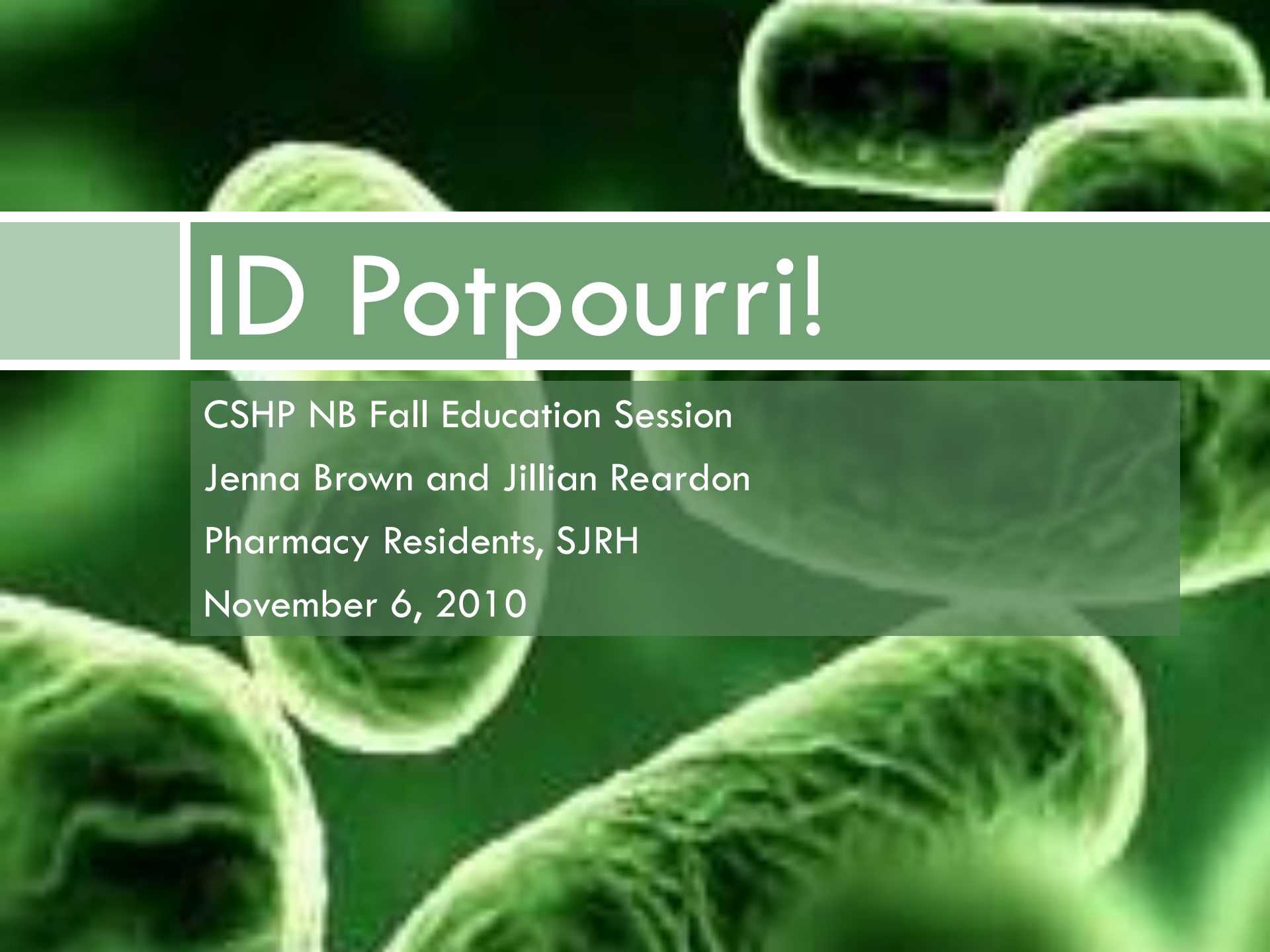


ID Potpourri!

CSHP NB Fall Education Session

Jenna Brown and Jillian Reardon

Pharmacy Residents, SJRH

November 6, 2010

The following presentation has been rated

	**RESIDENT**
	Disclaimer: We are pharmacy residents, not infectious disease specialists. **Viewer participation, discussion and feedback is strongly advised.**

Learning Objectives

At the end of this presentation you should be able to:

- Identify risk factors for pyelonephritis, cellulitis and bacterial meningitis
- List clinical signs and symptoms of pyelonephritis, cellulitis and bacterial meningitis
- Identify the most common pathogens associated with pyelonephritis, cellulitis (non-diabetic vs. diabetic) and bacterial meningitis
- Design a patient specific antibiotic regimen (drug, dose, frequency, duration, monitoring parameters) to treat a case of pyelonephritis, cellulitis and bacterial meningitis

Case 1

BB, a 27 year old female, presents to the ED with complaints of burning upon urination with lower back pain as well as fever, chills and 3 episodes of vomiting over the past 2 days

Ht: 170 cm Wt: 68 kg

BP: 95/60 HR: 108 Temp: 38.5

LKC: 16 SrCr: 90 CrCl ~90mL/min

Case 1

- **PMHx**
  - GERD
- **Allergies**
  - Sulfa (reaction: hives)
- **Medications**
  - Omeprazole 20 mg po daily
  - Yasmin 28

Case 1

Pyelonephritis is suspected, and a clean-catch mid-stream urinalysis is performed:

Bacteria	$>10^4$ CFU/mL
Color	Straw
Appearance	Cloudy
Odour	Foul smelling
Protein	Trace
Glucose	-
Ketones	-
Nitrites	+
LE	+++
WBC	30
RBC	++
Casts	WBC casts present

ID Talk

What type of cultures, if any, should be obtained?

