

Treating for Two:

Practical Management of Infections in Pregnancy



High-Risk Infections



Antibiotic Safety



Fetal Protection

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OBJECTIVES

- Describe Pregnancy-related changes that increase infection risk
- Recognize high risk infections in Pregnancy – Mother and baby
- Evaluate Antimicrobial therapy in pregnancy
- Integrate Vaccination and Screening recommendation into prenatal care
- Review common Postpartum infections and their management

Why Infections in Pregnancy Are Different

- Two patients: maternal + fetal risks
- Altered immunity in pregnancy
- Physiologic changes affecting diagnosis (\uparrow HR, \downarrow BP, leukocytosis, increased blood volume, respiratory volume changes)
- Antibiotic safety \neq antibiotic efficacy

You are in clinic...And.....

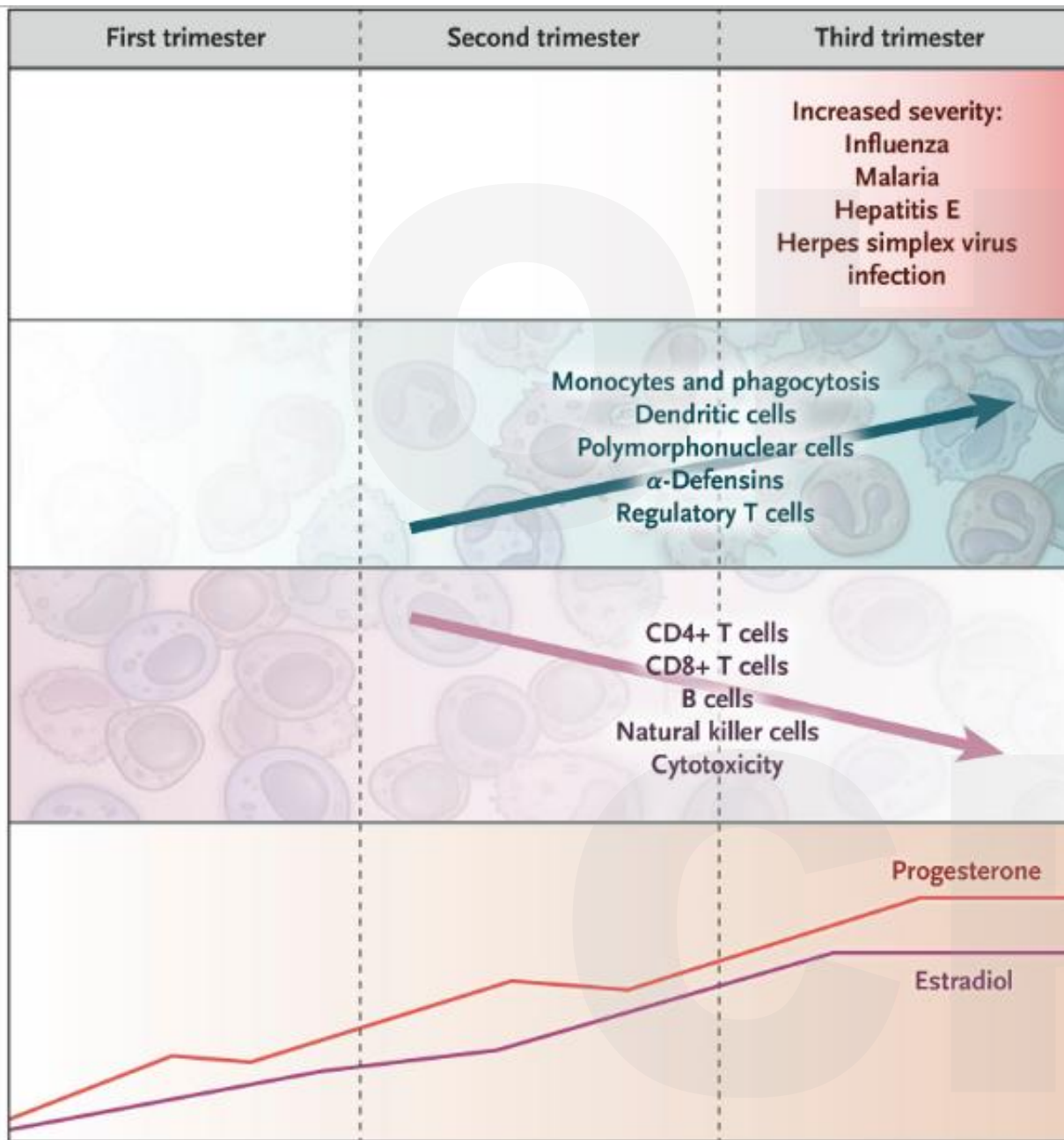
- “ my co-worker had **flu** and was fine- will it be the same for me since I am pregnant?”
- “ I ate **unpasteurized cheese** but feel okay – should I worry?”
- “ I never get **vaccines** - do I really need the flu shot during pregnancy?”
- “ if my body doesn’t reject the baby, does that mean my **immune** system is weaker”

What theme are you noticing

IS PREGNANCY IMMUNOSUPPRESSED?

