Ocular Antibiotics

The Charles T. Campbell Ophthalmic Microbiology Laboratory

Regis P. Kowalski, MS,[M]ASCP

Associate Professor of Ophthalmology

Associate Medical Director of The Charles T Campbell Laboratory

University of Pittsburgh, Pittsburgh, PA

Reading Materials for Ocular Antibiotics

- CORNEA – Krachmer, Mannis, & Holland, 2nd edition, Volume 1

- The CORNEA – Smolin and Thoft, 4th edition

- **Kowalski RP**, Yates KA, Romanowski EG, Karenchal LM, Mah FS, Gordon JS. An Ophthalmologist's Guide to Understanding Antibiotic Susceptibility and Minimum Inhibitory Concentration (MIC) Data. Ophthalmology 2005:112:1987-1991.

Definitions

- Antibiotics – natural targets –-penicillins
- Anti-infectives – chemically design fluoroquinolones
- Biocides – Indiscriminant Killers

  Chlorine, HCl, polyhexamethylene biguanide (PHMB)

Definitions

- Antiseptics – topical disinfectants

  povidone iodine, alcohols, ammonium compounds, boric acid, chlorhexidine gluconate, H_2O_2, mercurochrome, phenol compounds, octenidine dihydrochloride, NaCL, sodium hypochlorite, calcium hypochlorite, sodium bicarbonate

What Are the Types of Treatments Used in Ophthalmology?

- Topical – Most common (conjunctivitis, keratitis, blepharitis, prophylaxis)
- Intra-vitreal injection – endophthalmitis
- Systemic – not commonly used
- Subconjunctival – used to provide a constant flow of anti-infective to ocular surface.

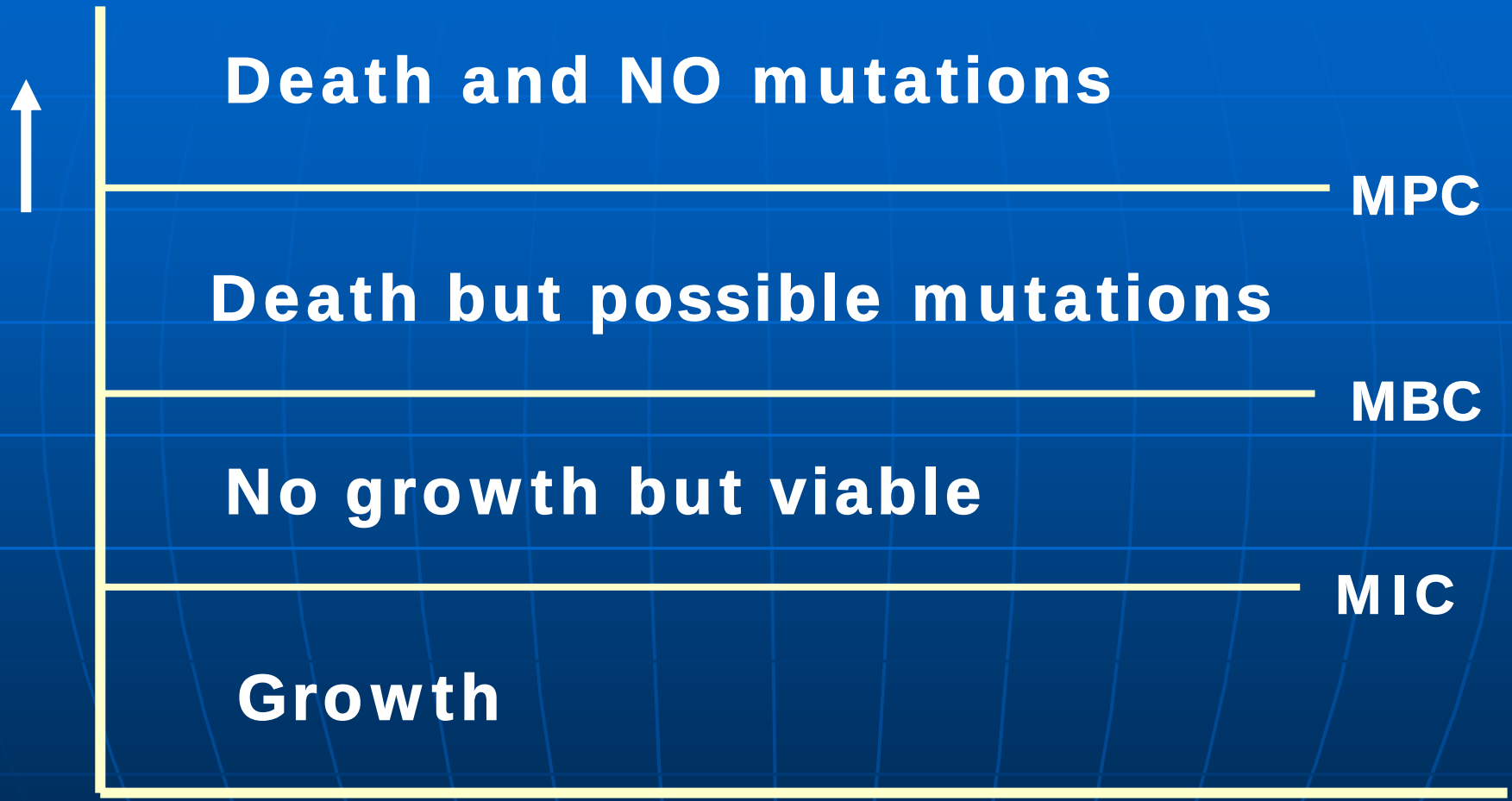
How is Antibacterial Susceptibility Assessed in Ophthalmology?

