



Infectious Diseases

- Antimicrobial Program
- Transplant Infectious Diseases
- Clinical Studies
 - Rifaximin vs vancomycin for *C. difficile*
 - Isavuconazole for Candidemia (8/07)
- Resident Projects
 - Database studies
 - Case studies

Your Notes:

- Document infection being treated
 - Site, source or disease process
 - FUO should not get antibiotics
 - Cultures and main sensitivities if available
- Document antibiotics being used
 - Give a length of therapy (day 5 of 7)
 - Note levels – ordered, drawn and results

Costs of Antibiotics

- Linezolid – po \$80/ day, IV \$130 day
- Daptomycin \$120/ day
- Voriconazole po \$50/ day, IV \$150/ day
- Micafungin \$150/ day
- Caspofungin \$430 day 1, \$ 300 after/day
- AmBisome \$1200/ day
- Abelcet \$200/day
- Vancomycin \$15/day
- Imipenem \$ 100/day



Non Formulary Antibiotics

- Ceftazidime
- AmBisome (Only order in Cancer Center)
- Synercid
- Timentin
- Tobramycin
- Chloramphenicol
- Caspofungin
- Streptomycin

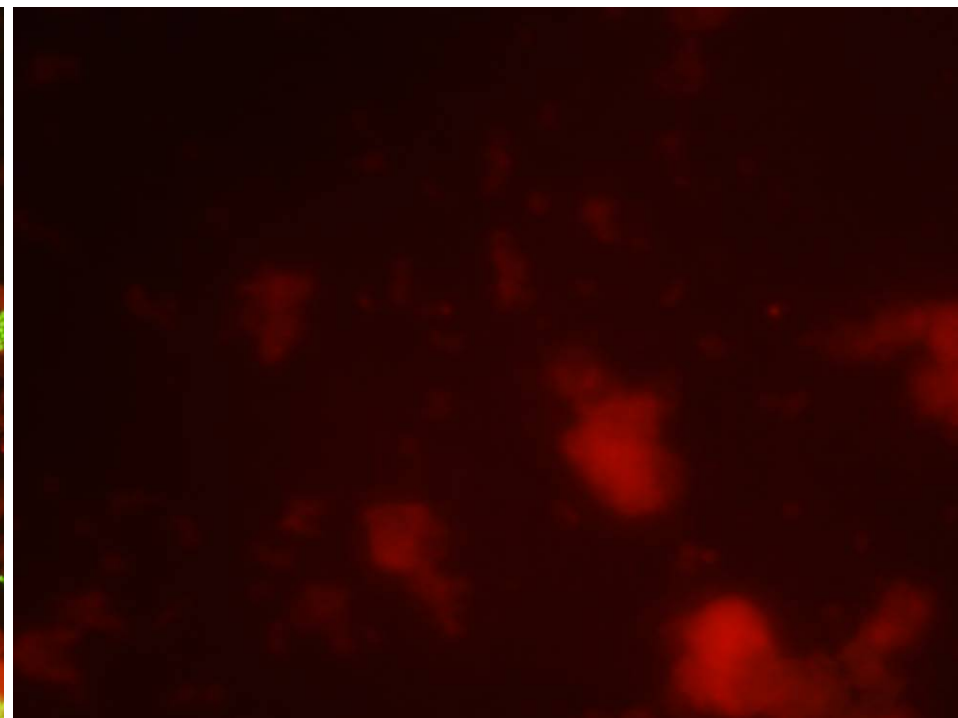
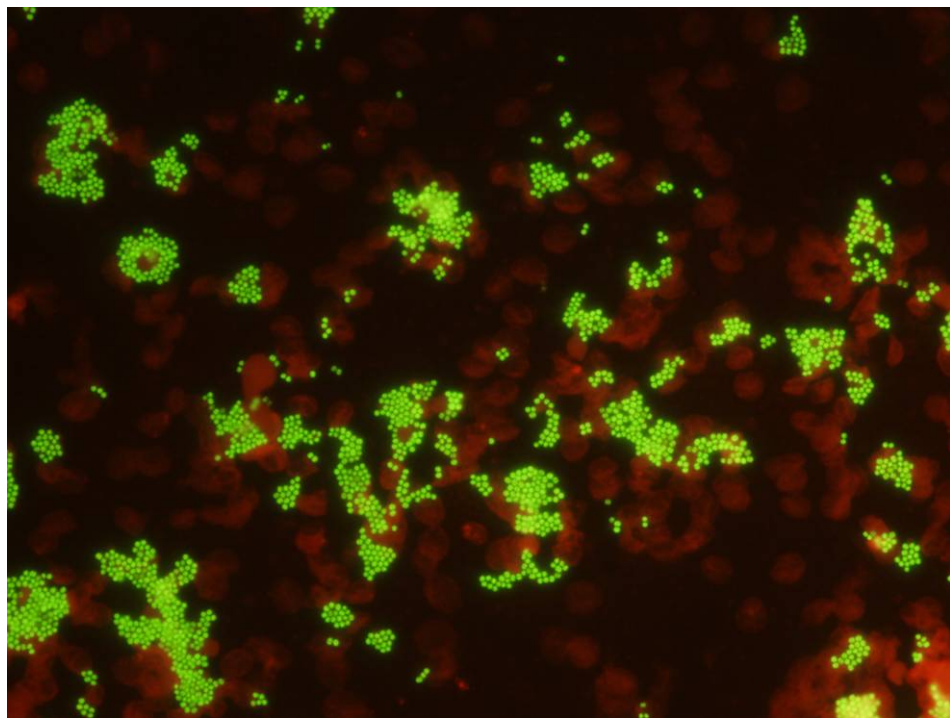
PNA FISH