ID IQ

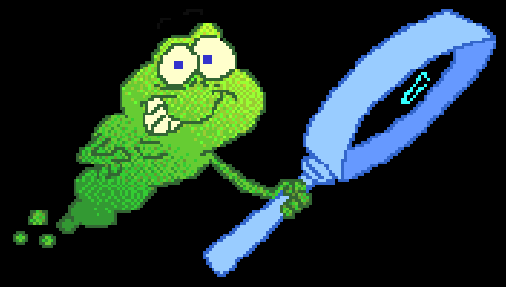
- **Which of the following is a risk factor for pyelonephritis?**

  A. Female

  B. Pregnancy

  C. Sexual Intercourse

  D. All of the Above



Pyelonephritis: Risk Factors

- Female
- Recent UTI
- Sexual Intercourse
- Family History
- Previous Antibiotic Use
- Recent Incontinence
- Urinary Obstruction
- Catheterization
- Pregnancy
- Diabetes

Pyelonephritis: Classification

- **Uncomplicated**
  - Mild: low-grade fever, normal or slightly elevated white count, no nausea or vomiting
  - Severe: systemic involvement, nausea, vomiting

- **Complicated Infections**
  - Elderly
  - Men
  - Catheterized
  - Spinal Cord Injury
  - Obstruction
  - Diabetes
  - Pregnancy

ID IQ

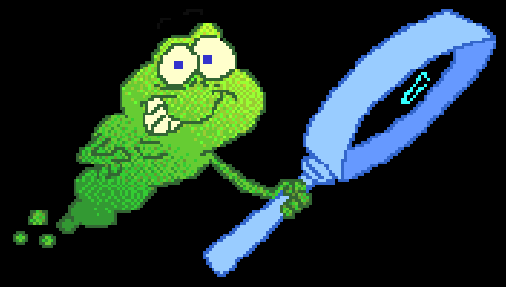
- **Which of the following is NOT true of the symptoms of pyelonephritis?**

A. Symptoms always include frequency, urgency, and dysuria

B. Symptoms of nausea and vomiting are indications for hospitalization

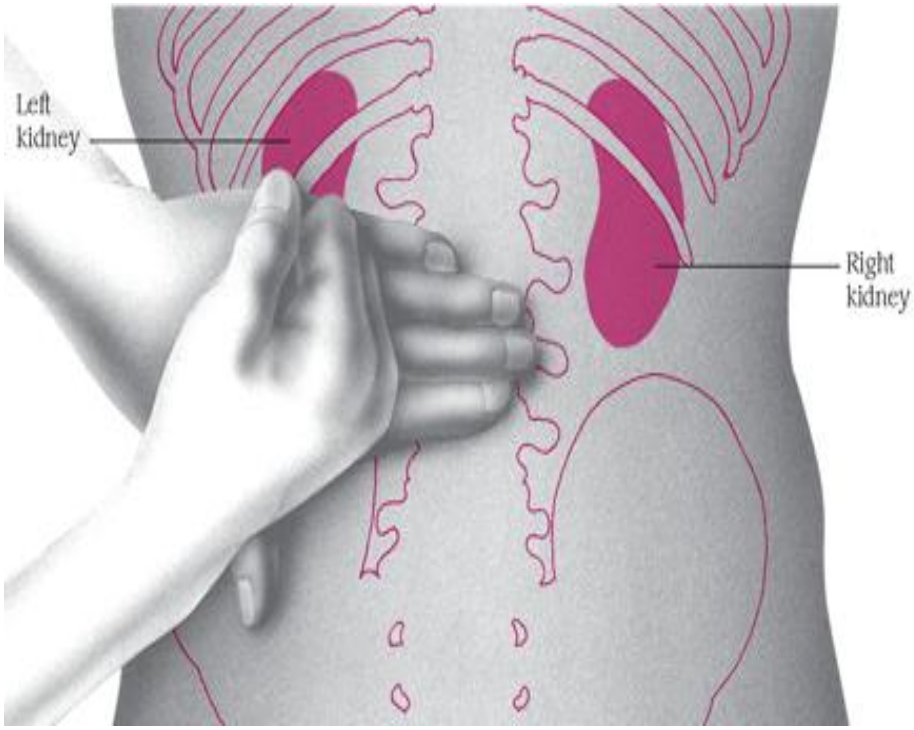
C. Patients often display CVA tenderness on physical exam

D. Fever and chills are common in patients with pyelonephritis



Pyelonephritis: Signs & Symptoms

- Urinary frequency
- Urinary urgency
- Dysuria
- Hematuria
- CVA tenderness
- Fever, Chills
- Nausea, Vomiting
- ↑WBC
- ↑ HR, ↓ BP



ID Talk

Should BB be treated
as an inpatient or outpatient?

