WIC & Interconception Care

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Importance of Interconception Care

• True story of a woman with prior severe preeclampsia x 2

Periconceptional Nutrition & Infertility

• Nurses Health Study II
• Women with ovulatory infertility
  • Consumed greater amounts of trans fats (Chavarro et al 2007)
  • Consumed greater amounts of high fat dairy foods (Chavarro et al 2007)
  • Consumed greater amounts of carbohydrates (Chavarro et al 2009)
  • Had higher dietary glycemic load (Chavarro et al 2004)
  • Consumed greater amounts of animal proteins & lower amounts of vegetable proteins (Chavarro et al 2008)
  • Were less likely to use iron supplements (Chavarro et al 2006)
  • Were less likely to use multivitamin supplements (Chavarro et al 2008)
• “Fertility diet” associated with lower ovulatory infertility
  • (RR=0.34; 95% CI 0.23-0.48) (Chavarro et al 2007)
Periconceptional Nutrition & Infertility


Periconceptional Nutrition & Infertility


Periconceptional Nutrition & Birth Defects

- Folate
  - Periconceptional folate supplementation has a strong protective effect against neural tube defects (RR=0.28, 95% CI: 0.13, 0.58) (Lumley et al Cochrane Database Syst Rev. 2001;2:CD001056.)
  - Periconceptional folate supplementation may prevent other birth defects (e.g. conotruncal and septal defects; orofacial clefts) (Botto et al Am J Med Genet C Semin Med Genet. 2004;15:12-21)

Periconceptional Nutrition & Birth Defects

| Groenen (2004) | Iron | Magnesium | Niacin | Spina bifida | Increased spina bifida with lower dietary intake of iron, magnesium, niacin |
| Velle (1993) | Zinc | Neural tube defects | Reduced NTDs with increased dietary & supplement intake of zinc |
| Kreasidou (2004) | Iron | Magnesium | Ascorbic acid | Orofacial clefts | Reduced OPs with increased dietary intake of iron, magnesium, ascorbic acid |
| Smidts (2008) | Riboflavin, Nicotinamide | Congenital heart defects | Increased CHDs with lower dietary intake of riboflavin & nicotinamide |
| Verkleij-Hagoort (2006) | B-vitamins | Congenital heart defect | Increased CHDs with lower dietary intake of vitamin B12 |

Cetin et al. Role of micronutrients in the periconceptional period. Human Reprod Update 2009;16:80-95

Periconceptional Nutrition

Birth Defects

- Neural crest cells are involved in organogenesis of the neural tube, lip/palate, and heart.
- Migration and differentiation of neural crest cells are influenced by homocysteine.
- Folate and B12 deficiencies have been shown to result in hyper-homocysteinemia.
- Organogenesis begins early.

Cetin et al. Role of micronutrients in the periconceptional period. Human Reprod Update 2009;16:80-95

Periconceptional Nutrition

PTB & SGA

- Pregnancy Infection, and Nutrition Study
  - Periconceptional multivitamin use associated with lower risk of PTB (RR=0.50; 95%CI 0.20, 1.25)
  - Prenatal and periconceptional use were not related to PTB (Vahdatian et al Am J Epidemiol. 2004;160:886-92)
- Pregnancy Exposures and Preeclampsia Prevention Study
  - Periconceptional multivitamin use associated with lower risk of spontaneous PTB (<34 weeks) (OR=0.40, 95% CI: 0.16, 0.99) and SGA (<5th percentile) (OR=0.64, 95% CI: 0.40, 1.03) (Cetin et al Am J Epidemiol. 2007;166:296-303.)
Periconceptional Nutrition
PTB & SGA

• **FASTER Trial**
  - Preconceptional folate supplementation for 1 y or longer associated with lower risk of spontaneous extreme PTB (20-28 wks) (HR 0.22, 95% CI 0.08-0.51) and early PTB (28 and 32 wk) (HR 0.45, 95% CI 0.24-0.83).