- Peptide nucleic acid in situ Hybridization assay
- Rapid diagnosis of *S. aureus*, *C. albicans* and *E. faecalis* in 150 min from blood cultures
- Can utilize in management with negative results
- Can not be run on other cultures
 - Future advances – Pseudomonas and E. coli
- Reported as positive or negative by In-situ hybridization
- Run twice a day (9 AM and 3 PM), Not in VA

S. aureus PNA FISH

S. aureus

CONS



S. Aureus FISH

■ **S. aureus Test:**

- If patient is IVDA, likely positive
- If catheter related GPCCI, can await test result and remove line if not already removed
- No vancomycin for FISH negative stable patients or 1 dose pending test
- 3 -5 days maximum for most line infections

■ **CNS in blood only treated if following:**

- Known endocarditis
- Prosthetic heart valve
- AICD or pacemaker in last year
- Irremovable recent intravascular graft or dialysis catheter
- LVAD

C. albicans FISH

■ *C. albicans* Positive

- If clinically stable, can await test result
- 50% isolates at UMMS *C. albicans*
- Fluconazole 1st line therapy

■ *C. glabrata* positive (Coming in August!)

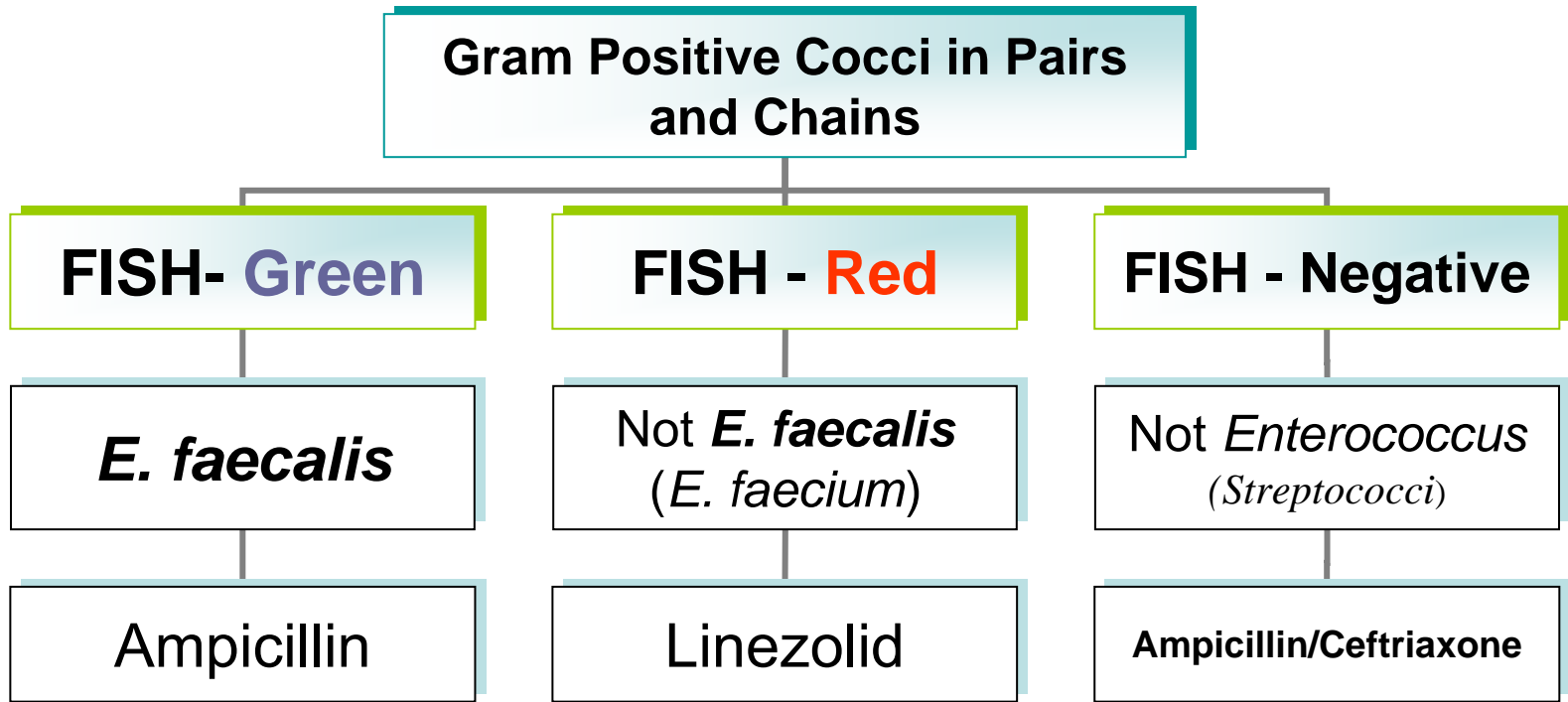
- Start micafungin
- Change when susceptibility returns when possible

■ Non *C. albicans/glabrata* – Fluconazole unless

- Recent transfer from outside hospital
- Clinically unstable
- Recent fluconazole use

Do Not Use Micafungin for yeast in blood in AIDS patients- Cryptococcus

Enterococcus Treatment Algorithm



Case 1

- 65 yo man, DM, HTN, CAD