ID IQ

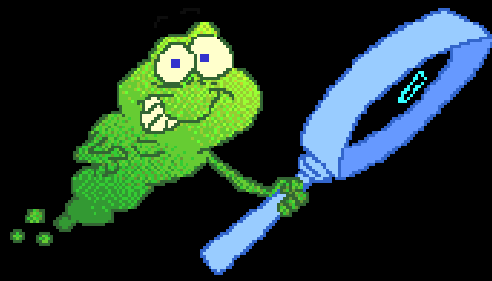
- **Which of the following is NOT a true statement about the bacteria causing urinary tract infections?**

A. Group B strep is a common cause in pregnancy

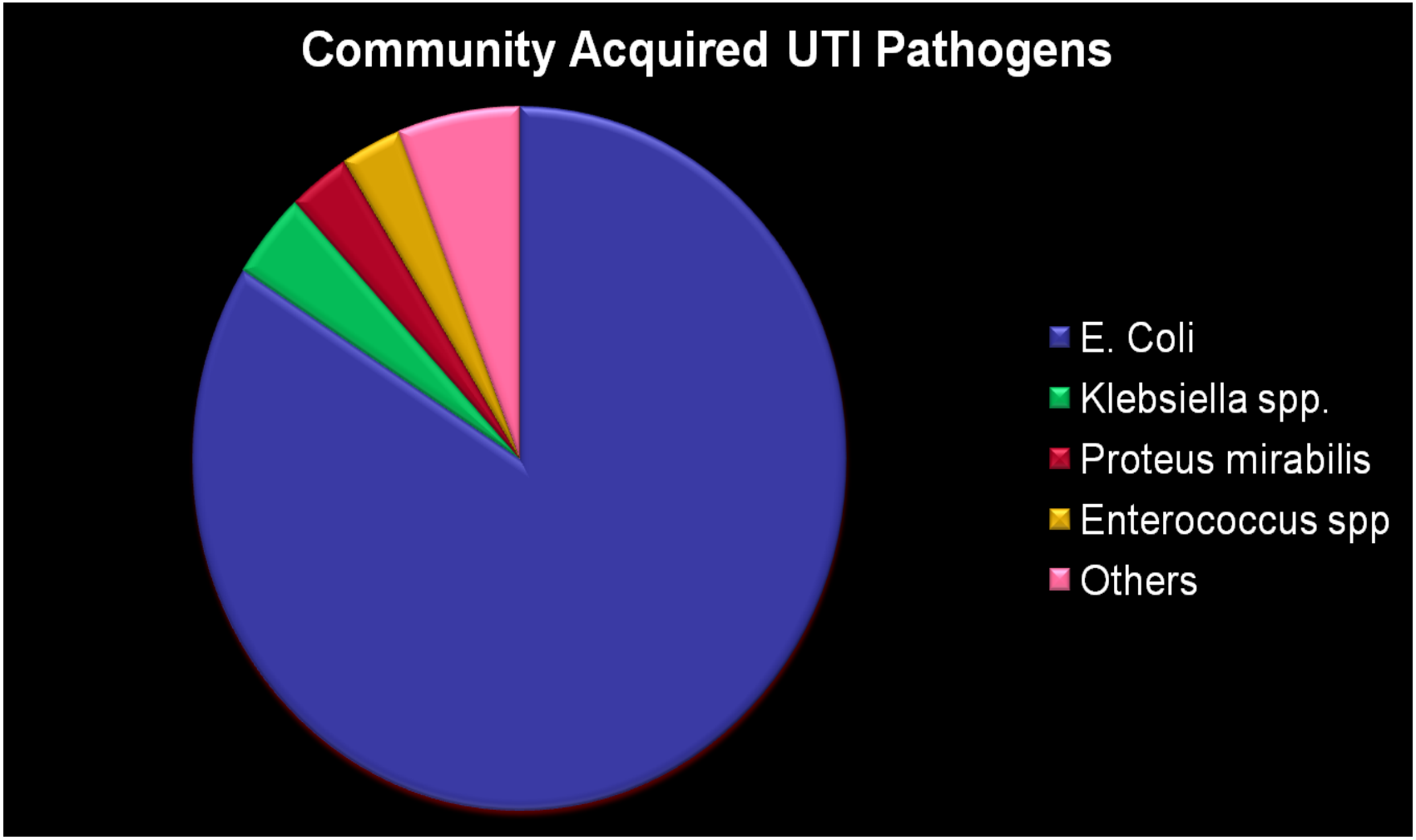
B. *S. saprophyticus* is the second most common cause in young, sexually active women

C. *E.coli* causes ~50-80% of cases

D. *Pseudomonas* is the most common cause in the elderly



Pyelonephritis: Pathogens



Pyelonephritis: Empiric therapy

Oral	
TMP/SMX or Ciprofloxacin or Levofloxacin	160/800 mg po BID 500 mg po q12h or 1 G XL po daily 250 mg po daily
Parenteral	
Gentamicin + Ampicillin Or Ceftriaxone Or Cefotaxime Or Ciprofloxacin	1.5-2 mg/kg IV q8h 1 g IV q6h 1 g Iv q24h 1 g IV q8h 400 mg IV q12h
Pregnancy	
Cefotaxime or Gentamicin $\pm$ Ampicillin	1 g IV q8h 1.5-2 mg/kg IV q8h 1 g IV q6h

ID Talk

What antibiotic regimen would be appropriate for BB (drug, dose, frequency, duration)?

Case 1 continued…

BB is empirically started on ciprofloxacin 400 mg IV q12 h for pyelonephritis.

ID IQ

The next day a preliminary lab report shows gram negative bacilli in the urine

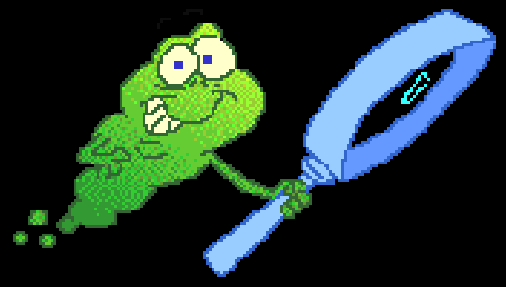
Which of the following urinary pathogens is NOT a gram negative bacilli?

