

Pregnancy for Vet Techs

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Objectives

- Review

- Principles of teratology
- Common occupational exposures
- Implications for pregnancy

- Opportunity for Discussion

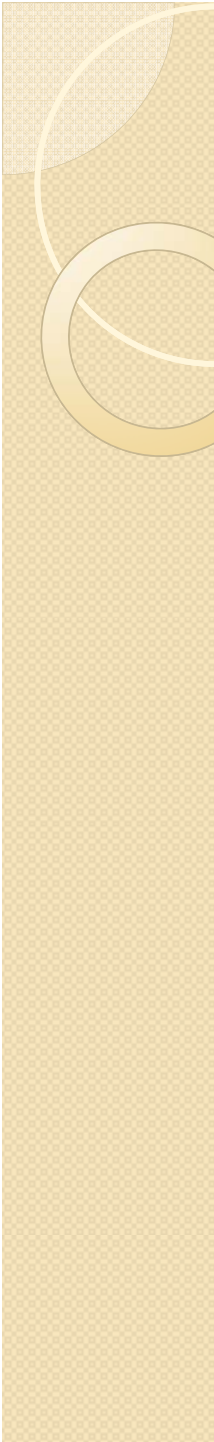
- Healthy Pregnancy



There seem to be a lot of *HAZARDS*

- **PHYSICAL**

- Trauma
- MVA
- Injuries (equipment and instruments)
- Assault and Substance Abuse



- **CHEMICAL** (spilled, inhaled, ingested, injected, absorbed)

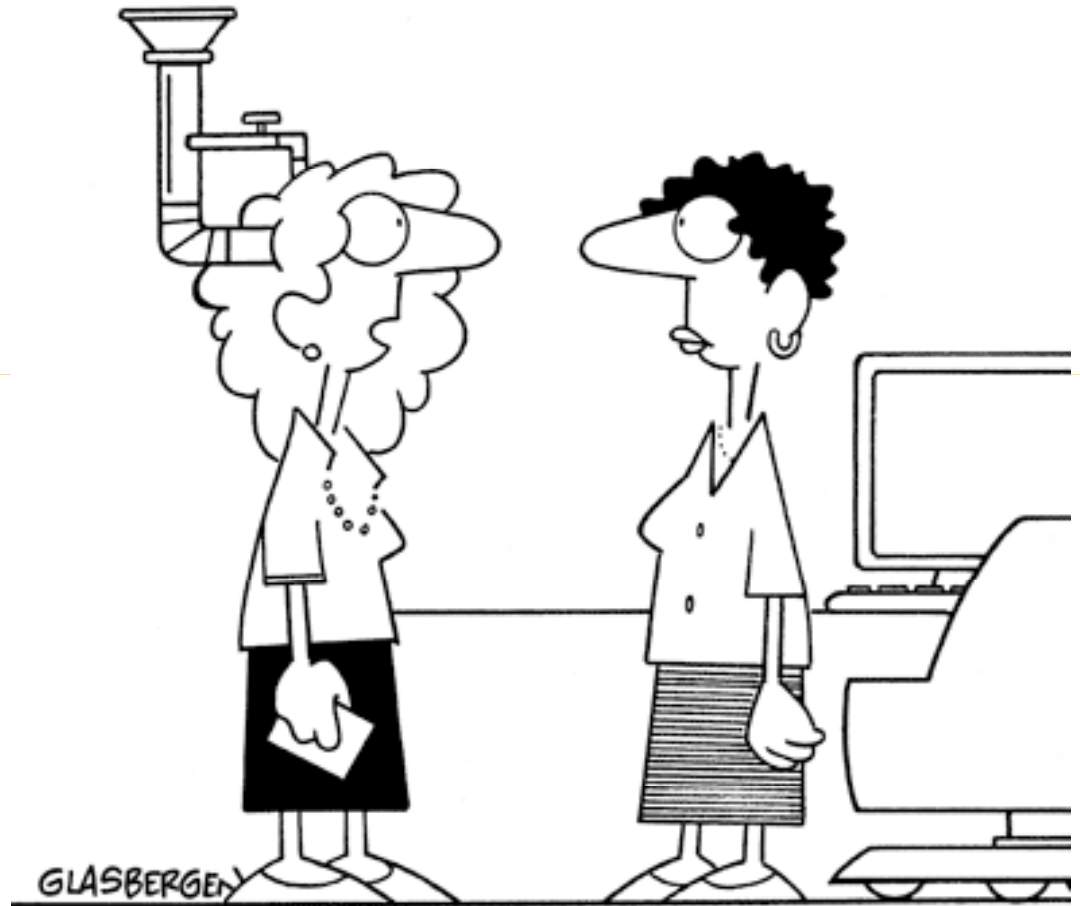
- Disinfectants
- Inhalational Agents
- Pesticides
- Antineoplastic Agents
- Analgesics
- Antibiotics
- Solvents



- **BIOLOGIC**

- Allergens
 - Latex
 - Zoonoses
-

• **STRESS**



**“The key to stress management is knowing
how to vent your frustration.”**

There seem to be a lot of women.