Pregnancy and Immunity

- Pregnancy involves complex **immunological adaptations** that increase susceptibility to certain infections and disease severity
- Also there is increased risks of **vertical transmission** to fetus that can cause congenital anomalies, growth restriction, preterm birth or fetal death (TORCH, Zika, parvoB19,VZV)
- Pregnancy related **physiological changes**- including decreased lung capacity, urinary stasis, hormonal shift further contribute to infection vulnerability.





Changes in Hormone Levels and Immune-System Characteristics during Pregnancy.

As pregnancy advances, T-cell activity, natural killer cell activity, and possibly B-cell activity are reduced, whereas α -defensin levels and monocyte, dendritic-cell, and polymorphonuclear-cell activity are increased.

The severity of some infections (particularly influenza, malaria, hepatitis E, and herpes simplex virus hepatitis and dissemination) increases with advancing pregnancy.

Kourtis AP, Read JS, Jamieson DJ. Pregnancy and infection. *N Engl J Med*. 2014 Jun 5;370(23):2211-8. doi: 10.1056/NEJMra1213566. PMID: 24897084; PMCID: PMC4459512.

Pregnancy: the Th1 Th2 Shift

Aspect	Change in pregnancy	Clinical Implication
Th1 (cell mediated)		Reduced ability to fight intracellular pathogen → increased severity of infections like listeria, influenza, TB
Th2 (humoral)		Antibody production preserved or enhanced → normal vaccine response (influenza, tdap)
Overall	Selective immune tolerance	Fetus tolerated, maternal infection risk slightly altered

“Don’t attack the fetus (Th1 down) but keep antibodies ready (Th2 up)”

Infections Posing Highest Maternal Risk

Infection	Key Points
Influenza	<ul style="list-style-type: none">✓ ↑ severe complications (ICU, ventilation, death)✓ Vaccinate any trimester.
Group A Strep	Rare (1 to 7% sepsis) but > 50% of sepsis deaths particularly in late pregnancy
COVID-19	severe illness and mortality compared to nonpregnant women
Malaria	Intermittent preventive treatment in endemic regions reduces antenatal parasitemia, placental malaria and low birthweight by 29% and neonatal mortality by 31%.

Infections posing highest fetal risk

Infection	Key fetal factors	Key points
Syphilis	Stillbirth, miscarriage, preterm, cong. infection	Early screening and treating
CMV	Hearing loss, neurodevelopmental delay	Most common cong. viral infection, risk highest with primary infection
Zika	Microcephaly, severe anomaly	Travel, no rx
Rubella	Cong. Rubella syndrome	cardiac, ocular, hearing defects in early infection
ParvoB19	Hydrops, IUFD	Highest in 2 nd trim
Varicella	Cong. Varicella synd	Limb hypoplasia, skin scarring, neuro defects

Infections affecting both mother and fetus

Infection	Impact	Screening	Treatment
Grp B Strep	Neonatal sepsis	36-37 weeks	IV penicillin intrapartum
UTI	Pyelo, preterm birth	1 st trim ucx	Nitrofurantoin
HIV	Vertical transmission (15-45%)	Universal	ART (<1%)
HBV	Chronic neonatal infection via vertical transmission	Universal	Vaccine + HBIG to neonate within 12hrs of birth
Listeria	Fetal loss	Food avoidance soft cheeses, deli meat, unpas. dairy)	Ampicillin

“What changed in Pregnancy?”