• The risk of early spontaneous PTB is inversely proportional to the duration of preconceptional folate supplementation. (Bukowski PLoS Med. 2009 May 5;6(5):e1000061. Epub 2009 May 12)

• **Generation R Study**
  - Preconception folic acid supplementation was associated with lower risks for LBW OR 0.43, 95 % CI 0.28, 0.69 & SGA (OR 0.40, 95 % CI 0.22, 0.72) (Timmermans et al Br J Nutr. 2009;102:777-85)

Periconceptional Nutrition & Preeclampsia

• **Pregnancy Exposures and Preeclampsia Prevention Study**
  - periconceptional multivitamin use associated with a 45% reduction in preeclampsia risk compared with nonuse (OR=0.55, 95% CI: 0.32, 0.95) (Bodnar et al Am J Epidemiol. 2006;164:470-7)

• **Danish Birth Cohort Study**
  - periconceptional multivitamin users had a 22% lower risk of preeclampsia compared to non-users (HR = 0.78, 95% confidence interval: 0.60, 0.99) among normal weight women. (Calov et al. Am J Epidemiol. 2009;169:1304-11)

Periconceptional Nutrition
PTB, SGA, & Preeclampsia

• **Major Pathways to Spontaneous PTB** (IOM 2007)
  - Premature activation of maternal-fetal HPA axis – periconception undernutrition accelerates maturation of the fetal HPA axis (Bloomfield et al Endocrinology. 2004;145:4278-85)
  - Infection/inflammation – Nutrition plays an important role in host susceptibility to infection/inflammation
  - Placental complications – one-third of PTB the placental bed vessels show failure of vascular remodeling, 15-25% show decidual vascular pathology characterized by thromboses and atheroses.

• **Preeclampsia**
  - Implantation defects

Periconceptional Nutrition & Implantation/Placentation

• Folate and B12 deficiencies linked to defects in the placental vascular bed

• Folate & B12 deficiencies result in hyperhomocysteinemia, which can cause placental thromboses & atheroses

• Vitamin C, vitamin E, vitamin D, iron, zinc, and other antioxidants protect against oxidative stress

Catlin et al. Role of micronutrients in the periconceptional period. Human Reprod Update 2009;16:40-95
Fetal Programming

Barker Hypothesis

Birth Weight and Coronary Heart Disease


Barker Hypothesis

Birth Weight and Hypertension


Barker Hypothesis

Birth Weight and Insulin Resistance Syndrome


Prenatal Programming of Childhood Obesity

Odds ratio adjusted for BMI

Epidemic of Childhood Overweight & Obesity

![Graph showing the increase in childhood overweight from 1976-1980 to 1999-2002 for Black, Hispanic, and White populations.](Image)

Source: National Center for Health Statistics, National Health and Nutrition Examination Survey

Note: Estimate not available for 1976-1980 for Hispanic; overweight defined as BMI at or above the 95th percentile of the CDC BMI-for-age growth charts.

Prenatal Programming of Childhood Obesity

- Maternal Diabetes & Intrauterine Hyperglycemia
- Intrauterine Hyperinsulinemia (Fetal Pancreatic β Cells)
- Prenatal & Postnatal Hyperleptinemia
- Preadipocyte Differentiation
- Adipocyte Hyperplasia
- Hypothalamic Leptin Resistance
- Pancreatic β-Cell Leptin Resistance
- Hyperphagia
- Hyperinsulinism
- Programmed Insulin Resistance
- Postnatal Hyperinsulinemia
- Adipogenesis

Epigenetics

- Same Genome, Different Epigenome

Gibbs WW. The Unseen Genome: Beyond DNA. Scientific American 2003

Periconceptional Nutrition & Fetal Programming

- Periconceptional nutrition can influence epigenetic modifications in the preovulatory oocyte and/or preimplantation embryo
- In sheep, restricting folate, vitamin B12, & methionine from periconceptional maternal diet leads to widespread epigenetic modifications, increased adiposity, insulin resistance, altered immune function, and high blood pressure in adult offspring (Simpson et al Proc Natl Acad Sci U S A. 2007;104:19351-6)
- In humans, periconceptional folic acid use was associated with increased methylation of the Igf2 gene in the offspring (Stroobants-Thibault et al Fertil Steril. 2009;4:67945)

Periconceptional Nutrition
Allostasis & Allostatic Load

- **Allostasis**
  - Maintain stability through change

- **Allostatic Load**
  - Cumulative physiological toll ("wear and tear") from chronic stress

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Allostasis


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Allostatic Load


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Allostasis & Allostatic Load


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What WIC Can Do To Promote Interconception Health

- 82 WIC agencies in California
- Over 600 sites across the state
- Serve 1.4 million women, infants, and children each month
- Women up to 6 months postpartum
- Breastfeeding women up to 1 year postpartum
- Children up to age 5
- WIC as window to promoting periconceptional nutrition
- WIC as gateway to promoting interconceptional health
What Can WIC DO?