- College of Veterinarians of Ontario

	Total	% Women (childbearing age)
Veterinarians	2745	45%
Vet Techs	1100	98%



Risks in the General Population

- Miscarriage 8-20%
- Congenital Malformation 3-6%

- Medical Complications
 - Diabetes 10%
 - Hypertension 6%
- Preterm Birth 5-15%
- Stillbirth 0.3%



TERATOLOGY

- The study of congenital malformations caused by environmental or drug exposure
-
- *Teratos*
 - “monster”



What is a teratogen?

- An agent that can cause abnormalities in the form or function of a developing fetus
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- Consequences
 - Fetal loss
 - Fetal growth restriction
 - Birth defects
 - Impaired neurologic performance



Environmental Exposures

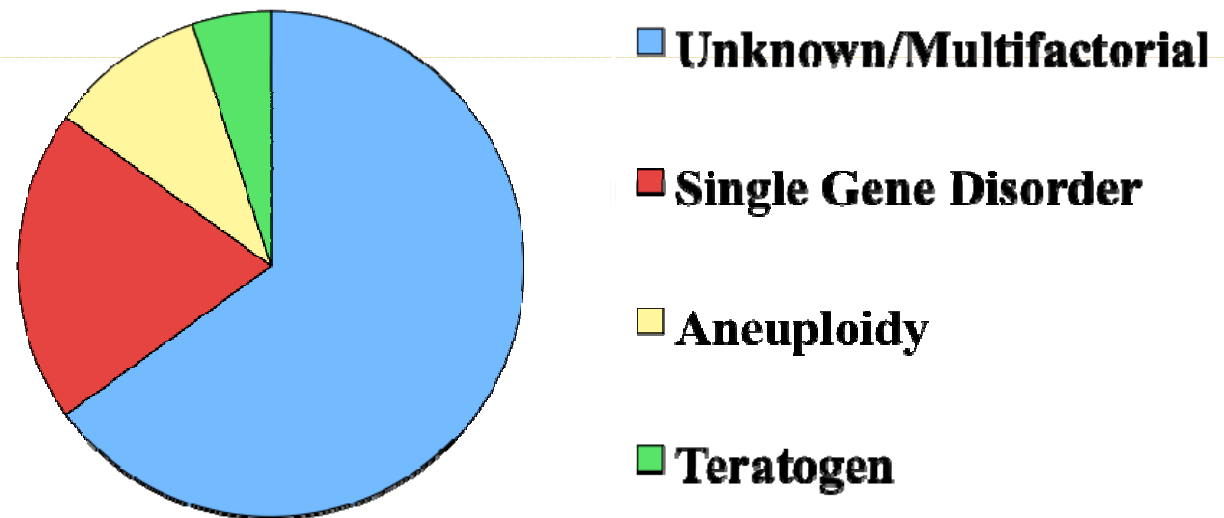
- Accounts for 4-6% of birth defects
 - Maternal Illnesses
 - Infection
 - Physical Agents (radiation or heat exposure)
 - Chemical Agents
 - Drugs



