KLEBSIELLA PNEUMONIAE* - SGH



% RESISTANCE OF *PSEUDOMONAS AERUGINOSA* - SGH



% RESISTANCE OF *STAPHYLOCOCCUS AUREUS* - SGH



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