- Ask about reproductive life plan
- Ask about pregnancy history
- Ask about medication use
- Ask about immunizations
- Ask about oral health
- Screen for psychosocial & behavioral risks
- Promote healthy weight
- Promote healthy foods
- Promote physical activity
- Promote breastfeeding

1. Ask About Reproductive Life Plan

Reproductive Life Plan

- A set of personal goals about having (or not having) children based on personal values and resources
- A plan to achieve those goals

http://www.cdc.gov/nch/ddis/preconception/QandA.htm#5

Examples of a Reproductive Life Plan

1. Do you hope to have any (more) children?
2. How many children do you hope to have?
3. How long do you plan to wait until you (next) become pregnant?
4. How much space do you plan to have between your pregnancies?
5. What do you plan to do until you are ready to become pregnant?
6. What can I do today to help you achieve your plan?

Opportunities to promote preconception health

- Ask about reproductive life plan at every visit
- Every woman, every time

2. Ask About Pregnancy History
3. Ask About Medication Use

<table>
<thead>
<tr>
<th>Agent</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACE inhibitors, ARBs</td>
<td>Kidney abnl if exposed in 2nd or 3rd tri</td>
</tr>
<tr>
<td>Statins</td>
<td>Abnormalities if exposure 4-9th week</td>
</tr>
<tr>
<td>Testosterone</td>
<td>Masculinization of female fetus</td>
</tr>
<tr>
<td>Carbamazepine</td>
<td>Fetal death, mental retardation, malformations of heart, genitals; cleft palate and arteries</td>
</tr>
<tr>
<td>Coumadin derivatives (warfarin)</td>
<td>Risk of bone + cartilage deformities, mental retardation, vision problems</td>
</tr>
<tr>
<td>Lithium</td>
<td>Increased risk of CV anomalies</td>
</tr>
<tr>
<td>Phenytoin</td>
<td>Risk of fetal hydantoin syndrome</td>
</tr>
<tr>
<td>Valproic acid</td>
<td>Use in 3-4 divided doses; not with carbamazepine + phenobarbitol</td>
</tr>
<tr>
<td>Isotretinoin</td>
<td>Elevated risk of SAB and anomalies</td>
</tr>
</tbody>
</table>

Content of Preconception Care
Risk Assessment

- **Category X**: Adequate and well-controlled studies have failed to demonstrate a risk to the fetus in this first trimester of pregnancy (and there is no evidence of risk in later trimesters).
- **Category B**: Animal reproduction studies have failed to demonstrate a risk to the fetus and there are no adequate and well-controlled studies in pregnant women. Animal studies have shown an adverse effect, but adequate and well-controlled studies in pregnant women have failed to demonstrate a risk to the fetus in any trimester.
- **Category C**: Animal reproduction studies have shown an adverse effect on the fetus and there are no adequate and well-controlled studies in humans. However, potential benefits may warrant use of the drug in pregnant women despite potential risks.
- **Category D**: There is positive evidence of human fetal risk based on adverse reaction data from investigational or marketing experience, and the risks involved in use of the drug in pregnant women clearly outweigh any potential benefits.
- **Category X**: Studies in animals or humans have demonstrated fetal abnormalities and there is positive evidence of human fetal risk based on adverse reaction data from investigational or marketing experience, and the risks involved in use of the drug in pregnant women clearly outweigh any potential benefits.

Opportunities to promote preconception health

- Ask about medication use
- Refer to local CTIS (California Teratogen Information Services) for consultation

4. Ask About Immunizations

- **Recommended Adult Immunizations**
  - Tdap
  - Hepatitis B
  - Influenza
  - Measles, Mumps and Rubella
  - Varicella
  - HPV
5. Ask About Oral Health

6. Screen for Psychosocial & Behavioral Risks

**Psychosocial & Behavioral Risks**
- Screen for intimate partner violence
- Screen for depression/other affective disorder
- Screen for tobacco, alcohol, and other drug use (CAGE)
- Make referrals where possible

**Screen for Intimate Partner Violence**
- Have you been hit, kicked, punched, or otherwise hurt by someone in the past year? If so, by whom?
- Do you feel safe in your current relationship? Are you afraid of your partner?
- Is there a partner from a previous relationship who is making you feel unsafe now?
- Has anyone, including your partner, ever forced you to have sex?
- Does your partner physically scream or curse at you? If so, how often?
- Does your partner insult or talk down to you? If so, how often?
- Does your partner threaten you with harm? If so, how often?