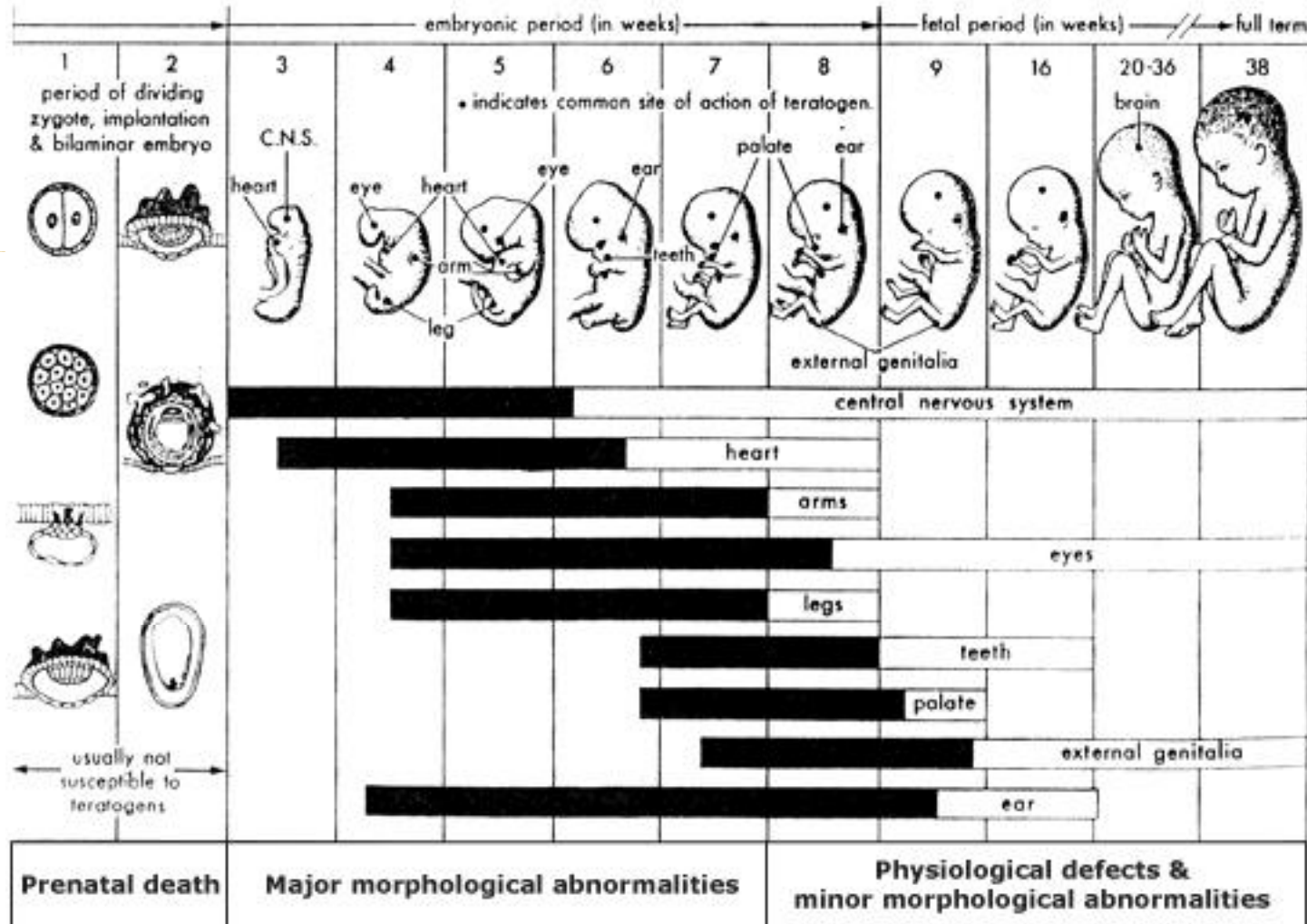
Teratogenic Effects

- Depends on several factors
 - Inherited susceptibility
 - Dose of agent
 - Timing of exposure
 - Any concurrent exposures or illnesses

Etiology of Congenital Malformations



Drug Effects are Dependant on GA





~ Nobody's risk is zero ~



Physical Trauma

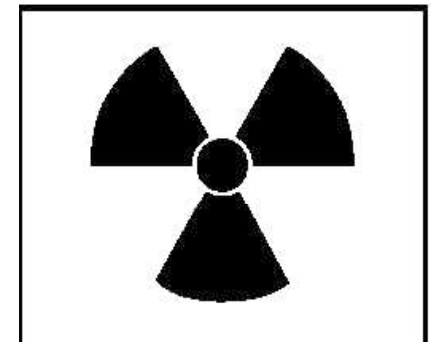
- Lifting/moving heavy animal and equipment
 - Predisposes to back injury
- With advancing pregnancy:
 - Limiting duties
 - Lifting, climbing, prolonged walking/standing
 - Avoiding situations with risk of falls/abdominal trauma

Ionizing Radiation

- No human studies on risks of ionizing radiation
- Based upon case reports/data from atomic bomb survivors

- The potential consequences are

- Pregnancy loss
- Malformations
- Disturbances of growth or development
- Mutagenic/Carcinogenic effects





Many factors affect level of exposure

- Gestational age at time of exposure
- Dose of radiation absorbed by the fetus
- Fetal cellular repair mechanisms

Critical Dose?

