Medications in Pregnant and Nursing Mothers

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Gestation age vs fetal age

- Gestation age - sperm penetrates the egg and zygote is formed
- Zygote (fertilized egg) travels from fallopian tube to uterus
- During this time, egg divides into cells - called a morula
- Continued dividing and morula - called a blastocyst - embeds in the uterus anywhere from 6-12 days after conception
- This begins the embryonic stage and fetal age begins
Fetal development - 1st trimester

Gestation age week 3-fetal age week 1: a lot of basic growth
Brain, spinal cord, heart, GI tract begin development
1st trimester

Gestation age-week 4 and 5: embryo ¼ inch long
Arm and leg buds, ears, eyes forming
Placenta forming and producing hormones
Heart is beating at a steady rhythm
Movement of rudimentary blood through blood vessels
1st trimester

Gestation age week 6: embryo is ½ in length

Lungs, jaw, nose, plate formation, hands and feet
Hand and feet buds have webbed structures
Brain forming into complex parts
1\textsuperscript{st} trimester

- Gestation age week 7: weighs less than an aspirin
- All essential organs have begun to form
- Hair, nail follicles, eyelids and tongue starting to form
- Trunk begins to straighten out
1st trimester

- Gestation age week 8: 1 in long, size of a bean
- All parts of adult are now present in the embryo
- Bones beginning to form
- Muscles begin to contract
- Facial features, including eyelids more developed
- Gestation age weeks 9-13: 3 in and weighs 1 ounce
- Genitalia clearly male or female
- Eyelids close
- Buds for teeth form
- Head is half size of fetus
2nd trimester

- Gestation age weeks 14-16: 6 in and 4 ounces
- Skin is transparent
- Hair on head is fine and called lanugo
- Fingerprints developed
- Bowls have begun to work making waste
- Baby moves more and mom begins to feel flutters
- Liver and pancreas producing secretions
2nd trimester

- Gestation age weeks 17-20: 8 in and 12 ounces
- Eyebrows and eyelashes
- Nails on fingers and toes
- Vernix forms and covers fetus’ skin—protects from amniotic fluid
2nd trimester

- Gestation age weeks 21-23: 10-11in and 1 lb
- Fine hair covers entire body
- Fat develops under skin
- Fetus starts to look like a newborn
- Eye components fully developed
- Liver and pancreas mostly developed
2nd trimester

- Gestation age weeks 24-26: 14in and 2 1/4 lb
- With assistance, if baby delivered, then could survive
- Sleep and wake cycles
- Some nervous system control
- Air sacs in lungs are forming
3\textsuperscript{rd} trimester

Gestational age weeks 27-32: 15-17in, 4-4 1/2 lb
Brain is rapidly developing
Fetus is storing fat and growing quickly
Some rhythmic breathing
Bones fully developed
Self storing of some minerals
Eyelids open
3rd trimester

- Gestational age weeks 33-36: 16-19 in, 5 3/4-6 3/4 lb
- Fetus descends, head down position
- Hair on body disappears
3rd trimester

- Gestational age weeks 37-40: 19-21 in, 6 ¾-10 lb
- Full-term at week 38
- All organs fully developed but lungs still maturing until birth
- Receiving antibodies from mother
Fetal eye development

- Surface ectoderm, neural ectoderm, neural crest give rise to all of structures of eye
- Optic pit → optic vesicle and optic stalk
- Optic vesicle → optic cup at 7 weeks
- Lens - primary, secondary fibers (y sutures) and embryonic nucleus formed at 3 months
- Secondary fibers develop until birth forming fetal nucleus
- Hyaloid arterial system-branch of internal carotid enters optic cup and becomes hyaloid artery
- Forms anterior and posterior tunica vasculosa lentis-supplies not arterial or venous-supply nutrients to lens
- Peak development-9 weeks
- 3-4 months atrophied and reabsorbed
- RPE is the first retinal layer to develop
- Retinal development is more advanced centrally than peripherally
- At birth, all of retina is fully developed except macular area
- The fovea is not fully developed until 4 months
- Hyaloid artery becomes central retinal artery
- Branch of primitive maxillary vein becomes central retinal vein
- Not completely developed until 3 months after birth
- Vessels to nasal periphery complete before those in temporal periphery
• Cornea-by month 5, all layers are present
• Sclera-by month 5, well differentiated
• Choroid-by full term, fully differentiated
• Ciliary body-OPE, IPE, major arterial circle, ciliary muscle formed at birth but annular muscle of Muller not complete until a few months old
• At 5 months, aqueous humor is secreted
- Iris—fully developed at birth
- Anterior chamber—fully developed at birth
- Vitreous—fully developed at birth
- Optic nerve fully developed 1 month after birth
- Eyelids fuse at week 10 and open at month six with all structures developed
• Orbital bones ossify and fuse at 7 months
• Globe is adult size at age 3
• Orbit is adult size at 16
• Lacrimal gland-develops until age 3
FDA Drug Categories

Historical Perspective and Review
FDA Pregnancy Drug Categories - History

- **Thalidomide introduced in 1950’s**
  - Effective tranquilizer, painkiller and antiemetic
  - Phocomalia – children born with deformed or missing body parts or limbs that looked like flippers of a seal.

- **Diethylstilboestrol (DES)**
  - Given to pregnant women under the mistaken belief it would reduce the risk of pregnancy complications and losses.
  - In 1971, DES was shown to cause a rare vaginal tumor in girls and young women who had been exposed to this drug in utero.
In 1979, the FDA established the 5 categories that classify a drug’s teratogenic effects on the fetus by considering the quality of data from animal and human studies.

- Category A, B, C, D, X

FDA requires a relatively large amount of high-quality data on a pharmaceutical for it to be defined as Category A. As a result of this, many drugs that would be considered Category A in other countries are allocated to Category C by the FDA.
<table>
<thead>
<tr>
<th>Pharmaceutical Agent</th>
<th>Australia</th>
<th>United States</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetaminophen</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>Amoxicillin</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>Triamcinolone</td>
<td>A</td>
<td>C</td>
</tr>
<tr>
<td>Theophylline</td>
<td>A</td>
<td>D</td>
</tr>
</tbody>
</table>
FDA Pregnancy Drug Categories

Category A

- Controlled studies in humans have demonstrated no fetal risk.

- Category A drugs are safe. Controlled studies in women fail to demonstrate a risk to the fetus in the first trimester (no evidence of a risk in later trimesters).

- Examples include prenatal vitamins, but not massive dosages of vitamins.

- B, C, D, E, folic acid
FDA Pregnancy Drug Categories

Category B

- Animal studies indicate no fetal risks, but there are no human studies.
- Adverse effects have been demonstrated in animals, but they were not confirmed in controlled human studies.
- Presumed safe with limited animal studies
- Examples: Acetaminophen, Doxylamine, Penicillin, Erythromycin, Gentamicin, Metronidazole, LMW Heparin, Ophthalmic Tobramycin
FDA Pregnancy Drug Categories

Category C

- Animal studies have revealed adverse effects but there are no controlled studies in humans.