**Screen for Depression**
- Postpartum Depression Screening Scale (PDSS)
- Edinburgh Postnatal Depression Scale (EPDS)
- Beck Depression Inventory (BDI)
- Center for Epidemiologic Studies Depression Scale (CES-D)

**The 5 A’s Approach to Smoking Cessation**

1. **Ask** about tobacco use

2. **Advise** to quit

3. **Assess** willingness to make a quit attempt

4. **Assist** in quit attempt

5. **Arrange** follow-up
CAGE Questions

- **Cut-down**: Have you ever felt you should cut down on your drinking?
- **Annoyed**: Have people annoyed you by criticizing your drinking?
- **Guilty**: Have you ever felt bad or guilty about your drinking?
- **Eye-opener**: Have you ever had a drink first thing in the morning (as an "eye opener") to steady your nerves or get rid of a hangover?

7. **Promote healthy weight**

Percent of women who gained greater than IOM guidelines 1993-2003, by prepregnancy BMI

Source: PRAMS CDC. Information contributed to the committee in consultation with P Dietz. Jan 2009

Promote Healthy Weight

- Underweight: BMI < 18.5
- Normal: BMI = 18.5-24.9
- Overweight: BMI = 25-29.9
- Obese: BMI > 30

Source: National Heart, Lung, and Blood Institute at www.nhlbi.nih.gov
### Promote Healthy Weight

- For weight loss,
  - Decrease calories in
  - Increase calories out (exercise)
  - Keep track of weight & nutrition

- Maintain a healthy weight for 3-6 months before pregnancy

### Make Healthy Food Choices
#### Eat a Balance Diet

- Whole grain foods: 5-7 servings
- Plant oils: 6 teaspoons
- Vegetable and fruits: 5 servings
- Nuts, beans and lentils: ½ to 1 cup
- Fish, poultry or egg: 1 serving a day
- Dairy: 3 servings
- Multivitamin: 1 a day

http://www.hsph.harvard.edu/nutritionsource/what-should-you-eat/pyramid

### Top 10 Brain Foods

- Beans
- Eggs
- Nuts & seeds
- Olive oil
- Alaskan wild salmon
- Yogurt & kefir
- Whole grains
- Spinach, collards, kale & broccoli
- Prunes, raisin, blueberries
- Oranges, red bell pepper, tomato

### Top 10 Toxic Foods

- Swordfish, shark, king mackerel and tile fish
- Soft cheese and unpasteurized milk
- Hot dogs, luncheon meats, deli meats, raw or smoked seafood
- Raw or undercooked meat
- Unwashed vegetables, raw vegetable sprouts, and unpasteurized juices
- Liver
- Saturated fats, trans fats, and partially hydrogenated oils
- Added sugars
- Refined flour
- Herbal preparations

### Fish:
#### Brain Food or Toxic Food?
What You Need to Know about Mercury in Fish & Shellfish

- 2004 EPA/FDA Joint Advisory for:
  - Women who might become pregnant
  - Women who are pregnant
  - Nursing mothers
  - Young children

- Do not eat Shark, Swordfish, King Mackerel, or Tilefish

- Eat up to 12 ounces (2 average meals) a week
  - Shrimp, canned light tuna, salmon, pollock, catfish are low in mercury
  - Albacore ("white") tuna has more mercury than canned light tuna

- Check local advisories about locally caught fish
  - [www.epa.gov/ost/fish](http://www.epa.gov/ost/fish)
  - [www.epa.gov/mercury](http://www.epa.gov/mercury)

9. Involve Men

Where is the M In W.I.C?

Protecting His DNA

- tobacco
- alcohol
- drugs (e.g. anabolic steroids)
- caffeine
- poor diet
- radiation and chemotherapy
- testicular hyperthermia
- diabetes mellitus
- varicoceles
- epididymitis
- 1,2-dibromo-3-chloropropane
- nonylphenol
- polycyclic aromatic hydrocarbons (PAHs)
- polychlorinated biphenyls (PCBs)
- dioxins
- phthalates


Preconception Care for Men
10. Promote Breastfeeding

The definition of insanity is doing the same thing over and over and expecting different results

- Benjamin Franklin

“We must become the change we want to see.”

- Mohandas Gandhi

“If you want 1 year of prosperity, grow grain. If you want 10 years of prosperity, grow trees. If you want 100 years of prosperity, grow people.”

Chinese Proverb

“If you want to grow healthier people, you start by improving periconceptional nutrition.”

Not A Chinese Proverb
"If you want to grow healthier people, you start by improving women’s health."

Not A Chinese Proverb