- The threshold at which an increased risk is observed has not been definitively determined
-
- >50 rads : severe MR
 - >10 rads: some adverse outcomes
 - 5-10 rads: controversial

Exposure < 5 rads

- No increased risk of:
 - Miscarriage
 - Fetal anomalies
 - Intellectual disability
 - Growth Restriction
 - Cancers
- **Most human exposures are fractionated over a period of time, this type of exposure is less harmful than acute exposure

Radiologic Imaging and Pregnancy

- *Concern about possible radiation exposure should not prevent medically necessary diagnostic procedures from being performed*

- CONSIDER

- Gestational age
- Other options (U/S?, MRI?)
- Abdominal shielding

- *Discuss risks and benefits of imaging*

Fetal Exposure

<i>PROCEDURE</i>	<i>FETAL EXPOSURE</i>
CXR	0.02-0.07 mrad
AXR (3 views)	100 mrad
CT head/chest	<1 rad
V-Q scan	0.4 rads
CT Abdomen	3.5 rads
CT Pelvis	2.5-7 rads
Barium enema	2-4 rads
Spine Xrays	0.37 rads
<i>Background radiation over 40 wks</i>	<i>0.1 rads</i>

Health Canada Guidelines

Affected Group	Annual Effective Dose Limit (mSv)	5 year Cumulative Dose Limit
Occupationally Exposed Workers	20* (2 rads)	100 (10 rads)
General Public/Incidentally Exposed Workers	1 (0.1 rads)	5 (0.5 rads)

What if you're pregnant?

- **Dose**

- Limited to $<4 \text{ mSv} = <0.4 \text{ rads}$

- **Risk Reduction**

- *Lead aprons*
- *Dosimeters (q 2-4 weeks)*
- *Maximize distance from source*
- *Minimize time of exposure*

Nuclear Medicine Tests - Thyroid

- By 10-12 weeks, radioiodine isotopes are readily absorbed by the fetal thyroid
 - No reports of adverse fetal effects from diagnostic doses of radioactive iodine
 - Avoid in pregnant women (risk of induction of thyroid cancer in the offspring)
- If a diagnostic scan of the thyroid is required, the preferred agents are Technetium Tc 99m or I-123 (but not I-131)

Are U/S and MRI safe?

- No known significant fetal effects from exposure to diagnostic ultrasound or MRI involving a magnetic field at 1.5 Tesla or lower.





Chemicals

- Inhalational Agents
 - Pesticides
 - Solvents
 - Antineoplastic Agents
 - Analgesics
 - Antibiotics
-



Inhalational Anaesthetic Agents

- Most of the existing evidence in humans indicates no associations between occupational exposure and increased risk of birth defects or miscarriage
- Use of Waste Scavenger Systems

Shirangi 2009
Shuhaiber 2002

Pesticides

- No evidence of significant exposure to pesticides in *health care workers* and increased risk of birth defects
- However, there has been *some increased risk* noted in women working in *agricultural activities* with pesticides
 - The almost universal exposure to low levels of pesticides makes it difficult to determine effects

Solvents

- Animal Studies

- Limb and CNS defects
- Skeletal malformations
- Usually high dose of single solvents

- Occupational exposures

- Exposure to multiple solvents at low dose
- Inhalational
- Studies all retrospective



Motherisk Study

- 125 women exposed to occupational solvents matched to 125 women in control group
 - Lab techs, Factory workers, Printing Industry
 - Hydrocarbons, Phenols, Xylene, Acetone, Vinyl Chloride
- Primary Outcome
 - Major malformations

Results

- Previous Miscarriage
 - Exposed Group 50%
 - Control Group 20%

	Exposed Group	Control
Miscarriage	8/125	6/125
**Major Malformation	13/125	1/125

Results

	Major Malformation
Exposed and symptomatic (75/125)	12/13
Exposed and Asymptomatic (43/125)	1/13



Conclusion

- Exposure to organic solvents associated with
 - Increased risk of previous miscarriage
 - Increased risk of major malformations
- Women reporting symptoms from their exposure have higher risks
- No specific congenital syndrome has been identified



Conclusion

- More study is needed to confirm these results
-
- Prevention
 - Personal Protective Equipment
 - Appropriate Ventilation



Medications

- Antibiotics
 - Almost all safe
 - Avoid: Tetracycline, Streptomycin, Erythromycin estolate, fluroquinolones,
- Analgesics
 - Safe
- Anti-neoplastic agents
 - Avoid Methotrexate

Are there risks for staff who handle chemotherapy agents?

- *Occupational exposures to chemotherapeutic agents have been linked to adverse pregnancy outcomes*
- A recent systematic review
 - No significant assoc between cytotoxic drugs and congenital malformations (OR 1.64%) or stillbirths (OR 1.16)
 - It did identify an association between exposure to chemotherapy and spontaneous abortions (OR 1.46)



