Fueling Fertility: Nutrition Interventions for Women

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Objectives

- ✓ Define infertility
- ✓ Demonstrate how preconception care and nutrition therapy can optimize fertility and promote healthy pregnancy outcomes
- ✓ Establish a basic understanding of the appropriate use of dietary supplements to optimize fertility and promote healthy pregnancy outcomes

Infertility Defined

- Infertility impacts 12% of women of child bearing age (7.3 million)
- Primary Infertility: failure to achieve a clinical pregnancy after 12 months or more of regular unprotected sexual intercourse (6 months if the women if over age 35)
  - Most couples will achieve pregnancy within the first 6 months of trying
  - 90% will become pregnant after one year
- Secondary Infertility: couples who have been pregnant at least once, but are not able to get pregnant now

Chandra A, Copen CE, Stephen, EH. Infertility and impaired fecundity in the United States, 1982-2010: Data from the National Survey of Family Growth National Health Statistics reports: no 67. Hyattsville, MD: National Center for Health Statistics, 2013.
World Health Organization. 2014. *Infertility Definitions and Terminology*. Retrieved August 25, 2016 from http://www.who.int/reproductivehealth/topics/infertility/definitions/en/
Fertil Steril. 2013 Apr;99(5):1324-1331.e1. doi: 10.1016/j.fertnstert.2012.11.037. Epub 2013 Jan 3.

Primary Contributing Factors to Infertility

- **25% of infertile couples have more than one factor that contributes to their infertility.**

- Irregular or abnormal ovulation accounts for approximately 25 percent of all female infertility problems.
- Most infertility cases -- 85% to 90% -- are treated with conventional medical therapies such as medication or surgery.
- While vital for some patients, in vitro fertilization and similar treatments account for less than 3% of infertility services, and about (or approximately) seven hundredths of one percent (0.07%) of U.S. health care costs.
- Twelve percent of all infertility cases are a result of the woman either weighing too little or too much.
- It is possible for women with body weight disorders to reverse their infertility by attaining and maintaining a healthy weight.
- Up to 13 percent of female infertility is caused by cigarette smoking.
- Chlamydia causes about 4 to 5 million infections annually in the United States.If left untreated, chlamydia can cause infertility.

American Society for Reproductive Medicine https://www.asrm.org/detail.aspx?id=2322

Why preconception care?

Preconception study of 367 couples ranging in age from 22 to 59

- History of infertility (37% of couple), miscarriage (38%), therapeutic abortion (11%), stillbirths (3%),low-birth-weight babies (15%), malformations (2%), and SIDS (1%).
- All couples received basic preconception care including nutrition counseling and a prenatal multivitamin for both partners.
- After 2 years 89% of the couples achieved live births. Of those with previously diagnosed infertility, 81% achieved live births, suggesting that lifestyle modification may positively affect fertility.

Ward N, Eaton K. Preconceptional care and pregnancy outcome. J Nutr Env Med. 1995; 5(2): 205-207.

Where Nutrition Impacts Infertility

- Polycystic Ovarian Syndrome (PCOS)
- Weight status (underweight or overweight)
- Environmental toxins (as it relates to nutrient needs for detoxification)
- HypothalamicAmenorrhea
- Eating Disorders (or history of restricted eating)
- Endometriosis and Fibroids
- Nutrient deficiencies
- Celiac Disease and food allergy
- Inflammatory Diseases

Weight Status

- Obesity accounts for 6% of primary infertility
- Low body weight in women accounts for 6% primary infertility

American Society for Reproductive Medicine: *"More than 70% of women who are infertile as the result of body weight disorders will conceive spontaneously if their weight disorder is corrected through a weight-gaining or weight-reduction diet as appropriate"*

A **modest** decrease of body weight, which can have a significant impact on improving fertility in over-weight/obese women. In one trial, 90% of women resumed ovulation and 45% spontaneously conceived following a 5% weight loss

Machado AP, Silva LR, Zausner B, Oliveira Jde A, Diniz DR, de Oliveira J. Undiagnosed celiac disease in women with infertility. J Reprod Med. 2013 Jan-Feb; 58(1-2): 61-6