- There are no adequate studies, either animal or human.

- Should be used with caution because some animal studies have shown teratogenic effects on the developing fetus.

- Examples: Gentamicin, Chloramphenicol, Fluoroquinolones, Sulfonamides, Anti-malarials, Anti-fungals, B-Blockers
FDA Pregnancy Drug Categories

Category D

- There is evidence of fetal risk, but benefits are thought to outweigh the risks.

- Category D drugs are indicated as unsafe, but may need to be prescribed if other drugs are ineffective in treating a life-threatening disease.

- Examples: Aspirin, Streptomycin, Tetracyclines, Hydroxyprogesterone, ACE inhibitors
FDA Pregnancy Drug Categories

Category X

- Clear evidence of fetal risks that clearly outweigh any possible benefit.

- Category X drugs are known to be very unsafe and contraindicated since there is strong evidence of teratogenic effects associated with these drugs.

- Examples: Androgens, Norgestrel, Norethindrone, Warfarin, Methotrexate
OPHTHALMIC MEDICATIONS:
Diagnostic
Ophthalmic Meds

- **Mydriatic agents**
  - Parasympathetic antagonist – paralyze the iris sphincter muscle
    - Atropine (0.5%, 1%)
    - Cyclopentolate (0.5%, 1%, 2%)
    - Homatropine (2%, 5%)
    - Tropicamide (0.5%, 1%)
    - Scopolamine (0.25%)
  - Sympathetic agonist – stimulating the iris dilator muscle
    - Pheynylephrine (2.5%, 10%)
  - FDA Pregnancy Category C
Cycloplegic agents

- Atropine (0.5%, 1%)
- Cyclopentolate (0.5%, 1%, 2%)
- Homatropine (2%, 5%)
- Tropicamide (0.5%, 1%)

- FDA Pregnancy Category C
- **Miotic agents**
  - Pilocarpine
  - Carbachol

- FDA Pregnancy Category C
• Analgesic agents
  ○ Proparacaine
  ○ Tetracaine

○ FDA Pregnancy Category C
• **Staining agents**
  - Sodium Fluorescein (Category C)
  - Lissamine Green (Category C)
  - Rose Bengal (No FDA Pregnancy Category)
In order for a drug to cause a teratogenic or pharmacological effect on the fetus, it must cross from maternal circulation to fetal circulation through the placenta by diffusion.

Rate of transfer depends on protein binding, pH difference, lipid solubility and molecular weight.
Minimizing systemic absorption

- We need to balance drug penetration with risk of systemic absorption.
  - Apply only one drop at a time
  - Lower fornix only holds one drop of topical medication

- Nasolacrimal drainage
  - Drops may drain thru nasolacrimal duct, absorbed thru epithelial mucosa lining then into systemic circulation
  - Punctal patency required for this to occur. Lids must be open.
  - Gently close the eyelids for 1-3 minutes to slow down drainage
  - Use nasolacrimal compression with digital pressure over the medial lower eyelid.
MEDICATIONS:
Treatment of common conditions
Meds for Common Conditions

Allergy Medications Overview

- Corticosteroids
- Antihistamines
- Decongestants
- Other
Meds for Common Conditions

Allergy Medications

- **Corticosteroids**
  - Help prevent and treat inflammation by blocking allergic reactions
  - Category C
  - Intranasal corticosteroids have not been associated with increase in congenital malformations in humans
  - Consider as first line of therapy over oral antihistamine, decongestant and mast cell stabilizers with respect to efficacy.
  - Use lowest effective dose
Ophthalmic Corticosteroids (Category C)
EconoPred, FML, HMS, Inflamase, OcuPred, Pred Forte, Pred Mild...

Pregnancy
No human studies on birth defects with ophthalmic corticosteroids, however, these medicines have not been reported to cause birth defects or other problems.
In animal studies, dexamethasone, fluorometholone, hydrocortisone, and prednisolone caused birth defects when applied to the eyes of pregnant animals. Also, fluorometholone and medrysone caused other unwanted effects in the animal fetus.

Nursing
Ophthalmic corticosteroids have not been reported to cause problems in nursing babies.
Allergy Medications

- **Antihistamines**
  - Block histamine, an inflammatory chemical released by immune system during an allergic reaction

- **Oral**
  - Benedryl (Cat B)*, Chlor-Trimeton (Cat B), Tavist (Cat B)
  - Atarax (Cat C)
  - Zyrtec (Cat B), Claritin (Cat B)
  - Allegra (Cat C), Clarinex (Cat C)

- **Ophthalmic (Category C)**
  - Antazoline, Ketorolac (NDAID), Levocabastine, Pheniramine
  - Patanol, Pataday, Zaditor, Vasocon, Naphcon, Visine, ClearEyes

* Benedryl also antiemetic but crosses Placenta.
Olopatadine (Patanol, Pataday)

- Animal studies have failed to reveal evidence of teratogenicity.
- Fetolethality increased in rats treated with extremely high oral doses (62,500 times the human dose).
- There are no controlled data in human pregnancy.
- Olopatadine is only recommended for use during pregnancy when benefit outweighs risk.

- There are no data on the excretion of olopatadine ophthalmic solution into human milk.
- However, due to minimal systemic absorption, it is not expected that clinically significant amounts would be excreted into breast milk.
Allergy Medications

- **Decongestants**
  - Used for quick, temporary relief of nasal and sinus congestion
  - Have not been definitively proven to adversely affect fetal outcome and may be used for short-term relief of symptoms when no other safer alternative is available

- **Oral**
  - Pseudoephedrine (Sudafed) (Cat C)

- **Nasal sprays**
  - Afrin, Vicks Sinix, NeoSynephrine, Dristan (Cat C)

- **Eyedrops** (Cat C)
  - All Clear, Clear Eyes, Visine AC
**Allergies**

**Antihistamine + Decongestant**
- Naphcon-A, Opcon-A, Visine-A

**Antihistamine + Astringent**
- Clear Eyes ACR, VasoClear A
Allergies

**Expectorant**
- Guaifenesin (Cat C) May be unsafe in first trimester

**Antitussive**
- Dextromethorphan (Cat C) Appears to be safe in pregnancy
Allergies

Allergy Medications

- **Other**
  - A few other medications work by blocking symptom-causing chemicals released during an allergic reaction

- **Mast Cell Stabilizers (Class B)**
  - Cromolyn
  - Lodoxamide

- Mast cell stabilizers not proven to be teratogenic and can be considered as excellent first-line option in place of intranasal corticosteroids.
Allergies