- Admitted CAP, RLL with T = 103.5, HR 120, BP 95/75, Pox 90% on 2 L
- CXR- RLL pneumonia
- Started Ceftriaxone/azithromycin 2 days earlier
- BC +ve GPC Pairs and Chains
- Tonight – T 101.9, HR 80, BP 130/76, Pox 98% on room air
- Sputum Cultures – +ve for *S. aureus*

What to do?

- Add Vancomycin
- Change to Moxifloxacin and clindamycin and stop Ceftriaxone
- Add Moxifloxacin
- Change ceftriaxone and azithromycin to oral cefpodoxime
- Change to zosyn and vancomycin

Do Not Flip-Flop!



Kerry's. *When you're serious about Flip Flops.*

A close-up photograph of a person's feet wearing blue flip-flops with black straps. The left strap has the text "John Kerry" printed on it. The person has red nail polish and a silver ring on their left foot. They are sitting on wooden steps outdoors.

They'll change your mind.
Over and over again.



Zosyn and Vanco

- **Lame excuse for not thinking!**

Oral Antibiotic Absorption

- Amoxicillin 74-90%
- Doxycycline 90-100%
- Metronidazole 95%
- Azithromycin 35-50%
- Ciprofloxacin (Susp) 85%
- Moxifloxacin 90%
- Fluconazole (Susp) 95%
- Voriconazole (Susp) 95%
- Linezolid (Susp) 99%

Common Errors

- **FEVER** is NOT an illness, it is a sign of illness
 - non-specific, HOST response to inflammation
 - not always an infectious cause – drug, tumor, lupus
 - May be natural course of disease process
 - Even if infectious does not necessarily need antibiotics right away – ie SBE
- No need to “cover everything”
 - most likely (not every) organisms implicated in disease

Do Not Panic!