- 28 yo G2P1 at 30 weeks presents with fever, right flank pain and nausea. UA shows pyuria and bacteriuria
- Which physiological change in pregnancy most likely contributed to her condition?
 - A. Increased gastric acidity
 - B. Progesterone – mediated ureteral dilation
 - C. Increased T cell immunity
 - D. Reduced plasma volume

B

-progesterone -> smooth muscle relaxation -> ureteral dilation and urinary stasis.
- Enlarging uterus compression ureters – risk of pyelo

Common infections in Pregnancy

1) UTI

- ✓ more frequent perinatal complication affecting approx. 8% of the pregnancies
- ✓ Range – asymptomatic bacteriuria (2-10%) to acute cystitis (1-2%) and pyelonephritis (1-2%)
- ✓ Predominantly Ecoli
- ✓ Group B Strep (GBS) colonization - important as it's a leading cause of serious neonatal infections (sepsis, meningitis and pneumonia) within the first week of life.
- ✓ Screening for GBS for all pregnant patients between 36-37 weeks of preg

2) Sexually Transmitted Infections and Reproductive tract infections

- ✓ Bacterial vaginosis – not common in USA but in sub-Saharan Africa – prevalence is > 50%
- ✓ Syphilis
- ✓ Gonorrhea
- ✓ Chlamydia
- ✓ Trichomonas
- Require screening and/or testing and treatment to reduce adverse maternal and fetal outcomes

3) Viral Infections

- ✓ TORCH – Toxoplasma, Rubella, CMV, HSV
- ✓ Others – VZV, Parvo B19, Hepatitis B and C, HIV, Zika
- These can cause congenital malformations, fetal death or neonatal diseases depending on the timing of the infection

4) Respiratory Infections

- ✓ Influenza
- ✓ COVID- 19
- ✓ Pneumonia – can require icu admission upto 40% of cases

“More than just food poisoning...”

- A 23yo at 23weeks of gestation, presents with fever, myalgias and diarrhea after eating unpasteurized cheese, BC show gram positive rods
- What is most concerning complication of this infection in pregnancy?
 - A. Maternal liver failure
 - B. Preterm labor or fetal loss
 - C. Congenital cardiac defects
 - D. Maternal Endocarditis

B

- **Listeria Monocytogenes**
- **Exposure to unpasteurized dairy, deli meat.**
- **Impaired cell mediated immunity in preg**
- **High risk for fetal loss and preterm delivery**

“Another Shot....? Really....?”

- 29yo at 28 wees of gestation – asks about vaccines
- Which vaccines is recommended during every pregnancy regardless of prior history?

- A. MMR
- B. Varicella
- C. Tdap
- D. HPV

C

- Tdap – during every preg (27-36weeks).
- Passive immunity to infant(pertussis protection)
- Avoid live vaccine- mmr, varicella

Preventive strategies for infections in pregnancy

- These include
 - ✓ Routine immunization - offer direct maternal protection and passive newborn immunity
 - ✓ Universal screening - recommended for infections causing high maternal and fetal morbidity
 - ✓ Targeted antimicrobial prophylaxis
 - ✓ Behavioral and environmental counselling – proper food handling, avoiding cat litter, travel counseling, sti etc

Prenatal Screening and Vaccination Schedules

Test/Vaccine	Timing
SCREENING TESTS	
HIV	1 st prenatal visit, repeat in 3 rd trim if high risk
Syphilis	1 st prenatal visit, repeat at 28 weeks and delivery
Hep B Sag	1 st prenatal visit
Hep C	1 st prenatal visit
Chlamydia	1 st prenatal visit, repeat 3 rd trim if high risk
Gonorrhea	1 st prenatal visit, repeat 3 rd trim if high risk
Asymptomatic bacteriuria	Early in prenatal care (1 st trim)
Group B Strep (GBS)	36-37 weeks of preg (vaginal-rectal culture)
VACCINATIONS	
Tdap	27-36 weeks of preg
Influenza (inactivated)	Any Trimester during flu season
COVID-19	Any Trimester
RSV	32-36 weeks gestation

COVID 19 during Pregnancy

- Increased severe maternal morbidity and mortality, preeclampsia, preterm birth and neonatal complications
- 5 fold increased risk of icu admission; 22 fold increased maternal mortality
- Treatment – multidisciplinary
 - ✓ Pharmacology –steroids, remdesivir, tocilizumab if hypoxic. paxlovid outpt setting may be considered
 - ✓ Thromboprophylaxis
 - ✓ Respiratory support
- Vaccination strongly recommended

Influenza during Pregnancy

- Increased hospitalization, icu admission, maternal death and pregnancy loss
- All patients with suspected or confirmed test should receive treatment regardless of vaccination, no need to wait for test results
- Oseltamivir within 48hrs of symptoms is ideal
- Post exposure prophylaxis for all pregnant and upto 2 weeks post partum
- Vaccination - for all pregnant patients in all trimesters (no live vaccines)
- Vaccines also offer fetal protection in few months of life