Allergy Medications

- **Colds and Allergies Summary**
  - Nondrug remedies: rest, lots of fluids, saline nasal spray
  - Flu shots in second or third trimester
  - Chlor-Trimeton is one of safest – used for many years without association with birth defect. Less known about newer drugs like Claritin.
  - Decongestion – nasal sprays with oxymetazoline (Afrin, Dristan)
  - Cough – dextromethorphan (Robitussin, Vicks 44) AVOID anything with iodine, which can cause potentially life-threatening thyroid problems in fetus. AVOID those containing high levels of alcohol
Meds for Common Conditions

Hypertension and Pregnancy
- Decreased blood flow to placenta
- Placental abruption
- Premature delivery
- Future cardiovascular disease

- Chronic Hypertension – before 20 weeks and lasting more than 12 weeks after delivery
- Gestational Hypertension – after 20 weeks and usually goes away after delivery
- Preeclampsia – high BP and protein in urine after 20 weeks. Can be fatal to mother and fetus
Hypertension Medications

- Alpha blockers
- Alpha-beta blockers
- Angiotensin-converting enzyme (ACE) Inhibitor
- Angiotensin II receptor blockers
- Beta Blockers
- Calcium channel blockers
- Central-acting agents
- Renin inhibitors
- Thiazide diuretics
- Vasodilators
Hypertension

- Usually there is a fall in blood pressure occurs during first half of pregnancy

- Methyldopa is first choice
- Labetalol good alternative

- Beta-Blockers useful in late pregnancy but avoid Atenolol (low birth weight)
- Calcium antagonists useful in late pregnancy
- Avoid ACE inhibitors especially in second and third trimester (fetal deaths, skeletal abnormalities, unexplained stillbirth)
- Diuretics - avoid because reduces maternal plasma volume and can cause electrolyte disturbances.
Hypertension

- Treatment summary:
  - Methyldopa has become first-line therapy and drug of choice
  - If Methyldopa side effects intolerable then alpha-beta-adrenergic blocking agent, Labetalol, is used.
Meds for Common Conditions

Diabetes Treatment Overview

- Insulin Injections
- Oral medications

- The safety and effectiveness of oral diabetes medications during pregnancy, particularly in the early part of pregnancy, is still unknown.

- In general, if pregnant woman is taking oral meds she will be switched to insulin injections during pregnancy.
Meds for Common Conditions

Anti-Infective Medications Overview

- Penicillins
- Cephalosporins
- Maxrolides
- Fluoroquinolones
- Sulfonamides
- Tetracyclines
- Aminoglycosides
Anti-infectives

- **Penicillins (Category B)**
  - penicillin, amoxicillin (Amoxil), ampicillin (Omnipen, Principen), carbenicillin (Geocillin), dicloxacillin (Dycill, Dynapen), or oxacillin (Bactocill)
  - Animal studies failed to reveal evidence of fetotoxicity or teratogenicity.
  - Adverse effects have not been reported during human use, but no controlled data in human pregnancies.
  - Penicillin is excreted into human milk in small amounts. Risk to the nursing infant is unlikely.
Anti-infectives

- **Cephalosporins (Category B)**
  - Cephalexin, Cefaclor

  - Animal studies failed to reveal any evidence of teratogenicity. There are no controlled data in human pregnancies.
  - Crosses the human placenta.
  - Has been used in various stages of pregnancy without evidence of fetal harm.
  - Excreted into human milk in small amounts. Adverse effects in the nursing infant are unlikely.
Anti-infectives

**Macrolides**

- **Azithromycin (Category B)**
  - Animal studies failed to reveal evidence of fetotoxicity. There are no controlled data in human pregnancy.
  - Azithromycin is excreted into human milk.

- **Clarithromycin (Category C)**
  - There are no data on the excretion of clarithromycin into human milk. Clarithromycin is excreted in the milk of lactating animals, and other drugs in the macrolide class are known to be excreted in human milk.

- **Erythromycin (Category B)**
  - Crosses placenta in small amounts
  - CDC considers drug of choice for Chlamydia in pregnant women
  - Excreted into human milk in small amounts. Erythromycin is considered compatible with breast-feeding by the American Academy of Pediatrics.
Anti-infectives

- **Fluoroquinolones (Category C)**
  - Ciprofloxacin (Ciloxan), Ofloxacin (Ocufox), Gatifloxacin (Zymar), Levofloxacin (Quixin), moxifloxacin (Vigamox)

  - There are no data on the excretion of ciprofloxacin, ofloxacin, gatifloxacin, moxifloxacin, levofloxacin ophthalmic into breast milk. Oral ciprofloxacin is excreted in milk.

  - Ofloxacin, Moxifloxacin - Animal studies using high doses have revealed evidence of fetotoxicity and skeletal defects.
  - Gatifloxacin - Animal studies with large oral doses have revealed evidence of maternal toxicity, decreased fetal weight, and delayed fetal skeletal ossification.
  - Levofloxacin - Animal studies have revealed evidence of harm to the fetus at 7000 times the human dose.
**Anti-infectives**

- **Sulfonamides (Category B/D)**
  - Sulfonamide ophthalmic preparations have not been shown to cause birth defects or other problems in humans.
  - Sulfonamide ophthalmic preparations have not been reported to cause problems in nursing babies.
  - Avoid Sulfa drugs if near delivery because they can increase the chance of newborn jaundice
Anti-infectives

**Tetracyclines (Category D)**
- Tetracycline, Doxycycline, Minocycline

- Animal studies have revealed evidence of embryotoxicity and teratogenicity, including toxic effects on skeletal formation.
- There are no controlled data in human pregnancy, however, congenital defects and maternal hepatotoxicity have been reported.
- When used during tooth development (second half of pregnancy) tetracyclines may cause permanent yellow-gray-brown discoloration of the teeth and enamel hypoplasia.
- The use of tetracycline during pregnancy is generally not recommended, especially during the last half of pregnancy.
Tetracyclines (Category D)

- Tetracycline, Doxycycline, Minocycline

- Tetracycline is excreted into human milk in small amounts.
- Theoretical risks of dental staining and inhibition of bone growth exist, although are unlikely.
- Tetracycline is considered compatible with breast-feeding by the American Academy of Pediatrics.
- However, the manufacturer recommends that because of the risk of serious potential adverse reactions in nursing infants, a decision should be made whether to continue breast-feeding or discontinue the drug, taking into account the importance of the drug to the mother.
• **Aminoglycocides**
  - Streptomycin (Cat D), Neomycin (Cat D, Cat C - Neosporin), Tobramycin (Cat D, Ophthalmic - Cat B), Gentamycin (Cat C)
  - Aminoglycosides cross the placenta.
  - Reports of fetal eighth cranial nerve toxicity with permanent bilateral deafness after in utero exposure to streptomycin.
  - Gentamycin, Streptomycin, Tobramycin excreted into human milk. Due to poor oral bioavailability, systemic toxicity in the nursing infant is unlikely.
  - Gentamycin, Streptomycin considered compatible with breastfeeding by the American Academy of Pediatrics
  - No data on the excretion of neomycin into human milk.
- Augmentin (Amoxicillin/Clavulanate) Category B

  - The results of a study suggest an increased risk of necrotizing enterocolitis in neonates if amoxicillin-clavulanate is given prophylactically to women with premature rupture of membranes.