- Know natural history of disease
 - Urosepsis
 - pneumonia
- 20% people colonized with *S. aureus*
- We do PCR for MRSA from nose so do not need to start vancomycin if negative
- Minimize therapy ASAP
- Antibiotics take time to reach steady state
 - 5 half-lives

Patient Assessment before starting antibiotics

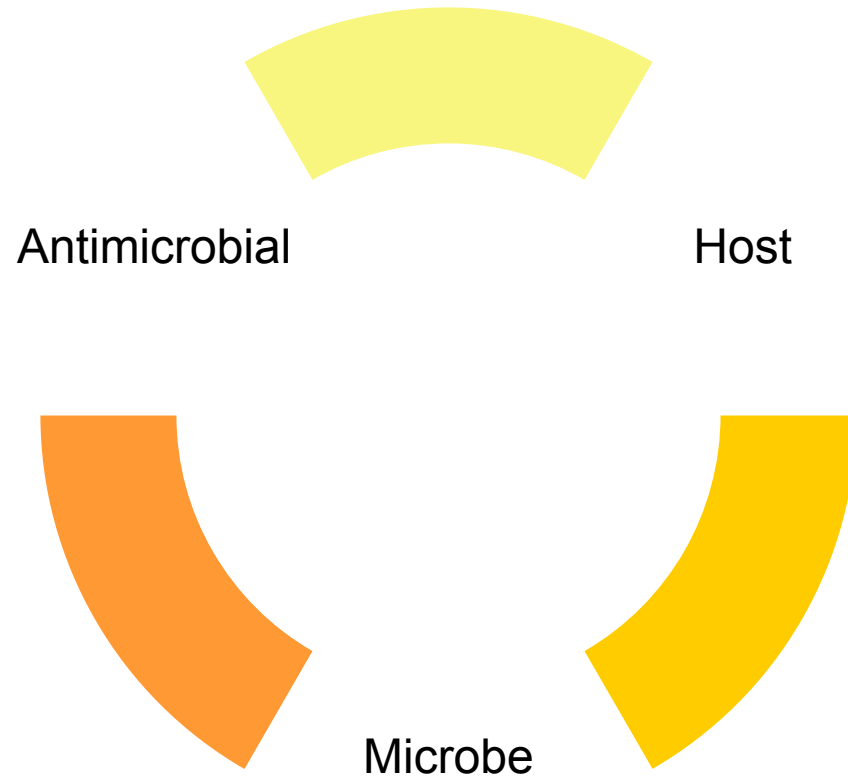
1. What is the host's risk factors
 1. Nursing home vs community
 2. Hospital acquired
 3. Immunosuppression
2. Is there a change in their condition
 1. Change in vitals from baseline
 2. Increased oxygen requirements
3. Natural history of the disease
 1. How does the body resolve the process

Don't Treat Spike!



Fever Spikes

- Do not Treat Spikes
 - A term taken from cancer center and applied liberally
- Assess clinical syndrome
 - Change in vitals
 - Sustained elevation despite antibiotics
 - Clinical deterioration
- What is the disease pathophysiology
 - Pneumonia may “spike” for several days
 - Endocarditis may have fevers for a week
- Do not add antibiotics
 - Review length of therapy and coverage
- Remove unnecessary lines



Reasons for antibiotic failure

- Wrong Drug for Bug
 - Ceftriaxone for Pseudomonas
 - Imipenem for Stenotrophomonas
- Wrong Dose
 - Underdosed or overdosed
 - Beware Kidney function in elderly and low albumin
- Penetration of site
 - Aminoglycosides and lung
 - Renal failure and treating bladder slime
 - Antibiotics do not treat gangrene
- Emergence of resistance
 - Occurs rarely! Often in high burden infections after 10 to 14 days of therapy
 - Does not occur after 1 dose!!

Case 2

- 60 YO man admitted to MICU
- Transferred from Outside hospital
- BP 90/70, HR 120, T 102F
- Decreased AE bilaterally
- CXR – clear
- Creatinine 8.6, WCC 32
- Tracheostomy
- Right Femoral line present for 3 weeks for IV antibiotics
- Transfer antibiotics – ceftazadime, aztreonam, amikacin, caspofungin, linezolid, vancomycin,

What are you going to do?