Estradiol Metabolism in women depending on weight

Estrogen deficiency vs. excess estrogen

- Women with a healthy body weight metabolize estradiol to 2-hydroxyestribe –an antiestrogen
  - Progressively "turning down" the reproductive cycle until it is "turned off" when body weight is too low
- Obese women metabolize estradiol to estriol –a weak estrogen
  - Progressively increase their alternate estrogens (estrone and estriol) until ovulation ceases and they become infertile

Bates GW: Body Weight and Reproduction. In Seibel MM, Infertility: A Comprehensive Text. Appleton-Century-Crofts. New York, 1996
Green BB, Weiss NB, Daling JR: Risk of ovulatory infertility in relation to body weight. Fertil Steril 50:721, 1988.

Excess Body Fat and Fertility

- Excess energy storage in adipose tissue causes deficits in the pool of oxidizable fuels available for the reproductive system → reproduction becomes inhibited
- Negatively impacts sex hormone secretion and overall function of chemical messengers in the reproductive system
- Hyperandrogenism in obese women

Schneider, J. E. (2004). Energy balance and reproduction. Physiology & behavior, 81(2), 289-317. http://www.sciencedirect.com/science/article/pii/S0031938404000496
Pasquali, R. (2006). Obesity, fat distribution and infertility. Maturitas, 54(4), 363-371.

Polycystic Ovary Syndrome (PCOS)

- Most common cause of infertility in women
- Common endocrine disorder of unknown etiology
- Affects estimated 10% of women
- Characterized by various combinations of symptoms including:
  - Infertility, anovulation,amenorrhea or menstrual irregularities, hirsutism, acne, male pattern baldness, obesity, sleep apnea, enlarged ovaries with multiple cysts
- Biochemical and endocrine abnormalities
  - Elevated levels of androgens, hyperinsulinemia, impaired glucose tolerance, hyperlipidemia

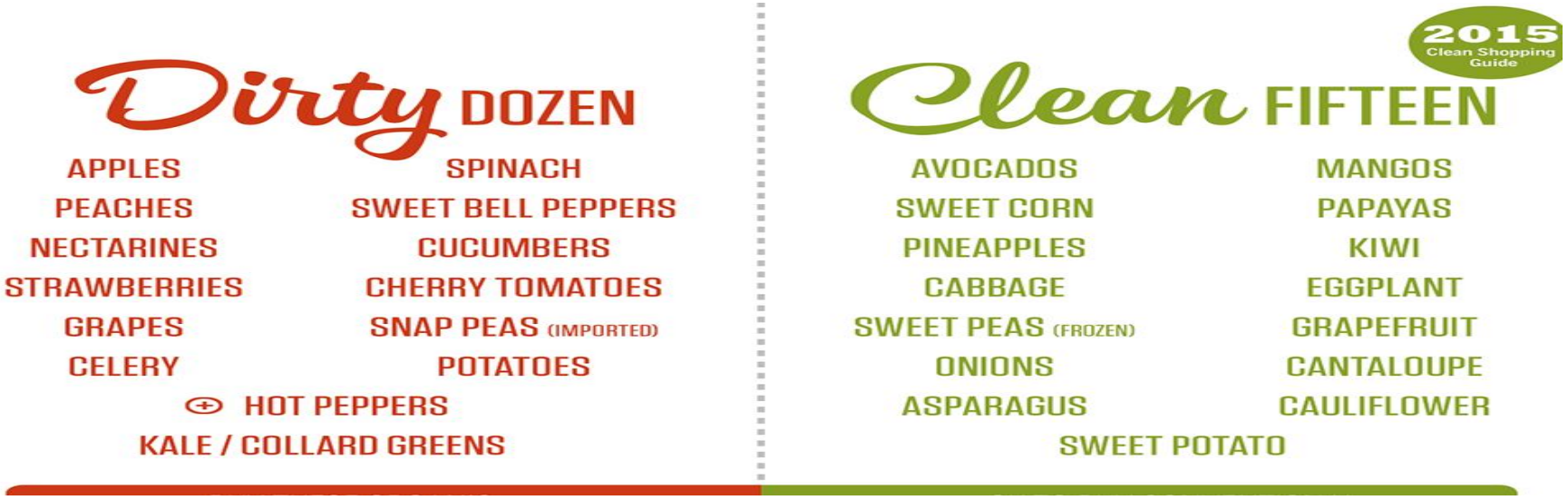
PCOS

- Dietary interventions can help improve chances of fertility
  - Diet:
    - Address insulin sensitity
      - weight loss if overweight
      - avoid refined sugar and other refined carbs
      - small frequent meals
      - Emphasize high-fiber foods
      - Increase healthy fats and protein