  - Cephalexin is excreted into human milk in small amounts, although adverse effects are unlikely in the nursing infant. Other cephalosporins have been classified as compatible with breast-feeding by the American Academy of Pediatrics.
Anti-viral Medications Overview

- **Topical Antivirals**
  - Trifluridine (Viroptic) Category C
  - Vidarabine (Vira-A) D/C 2001

- **Oral Antivirals**
  - Acyclovir (Zovirax) Category B
  - Valacyclovir (Valtrex) Category B
  - Famciclovir (Famvir) Category B

- Cold compresses and artificial tears
  - Herpes Viruses— HS, HZ, acute ret necrosis, Epstein-Barr infections, herpetic genital dz
  - Adenovirus – EKC, PCF
Topical Anti-virals

- **Viroptic**
  - The teratogenic potential of this compound in humans is unknown.
  - Not known whether secreted in human milk

- **Vira-A**
  - Likelihood of fetal damage of Topical Vira-A 3% is remote
  - Not known whether secreted in human milk

- Should not be administered to pregnant women or nursing mothers unless the anticipated benefits outweigh the potential risks.
Oral Anti-virals

- **Acyclovir (Category B)**
  - No toxicity reported in mothers & neonates
  - Use if life-threatening condition, but avoid if non-life-threatening infections
  - Excreted into and concentrated in human milk but adverse effects not reported
  - American Academy of Pediatrics considers Acyclovir ok when nursing

- **Famciclovir (Category B)**
  - No data on excretion into human milk, but higher concentration in milk than plasma in rats

- **Valacyclovir (Category B)**
  - Increase in Acyclovir excreted into breast milk after valacyclovir administration
Anti-fungal

Anti-fungal Treatment Overview
- Polyene Antibiotics
- Pyrimidine Analogs
- Imidazoles
- Triazoles
- Silver Sulfadiazine

OPHTHALMIC
- Natamycin (Category C)
  - Not known if Natamycin found in breast milk
  - Nystatin topical cream, ointment, powder (Category C)
  - Nystatin vaginal tablets (Category A)
Meds for Common Conditions

Glaucoma Medications Overview

- Prostaglandins
  - Xalatan, Travatan, Lumigan, Rescula

- Beta Blockers
  - Betoptic, Ocupress, Betagan, Timoptic
  - Cosopt, Combigan

- Alpha Adrenergic Agonists
  - Alphagan, Iopidine

- Carbonic Anhydrase Inhibitors
  - Diamox, Azopt, Trusopt, Neptazane
Glaucoma

- **Prostaglandin Analogs (Class C)** Xalatan, Travatan, Lumigan, Rescula
  - No report of harmful human fetal effects
  - May cross the blood-placental barrier
  - Known to be involved in stimulating uterine contraction
  - Cervical ripening and labor induction
  - Should not be used at any stage of pregnancy

- **Beta-Blockers (Class C)** Betoptic, Ocupress, Betagan, Timoptic, Cosopt, Combigan
  - Little literature regarding fetal adverse effects with topical
  - More concern with topical B-Blockers in nursing than pregnancy
  - Detected in breast milk at higher concentrations than plasma
  - Monitor fetus closely for signs of apnea and bradycardia
Glaucoma

- **Alpha adrenergic Agonists (Class B)**  
  Alphagan, Iopidine
  - One of safer meds during pregnancy, but may cross placenta and not clear if secreted in breast milk
  - Brimonidine (Alphagan)

- **Carbonic Anhydrase Inhibitors (Class C)**  
  Diamox, Azopt, Trusopt
  - Found in very low concentrations in breast milk
  - Fetal renal and metabolic disorders from use in pregnancy
  - Oral CAIs (Acetazolamide) should be avoided during pregnancy, no reports of adverse effects to fetus with topical CAIs
  - Unknown if topical CAIs excreted in breastmilk
  - Acetazolamide, Cosopt
### Glaucoma Summary Chart

<table>
<thead>
<tr>
<th>Use</th>
<th>Pregnancy</th>
<th>Nursing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prostaglandin analogs</td>
<td>NO</td>
<td>Yes</td>
</tr>
<tr>
<td>Beta Blockers</td>
<td>Yes</td>
<td>NO</td>
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<tr>
<td>Cosopt</td>
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<tr>
<td>Brimonidine – Alphagan</td>
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<tr>
<td>Oral CAI</td>
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</tr>
<tr>
<td>Topical CAI</td>
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</tr>
</tbody>
</table>

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Glaucoma Summary Algorithm

PREGNANT

↓

Alphagan

↓

Beta Blocker/Topical CAI

↓

Delivery then NURSING

↓

D/C all above and use PGA

Joseph W. Sowka
Anti-inflammatory Treatment Overview

- **Steroidal anti-inflammatory drugs**
  - Affects fertility before conception
  - While pregnant, if a woman is at risk for preterm delivery, dexamethasone/betamethasone injections (24-48) for fetal lung development
  - Multiple injections questionable
  - Prednisone no specific category—presnisolone category C
  - No consistent results with regards to low BW, data is conflicting
  - American Academy of Pediatrics states okay to breastfeed while taking prednisone-only very small amount in breastmilk

- **Anti-infective/Anti-inflammatory combinations**
Pain management

Topical ocular medications
- Alcaine (Proparacaine hydrochloride) (Category C)
- Tetracaine (Category C)

Oral medications
- Acetaminophen – recommended
  - Tylenol (Category B/B/B)
- Aspirin – avoid (Category D/D/D)
- NSAIDS – avoid (Category B/B/D)
  - Ibuprofen (Advil, Motrin)
  - Naproxen (Aleve)
Psychotropic

- Best if not used during first trimester
- Lowest possible dose for control should be used
- Found in breastmilk in varying amounts

- Typical antipsychotics, first generation, atypical, second
Some statistics
- 20% of women suffer from mood or anxiety disorders during pregnancy
- If D/C medication, high rates of relapse of depression or bipolar disorder (much less likely if maintain treatment)
- Common for women to have initial onset of psychiatric illness during pregnancy
- Weigh risks of medication exposure vs illness effects on mother
- Preterm delivery, preeclampsia, are complications of women experiencing distress during pregnancy
Antidepressants

- **Non-tricyclic antidepressant**
  - Bupropion-no increased risk of congenital malformation