BIOLOGIC EXPOSURES

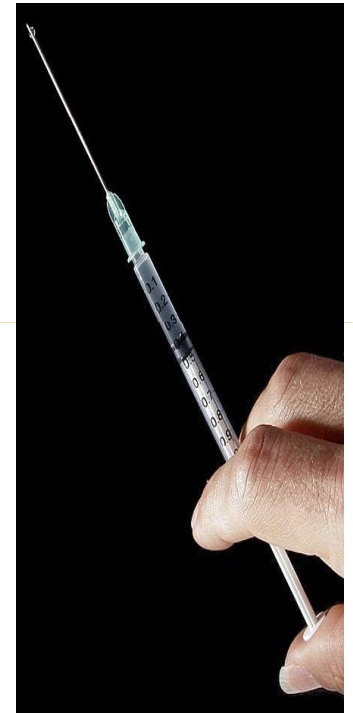


Bites

- Dogs & Cats
- Pathogens
 - Oral flora of biting animal & human skin flora
 - Include: Pasteurella species, staphylococci, streptococci, and anaerobic bacteria.
 - Bartonella (cat scratch disease)

Management of Bites

- Similar to non-pregnant adults
 - Wound inspection
 - Meticulous wound care
 - +/- closure of wound
- Prophylactic antibiotics
 - If high risk of infection
 - Clavulin often 1st line – SAFE in pregnancy
- Prophylaxis for tetanus



Rabies Prophylaxis

- *Rabies Immune Globulin*
 - *Rabies Immunization*
-
- Safe in pregnancy
 - Not known to cause any fetal anomalies
 - Higher risk to have untreated rabies than to expose woman to vaccine/immune globulin

Insect Bites

- Flies, fleas, ticks
- Management as per non-pregnant adults





Lyme Disease

- Borrelia (spirochete)
- If treated, *no evidence* of congenital syndrome
- *No evidence* for vertical/horizontal transmission
- Treatment as per non-pregnant
 - EXCEPTION: avoid doxycycline



TORCHS infections

- ***T*oxoplasmosis, *R*ubella, *C*MV, *H*erpes, *S*yphilis**
 - Can cause fetal malformation and disease
 - Risk of congenital disease especially with infection in first trimester
 - Testing: IgM, IgG

Rubella

- aka German Measles
- Mother: self-limited
- Fetus: anomalies
- Screening for antibodies to rubella is a routine test at first prenatal visit



Congenital Rubella Syndrome

- Rare
- Occurs mostly with exposure < 20 weeks

- Risk of miscarriage and stillbirth

- Fetal Risks
 - Growth restriction
 - Deafness
 - Cataracts
 - Cardiac anomalies





Prevention

- Rubella vaccine
 - Live Attenuated vaccine
 - Contraindicated in pregnancy
- Assess immunity as part of care of “reproductive age women”



Cytomegalovirus

- A DNA herpes virus
 - One of the most common viral infections in pregnancy
 - Usually asymptomatic in women
 - Seroconversion in pregnancy: 1-4%

Diagnosis of CMV

- Serology (IgM, IgG)
- Presence of CMV IgM is not helpful for timing the onset of infection because:
 - It's found in only 75 -90% of women with acute infection
 - Can remain + for >1 year after acute infection
 - It can revert from negative to positive in women with CMV reactivation or reinfection with a different strain



Maternal Infection

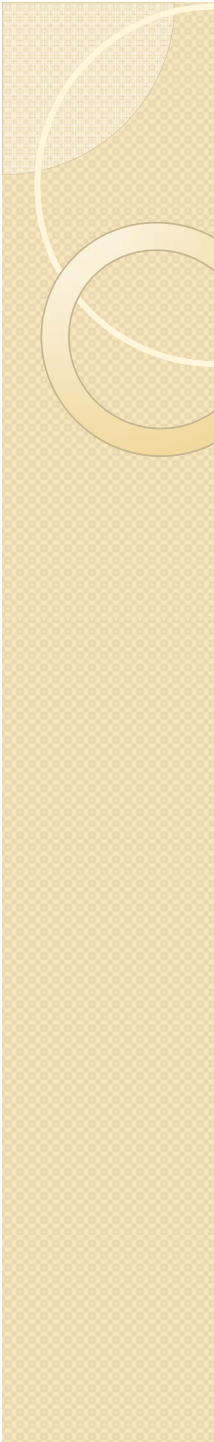
- Preexisting maternal CMV seropositivity significantly decreases intrauterine transmission, suggesting a protective role of maternal immunity
- Rates as low as 1% (higher if conceive within 1 year of primary infection)



Should we screen routinely for CMV?