A. *E. coli*

B. *E. faecalis*

C. *Enterobacteriaceae spp.*

D. *Klebsiella spp.*



ID Talk

Should therapy be modified based on these findings?

Pyelonephritis: Step-down

- Step-down from IV → PO treatment:
  - Clinical improvement
  - Able to tolerate PO antibiotics
  - Afebrile for 24-48 hours
  - Culture and sensitivity (if available) to direct therapy

ID IQ

24 hours later BB's urine culture comes back positive for *E.coli*…(blood cultures are negative)

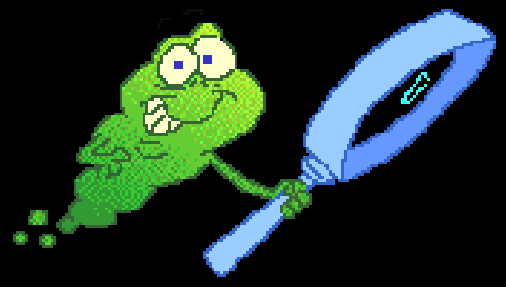
- **Which of the following would be an appropriate oral step-down for BB?**

A. Amoxicillin 500 mg po TID

B. Ciprofloxacin 500 mg po BID

C. TMP/SMX 160/800 mg po BID

D. BB should continue IV therapy for a total of 10 days



Case 1 continued…

E. coli comes back sensitive to ampicillin.

BB improves clinically over the next 2 days and is appropriately stepped down to amoxicillin 500 mg po TID which will be continued for a total 14 days of antibiotic therapy.

ID Talk

What are appropriate monitoring parameters for BB?

Case 2

JJ, a previously healthy 4 year old boy is brought to the ED by his mother who reports the abrupt onset of fever and rash on his arms and legs accompanied by increasing irritability and episodes of inconsolable crying since last night.

Physical exam reveals nuchal rigidity, positive Brudzinski and Kernig signs with petechial rash to the extremities.

Case 2

Ht: 95 cm
Wt: 18 kg

T: 39.2 (oral)
BP: 93/50 (95/55)

HR:110 (100)
RR: 32 (25)

LKC: 21 (5.5-15.5) SCr: 53

Na: 128
K: 3.2
Cl: 102

- **Allergies**
  - Penicillin (Rash)
- **PmHx**
  - Unremarkable
  - Vaccination status: Childhood vaccines up to date

ID Talk

What are potential risk factors for meningitis?

Meningitis: Risk Factors

- Age
- Immunocompromised
- Daycare/military/university students
- Upper respiratory tract infection
- Neurosurgery/head trauma

Case 2 continued…

As a diagnosis of meningitis is strongly suspected 2 sets of blood cultures are drawn and an LP is performed by the attending physician.

ID IQ

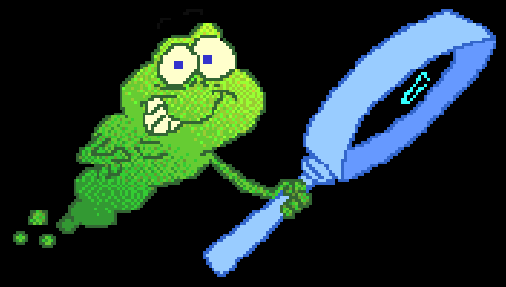
- **What is the classic "triad" of meningitis symptoms?**

  A. Fever, seizures, ↑ LKC

  B. Nuchal rigidity, fever, altered mental status

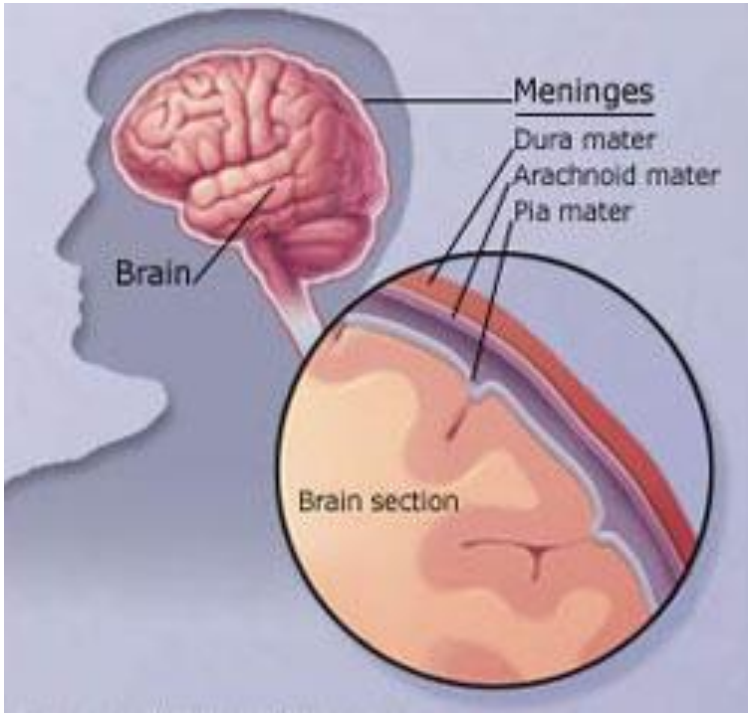
  C. Headache, photophobia, nuchal rigidity