- **TCAs-tricyclic antidepressants**
  - Norpramin, Pertofrane, Pamelor, Aventyl
  - No increase of congenital malformation
  - Also used for obsessive compulsive disorder
  - Safe in breastfeeding women-avoid doxepin

- **SSRIs-selective seratonin reuptake inhibitors**
  - *prozac, celexa, lexapro, zoloft*-category C
    - No increase of congenital malformation
  - Paxil-category D
    - Conflicting results regarding risk of cardiac defects
• DO NOT use MAOIs during pregnancy or breastfeeding
• SNRI-serotonin-norepinephrine reuptake inhibitor
  ○ no increase of major malformation-effexor
  ○ Cymbalta-no prospective data
- TCAs and prozac-studies performed, no long term effects between women who
  - Used medication throughout the entire pregnancy
  - Discontinue medication before delivery
  - Between 1-4 days after birth see
    - Tremor, restlessness, increased muscle tone, increased crying
    - No significant effect later in life on cognitive, language, or behavior
• **Bipolar disorder/borderline personality disorder**
  - Lithium-cardiovascular abnormalities, DO NOT use while breastfeeding
  - Anticonvulsants used to treat bipolar disorder
    - Tegretol-organ malformation
    - Depakote-DO NOT use-high risk of serious birth defects, DO NOT use while breastfeeding
    - Limited information on
      - Neurontin
      - Trileptal
      - Gabitril
      - Topamax
      - Zonegran
  
  Lamictal-safest but some reports of increased oral cleft
Anti anxiety

- Non benzodiazepines-no data
  - Ambien, sonata
  - Not recommended for use during pregnancy

- Benzodiazepines-varying reports
  - Most common cleft palate or lip
  - Newborn withdrawal symptoms but not long term
    - Restlessness, apnea, lethargy
  - Lorazepam, clonazepam-short or medium half life better to use than long half life
Anti psychotic

- **Low potency vs high potency neuroleptic agents**
  - Schizophrenia, bipolar, OCD
  - Low potency-chlorpromazine, higher risk of congenital malformations
  - High potency-haldol, trilafon, stelazine
  - Atypical antipsychotic medications-no major risk of malformations or obstetrical or neonatal complications
    - Zyprexa, risperdal, seroquel, clozapine
### Medications to avoid during pregnancy

<table>
<thead>
<tr>
<th>Pregnancy phase</th>
<th>Medication</th>
</tr>
</thead>
<tbody>
<tr>
<td>First trimester</td>
<td>Carbamazepine-bipolar</td>
</tr>
<tr>
<td></td>
<td>Valproic acid-depakote, bipolar, antidepress</td>
</tr>
<tr>
<td></td>
<td>Lithium (if possible)</td>
</tr>
<tr>
<td></td>
<td>Low-potency typical antipsychotics</td>
</tr>
<tr>
<td>Third trimester and labor and delivery</td>
<td>High-dose benzodiazepines</td>
</tr>
<tr>
<td>All trimesters</td>
<td>Monoamine oxidase inhibitors (MAOIs)</td>
</tr>
</tbody>
</table>
### Effects of exposure to psychotropic medications during pregnancy

<table>
<thead>
<tr>
<th>Medication</th>
<th>Effects</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Benzodiazepines</strong></td>
<td>Exposure to high-dose benzodiazepines in utero has been associated with newborn withdrawal symptoms, including irritability and restlessness, apnea, cyanosis, lethargy, and hypotonia. No long-term effects have been reported, although data are limited. Drugs with a short or medium half-life (lorazepam, clonazepam) at the lowest effective doses should be used.</td>
<td></td>
</tr>
<tr>
<td>Tricyclic antidepressants (TCAs)</td>
<td>The tricyclic antidepressants are most commonly used for comorbid conditions and when other treatments have failed. TCAs, which were once the treatment of choice for depression and panic, remain effective and are not associated with teratogenesis. Doses may need to be adjusted as the pregnancy proceeds. While data analysis has shown that exposure in pregnancy does not increase the incidence of teratogenesis, neonatal withdrawal symptoms have been associated with these medications, so careful monitoring of the newborn is essential.</td>
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<tr>
<td>SSRIs-also used for OCD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• clomipramine</td>
<td></td>
<td></td>
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<tr>
<td>• desipramine</td>
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<tr>
<td>• imipramine</td>
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<tr>
<td>• amitriptyline</td>
<td></td>
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<tr>
<td>• nortriptyline</td>
<td></td>
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<tr>
<td>Monoamine oxidase inhibitors (MAOIs)</td>
<td>The MAOIs are contraindicated in pregnancy, based on animal studies that have reported increased rates of congenital abnormalities.</td>
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<td>-----------------------------------------</td>
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<tr>
<td>Isoniazid, zyvox</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Other non-SSRI antidepressants</th>
<th>Limited data are available on the use of these medications during pregnancy</th>
</tr>
</thead>
<tbody>
<tr>
<td>• buproprion-wellbutrin</td>
<td></td>
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<tr>
<td>• mirtazapine</td>
<td></td>
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<tr>
<td>• trazodone-desyrel</td>
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<tr>
<td>Atypical antipsychotics-bipolar, schizophrenia, OCD</td>
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<td>-------------------------------------------------</td>
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<tr>
<td>• olanzapine-zyprexa</td>
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<tr>
<td>• risperidone</td>
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<tr>
<td>• clozapine-clozaril</td>
<td></td>
</tr>
<tr>
<td>• quetiapine-seroquel</td>
<td></td>
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<tr>
<td>• ziprasidone-geodon, zeldox</td>
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</tbody>
</table>

Low-potency dopamine blockade neuroleptics have been associated with an increased rate of congenital abnormalities. High-potency dopamine blockade antipsychotic medications have not been associated with congenital abnormalities. However, data are limited, and little or no information is available on clozapine, ziprasidone, and quetiapine. Ziprasidone is not yet available in Canada, but to date there are no reports of increased risk with exposure.
**Typical antipsychotics – schizophrenia, bipolar**
- haloperidol-haldol
- loxapine
- trifluoperazine
- chlorpromazine-thorazine
- thioridazine-mellaril

**Low-potency typical antipsychotics (e.g., thioridazine) have been associated with increased risk of mild malformations. High-potency typical antipsychotics (e.g., haloperidol) have not been associated with increased risk.**
<table>
<thead>
<tr>
<th>Mood stabilizers-bipolar, borderline personality disorder</th>
<th>Limited information is available regarding lamotrigine, topiramate, and gabapentin use in pregnancy. Carbamazepine and valproic acid use during the first trimester has been associated with an increased risk of neural tube defects, as well as minor and major fetal malformations, low birth weight, and thrombocytopenia. Lithium use in pregnancy has been associated with a pronounced increase in the rate of Ebstein anomaly; however, recent literature suggests that this rate is much lower than previously reported (1 in 4000 vs 1 in 400). If lithium is continued in pregnancy, because of the risk of decompensation, drug levels should be monitored carefully.</th>
</tr>
</thead>
<tbody>
<tr>
<td>• lithium</td>
<td></td>
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<tr>
<td>• valproic acid-depakote</td>
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<tr>
<td>• carbamazepine-tegretol</td>
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<tr>
<td>• lamotrigine</td>
<td></td>
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<tr>
<td>• topiramate-topamax</td>
<td></td>
</tr>
<tr>
<td>• gabapentin-neurontin</td>
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</tbody>
</table>
Antipsychotics and lactation