- **No**

- No vaccine is available
- Difficult to ddx between primary and nonprimary infection or determine the timing of the infection, which could have occurred many months before conception

- 
- No evidence that tx with antiviral drugs prevents/mitigates sequelae of CMV infection

 - Although fetal infection can be detected, there is no way to accurately predict whether the fetus will develop significant sequelae

Congenital CMV

- Primary Infection

- Mortality 5%
- Long term neurologic sequelae 50 to 60%
- Microcephaly
 - Progressive hearing and/or visual loss
 - Cognitive impairment

- Nonprimary infection

- Occasionally results in symptomatic disease at birth
- Rarely - death



Prevention and Treatment of CMV

- Prevention

- Good personal hygiene
- Using CMV negative blood products when transfusing seronegative women

- Treatment

- Antivirals
- +/- IVIG

Parvovirus

- Aka “Fifth Disease”
 - Fever, “slapped cheeks”
 - Test: Parvovirus IgM/IgG
- Maternal Risks
 - Usually asymptomatic
 - *Arthralgias most common symptom
- Fetal Risks
 - May develop severe bone marrow suppression with infection – leads to risk of anemia



Varicella

- “Chicken pox”
 - >90% of adults are immune



- In pregnancy
 - High risk of maternal varicella pneumonia and severe illness
- Exposed non-immune pregnant women
 - Prophylactic Varicella Immune Globulin (within 96 hours) and Acyclovir to decrease severity of disease



Congenital Varicella Syndrome

- Most common with infection at between 8-20 weeks
 - Risk ~ 2%
-
- Features
 - Limb hypoplasia
 - Cataracts
 - Microcephaly
 - Growth restriction



Neonatal Varicella

- Highest risk if fetus is born within 5 days of mother developing varicella
 - No time for passive immunity
- Risks
 - Mortality 25%
 - Disseminated disease
- Vaccine
 - Avoid in pregnancy



Influenza

- Common infection during fall and winter
- May precipitate severe respiratory difficulties in pregnancy
 - Viral pneumonia with bacterial superinfection
 - May lead to respiratory failure, ICU, etc
- Immunizations recommended in flu season for all pregnant women



Toxoplasmosis

- Systemic illness caused by protozoa
 - *Toxoplasma gondii*
 - 15-40% of women are already immune to future infection
- Transmission
 - Ingestion of undercooked meat, unpasteurized goat's milk, contaminated water, *exposure to feces of infected cat*

Cats

- Owning a cat has not been shown to be a risk factor
- Cats that don't hunt outdoors/are not fed raw meat are not likely to acquire Toxo
- Due to their grooming habits, fecal matter is not usually found on their fur and adult cats are not diarrheal during the period in which they are shedding oocysts
 - Transmission to humans via touching cats is virtually nonexistent



Toxoplasmosis

- Subclinical or mild infection
- Incidence of maternal infection during pregnancy ranges from 1-8 per 1000 susceptible pregnancies
- No good evidence for routine screening



Is Previous Infection a Risk?

- Immunocompetent women infected prior to conception virtually never transmit toxoplasmosis to the fetus, although rare exceptions have been reported

Toxoplasmosis

- Vertical transmission possible
 - Higher risk as gestation advances
 - But, greater severity with earlier transmission
-
- Only 15% of infants symptomatic at birth
 - **Classic Triad**
 - Hydrocephalus
 - Intracranial calcifications
 - Chorioretinitis



Testing - Toxoplasmosis

- Maternal serology
 - Amnio with PCR
 - U/S
-

Management of Toxo

- No treatment has been proven to reduce transmission
-
- Spiramycin
 - Pyrimethamine-sulphonamides.



Prevention of Toxoplasmosis

- Avoid of sources of infection
 - Animal feces
-
- Hand washing



Listeriosis

- Most commonly occurs in third trimester
- Presents as fever, chills, back pain, flu-like illness
 - Diagnosed on cultures in woman with fever

- May be self-limiting
- Fetal Risks
 - Vertical transmission – NN infection
 - Preterm birth
 - Fetal death
- Treatment
 - As per non-pregnant adults



Brucellosis

- Zoonotic infection transmitted to humans by contact with fluids from infected animals
 - Sheep, cattle, goats, pigs
 - Derived food products such as unpasteurized milk and cheese
- Varied and nonspecific symptoms
 - night sweats, malaise, anorexia, arthralgias, fatigue, weight loss, and depression



Brucellosis in Pregnancy

- In contrast to certain animal species, brucella does not seem to cause abortions in humans

- Sepsis: may cause preterm birth

- Treatment
 - Rifampin +/- Sulfa
 - (usual – tetracycline – must be avoided)



Q fever

- Zoonotic infection caused by *Coxiella burnetii*
- Most common sources of human infection
 - Farm animals such as cattle, goats, and sheep.
 - Cats, rabbits, pigeons, dogs
- Inhalation of contaminated aerosols from parturient fluids of infected livestock



Q Fever

- Presentation
 - A self-limited flu-like illness
 - Pneumonia
 - Hepatitis
-



Q Fever in Pregnancy

- Tends to be asymptomatic
- Associated with:
 - Miscarriage
 - Low birthweight
 - Low amniotic fluid
 - Preterm delivery
 - Stillbirth
 - Unclear if this is associated with a congenital syndrome

Q Fever in Pregnancy

- Systemic testing for Q fever should be performed during pregnancy
 - In areas where Q fever is prevalent
 - When a pregnant woman has fever of unknown origin
- Treatment
 - Cotrimoxazole
 - (Usual tx is tetracycline, doxycycline but these must be avoided in pregnancy)

Stress

- Our lives should exist in a state of homeostasis
- We are constantly challenged by adverse stimuli

~stressors~





How do we respond to stress?