  D. Brudzinski's sign, hypotension, fever

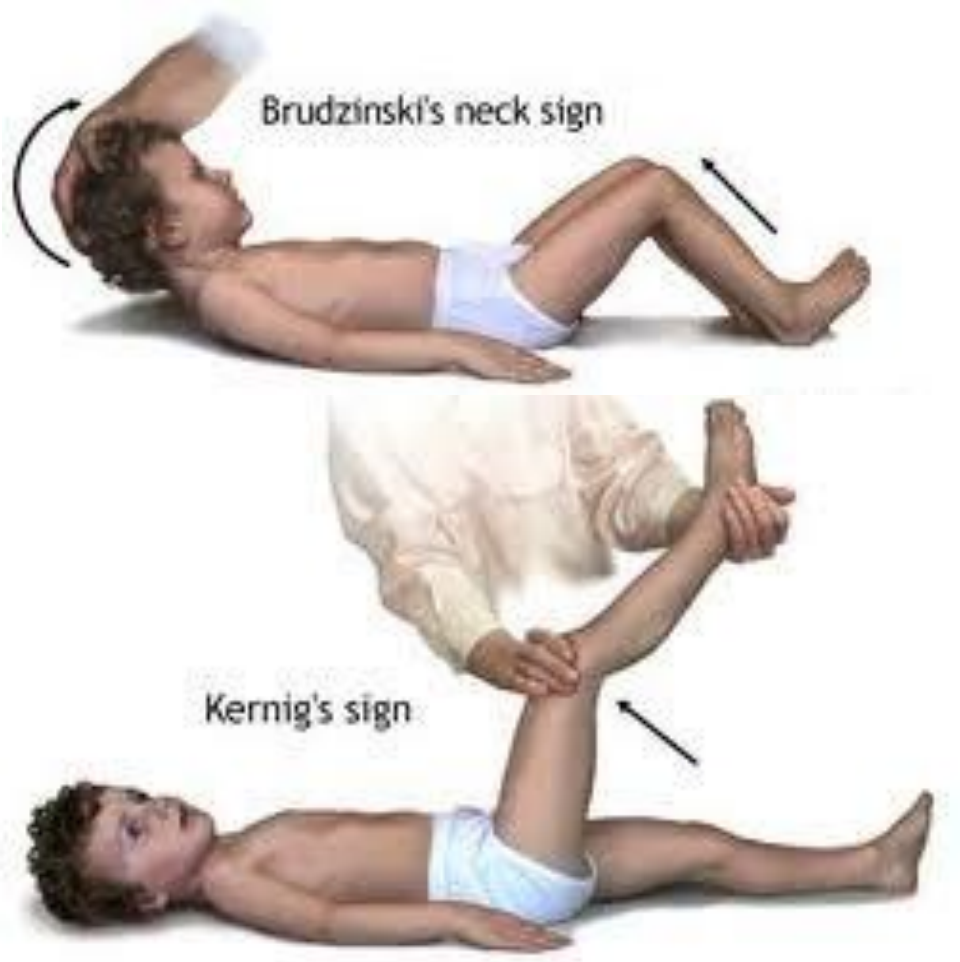


Meningitis: Signs + Symptoms

- Nuchal rigidity, fever, altered mental status
- Headache
- Photophobia/phonia
- Seizures
- Petechial rash
- Bulging fontanelle (infants)
- Neurological sequelae
- + Brudzinski and Kernig's signs



Meningitis: Signs + Symptoms



Meningitis: Signs + Symptoms

ID IQ

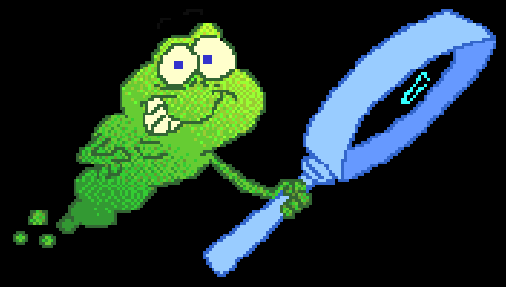
- **Which of the following is a likely causative pathogen of meningitis in JJ's age group?**

  A. *S. pneumoniae*

  B. *Neisseria meningitidis*

  C. *H. influenzae*

  D. A and B



ID IQ

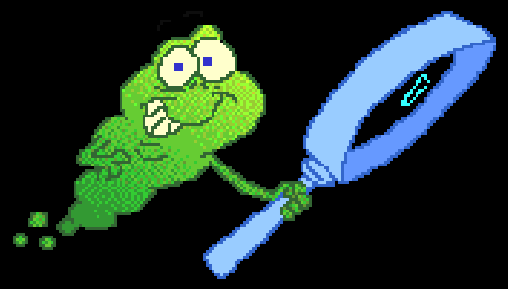
- **When selecting an antibiotic for CSF penetration which of the following is NOT a desirable property?**

A. Low molecular weight

B. High lipid solubility

C. Ionized

D. Low protein binding



Meningitis: Pathogens + Treatment

< 1mo	*S. Agalactiae* (Group B Strep) *Listeria monocytogenes* *E. coli* *Klebsiella species*	Ampicillin + Cefotaxime or Gentamicin or Tobramycin
1-23 mo	*S. Agalactiae* *E. coli* *S. Pneumoniae* *Neisseria meningitidis* *H. influenzae*	Vancomycin + Cefotaxime (<3 mos) or Ceftriaxone
2-50 yrs	*Neisseria meningitidis* *S. pneumoniae*	
>50 yrs	*Neisseria meningitidis* *S.pneumoniae* *Listeria monocytogenes* *Aerobic Gram - bacilli*	Vancomycin + Ampicillin + Ceftriaxone/Cefotaxime

Tunkel et al. 2004

Case 2 continued…

JJ is admitted to the PICU and the following medications are started:

- Dexamethasone 2.5 mg IV q6h
- Vancomycin 150 mg IV q6h
- Ceftriaxone 1G IV q12h

A note on dexamethasone

- Reduces CNS inflammation
  - ? Prevention of neurological sequelae
- Evidence
  - Children: *H. influenzae*
  - Adults: *S. penumoniae*
- Give before or with FIRST dose of antibiotics

Case 2 continued…

CSF analysis reveals the following:

Glucose	1.1 mmol/L (4.0-6.0)
Protein	2.5 g/L (0.2-0.45)
LKC	3000 (<5) *predominance of PMNs
Color	Turbid

Gram stain: Gram negative diplococci

ID Talk

Based on the gram stain should

JJ's therapy be altered?