### Benzodiazepines
- lorazepam
- clonazepam
- alprazolam
- diazepam

Case reports indicate that milk plasma concentrations vary from 0.1% to 0.5% of the maternal dose for different benzodiazepines. Sedation, lethargy, impaired respiration, and withdrawal have been reported in exposed infants after prolonged use. Therefore, if these medications are indicated, the minimum dose required for symptom relief should be used, and the infant should be monitored regularly.
<table>
<thead>
<tr>
<th>Tricyclic antidepressants (TCAs)</th>
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<tbody>
<tr>
<td>• clomipramine</td>
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<tr>
<td>• amitriptyline</td>
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<tr>
<td>• nortriptyline</td>
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<tr>
<td>• doxepin</td>
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</tbody>
</table>

The tricyclic antidepressants appear to be safe for use by breastfeeding women. Occasional sedation has been reported in infants exposed to clomipramine and doxepin. The active metabolite of doxepin has the longest half-life of all TCAs, and should be avoided if possible because of the potential for excess accumulation in infant serum. A recent long-term study has reported no adverse developmental effects in infants exposed to TCAs through breast milk.
### Monoamine oxidase inhibitors (MOAIs)

The MOAIs are not recommended for use by breastfeeding mothers because of profiles indicating extensive interaction with other medications.

### Antipsychotics

- olanzapine
- risperidone
- clozapine
- quetiapine
- ziprasidone

The long-term developmental effects of neuroleptic exposure on the infant dopamine system and receptors are still unclear. Recent data on haloperidol, olanzapine, and quetiapine are encouraging, with no adverse effects reported. Clozapine has been associated with sedation.
Mood stabilizers
• lithium
• valproic acid
• carbamazepine
• lamotrigine
• topiramate
• gabapentin

Lithium has been reported to cross into breast milk at approximately 40% to 50% of the maternal levels. The use of lithium during lactation is contraindicated because the neonatal kidney is still immature and the risk for lithium accumulation is high. Low serum levels have been detected in infants exposed to carbamazepine and valproate through breast milk, suggesting that these drugs are compatible with breastfeeding. However, the possible association between these drugs and thrombocytopenia and hepatotoxicity indicates that close monitoring of the infant is necessary. Gabapentin has been
• **Acne Treatment**
  - **Accutane (isoretinoin):** oral, category X
    - craniofacial, heart, and CNS defects (25-35% of time if introduced in first trimester), increased risk of miscarriage, do not use while breastfeeding
  - **Retin-A (tretinoin):** category C,
    - very little reaches baby however still warnings against usage
  - **Tetracycline:** category D
    - fetus can have discolored teeth or inhibited bone growth, safe for breastfeeding,
  - **OTC meds:** if it contains benzoyl peroxide, okay
    - If it contains salicylic acid, not okay
Attention Deficit Hyperactivity Disorder in Adults

- Children with ADHD or ADD carry these characteristics into adulthood
- Three major symptoms of adult ADHD
  - Impulsivity-tough to control immediate reactions
    - Verbal outbursts, addictions to gambling, shopping
  - Hyperactivity
    - Constant desire to be doing something, restless
  - Distractibility
    - Trouble keeping mind focused on a specific task
Attention disorders

**NON-STIMULANT MEDICATIONS**

- **ATOMOXETINE, 24 HOURS (Strattera)** - Only nonstimulant medication approved by FDA for treatment of ADD/ADHD
  - Boosts level of norepinephrine
- **CLONIDINE, TABLETS: 4-5 HOURS, PATCH: 5-6 DAYS (Catapres)**

**STIMULANT MEDICATIONS: OVERVIEW** - Stimulant medications increase dopamine levels

- **METHYLPHENIDATE TABLETS, 2-4 HOURS (Ritalin) - category C**
- **DEXTRO-METHYLPHENIDATE, 4-6 HOURS (Focalin)**
- **METHYLPHENIDATE SUSTAINED RELEASE, 6 HOURS (Ritalin SR20)**
- **METHYLPHENIDATE LONG ACTING, 8 HOURS (Ritalin LA)**
- **METHYLPHENIDATE CONTROLLED DISPENSE, 8 HOURS (Metadate CD)**
- **METHYLPHENIDATE EXTENDED RELEASE, 12 HOURS (Concerta)**
- **METHYLPHENIDATE TRANSDERMAL SYSTEM, 12 HOURS (Daytrana)**
- **DEXTROAMPHETAMINE TABLETS, 4 HOURS (Dexedrine, Dextrostat)**
- **DEXTROAMPHETAMINE SPANSULES, 6 HOURS (Dexedrine)**
- **AMPHETAMINE SALTS TABLETS, 6 HOURS (Adderall tablets)**
- **AMPHETAMINE SALTS EXTENDED RELEASE, 12 HOURS (Adderall XR)**
- **PEMOLINE, 24 HOURS (Cylert)**
- Vyvanse
ADHD Medications

- Adderall, Adderall XR
- CNS stimulant
- FDA approved for treatment of child and adult ADHD
- FDA approved for treatment of narcolepsy
- XR is extended release-oral
- Increases flow of neurotransmitters dopamine and norepinephrine
- Do not use if have a history of drug abuse
- Cardiac precautions-arteriosclerosis, heart disease, HBP
- Pregnancy category C
- Breastfeeding-can pass into milk
- Cylert
- CNS stimulant
- FDA not approved for ADHD treatment due to potential to cause liver damage
- Discontinued production in 2005 but supplies out in the market were not withdrawn
- Oral dosage
- Pregnancy category B, not known if in breastmilk
• Dexedrine
• FDA approved to treat childhood and adult ADHD
• Oral dosage
• CNS stimulant, increases release of norepinephrine and dopamine
• Cardiac precautions
• Pregnancy category C, can pass into breastmilk
• Concerta, Metadate CD, Metadate ER, Methuline ER, Ritalin, Ritalin LA, Ritalin-SR, Vyvanse, Focalin, Daytrana
• FDA approved to treat childhood and adult ADHD and narcolepsy
• CNS stimulants-instant release and sustained release are equally effective
• Oral and patch (Daytrana)
- Not recommended for those who have a history of drug abuse
- Cardiac precautions
- Pregnancy category C, can pass into breastmilk
• Catapres
• FDA approved as an antihypertensive
• Well accepted as alternative to stimulants to treat ADHD
• Oral or extended release patch
• Reduces activity of sympathetic nervous system
• Take as directed to avoid withdrawal
• Pregnancy category C, can pass into breastmilk
Strattera-Only nonstimulant medication approved by FDA for ADHD treatment in adults and children.
Inhibits presynaptic norepinephrine transporter-more norepinephrine is available.
Contraindicated in those with narrow angle glaucoma.
Suicide warning.
Pregnancy category C-can pass into breastmilk.
Review of ADHD medication side effects