Th!nk

BREATHE

- Do Not Repeat Other peoples Mistakes!
 - DO not rewrite orders from ER
 - Do not write same orders from outside hospitals
- Review cultures sent
- Call Outside Hospital in AM and Get Micro data
- Get ID Help
- Make sure diagnosis is correct!

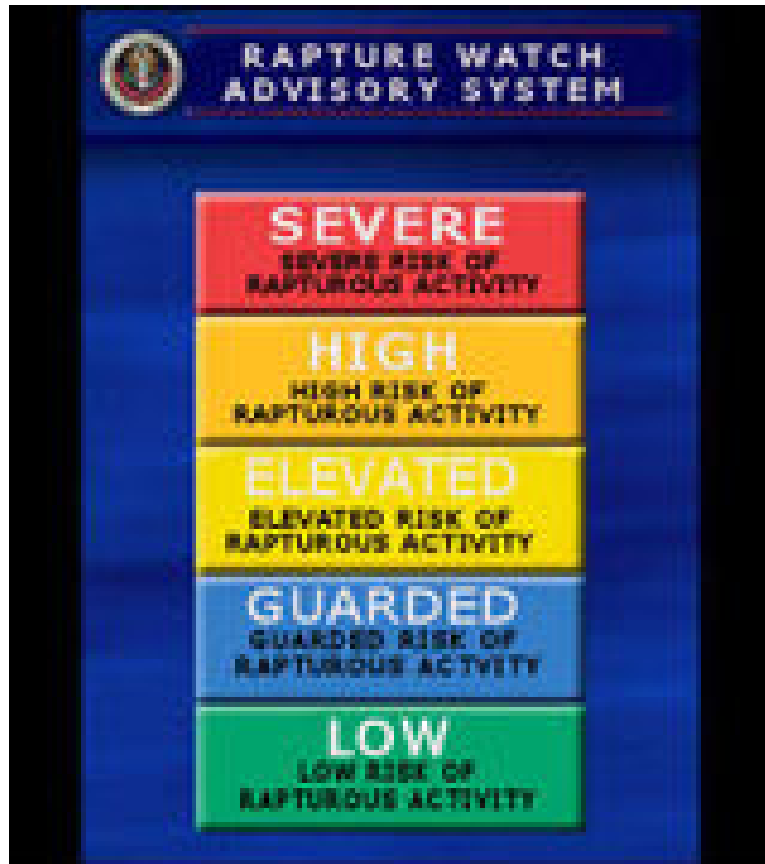


Cultures

- Tracheostomy – Enterococcus, yeast and MDR Pseudomonas
- Urine – Enterococcus, yeast and CNS
- Blood cultures –
 - Line – CNS and yeast
 - Peripheral - yeast



Faith Based Medicine and Antibiotic Resistance? Is there really any difference in outcomes



MDR Acinetobacter

MDR Pseudomonas

MRSA

Penicillin resistant

Pneumococcus

VRE

Pseudomonas aeruginosa

- Ampicillin/sulbactam – R
- Ciprofloxacin & Moxifloxacin– R
- Cefepime – R
- Aztreonam – R
- Amikacin and Gentamicin – R
- Pip/tazobactam – R
- Imipenem – R
- Timentin - R

Treat infection not colonization

- Treat urinary tract infection not the catheter
 - Urinary catheters are often colonized
 - Rarely UA done
- Treat bacteremia not the catheter tip or hub
 - Central line hubs are often colonized
- Treat pneumonia not the culture
 - Patients who are intubated are often colonized
 - Tracheostomies are always colonized
- Treat Osteomyelitis not superficial culture
 - Superficial skin culture are contaminated

Treatment Lengths

■ Empiric

- Stop if cultures are negative within 72 hours
- Look for other causes
- No need for vancomycin if no MRSA!