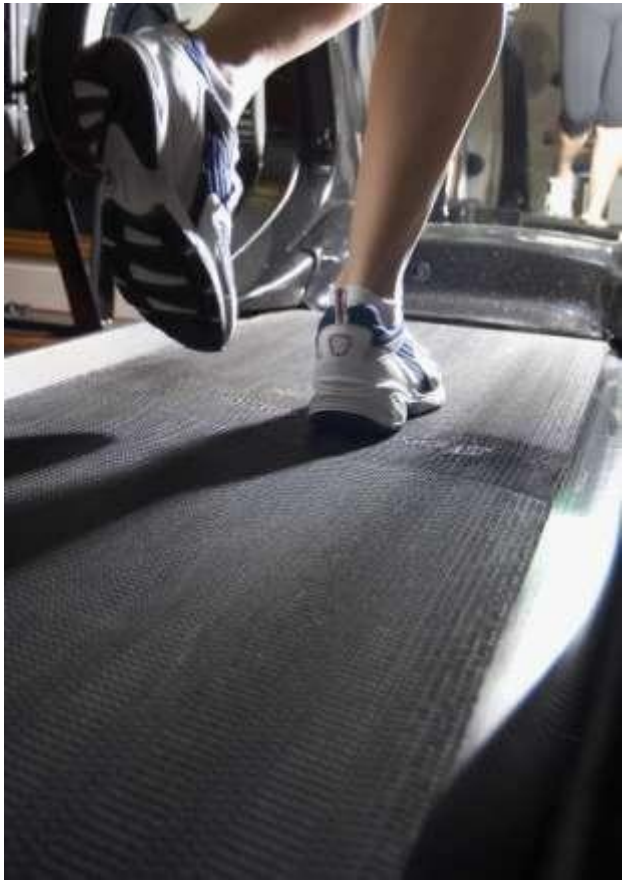
Environmental Factors

- Exposure to volatile organic solvents, chemical dusts, or pesticides is associated with an increased risk of infertility
- Endocrine disrupters such as BPA (and many other plasticizers!)
- Association between cigarette smoking and decreased fertility

- Practical Nutrition Tips:
  - Choose organic when possible, especially when it comes to the "Dirty Dozen"
  - Choose glass containers and utensils over plastics



Hypothalamic Amenorrhea



- Hypothalamus slows or stops releasing gonadotrophin-releasing hormone (GnRH), the hormone that starts the menstrual cycle.
  - Common characterisics of women with hypothalamic amenorrhea include:
    - Low body weight
    - Low percentage body fat
    - Very low intake of calories or fat
    - Emotional stress
    - Strenuous exercise→inadequate calories to meet needs
    - Leptin deficiency
    - A medical condition or illness

Gordon, C. M. (2010). Functional hypothalamic amenorrhea. New England Journal of Medicine, 363, 365–371

Hormone Health Network. (n.d.). *Amenorrhea.* Retrieved February 25, 2014, from http://www.hormone.org/Reproductive/emenorrhea.cfm

Celiac Disease and Food Allergy

- Can cause infertility in women
  - Nutrition deficiencies secondary to malabsorption

Consumption of gluten-free diet frequently restores fertility

- Other food allergies and sensitivities should be considered as potential contributing factor

Baker PG, Read AE. Reversible infertility in male coelic patients. Br Med J 1975;2:316-317.
Meloni GF, Dessole S, Vargiu N, et al. The prevalence of coelic disease in infertility. Hum Reprod 1999;14:2759-2761. Ferguson R, Holmes GKT, Cooke WT. Coelic disease, fertility, and pregnancy. Scand J Gastroenterol 1982;17:65-68

Caffeine and Tannic Acid

- Consumption of large amounts of caffeine by women associated with delayed conception
  - Lowest level of caffeine intake associated with delayed conception between 300-500mg/day (4-7 cups of coffee)
  - <300mg caffeine/day had no effect
  - Tannic acid (present in both coffee and tea) true culprit?