- Activation of our “stress system”
 - Hypothalamic-pituitary-adrenal axis
 - Locus-Ceruleus Norepinephrine system
- Coordinated fashion leading to changes that improve our ability to adjust homeostasis



Hallmark of Stress

- Increased glucocorticoids
 - Crosses placenta
-
- Wide range of effects on multiple systems involved in growth, maintenance and reproduction

Effect of stress on pregnancy

- Short Term (fetus)

- Fetal Growth Restriction
- Hypertension
- Preterm Birth

- Short Term (childhood)

- Obesity
- Mood Disorders

- Long Term (adult)

- Metabolic Syndrome
- Heart Disease
- Diabetes
- Hypertension
- High Cholesterol
- Mood Disorders

A question....

- Are pregnancy outcomes worse if you work as a vet tech?



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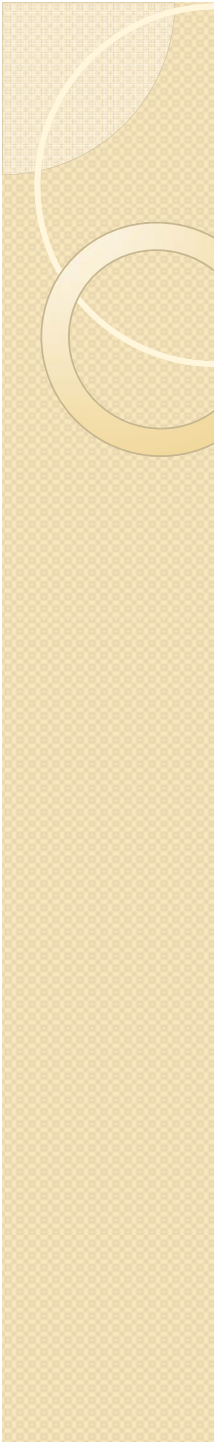
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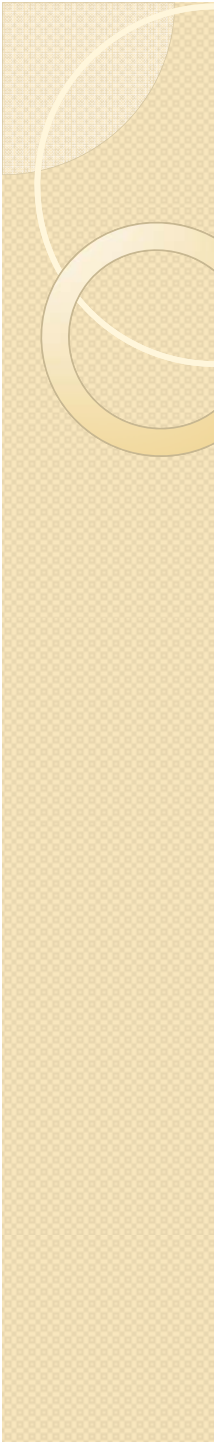
Shirangi 2009

- n = 780 pregnancies
 - Female Vets “Health Risks of Australian Veterinarians”
-
- Questionnaire
 - Outcomes not verifiable
 - 1960-2000*
 - Response Rate 59%

Results

- Of 780 pregnancies,
 - Live births 764
 - Stillbirth 6
 - Termination of preg (anomalies) 10
- Excluded:
 - 146 women who had miscarriages
 - 14 women who had TOP with no anomalies

- 
- **Congenital Malformations 6.4%**
 - No significant difference in women working in various types of practices, with or without pesticides or those who were exposed to anaesthetic gases

- 
- Rates of defects higher if took >10 xrays per week or exposed to pesticides
 - BUT – absolute increase in risk was not *clinically* significant
 - Risk of birth defects was highest in women who graduated <1970 .
 - Outcomes were better for women who had babies >1980