Case 2 continued…

24 hours later CSF and blood cultures come back positive for *N. meningitidis* sensitive to penicillin and ceftriaxone

- Do these results alter our choice of therapy?

ID IQ

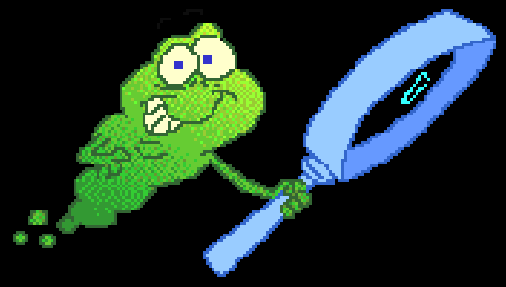
- How long should JJ receive antibiotics for?

A. 7 days

B. 21 days

C. 14 days

D. 35 days



Meningitis: Duration of therapy

N. meningitidis	7 days
H. influenzae	7 days
S. pneumoniae	10-14 days
S. agalactiae	14-21 days
Aerobic gram - bacilli	21 days
Listeria monocytogenes	≥ 21 days

ID Talk

What are appropriate monitoring parameters for JJ?

Case 2 continued…

Upon JJ's admission, a prophylactic dose of ciprofloxacin is given to his mother and father. A two day course of rifampin is provided to his 8 year old sister.

Meningitis: Contact prophylaxis

Pathogen	**Prophylaxis required**	**Antimicrobial options**
N. meningitidis	Close contacts	Rifampin 600 mg po BID x 2 days Ciprofloxacin 500 mg po x 1 Ceftriaxone 250 mg IM x 1 Azithromycin 500 mg po x 1
H. *influenzae*	All individuals in households with an unvaccinated child < 48 mo	Rifampin 20 mg/kg po daily x 4 days

ID Talk

Would the pharmacist conducting JJ`s medication history in the ED require prophylaxis against *N. Meningitidis?*

Case 2 continued…

After 2 days in hospital, dexamethasone is discontinued and after 7 days of ceftriaxone therapy JJ is starting to feel like himself again. He is discharged home with no obvious neurologic sequelae and an excellent prognosis.

Case 3

RR, a 38 year old male, presents to the ED with complaints of a red, swollen leg accompanied by flu-like symptoms for the past 2 days.

Physical exam reveals a pin point, erythematous rash on the right calf which is edemateous and warm.

Ht: 5'11	Wt: 159 kg		
T: 39.3	BP: 110/87	HR:120	RR: 23
LKC: 12	SCr: 82	ClCr: >90	Glu: 14.8
Na: 139	K: 4.2	Cl: 102	

Case 3

- **PMHx**
  - Type 2 Diabetes, HTN
- **NKDA**
- **Medications**
  - Metformin 500 mg po BID
  - Insulin NPH 25 U hs
  - HCTZ 25 mg po daily
  - Ramipril 5 mg po daily

RR is admitted to the family medicine service with a diagnosis of cellulitis.

ID IQ

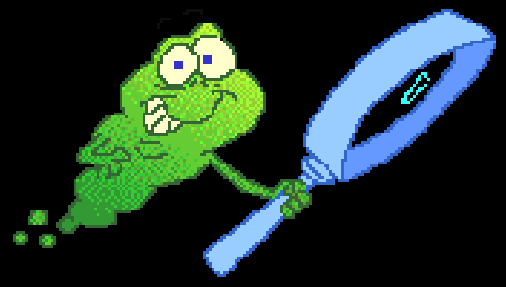
- Which of the following is not a risk factor for the development of cellulitis?

A. Diabetes

B. Excessive alcohol consumption

C. IV Drug Use

D. Venous insufficiency



Cellulitis: Risk Factors

- Advanced age
- Immunocompromised
- Diabetes
- Trauma
  - Penetrating wounds, IV drug use
- Inflammation
  - Eczema, radiation therapy
- Prexisting skin infection
  - Impetigo, tinea pedis, varicella
- Edema
  - Venous insufficiency
- Post-surgical lymphatic obstruction

ID IQ

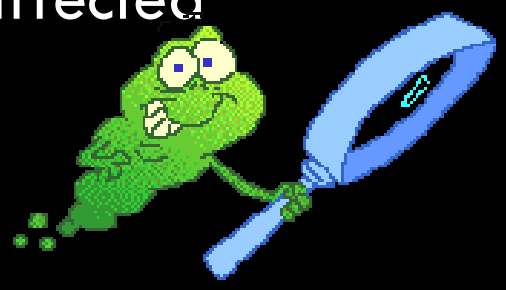
- Which of the following statements regarding the clinical presentation of cellulitis is true?