Stanton CK, Gray RH. Effects of caffeine consumption on delayed conception.Am J Epidemiol 1995;142:1322-1329
Joesoef MR, BeralV, Rolfs RT, et al.Are caffeinated beverages risk factors for delayed conception? Lancet 1990;335:136-137. Cramer DW. Caffeine and Infertility. Lancet1990;335:792

Alcohol

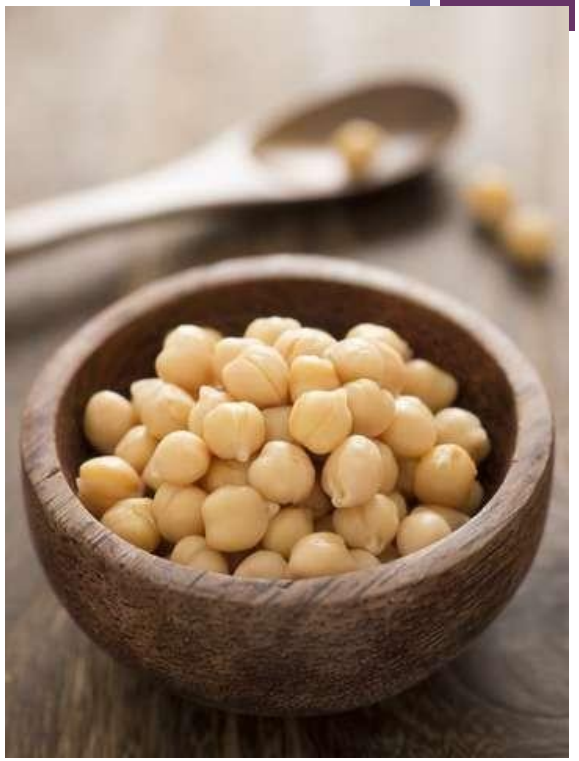
- Infertility is common among chronic alcoholics
- Moderate alcohol intake *may* lead to impaired fertility in women
  - Result of ovulatory disturbances or endometriosis
- CDC now says, "no amount of alcohol is safe" for pregnant women and "Stop drinking alcohol if they are trying to get pregnant or could get pregnant."
- Dose dependent?

Garg MK, Mehta MR, Mathur CP, Jain JK. Hypogonadism and serum zinc status in chronic alcoholics. J Assoc Physicians India 1986134:854-855.

Hakim RB, Gray RH, Zacur H. Alcohol and caffeine consumption and decreased fertility. Fertil Steril 1998;70:632-637 Grodstein F, Goldman MB, Cramer DW. Infertility in women and moderate alcohol use. Am J Public Health 1994;84:1429-1432.

Protein: plant based best?

- Findings from the Nurses' Health Study
- N=18,555
  - Lowest protein intake (77g/day) Highest protein intake (115g/day)
  - Women in highest protein group were 41% more likely to have reported problems with ovulatory infertility than women in lowest protein group
  - Ovulatory infertility was 39% more likely in women with the highest intake of animal protein
  - Women who had the highest intake of plant protein were substantially less likely to have ovulatory infertility than those with the lowest intake of plant protein



Chavarro JE, Rich-Edwards JW, Rosner B, and Willet WC. Protein intake and ovulatory infertility. *American Journal of Obstetrics and Gynecology* 2007; In press.

Findings from Nurse's Health Study

- An increased risk of anovulatory infertility was associated with diets that provided an overall higher glycemic load, and contained trans fatty acids, low-fat dairy, and animal protein sources.
- A reduced risk was associated with consumption of adequate folic acid, iron from plant sources, one high-fat dairy product daily, and vegetable protein sources.

Chavarro JE, Rich-Edwards JW, Rosner B, Willett WC. Diet and lifestyle in the prevention of ovulatory disorder infertility. Obstet Gynecol 2007; 110(5):1050-58.