■ Documented

- Endocarditis, Meningitis – defined lengths
- Candidemia – 14 days
- VAP – 8 vs 14 days
- Osteo - ?
- Community pneumonia – 3 vs 7 days

Question ?:

- Which is better?
- Imipenem or Zosyn?
- Vancomycin or nafcillin for *S. aureus*?
- Ampicillin or Vancomycin for *E. faecalis*?
- Moxifloxacin or ceftriaxone for pneumonia?
- Linezolid or Vancomycin for VAP?

Terms to Avoid

- “The drug always works”
 - Name a 100% effective antibiotic
 - It’s the host – age, immunocompromised state
- “It’s a better antibiotic!”
 - Define better – tolerability, administration, side-effects, drug-interactions
 - All antibiotic studies are non-inferiority
- “I added vanco for broad coverage!”
 - It only gets Staphylococci, Streptococci and some Enterococci
 - And it is not that effective!

SPACE

- Serratia
- Pseudomonas
- Acinetobacter
 - Multi-drug resistant often
- Citrobacter
- Enterobacter
 - Avoid 2nd or 3rd Generation cephalosporins

SPACE Therapy

▶ 1st Line

- Zosyn, cefepime or Imipenem

▶ 2nd Line

- Quinolone, aminoglycoside, Aztreonam, Tigecycline?

▶ 3rd Line

- Polymyxin B

▶ 4th Line

- Hope

Double Coverage Therapy

- ▶ No Proof increases survival
- ▶ No Proof decreases resistance
- ▶ Beneficial in Empiric Therapy until Sensitivities known
 - ▶ Would do if NH or Vent facility patient comes with sepsis until susceptibilities known
 - ▶ No benefit in community acquired infections
- ▶ Only benefit is in Enterococcal endocarditis

Case 3

- 75 yo NH resident admitted for CVA.
- Edentulous
- Tube feeds started
- Found in respiratory distress and “tube feed” in mouth and larynx on intubation
- WCC 17,000, T 101.5, Resp 30
- CXR – diffuse infiltrates

Aspiration pneumonia

- Majority of cases are chemical
 - May have fever, WCC and infiltrate
- Oral anaerobes need teeth
- **Marik, Chest 1999;115:178** - VAP study
 - Protected brush specimen with BAL
 - Quantitative anaerobic cultures
 - 1/178 patients grew an anaerobe
 - Most GNR and *S. aureus* – clindamycin failed
- ATS guidelines DO NOT recommend anaerobic coverage in nosocomial cases

Anaerobic Double Coverage?

- Increasing prevalence in practice
- No data or guidelines supporting this practice
- No evidence that clindamycin resistant *B. fragilis* can not be treated with standard therapy
- Air works – ie drain abscesses
- Inappropriate combinations
 - Piperacillin/tazobactam and metronidazole **or** clindamycin
 - Imipenem and metronidazole **or** clindamycin
 - Ampicillin/sulbactam and metronidazole **or** clindamycin
 - Clindamycin and metronidazole
 - Moxifloxacin and flagyl



Last Case

- 27 yo woman, IVDU
- T 102, HR 100, BP 90/70
- Septic Emboli on CXR
- GPC in clusters in 1/2 blood cultures
- FISH Positive

S. Aureus Bacteremia

- ALWAYS get follow up blood cultures until clear (especially MRSA)
- It is NEVER a contaminant regardless of number of positive cultures
- Must treat 2 Weeks from last positive culture
 - 33% relapse if treated less
- Caution with Gentamicin
 - If cleared bacteremia do not add as no benefit
 - No longer than 5 days
- DO Not add rifampin