“Colonizer Today, Pathogen Tomorrow”

- 28yo G1P0 at 36 weeks had a positive group B strep screen. She feels well. No fever, no urinary symptoms.
- What is the next best step:
 - A. Start oral antibiotics now
 - B. Give IV antibiotics during labor
 - C. No treatment needed
 - D. Repeat GBS test at 39 weeks

B

- Give IV abx during labor
- GBS colonization is not infection
- Treatment is intrapartum (except when there is bacteriuria)
- Goal – prevent early neonatal sepsis

Group B Strep – Key Concepts

- Universal screening for Group B strep done 36-37 weeks of gestation
- This provides a 5 weeks window of valid cultures results thru 41 weeks
- Vaginal-rectal culture
- If positive – intra-partum prophylaxis is to be administered
- It is the leading cause of new born infections, approx. 50% of colonized women transmit to the newborn, and 1-2 % newborns develop neonatal sepsis
- Automatic intrapartum prophylaxis
 - ✓ GBS bacteriuria in current pregnancy
 - ✓ Previous infant with GBS disease

Treatment protocol for pos GBS pts

Clinical Scenario	Antibiotic	Initial dose	Maintenance dose	Notes
1 st line (no penicillin allergy)	Penicillin G	5 million units IV	2.5-3 million units q4h IV until delivery	Narrow spectrum, reduce resistance
1 st line(no penicillin allergy)	Ampicillin	2g IV	1g q4h IV until delivery	Alternate to Pen G
Low risk penicillin allergy	Cefazolin	2g IV	1g IV q8h IV until delivery	No hx of anaphylaxis, angioedema, resp distress, urticaria (1% cross reactivity)
High risk penicillin allergy (if clinda susceptible)	Clindamycin	900mg po q8h until delivery	n/a	Requires susceptibility testing, 42% of GBS are resistant
High risk penicillin allergy (if clinda resistant or unknown)	Vancomycin	20mg/kg IV q8h until delivery	n/a	Longer infusion times

Antimicrobials in Pregnancy – “What’s safe, What’s not”

- During pregnancy, infections are associated with significant morbidity, including low birth weight, preterm birth, and spontaneous abortion.
- Approximately 1 in 4 women will be prescribed an antibiotic during pregnancy, accounting for nearly 80% of prescription medications in pregnant women.
- Physiologic changes in pregnancy lead to an increase in glomerular filtration rate, increase in total body volume, and enhanced cardiac output.
- These changes may lead to pharmacokinetic alterations in antibiotics that require dose adjustment or careful monitoring and assessment.

Antibiotics in Pregnancy

Antibiotic Class	Safety in Pregnancy	Considerations
Beta Lactams	Safe – 1 st line	Preferred(avoid empiric augmentin for uti
Nitrofurantoin	Safe	Avoid near term (36weeks) – theoretical risk of hemolytic anemia in g6pd def pt, neonates,
Macrolides (azithromycin)	Safe	Minimal placental transfer, clarithromycin not recommended
Metronidazole	Safe	Widely used, some guidelines advice to avoid use in 1 st trim.
Clindamycin	Safe	No risk of birth defects or adverse outcomes.
Vancomycin	Safe	Theoretical oto/nephrotox due to placental crossing but clinical data is reassuring. Monitor levels

Antibiotic class	Safety in preg	Considerations
Fluoroquinolones	Avoid if alternate exists	No teratogenicity in humans despite animal cartilage concerns, use with caution, when no alternatives
Bactrim	Avoid in 1 st trim	Assoc. Neural tube, cardiac, urinary. Supplement with folic acid 4mg/day
Tetracycline/Dox y/ Mino	Contraindicated	Risk of maternal hepatotox, permanent teeth discoloration, impaired fetal growth
Sulfonamides	Avoid near term/3 rd trim	Neonatal hyperbili, kernicterus
Aminoglycosides	Use with caution	Safe when dosed appropriately, monitor levels

PMID: 40744046.

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“ The Silent Threat...”

- A pregnant patient presents with painless genital ulcer. RPR is positive
- What is the most serious fetal risk if untreated?