Mediterranean-style diet

- Emerging research suggests that women who follow a Mediterranean-style diet pattern may increase their chance of pregnancy
- A preconception "Mediterranean" diet by couples undergoing IVF/ICSI treatment may contribute to the success of achieving pregnancy.

Vujkovic M, de Vries JH, Lindemans J, et al. The preconception Mediterranean dietary pattern in couples undergoing in vitro fertilization/intracytoplasmic sperm injection treatment increases the chance of pregnancy. Fertil Steril 2010; 94: 2096-101.

Twigt JM, Bolhuis MEC, Steegers EAP, et al. The preconception diet is associated with the chance of ongoing pregnancy in women undergoing IVF/ICSI treatment. Hum Reprod 2012; 27 (8): 2526-2531.

Trans Fatty Acid

- Prospective cohort study of 18,555 premenopausal women without hx of infertility who attempted to become pregnant during an 8-year period
  - Higher intake of trans fatty acids was associated with an increased risk of infertility due to ovulatory abnormalities
  - 2% increase in absolute intake of energy from trans fatty acids was associated with a 75% increase in risk of ovulatory infertility

Getting 2% of Calories from Trans Fat Instead of 2% of Calories from:	Increases the risk of Ovulatory Infertility by:
Carbohydrates	73%
Polyunsaturated fat	79%
Monounsaturated fat	131%

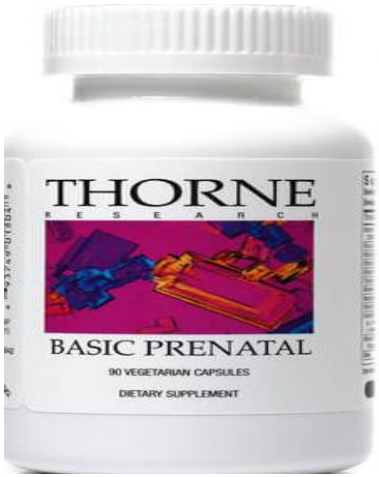
Chavarro JE, Rich-Edwards JW, Rosner B, and Willet WC. Protein intake and ovulatory infertility. *American Journal of Obstetrics and Gynecology* 2007; In press.

Diet & Lifestyle Interventions

- Diet should be rich in:
  - plant-based, antioxidant-rich foods
  - high-quality protein
  - healthy fats (remove sources of trans fat)
  - full-fat dairy

Supplements

- Prenatal Multivitamin: go for high quality, pharmaceutical grade options
  - Free of fillers, colors, and dyes
  - Contains active forms of vitamins:
    - Pyridoxal 5'-phosphate (vitamin B6)
    - Riboflavin 5'-phosphate (vitamin B2)
    - Folinic acid or L-5-MTHF (active forms of folate)
    - Adenosylcobalamin or methylcobalamin (vitamin B12)
    - Calcium citrate , malate, taurinate, or glyinate
- Has broad spectrum of vitamins AND minerals
- EPA/DHA: fish oil, algae



Supplement Facts

Serving Size: Three Capsules
Servings per Container: 30

Three Capsules Contain:		% DV
Vitamin A (3,000 IU from Beta Carotene and 2,000 IU as Palmitate)	5,000 IU	100%
Vitamin C (as Ascorbic Acid)	150 mg	250%
Vitamin D (as Vitamin D3)	1,000 IU	250%
Vitamin E (as d-Alpha Tocopheryl)	50 IU	167%
Vitamin K (as Vitamin K1)	100 mcg	*
Thiamin (as Thiamin HCl)	4 mg	264%
Riboflavin (as Riboflavin 5'-Phosphate Sodium)	3.6 mg	212%
Niacin (as Niacinamide)	30 mg	150%
Vitamin B6 (as Pyridoxal 5'-Phosphate)	10 mg	500%
Folate (500 mcg as Calcium Folinate and 500 mcg as L-5-Methyltetrahydrofolate from L-5-Methyltetrahydrofolic Acid, Glucosamine Salt)	1 mg	250%
Vitamin B12 (100 mcg as Adenosylcobalamin and 100 mcg as Methylcobalamin)	200 mcg	3,334%
Biotin	50 mcg	17%
Pantothenic Acid (as Calcium Pantothenate)	16 mg	160%

