Nutrition for Fertility: Priming for Pregnancy

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Objectives

- Identify individuals who would benefit from medical nutrition therapy (MNT) for reproductive nutrition.
- Increase awareness of the association of nutrition and metabolism on the alteration of reproductive function and utilize potential screening tools to predict potential risks for infertility.

- Provide women and men with diagnosed infertility evidenced based medical nutrition therapy to optimize fertility and healthy pregnancy outcomes.
- Describe the role of the RD in fertility treatment in coordination with reproductive endocrinologists, obstetrician-gynecologists, therapists and alternative providers.

In the news...

Fertility and Diet

The Fertility Diet

Ideally...

- At least 3 months prior to conception partners should be well nourished and at a healthy body weight.
In reality...

- Population is gaining weight, less time for healthy foods and are older when considering a pregnancy.
- Often the male partner has no idea his diet matters too.

Nutrition

- Often overlooked as essential tool to boost fertility
- Science is taking a look at the role nutrition plays in improving fertility and pregnancy outcomes

Infertility

- One year of unprotected intercourse without conception
- Affects 10-15% of couples in reproductive age group
- Increased numbers seeking treatment for infertility
- Many older than 35 and often nulliparous.

Causes of Infertility

- 35% tubal and/or pelvic problems in women
- 35% male factors
- 15% ovulatory dysfunctions
- 5% rare etiologies
- 10% unexplained

Optimizing Diet for Fertility

**Eat More**

- Whole grains
- Fruits, Vegetables
- Beans, Lean Meat, Poultry
- Dairy
- DHA/Omega 3 sources
- Folic Acid

**To Gain**

- B vitamins, Vit E, fiber
- Vit C, antioxidants
- Protein, zinc, iron
- Protein, calcium, Vit D
- Baby’s neuro development/ decrease preterm delivery
- Reduce risk Neural tube defects
More tips...
- Choline - potential to reduce harmful gene effects that can cause birth defects (cauliflower, whole grains, eggs, beans, chicken, fish and veggies)
- Iodine - 150-220 mcg daily for prenatal needs (Potassium iodide more consistent than kelp iodide)
- Males - need Vit C, E, Zinc, B12 and Folic acid to improve sperm health
- Adequate Fluids - needed for cervical fluid and sperm

Factors that can Effect Fertility in Men and Women
- Chronic under-nutrition
- Acute, severe nutrition depletion
- Weight status (low or high BMI)
- Eating Disorders
- Extreme vegetarian diets
- PCOS - Polycystic ovary syndrome
- Celiac Sprue (gluten intolerance)
- Low HDL levels
- Inflammation

Eating Disorders
- Anorexia Nervosa: 3 or more months amenorrhea
- Bulimia Nervosa and EDNOS: even normal weight 50% have irregular cycles
- Essential to explore diet and exercise history for treatment of a potential eating disorder
- Eating disorders are more prevalent in women seeking care for infertility, Ends are disrupting the hormonal cycle needed for ovulation.

Low Energy Availability (EA)
- Diet and exercise yielding an energy availability of less than 30 kcal/kg FFM/day directly leads to reduction in growth, gonadal and metabolic hormones.
- Low EA disrupts hormones that regulate basal metabolic rate, menstrual function and bone metabolism.
- Low EA <30 kcal/kg LH pulsality is disrupted in 5 days.
- Leptin depends on EA, not intake or energy expenditure alone.
BOX 5. SCOFF QUESTIONNAIRE

Eating Disorders in the Obstetric and Gynecologic Patient Population.
Andersen, Arnold; Ryan, Ginny
DOI: 10.1097/AOG.0b013e3181c070f9

Weight Issues
- Too little or too much weight can impact fertility
- Too thin: may not be producing enough estrogen
- Too much weight: can cause irregular cycle and anovulation

Excess Body Fat and Fertility
- Many obese men & women are not infertile, but have delays in length of time to conceive.
- Obese women with higher levels of estrogen, androgen, and leptin have more menstrual irregularities.
- 30-47% of overweight and obese women have menstrual irregularities: anovulation, ovulatory failure and amenorrhea.
- Infertility treatments are less effective in obese than normal weight women.

Male Obesity
- Effects on fertility are now being researched.
- Obesity related to reduced male fertility is modest, but probably rising.
- Studies show decrease in sperm concentration and motility.
- Potential negative effect of environmental toxins and tend to accumulate in fat.
- Impact of increased testicular heat
- Metabolic syndrome has further negative impact on sperm

Partitioning of metabolic fuels by priority (Wade and Jones, 2004)

<table>
<thead>
<tr>
<th>FOOD</th>
<th>1</th>
<th>Essential processes: cell maintenance, circulation, neural activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glycogen</td>
<td>2</td>
<td>Reducible processes: thermoregulation, locomotion, growth</td>
</tr>
<tr>
<td>Oxidable metabolic fuels</td>
<td>3</td>
<td>Expendable processes: reproduction, fat storage</td>
</tr>
<tr>
<td>Fatty acids</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Sci Tot Environ 2006;372:32-8
Environ Res 2006;102:107-112
Fertil Ster 90,4 2008
BMI and Sperm Quality