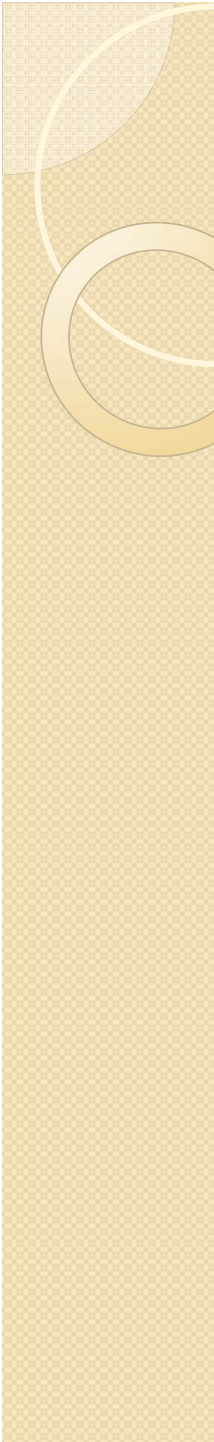
Ontario Data 2002

- 190 female veterinary staff
 - 95 “exposed” women (radiation, inhaled anaesthetics)
 - 95 “control” women
-
- Compare:
 - Rates of major malformations
 - Adverse pregnancy outcomes

Results

	Study Group	Control Group
Livebirth	94%	93%
Miscarriage	6.4%	7.4%
Stillbirth	1.1%	0%
Birthweight	3597 g	3437g
Preterm Delivery	7%	6.8%

None of these differences were significant



	Study	Control
No birth defects	95.2%	96.5%
Major birth defects	4.8%	3.4%

- Criticisms

- Some vet staff changed level of exposure with diagnosis of pregnancy
- Small sample size



Resources

- Obstetricians
- Motherrisk
 - www.motherrisk.org
 - **(416) 813-6780**
- Reprotox
 - www.reprotox.org



Immunizations in Pregnancy

- Ideally, immunizations are given *preconceptionally*

- Immunization in Pregnancy
 - If known to be safe
 - At high risk of exposure
 - Infection potentially hazardous to mom/fetus



Routine Immunizations in Pregnancy

- Primary or booster doses of adult type tetanus and reduced diphtheria toxoids (Td)

- Inactivated influenza vaccines
- Pertussis (PP*)



Immunization – general advice

- Live or live/attenuated vaccines
 - Contraindicated in pregnancy
 - Theoretic risk
 - No evidence that current vaccines are teratogenic
 - Examples: MMR, Varivax, Yellow Fever



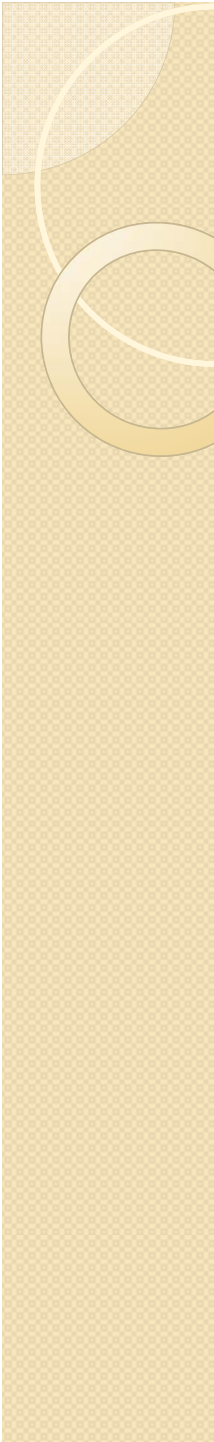
- Inactivated Viral Vaccines, Bacterial Vaccines, and Toxoids

- Safe in pregnancy
- Examples
 - Hep A/Hep B
 - Meningococcus
 - Rabies

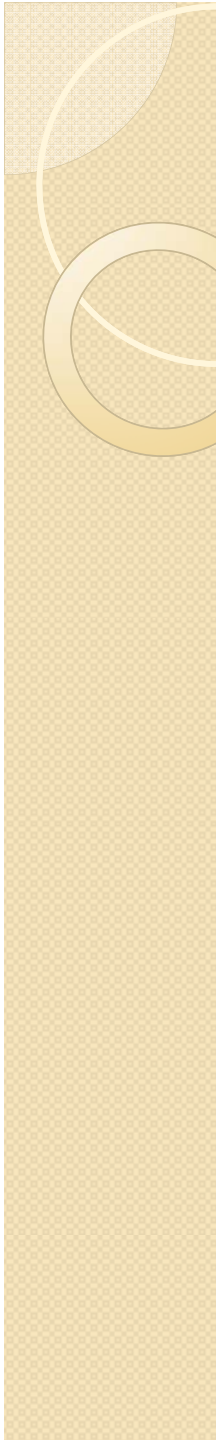


While there are risks.....

- Strategies to minimize exposures:
 - Personal protective equipment
 - Monitor exposures
 - Avoid known teratogens
 - Ensure immunizations up to date
- *Remember.....*



**The right treatment when
you are not pregnant
is
- nearly always -
the right treatment when
you are pregnant.**



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