Three Capsules Contain:		% DV
Calcium (90 mg as Calcium Citrate and 90 mg as Calcium Malate)	180 mg	18%
Iron (as Iron Picolinate)	45 mg	250%
Iodine (as Potassium Iodide)	150 mcg	100%
Magnesium (45 mg as Magnesium Citrate and 45 mg as Magnesium Malate)	90 mg	23%
Zinc (as Zinc Picolinate)	25 mg	167%
Selenium (as L-Selenomethionine)	50 mcg	*
Copper (as Copper Picolinate)	2 mg	100%
Manganese (as Manganese Picolinate)	5 mg	*
Chromium (as TRAACS® Chromium Nicotinate Glycinate Chelate)†	100 mcg	*
Molybdenum (as Molybdenum Picolinate)	50 mcg	*
Boron (as Boron Picolinate)	1 mg	**
Lutein (from Aztec Marigold extract (flower) [*Tagetes erecta*])	72 mcg	**

*Daily Value (DV) not established for pregnant or lactating women.
**Daily Value (DV) not established.

Other Ingredients: Hypromellose (derived from cellulose) capsule, Microcrystalline Cellulose, Calcium Laurate, Silicon Dioxide.

Manufactured For: Thorne Research, Inc.
P.O. Box 25, Dover, Idaho 83825 USA
1-800-228-1966 www.thorne.com

Resources

- The Fertility Diet: Groundbreaking Research Reveals Natural Ways to Boost Ovulation & Improve Your Chances of Getting Pregnant by Jorge E. Chavarro, MD, Walter Willett, MD, Patrick J. Skerrett
- Before Your Pregnancy: 90-Day Guide for Couples on How to Prepare for a Healthy Conception, Amy Ogle, MS, RD and Lisa Mazullo, MD, 2011
- The PCOS Workbook: Your Guide to Complete Physical and Emotional Health, Angela Grassi, MS, RD, LDN, 2009
- Eating Expectantly Practical Advise for Healthy Eating Before, During and After Pregnancy Bridget Swinney, MS, RD 2013
- The PCOS Diet Plan A Natural Approach to Health for Women with Polycystic Ovary Syndrome by Hilary Wright 2010.

Questions?

References

- US Center for Disease Control. *Fertility, Family Planning, and Reproductive Health of US Women: Data from the 2002 National Survey of Family Growth.* National Center for Health, Statistics, Vital Health Stat 23(25) (2005).
- Carlson E, Giwercman A, Keilding N, et al. Evidence for decreasing quality of semen during the past 50 years. BMJ. 1992;305 (6854):609.
- Chandra A, Copen CE, Stephen, EH. Infertility and impaired fecundity in the United States, 1982-2010: Data from the National Survey of Family Growth National Health Statistics reports: no 67. Hyattsville, MD: National Center for Health Statistics, 2013.
- World Health Organization. 2014. *Infertility Definitions and Terminology.* Retrieved August 25, 2016 from
- http://www.who.int/reproductivehealth/topics/infertility/definitions/en/
- Fertil Steril. 2013 Apr;99(5):1324-1331.e1. doi: 10.1016/j.fertnstert.2012.11.037. Epub 2013 Jan 3.
- American Society for Reproductive Medicine https://www.asrm.org/detail.aspx?id=2322
- Ward N, Eaton K. Preconceptional care and pregnancy outcome. J Nutr Env Med. 1995;5(2):205-207.
- Machado AP, Silva LR, Zausner B, Oliveira Jde A, Diniz DR, de Oliveira J. Undiagnosed celiac disease in women with infertility. J Reprod Med. 2013 Jan-Feb;58(1-2):61-6
- Bates GW: Body Weight and Reproduction. In Seibel MM, Infertility: A Comprehensive Text. Appleton-Century-Crofts. New York, 1996
- Green BB, Weiss NB, Daling JR: Risk of ovulatory infertility in relation to body weight. Fertil Steril 50:721, 1988.
- Wade, G. N., & Schneider, J. E. (1992). Metabolic fuels and reproduction in female mammals. Neuroscience & Biobehavioral Reviews, 16(2), 235-272. http://www.sciencedirect.com/science/article/pii/S0149763405801836
- *Nature Reviews Endocrinology* **10**, 13–23 (2014) doi: 10.1038/nrendo.2013.203 Published online 22 October 2013