A. Affected area is defined by a distinct border

B. A definite entry point for infection is identifiable

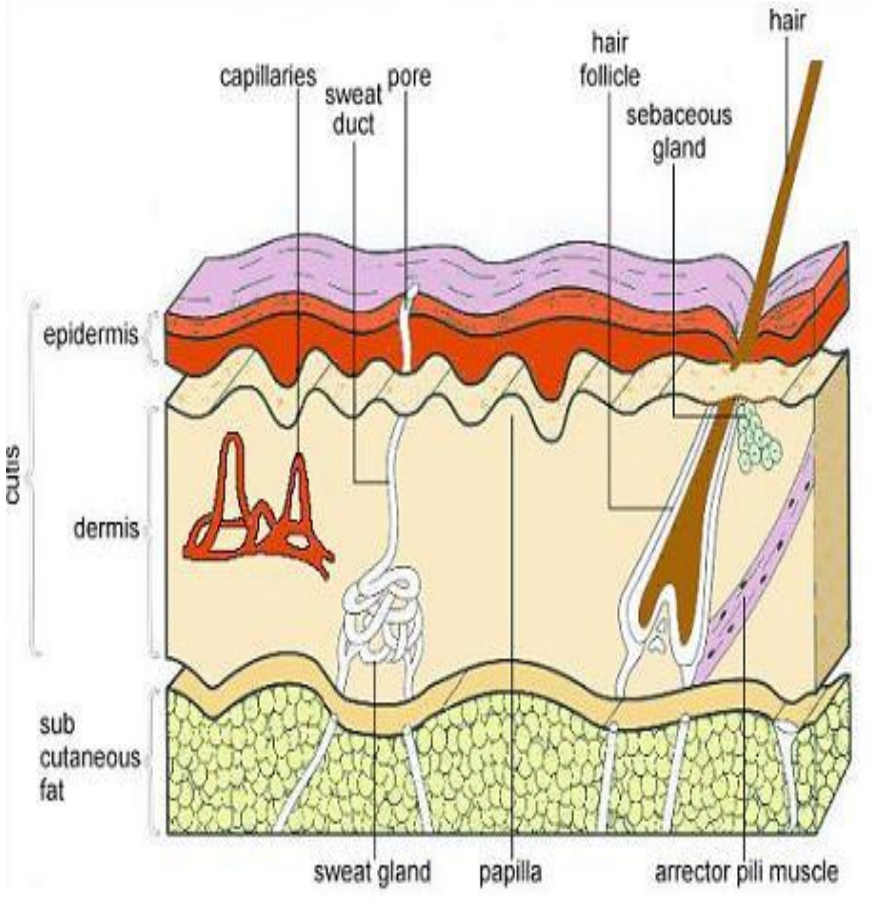
C. Concurrent bacteremia is present in most cases of cellulitis

D. Lower extremities are most commonly affected



Cellulitis: Signs + Symptoms

- Acute inflammation of dermis/ subcutaneous fat
- Lower extremities
- Gradual onset
- Erythema
- Pain/tenderness
- Edema
- +/- definite entry point
- Systemic manifestations
  - Lymphadenopathy
  - Fever
  - ↑ LKC



ID IQ

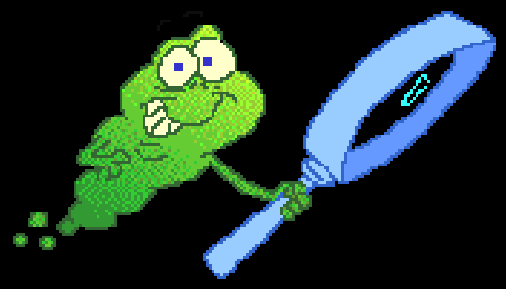
- Which are the most likely causative organisms of uncomplicated cellulitis?

A. *S. pyogenes* and *S. aureus*

B. *S. pneumoniae and Enterococci*

C. *S. aureus* and *S. pneumoniae*

D. *S. pyogenes and* anaerobes



ID Talk

Would you expect these pathogens to differ in a patient with diabetes?

Cellulitis: Pathogens

Non-diabetic infection	**Diabetic infection**
Group A Strep* *S. aureus* *IVDU, homeless, hx of incarceration: consider MRSA*	Group A Strep* *S. aureus* *S. epidermis* *Enterococcus spp.* *Enterobacteriaceae* Anaerobes *P. Aeruginosa*

**Streptococcus pyogenes*

ID IQ

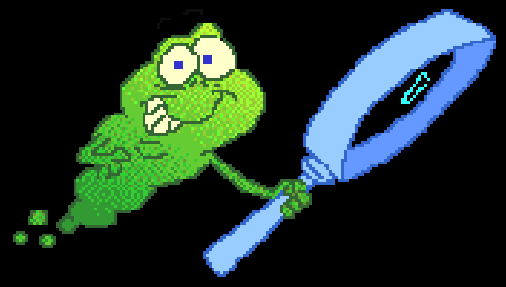
- **Which of the following antimicrobials has coverage against anaerobes?**

A. Clindamycin

B. Piperacillin/tazobactam

C. Moxifloxacin

D. All of the above



ID IQ

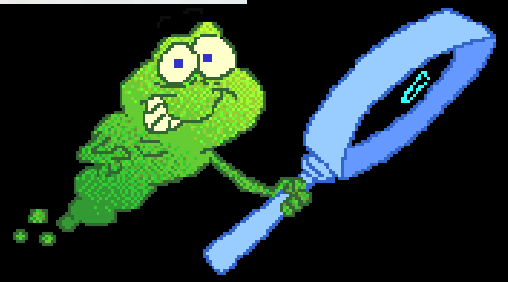
- Which of the following antimicrobials has reliable gram positive coverage against Group A Strep and *S. aureus?*

A. Ciprofloxacin

B. Cephalexin

C. Gentamycin

D. Amoxicillin



Cellulitis: Treatment

Mild cellulitis		
1st line	Cephalexin Cloxacillin	500 mg po QID 500 mg po QID
2nd line or Penicillin allergy	Clindamycin	150 -300 po QID