- Amphetamines, stimulant medications - most of the medications used to treat ADHD are of this type
  - Examples: dexedrine, adderall
  - No increased risk of malformations with use of therapeutic doses
  - Examples: adderall, ritalin, concerta: data very limited
- Atomoxetine (strattera), data very limited
  - No teratogenicity
Cancer treatment

- Cancer is rare during pregnancy 1 in 1,000
- Can be diagnosed late due to alike symptoms between pregnancy and cancer
  - Tender, swollen breasts (breast cancer)
  - Abdominal bloating (ovarian)
  - Frequent headaches (brain)
- Most common cancer during pregnancy-breast-1:3000 in ages 32-38
- Genetic tie between breast and ovarian cancer
- Other common cancers are those of younger women such as cervical cancer, Hodgkin lymphoma, malignant melanoma, and thyroid cancer
General cancer treatment considerations

- How far along is pregnancy
- Type
- Location
- Size
- Stage of cancer
- Wishes of mother
  - Some cancer treatments effect fetus, delay tx until 2\textsuperscript{nd} trimester
  - If dx later in pregnancy, may induce labor early or wait to tx until after delivery (cervical)
Treatment

- **Surgery**
  - Little risk to fetus, safest option

- **Chemotherapy-use of drugs to kill cells**
  - Can pass to fetus, do not use in 1\textsuperscript{st} trimester
  - Some drugs do not pass placenta so safe to use in 2\textsuperscript{nd}, 3\textsuperscript{rd} trimester
  - Can indirectly harm fetus due to poor mother health, ie anemia, malnutrition

- **Radiation-high energy x-rays shrink tumor, kill cells**
  - Not used in 1\textsuperscript{st} trimester, later dependent on dose and area of body being treated
• Chance of recovery for pregnant woman is same as non pregnant
• Unless delayed dx, then outcome prognosis equal
• Due to varying hormones during pregnancy, cancer behavior can change
• Cancer cells do not spread to fetus, but may spread to placenta
• Cancer cells cannot spread to baby in breastmilk, tx can spread-no breastfeeding
• Pregnancy after cancer survival is safe
• Pregnancy does not increase chance of cancer return
• Depending on type of cancer and stage, MD will recommend waiting a certain amount of time before trying to become pregnant
Breast cancer

• Prognosis and treatment depends on
  ○ Stage of cancer
  ○ Size of tumor
  ○ Type of breast cancer
  ○ Age of fetus
  ○ Whether there are symptoms
  ○ Patient’s general health
Treatment options include

- Surgery - simple mastectomy, modified mastectomy, breast-conserving surgery (partial mastectomy, lumpectomy)
- Chemotherapy - kills cells or keeps them from dividing
  - Not given during 1st trimester
  - Afterward - can cause early labor and low BW
- Radiation therapy - x rays to kill cancer cells
  - Cannot be used in early stage (I, II) cancer
  - Late stages (III, IV) okay after 1st trimester
- Hormone - blocks hormone actions, removes, or stops growing cells
- Combination - adjuvant therapy - surgery then ...
- Early stage breast cancer (stage I and II)
- Late stage breast cancer (stage III and IV)
  - Radiation therapy
  - Chemotherapy
  - Breast cancer cells do not pass from mother to fetus
- Breastfeeding is not recommended while being treated for cancer with any type of treatment regimen
  - Need to reduce blood flow to breasts for surgery
  - Contraindicated in chemotherapy
- Pregnancy after cancer
  - Unknown effects of treatment on later pregnancies for high dose chemotherapy and bone marrow transplant
  - Otherwise, does not affect future fetus if mother had breast cancer
Scanning Technology

- Computed tomography (CT Scan)
- Computerized axial tomography (CAT Scan)
- Computer combines multiple x-rays and get cross-sectional and 3D images
- Assess internal structures
- Radiation levels are slightly higher than that of x-rays
- Benefit vs radiation exposure
- CAT scans are not recommended during pregnancy unless the benefits “clearly” outweigh the risks
Most common complaint
- Mild allergy to dye-itching, hives, nausea, rapid breathing-
- If breastfeeding, wait 24-48 hours to feed the baby
Magnetic Resonance Imaging (MRI)
- Uses magnetic and radio waves to capture image
- Aligns the water molecules of the body
- Use to image tissues, organs, skeletal system

Guidelines of the FDA state safety of MRI with respect to the fetus "has not been established"
- No contraindications for mother
- "Fetal concerns are twofold; first, the possibility of teratogenic effects, and second, the possibility of acoustic damage. In general, it should be noted that most studies evaluating MRI safety during pregnancy show no ill effects"
Ultrasound
- High frequency sound waves
- Noninvasive procedure does not harm fetus unless used improperly, repeated, or lengthy usage
- Should only be performed by trained and credentialed professionals (licensed physicians, registered sonographers)
X-Ray
Not all x-rays have equal exposure to uterus
American College of Radiology “no single diagnostic x-ray has a radiation dose significant enough to cause adverse effects in a developing embryo or fetus”
American Academy of Family Physicians states that x-rays are generally safe during pregnancy
All controversial and studies are conflicting
Other

- Paint
  - Oil, lead, mercury, latex
    - Household painting-avoid exposure
    - Wear protective clothing, take breaks, open a window, use fans
    - Lead paint was used in houses before 1970-do not remove old paint
  - Water colors, acrylic, tempera
  - Occupational or industrial use
    - Spray paint is the largest concern-large amounts inhaled
  - Recreational use
    - Sniffing or inhaling paint
    - No studies which document harm to baby with normal paint exposure-painting baby’s room, but miscarriage and malformations if higher levels ingested by sniffing or inhaling regularly
    - Today’s paints do not include lead
Environmental Chemicals

- Pesticides and insecticides
  - Riskiest time of exposure is during first trimester (3-8 weeks)
  - Mode of action in insects-attacks nervous system
  - California Birth Defects Monitoring Program-
    - 3 of every 4 women are exposed to pesticides in home
    - Women exposed to household gardening pesticides-modest risk increase of delivering babies with oral clefts, neural tube defects, heart defects, limb defects
    - Women living within ¼ mile of agricultural crops had same risks
- Chemical cleaning products
  - Bleach, ammonia
    - windex, pinesol, comet okay
  - Make sure to have good ventilation
  - Can go natural-baking soda and vinegar are the alternative
Natural herbs and vitamins:

Do not go through the same evaluation process by the FDA

Non standardized therefore two batches of the same product or product from different manufacturers may vary

Label may not be correct

FDA URGES pregnant women to speak to doctor before taking herbs

Few studies done on herbals to measure effects on pregnant woman or fetus
• **Herbs to avoid during pregnancy-orally**
  - Saw palmetto-hormonal influences
  - Goldenseal-can cross placenta (cold tx)
  - Dong Quai, black cohosh, blue cohosh-uterine stimulant (menstrual cramps)
  - Ephedra, Yohimbe (aphrodisiac), Pay D’ Arco, Passion Flower (HA, bruises), Roman Chamomile (sleep), Pennyroyal, Rosemary (digestion), Thuja (resp inf), Juniper (heartburn), St. John’s Wort, feverfew (HA)
Herbs which are likely safe/possibly safe

- Red raspberry leaf - use during 2nd, 3rd trimester - rich in iron, helps tone uterus, increase milk production, decrease nausea, ease labor pains
- Peppermint leaf, ginger root, slippery elm bark - all to alleviate nausea
- Blond psyllium, black psyllium (laxative), garlic, capsicum
Herbs which are possibly unsafe

- Dandelion, chamomile, nettles
- Aloe, ginseng, evening primrose, feverfew (headaches), kava kava (anxiety)
• Non herbal and herbal teas
  ○ Non herbal-black, green, oolong (mix of two)
  ○ Non herbal are made from tea leaves-caffeine and antioxidants
  ○ Herbal tea made from roots, berries, flowers, seeds, and leaves of a variety of plants, not actual tea plant leaves
  ○ Herbal tea is caffeine free
  ○ Commercial brands safe
Unsafe are not available commercially or those with excessive amounts of herbs

- Red raspberry leaf, ginger root-relieve nausea, vomiting
- Lemon balm-reduces anxiety
- Dandelion-vitamin A, Ca, Fe,
- Chamomile-Ca, Mg, sleeplessness
- Nettles-vitamins A, C, K, Ca, K, Fe
- Alfalfa, yellow dock-possibly unsafe-vitamins
Marijuana use is most frequent
- Crosses placenta
- Use slows fetal growth
- Decreases length of pregnancy
- After birth, undergo withdrawal-like symptoms
- No decrease of IQ
- Have attention deficits
Ecstasy and methamphetamine

- Large increase in use in recent years
- Both cross placenta and cause:
  - Low birth-weight babies
  - Smaller than normal head circumference
  - Withdrawal-like symptoms after birth
- Unknown long term effects, however, low birth-weight and small head circumference babies are more likely to have learning problems
Heroin abuse

- More serious complications are caused by heroin
- Crosses placenta and can cause:
  - Poor fetal growth, premature rupture of the membranes, premature birth, stillbirth
  - One half of all heroin babies are low birth-weight
  - Withdrawal symptoms after birth
    - Severity depends on length of drug use and dosage
    - Increased risk of learning and behavioral problems
Cocaine abuse

- Crosses placenta and takes a longer time to be eliminated by fetus than in adult. Results in:
  - Miscarriage, preterm labor, poor fetal growth, placental abruption
  - Often born premature and low birth-weight and small head circumference
  - Withdrawal and behavioral disturbances
    - Jittery, irritable, difficult to comfort
    - Can “turn off” surrounding stimuli and go into a deep sleep for most of the day
    - Resolves over the first few months of life
    - Normal intelligence
    - Have subtle learning and behavioral disturbance
      - Examples-language delays, attention problems
- Smoking
  - primary
  - secondary exposure (low BW, health issues-asthma)

- 10% of women smoke during pregnancy
  - Down 42% from 1990

- Doubles the chance of a low birth-weight baby
  - 20-30% of overall low BW babies
  - 14% of preterm deliveries
  - 10% of all infant deaths

- Preterm delivery, slows fetal growth
Nicotine replacement therapy can also affect fetus
If smoking is stopped by the end of the second trimester, then chance of low birth-weight baby is the same as if the mother had never smoked
Placental previa, abruption, heart defects can still occur
Child may have withdrawal-like symptoms after birth
Smoking affects fertility
3x more likely to die of SIDS
Fetal alcohol syndrome

FAS triad
1. Facial Dysmorphology
2. Growth Deficiency
3. CNS Dysfunction—this damage occurs more readily than others

FAS first appeared in the U.S. literature in 1973

• 4.3% of children born to mothers who drink heavily during pregnancy will have FAS
• This translates to 1 child per 1,000 live births in the U.S.
• In Europe, the rate is about 1:4,000
• Children of binge drinkers at highest risk because of unplanned pregnancy
• 10 times the number of FAS children in foster care as in the general population
>50% of women, childbearing age, report alcohol use in previous month-mostly occasional use
13% reported moderate or heavy alcohol use
50% of all pregnancies are unplanned
Since alcohol during pregnancy is a teratogenic, the most severe cases can result in miscarriage, especially during the first trimester.

The least severe can result in milder fetal alcohol spectrum disorders (FASD), without obvious physical manifestations.

All surviving children with significant alcohol exposure are said to have FASD.
According to Duckman, here is how FAS differs from Fetal Alcohol Trait:

- Physical appearance, along with size and mental function, is affected by alcohol consumption starting in the first-trimester.
- BUT, if drinking starts in the second trimester, only physical size and mental function will suffer, not appearance.
- Thus, FASD can go undiagnosed and may be up to you to detect, especially late-term drinking.
FASD facial traits

- Small head
- Low nasal bridge
- Epicanthal folds
- Small eye openings
- Flat midface
- Short nose
- Smooth philtrum
- Thin upper lip
- Underdeveloped jaw
FASD Ocular Characteristics

Most likely to include:
1. Epicanthal folds, reduced palpebral aperture and hypertelorism
2. High myopia and astigmatism
3. Strabismus and Amblyopia

Less likely to include:
4. Congenital cataracts
5. Iris coloboma
6. Microcornea
7. Optic nerve hypoplasia
Caffeine

- Studies on animals
  - Birth defects, preterm delivery, reduced fertility, increased risk of low BW
- Inconclusive human studies and effects
- Stimulant, diuretic, crosses placenta
- Fetus cannot fully metabolize caffeine
- Can cause changes in fetus’ sleep or movement patterns
- Found in tea, soda, chocolate, some OTC medications
- Moderate levels (150-300mg/day) no negative effect on pregnancy

Examples of amount of caffeine in common drinks
- Starbuck grand coffee-400mg
- 7-eleven big gulp diet coke-124mg
- Green tea (6oz) 40mg
- Dr. Pepper (12oz) 37mg