Study: 1558 Danish men

<table>
<thead>
<tr>
<th>BMI</th>
<th>Sperm count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low BMI (&lt;20)</td>
<td>36% lower</td>
</tr>
<tr>
<td>High BMI (&gt;25)</td>
<td>25% lower</td>
</tr>
</tbody>
</table>

Higher BMI, testosterone decreases
Low and High BMI increase risk for infertility
Decreased sperm quality with low and high BMI

Fertil Steril 2004 82: 863-70

Male Diet

- Excessive meat and dairy may harm sperm quality in comparison to those who eat more fruit, vegetables and low-fat diet.
- Antioxidants found in fruits and vegetables may help prevent sperm from damage in another study.
- Higher meat and fat diets exposes men to more xenobiotics that have estrogen-like effects.
- Environmental contaminants can get into livestock and water supply.

Fem Conc Clin Office Pract 37 (2010) e43-e52

Body Fat and Fertility

- Estrogen and leptin
- Levels of estrogen and leptin increased with high body fat and reduced with low body fat
- Both extremes lower fertility
- Infertility higher with BMI<20 or >30
- 5’5” female: <120 lbs or >180


Girth: Waist Circumference

- Women >35 inches increases health risks
- Desirable Waist to Hip Ratio:
  - Women .7, men .9
  - 500 women Netherlands clinic- IUI
  - 0.1 unit increase in WHR decreases 30% probability of conception per cycle

Increasing WHR is negatively correlated with fertility

BMJ. 1993 Feb 20;306(6876):484-7

Weight Loss

- Improves fertility with PCOS and ovulatory disorders
- Must be realistic
- Emphasize movement
- Encouragement and support
- Tools: individualized professional assistance, food logs, weekly goals, recipes, home delivered meals etc

Celiac Disease

- Autoimmune disease involving inflammatory injury of the mucosa of the small intestine, can cause malabsorption
- Many adults have “silent” CD, no GI or skin symptoms for many years prior to diagnosis
- Consider screening patients with unexplained fertility, especially if other autoimmune disorders or GI symptoms
- If positive, treated with gluten free diet

Fer Sterility 89, 4,1002-4
Lifestyle Habits
- Caffeine
- Alcohol
- Smoking
- Sleep
- Meal Skipping
- Medications
- Supplement use

Micronutrients in Periconceptional Period
- Micronutrients may impact fertility, embryogenesis, and placentation and efforts to increase a healthy diet should start prior to conception.
- Micronutrients' dietary intake and maternal status affect the different phases of the inset and development of pregnancy and conception.

Micronutrients in Periconceptional Period

Nutrients that can impact Fertility and Early fetal health

Deficiency of:
- Folic Acid, B12
- Zinc
- Antioxidants (food or supplement?)
- Vitamin A and Carotenes
- Vit D
- Essential Fatty Acids
- Energy- total calories

Excess:
- Trans fatty acids, Kcal

Key Players...Fertility

- Calories/energy
- Protein (animal vs plant)
- Carbohydrates
- Essential Fats
- Folic Acid
- Iron
- Calcium
- Vitamin D
- Vit B12
- Vit C
- Zinc
- Selenium
- Vit A, E, K
- B vitamins
- Magnesium, potassium, iodine
- Fluids

Herbs and Supplements Contraindicated in Pre-conception

- Dong Quai- stimulates uterine contractions
- Pennyroyal- strong abortificant
- Hydrastis family herbs: goldenseal, barberry, and Oregon Grape can increase oxytocin (uterine contractions) and can damage liver of fetus
- Check Natural Database of Medicine for safety of herbs

Supplements and Herbs Considered Safe

- Probiotics
- Fish oil and Flax Oil ( up to 3 gm omega 3)
- Echinacea (likely safe)
- Marshmallow root
- Slippery elm
- Nettles
- Alfalfa
- Culinary Herbs
- Vit D
- Multi/ prenatal – watch out for duplication
Potential Beneficial Supplements
- Cinnamon extract
- N-acetyl cysteine
- Pycnogenol
- Chromium
- Magnesium

The Fertility Diet
- Past research indicated body weight, physical activity and dietary factors influence fertility
- Harvard researchers (Chavarro & Willett) followed a cohort 17,544 women without history of infertility who tried to become pregnant
- Findings:
  - Increasing adherence to a “fertility diet” was associated with a lower risk of ovulatory disorder infertility

Fertility Diet Pattern
- Combination of 5 or more low risk lifestyle factors (diet, weight control and activity) was associated with a 69% lower risk of infertility (ovulatory disorders)

Fertility Diet
- Validated by reviews of medical records
- All married
- Diet and exercise information obtained
- Diabetic women excluded
- All other infertility cases by other causes were excluded
- Prospective study