References

- Langley, S. (2014). A Nutrition Screening Form for Female Infertility Patients. Canadian Journal Of Dietetic Practice & Research, 75(4), 195-201 7p.
- Schneider, J. E. (2004). Energy balance and reproduction. Physiology & behavior, 81(2), 289-317. http://www.sciencedirect.com/science/article/pii/S0031938404000496
- *Pasquali, R. (2006). Obesity, fat distribution and infertility. Maturitas, 54(4), 363-371.*
- Gordon, C. M. (2010). Functional hypothalamic amenorrhea. New England Journal of Medicine, 363, 365−371
- Hormone Health Network. (n.d.). *Amenorrhea.* Retrieved August 25, 2016, from http://www.hormone.org/Reproductive/emenorrhea.cfm
- Baker PG, Read AE. Reversible infertility in male coelic patients. Br Med J 1975;2:316-317.
- Meloni GF, Dessole S, Vargiu N, et al. The prevalence of coelic disease in infertility. Hum Reprod 1999;14:2759-2761.
- Ferguson R, Holmes GKT, Cooke WT. Coelic disease, fertility, and pregnancy. Scand J Gastroenterol 1982;17:65-68
- Stanton CK, Gray RH. Effects of caffeine consumption on delayed conception. Am J Epidemiol 1995;142:1322-1329
- Joesoef MR, Beral V, Rolfs RT, et al. Are caffeinated beverages risk factors for delayed conception? Lancet 1990;335:136-137.
- Cramer DW. Caffeine and Infertility. Lancet 1990;335:792
- Garg MK, Mehta MR, Mathur CP, Jain JK. Hypogonadism and serum zinc status in chronic alcoholics. J Assoc Physicians India 1986134:854-855.
- Hakim RB, Gray RH, Zacur H. Alcohol and caffeine consumption and decreased fertility. Fertil Steril 1998;70:632-637
- Grodstein F, Goldman MB, Cramer DW. Infertility in women and moderate alcohol use. Am J Public Health 1994;84:1429-1432.

References

- Chavarro JE, Rich-Edwards JW, Rosner B, and Willet WC. Protein intake and ovulatory infertility. *American Journal of Obstetrics and Gynecology* 2007; In press.
- Chavarro JE, Rich-Edwards JW, Rosner B, Willett WC. Diet and lifestyle in the prevention of ovulatory disorder infertility. Obstet Gynecol 2007; 110(5): 1050-58.
- Vujkovic M, de Vries JH, Lindemans J, et al. The preconception Mediterranean dietary pattern in couples undergoing in vitro fertilization/intracytoplasmic sperm injection treatment increases the chance of pregnancy. Fertil Steril 2010; 94: 2096-101.
- Twigt JM, Bolhuis MEC, Steegers EAP, et al. The preconception diet is associated with the chance of ongoing pregnancy in women undergoing IVF/ICSI treatment. Hum Reprod 2012; 27 (8): 2526-2531.
- Chavarro JE, Rich-Edwards JW, Rosner B, and Willet WC. Protein intake and ovulatory infertility. *American Journal of Obstetrics and Gynecology* 2007; In press.
- Klimek M, Pabian W, Tomaszewska B, et al. Levels of plasma ACTH in med from infertile couples. *Neur Endocrinol Lett.* 2005; 26(4): 347-350.
- Arcuri F, Monder C. Lockwood CJ, et al. Expression of 11 beta-hydroxysteroid dehydrogenase during decidulization of human endometrial stromal cells. *Endocrinology*. 1996; 127(2): 595-600.
- McEwen BS. Stressed or stressed out: what is the difference? *J Psychiatry Neurosci*; 30: 315-318
- Simon, Judy. "Promoting Fertility via Optimal Nutrition: Nutrition in Infertility Prevention and Management." *Women's Health Report (Feb. 2014): n. pag. Print.*

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