- A. Congenital syphilis
- B. Neural Tube defects
- C. Macrosomia
- D. Neonatal HSV

A

Congenital syphilis

- High vertical transmission is untreated
- Still birth, hydrops fetalis, severe neonatal disease

Treatment of Syphilis in Pregnancy

Stage	Treatment	Alternative	Followup
Primary, Secondary or early latent	Benzathine PCN G 2.4m units IM X1	Can repeat 2 nd dose a week later for cong. Syphilis prevention	Repeat serology at 8 weeks post rx (<24 preg) and at delivery
Late Latent, tertiary or unknown duration	Bnz. PCN G2.4m units weekly X 3 doses	None	Repeat serology at delivery
Penicillin allergy	Desensitize then PCN	None	
Neurosyphilis	IV pcn G 18-24m units X14 days	Desensitize if allergic	CSF examination at 6 months post rx. Could do IM PCN weekly X 3 doses after IV course

Treatment guidance on STI

INFECTION	1 ST LINE RX	ALTERNATIVE	TEST OF CURE	NOTES
Chlamydia	Azithromycin 1g po X1	Amox 500mg po tid X7 days	4 weeks after Rx	Doxy CI in preg Treat sexual partners
Gonorrhoea	Ceftriaxone 500mg- 1g IM X1	Consult ID if ceftriaxone not available or allergic	4 weeks after Rx	Add Azithro if chlamydia not excluded Treat sexual partners
Gonorrhoea + Chlamydia coinfection	Ceftriaxone 500mg IM X1 + 1g po Azithro		4 weeks after Rx	Simultaneous rx Treat sexual partners
Trichomonas	Metronidazole 2g po X1	None, tinidazole avoided in preg	1-3 weeks after Rx (3 months again if high risk)	Untreated -> preterm birth, lbw, treat sexual partner
Bacterial Vaginosis - Symptomatic - Asymptomatic	-Po Flagyl 500 bid -Not rec	Flagyl 250mg po tid, clinda 300mg po bid, topical metronidazole, clinda ovules vaginal	5 days	Oral therapy not superior to topical. Routine screening not rec, mixed evidence for high risk

“Its Not Baby Fever...”

- A 3 day post partum patient after vaginal delivery, presents with fever, uterine tenderness and foul smelling lochia
- What is the most likely diagnosis

- A. Mastitis
- B. UTI
- C. Septic Pelvic thrombophlebitis
- D. Endometritis

D

Post partum endometritis

- **Triad of fever, uterine tenderness, foul lochia.**
- **Usually anaerobes and GNR**
- **Rx – clinda and gentamicin**

“Mama Needs Relief – Fast”

- A breastfeeding mom presents with breast pain, erythema and fever with concerns for mastitis
- What do you recommend ?
 - A. Stop Breastfeeding
 - B. Start antibiotics and cont. breastfeeding
 - C. Surgical management immediately
 - D. Observe

B

- Abx and cont. breastfeeding
Watch for abscess – may need I&D
- MRSA coverage is high risk or colonization or abscesses

Post Partum Infections - Infections that typically occur within 6 weeks after delivery

Risk Factors

- ✓ Cesarean delivery (highest risk)
- ✓ Prolonged labor, rupture of membranes
- ✓ Multiple vaginal exams
- ✓ Retained products of conception
- ✓ Obesity, Diabetes
- ✓ Grp B strep colonization
- ✓ Breastfeeding complications

Common Infections

- ✓ Endometritis
- ✓ Surgical site infections
- ✓ Mastitis/breast abscess
- ✓ UTI
- ✓ Septic pelvic thrombophlebitis

Antibiotic safety during Breastfeeding

- Most antibiotics are compatible with breastfeeding
- Key considerations
 - ✓ Drug transfer in breast milk
 - ✓ Infant age (premature vs full-term)
 - ✓ Oral bioavailability in infant
- Breastfeeding is rarely a reason to withhold abx
- Treat maternal infection promptly
- Encourage continued breastfeeding esp with mastitis

Safety Category	Antibiotics	Key Consideration
Safest	Cephalosporin, Penicillin, Vancomycin	Undetectable infant levels, minimal adverse effects
Safe	Macrolide, Fluoroquinolone	Low breast milk level, GI s/e with FQ
Use with caution	Clindamycin, Metronidazole, Doxy	GI s/e, doxy safe ≤ 21 days
Avoid in specific situations	<ul style="list-style-type: none"> - Bactrim - Nitrofurantoin 	<ul style="list-style-type: none"> - Premature or jaundice - G6PD def, < 1 month

A collage of medical and baby-related items including a stethoscope, ultrasound, baby shoes, pacifier, pills, syringe, and flowers.

Thank You!

— for your attention! —

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