- Antibiotics – No Topical Standards for Interpreting Susceptibility

- Use Serum Systemic Susceptibility Standards - But we must assume that “The antibiotic concentrations reached in the ocular tissue by topical therapy is equal to or greater than the concentration of antibiotic in the blood serum”.

- Ocular antibiotics are developed from systemic antibiotics for conjunctivitis, keratitis

What Are the Important Susceptibility Descriptive Statistics?



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What are the important Antibiotic Parameters?

- Concentration–dependent
  fluoroquinolones, aminoglycosides
- Time-dependent
  vancomycin, cefazolin
- Bactericidal – kill
  FQs, vancomycin,
- Bacteristatic – inhibit
  erythromycin, azithromycin, sulfa

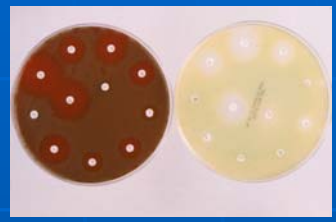
What are the Factors for Resistance of Bacteria?

- A function of the anti-infective mechanism,
- Target bacteria,
- The ocular tissue, and
- The treatment regimen.

What Anti-Infectives are used to treat ocular infections?

Keratitis	Endophthalmitis	Conjunctivitis
bacitracin	vancomycin	bacitracin
vancomycin	gentamicin	erythromycin
ciprofloxacin	ciprofloxacin	gentamicin
ofloxacin	ofloxacin	ciprofloxacin
polymyxin B	cefazolin	ofloxacin
cefazolin	amikacin	trimethoprim
tobramycin	ceftazidime	polymyxin B
sulfisoxazole	cefoxitin	tobramycin
cefoxitin	ampicillin	sulfisoxazole
gentamicin	clindamycin	azithromycin
gatifloxacin	gatifloxacin	gatifloxacin
moxifloxacin	moxifloxacin	moxifloxacin

What methods are used to test antibacterial susceptibility?



Disk Diffusion

- Mueller Hinton
- Mueller Hinton with 5% Sheep Blood
- HTM

MIC Testing

- Broth dilution
- Agar Dilution
- E-Tests

Class	Mode of Action	Primary Indication besides conjunctivitis
Fluoroquinolones (ciprofloxacin, ofloxacin, levofloxacin, gatifloxacin, moxifloxacin) besifloxacin	DNA synthesis bactericidal	keratitis, surgical prophylaxis Broad-spectrum coverage
Aminoglycosides (gentamicin, tobramycin, amikacin)	protein synthesis cell wall bactericidal	keratitis, endophthalmitis surgical prophylaxis Broad-spectrum coverage
Cephalosporins (cefazolin, ceftazidime)	cell wall bactericidal	keratitis, endophthalmitis Gram-positive coverage
Glycopeptides (vancomycin)	cell wall bactericidal	keratitis, endophthalmitis MRSA prophylaxis Gram-positive coverage
Macrolides (erythromycin, azithro)	protein synthesis bacteristatic	blepharitis Gram-positive coverage
Peptides (bacitracin, polymycin B)	cell wall bactericidal	blepharitis, keratitis Bac – GMpos PB – GMneg
Sulfa drugs (sulfacetamide)	enzyme inhibitor bacteristatic	keratitis, 2nd – line MRSA Broad-spectrum coverage

What Antifungal Drugs are used for treating fungal infections?

- Polyenes
  - damage membrane (allows leakage)
  - penetrate cornea poorly
  - amphotericin B and natamycin
  - topical, intravitreal, subconjunctival, IV
- Imidazoles
  - damage membrane (permeability)
  - miconazole (topical, intravitreal, subconj)
  - ketoconazole – better permeability - oral

Antifungals

- Triazoles
  - damage membrane (permeability)
  - fluconazole - oral
  - itraconazole – oral, IV
  - voriconazole – oral, topical
- Fluorinated Pyrimidine
  - inhibits thymidylate synthase –DNA
  - fungi require a permease for penetration
  - flucytosine – oral and topical
  - adjunct to amphotericin B

What Anti-Amoebic Drugs are used to treat acanthamoeba?

- Polyhexamethylene biguanide 0.02% PHMB
- Chlorhexidine
- Propamidine isethionate 0.1%
- Topical dibromopropamidine 0.15% ointment
- Antibacterials (neomycin; neomycin-polymyxin B-gramicidin;
- Antifungals natamycin, imidazoles, triazoles

Thank You !!