Ten Steps to Improving Fertility
1. Avoid trans fatty acids
2. Use more unsaturated vegetable oils (olive and canola)
3. Eat more vegetable protein, like beans and nuts, and less animal protein
4. Choose whole grains and other carbohydrates that have lower, slower effects on blood sugar and insulin
5. Consume a serving of a whole fat dairy product daily

More changes...
6. Take a multivitamin that contains folic acid and other B vitamins
7. Get plenty of iron from fruits, vegetables, beans and supplements but not from red meat
8. Beverages matter: water is great; coffee tea, and alcohol are ok in moderation; leave sugared sodas unopened
9. Aim for a healthy weight
10. If you aren’t physically active, start a daily plan
Polycystic Ovarian Syndrome (PCOS)

- Dietary management should be the first line treatment
- 6-10% women in US (over 50% are overweight or obese)
- Most common cause of menstrual irregularities and infertility
- Polygenic - multiple types of gene mutations
- Insulin resistant and increased androgen production


PCOS

Hyperinsulinemia:
- Weight gain
- Acanthosis nigricans
- Skin tags
- Follicular keratosis

Hyperandrogenemia:
- Irregular and/or painful menstrual cycles
- Infertility
- Acne
- Hirsutism
- Alopecia
- Elevated Androgen (testosterone, DHEAS)

Higher rates of miscarriage, preterm delivery, gestational diabetes and still births

PCOS Comorbidities

- Hypertension
- Coronary heart disease
- Diabetes
- Dyslipidemia (low HDL, high triglycerides)
- Impaired glucose tolerance
- Metabolic syndrome

Nutrition Management PCOS

- Carbohydrate management
  - Emphasis on low glycemic, high fiber choices, whole foods
  - Carb "budget" per meal helpful
  - 40-45% total kcal
  - Start with 45 grams per meal, 15-30 gm for snacks
  - Omega 3:6 ratio
  - Anti inflammatory foods
  - Spread carbs throughout the day

Nutrition PCOS

Protein
- Include with meals and snacks
- Emphasis on more plant based meals
- Including protein with lower glycemic carbs will lower glucose and insulin
- Examples: hummus spread, vegetables and whole wheat pita
Nutrition and PCOS

- Fats
- Include sources of omega 3 fatty acids
  - (anti-inflammatory)
- Fish, nuts, flax, olive and canola oils
- Balance fats, decrease
  Omega 6 fats in diet

Clinical Applications: Strategies for Balancing EFAs

- Cook with “neutral” monounsaturated fats (n-9).
- Switch to grass-fed meats when possible.
- Get in the habit of identifying the omega-3 source on each plate.
- Increase antioxidant-rich whole foods (vitamin E).
- Using food, supplements or a combination, aim for a minimum daily intake of 650 mg of EPA+DHA.

Vitamin D

- Vit D receptors are present in almost every tissue and cell in the body
- Involved in follicle egg maturation and development
- Small study found 7/9 women with irregular cycles resumed normal menses in 2 months after Vit repletion
- Vit D plays a role in decreasing insulin resistance
- Screen Vit D Level preconception and supplement as needed
- Fat sequesters Vit D

Fish Safety

- Avoid
- AVOID
- 2-3 MEALS PER WEEK FROM FISH LIST

Oxidative stress and antioxidants

- Dietary antioxidants and oxidative stress (OS) may influence timing and maintenance viable pregnancy
- Men: OS reduces sperm number and motility; diet can prevent oxidative damage to sperm DNA
- Women: OS likely to be a mediator of conception
- Additional prospective studies are needed
Selected studies on the association of antioxidants, oxidative stress and conception

Role of oxidative stress in fertility

Meals- what to eat?

Top 20 Antioxidant Foods
- Small red beans
- Wild blueberry
- Red kidney bean
- Pinto bean
- Blueberry
- Cranberry
- Artichoke
- Blackberry
- Prune
- Raspberry
- Strawberry
- Red delicious apple
- Granny smith apple
- Pecan
- Sweet cherry
- Black Plum
- Russet Potato
- Black bean
- Plum
- Gala Apple

RD Nutrition Assessment and Management
- Weight History, activity
- Eating disorders
- Celiac
- Stop dieting, eat for health
- Athletes- meet nutrient needs
- Vegetarians
- Supplements, Herbs appropriate for conception and pregnancy
- Diabetes, pre-diabetes, PCOS- management should be optimized
- Meeting preconception needs?

Fertility Providers
- Reproductive endocrinologists
- Ob-gynecologists
- Primary care providers
- Acupuncturists
- Naturopaths
- Yoga instructors
- Health Educators- Mind Body
- Massage therapists
Lay Resources

- Expect the Best Your Guide to a Healthy Pregnancy Before, During & After 2009 by American Dietetic Association
- Before Your Pregnancy: A 90 Day Guide for Couples on How to Prepare for a Healthy Conception by Amy Ogle MS, RD (2nd ed available Summer 2011)

Professional Affiliations

- American Society Reproductive Medicine
- American Dietetic Association-Woman’s Health DPG
- RESOLVE
- Seattle Tacoma Area Reproductive Society