Cellulitis: Treatment

Severe cellulitis		
First line	Cloxacillin or Cefazolin +/- Clindamycin	1-2 g IV q6h 1-2 g IV q8h 600 mg IV q8h
Second line	Clindamycin	600 mg IV q8h
	Ceftriaxone	1g IV/IM q24h

Cellulitis: Treatment

Diabetic foot		
Mild	Cefazolin or TMP/SMX *Plus* Metronidazole Amoxicillin-clavulanate	1-2 g IV q8h 2 DS po BID 500 mg po BID 875 mg po BID or 500 mg po TID
Moderate	Ciprofloxacin + Clindamycin	500 - 750 mg po BID 300 mg po QID/ 600mg IV q8h
Limb-threatening cellulitis		
	Meropenem or Piperacillin/tazobactam	1 g IV q8h 3.375 g IV q6h

ID Talk

What antibiotic regimen would be appropriate for RR (drug, dose, frequency, duration)?

Cellulitis: Duration of therapy

- 7-10 days
  - Uncomplicated cellulitis
- 14-21 days
  - Diabetic foot
- Step down to oral therapy when appropriate

Case 3 continued…

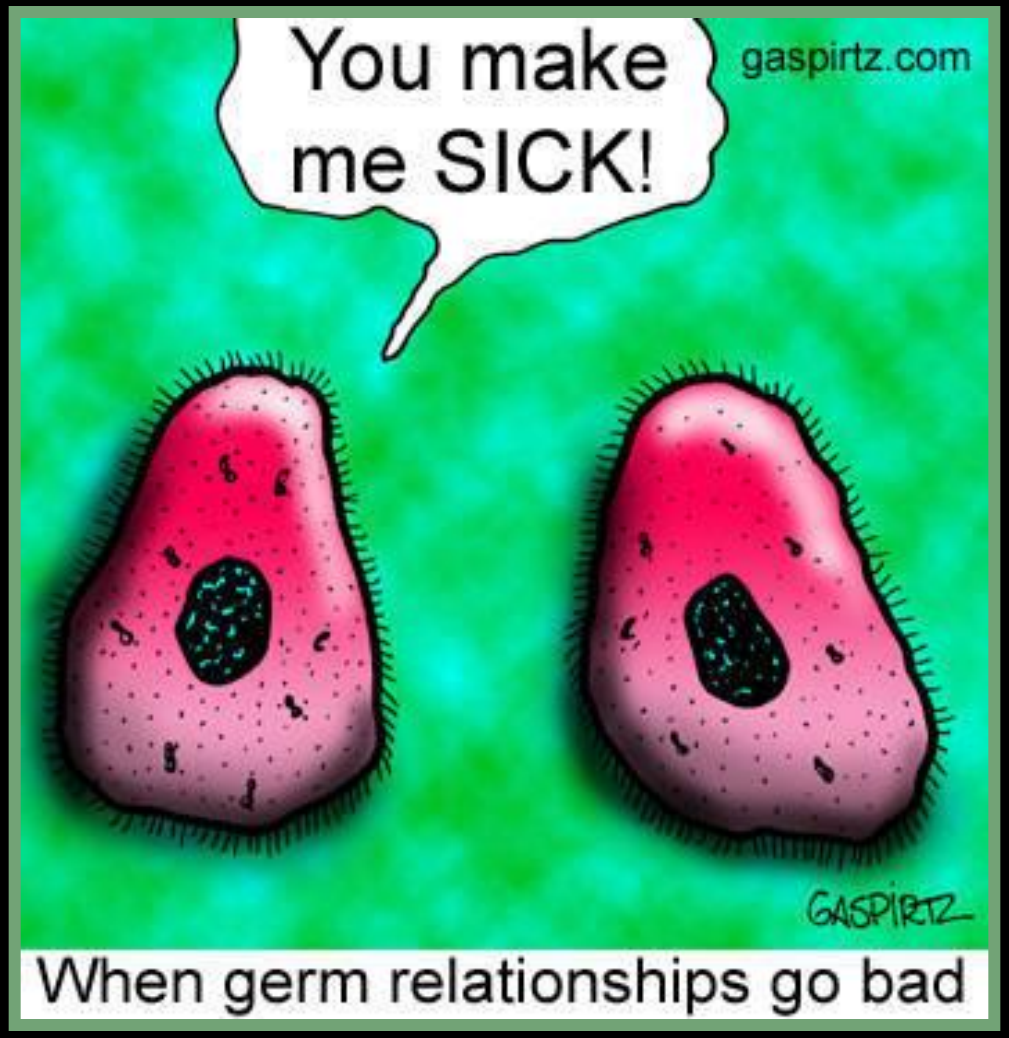
After 2 days of IV therapy with cefazolin RR is afebrile and feeling well. His cellulitis has decreased as per markings.

He is sent home on Cephalexin 500 mg po QID for a total duration of 10 days of antibiotic therapy.

Learning Objectives

- ✓ Identify risk factors for pyelonephritis, cellulitis and bacterial meningitis
- ✓ List clinical signs and symptoms of pyelonephritis, cellulitis and bacterial meningitis
- ✓ Identify the most common pathogens associated with pyelonephritis, cellulitis (non-diabetic vs. diabetic) and bacterial meningitis
- ✓ Design a patient specific antibiotic regimen (drug, dose, frequency, duration) to treat a case of pyelonephritis, cellulitis and bacterial meningitis

Questions?


You make me SICK!
gaspirtz.com
GASPIRTZ
When germ relationships go bad

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