BRITNEY SPEARS



TOXIC



GENTAMICIN POISONING

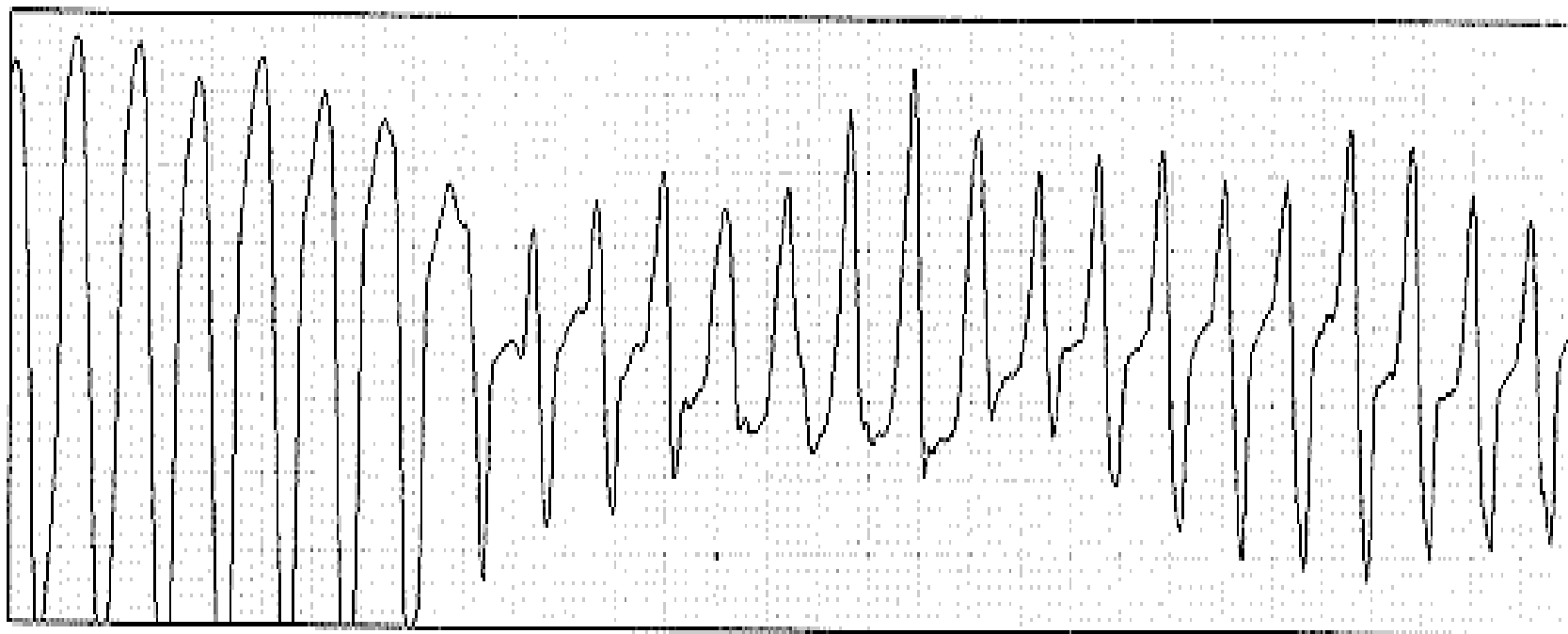
ARE YOU A VICTIM OF GENTAMICIN POISONING?

If you, a member of your family, or a friend was prescribed Gentamicin and is experiencing difficulty with balance while walking, bouncing vision (oscillopsia), hearing loss, or kidney damage, Gentamicin-induced ototoxicity, vestibular toxicity, or nephrotoxicity is a genuine concern. If you feel you have suffered injury as a result of the negligent prescription or administration of Gentamicin please feel free to call the attorneys at or fill out the [intake form](#) on our Contact Us page.

Aminoglycoside Use

- MUST document reason for using
- Daily dosing for Gram Negative preferable
- MUST check and note levels
- Do not use Creatinine to base dose
 - need creatinine clearance
- If using for *S. aureus* synergy, STOP once bacteremia has cleared or 5 days at most
 - NO prolonged therapy, of no benefit
- Ask pharmacy for help

Just Add Another Antibiotic – It can't hurt!



Antibiotic Side-effects

- Fever
- Rash, allergic reactions and anaphylaxis
- Renal failure and interstitial nephritis
- Ototoxicity and vertigo
- Torsade's
- C. difficile colitis
- Liver failure
- Aplastic anemia
- Neuropathies
- Myopathies

Basic Principles

- Correct Antimicrobial
 - Site, host and bug
- Correct Dose
 - Adjust for liver and renal function
- Correct Duration
- Correct disease and process
- Correct Site
- Watch for Drug Interactions
- Don't Panic
 - Takes 5 half lives to reach steady state
 - Takes most antibiotics 45-60 mins to reach peak levels

Antibiotic Prescribing is Directly Proportional to Drug Rep's Looks



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