





## Nutrition & Fertility: What's the Connection?

Susie Langley M.S., RD  
March 23, 2006 10:00-11:00 AM  
AODA Conference Dublin, Ireland



## Learning Objectives:

- ◆ To increase awareness of the link between nutrition and optimum fertility
- ◆ To identify some basic screening tools to predict potential risks for infertility
- ◆ To gain practical knowledge about nutrition, metabolism and fertility via case studies.
- ◆ To identify infertility patients who would benefit from nutrition assessment & counseling



## 2010 U.S. Dietary Goals related to pre-conception


- ◆ Increase number of adults with a healthy weight
- ◆ Decrease number of obese adults
- ◆ Decrease iron deficiency in child-bearing women
- ◆ Decrease the incidence of neural tube defects
- ◆ Increase the proportion of women who receive **pre-conceptual counseling**

Nutrition Through the Life Cycle 2005



"Fertility is achieved and maintained by a carefully orchestrated, complex process that can be disrupted by a number of factors related to *body weight* and *dietary intake*."

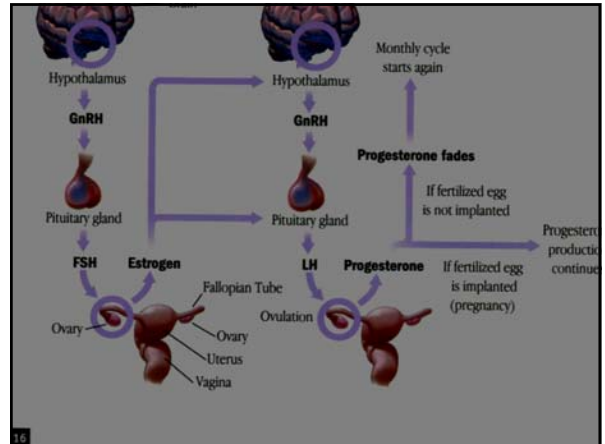
Nutrition Through the Life Cycle 2005



Infertility is defined as the lack of conception after one year or more of unprotected intercourse.

Infertility in this context = subfertility





## SWCH & Create IVF Clinic

Multidisciplinary team:

- Infertility specialists/MDs
- Reproductive physiologists
- Lab, Ultrasound technicians
- Office, Nursing staff
- Nutrition counseling
- Stress management
- Acupuncture
- Massage
- Yoga

SWCH- Sunnybrook & Woman's College Hospital, Toronto; IVF- In Vitro Fertilization

## Nutrition Checklist

Healthy eating and optimum nutrition set the stage for the best possible environment for conception and a successful outcome.

How do you rate when it comes to healthy eating and optimum nutrition? Your fertility may be at risk if you check one or more of the following:

- under- or overweight
- history of dieting/disordered eating
- vegetarian
- avoid or eliminate major food groups
- too little or too much exercise
- skip meals & snacks regularly
- food intolerances or allergies
- high stress job/lifestyle
- excess caffeine, alcohol, recreational drugs
- medications
- dietary supplements used inappropriately

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## Nutrition Screening Form

- ◆ Weight history
- ◆ Medical history
- ◆ Diet history
- ◆ Exercise history
- ◆ Other lifestyle habits
- ◆ Supplement use
- ◆ Medications
- ◆ Perceived level of stress

Staff distributes forms to all new clinic patients  
Susie screens forms, recommends who needs referral. Voluntary for patient. Fee for service

## Purpose of Screening Form

To develop a Nutrition Screening Tool for infertility patients to:

- ◆ assist the physician in screening for nutrition and other lifestyle factors that may impact on fertility status.
- ◆ facilitate nutrition referrals in the initial stages of the work-up for a more successful outcome.

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## Results: 300 Female Infertility Patients

- 26% vegetarian
- 41% low fat/low cholesterol diet
- 21% high vegetable/fruit diet
- 31% skip breakfast
- 19% eat on the run
- 27% avoid fats/oils
- 24% avoid red meat
- 12% avoid milk/products
- 10% avoid fish
- 7% avoid eggs
- 6% avoid wheat

Data: START Clinic Toronto Susie Langley MS, RD  
Women: ages 18-44 years CFAS 2002  
CFAS – Canadian Fertility & Andrology Society (Canada)

## Results: 300 Female Infertility Patients

- 81% took dietary supplements
- 10% took herbal supplements
- 14% not taking folic acid
- 36% took medications
- 24% noted food allergies/sensitivities

<u>Perceived level of stress:</u>	<u>Self-reported exercise:</u>
33 % High	28% Sed-Low
49% Moderate	32% Moderate
18% Low	20% Active
	10% Very active

Susie Langley MS, RD

## Nutrition-related Disruptions in Fertility

- ◆ Undernutrition
- ◆ Weight loss
- ◆ Obesity
- ◆ High exercise levels
- ◆ Specific diets  
fad diets, vegetarian
- ◆ Specific food components  
fat, fiber, soy, carotene

Susie Langley MS, RD

It is estimated that 30% of the cases of impaired fertility are related to simple weight loss or weight-related amenorrhea.

Nutrition Through the Life Cycle 2005  
Van der Spuy Clin Obstet Gyn 1985; 12:579-604

## Undernutrition

Starvation studies:

- ◆ Holland famine World War II  
Women → 53% drop in birth rate  
Fertility status improved within 4 months...up to 1 year after the famine to regain weight
- ◆ Ancel Keys study World War II  
Men on restricted Kcal intake: ↓ sex drive  
↓ sperm viability, motility  
All parameters returned to normal after weight regained

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## Energy Balance & Weight

### Maintain weight:

Energy Input = Energy Output

dietary intake	physical activity
----------------	-------------------

*Infertility patients often do not realize how much energy they need. Others will often change providers if they are asked to gain weight.*




## Energy Balance

### Weight loss:


Energy input < Energy Output

*Negative Energy Balance*  
*Fad diets, Excess exercise, Eating Disorders*  
*Energy availability is key*  
 Treatment: weight gain




## Effects of Weight loss

- ◆ Losing 10-15% of usual body weight can decrease estrogen and testosterone (F, M)
- ◆ Losing 25% of usual body weight decreases sperm production entirely (M)
- ◆ Gaining weight to within 95% of usual body weight can return hormone levels to normal




## Eating Disorders & Infertility

- ◆ 3-5% of young American women
- ◆ Both Anorexia Nervosa and Bulimia are related to menstrual irregularities and infertility
- ◆ Anorexia poses more severe changes in endocrine and hypothalamic function vs normal weight females who are losing weight
- ◆ Hormone therapy not as effective until weight is gained
- ◆ Underweight women have 2x more small for gestational age infants vs those who gain weight and experience unassisted conception



## Excessive Exercise & Infertility

- ◆ **High** levels of physical activity and **calorie deficits** can cause delays and interruptions in normal menstrual cycles which appear to result from hormonal and metabolic changes.
- ◆ Modified estrogen, FSH, LH and other hormones (F)
- ◆ Decreased testosterone (M)



## Energy Drain

- ◆ Prolonged energy restriction leads to "Energy Drain" (constant dieting, not enough food, excessive exercise)
- ◆ Negative energy balance leads to amenorrhea  
 sustained stress:  
 elevated cortisol → low estrogen  
 shuts off reproductive axis
- ◆ Energy Drain affects all systems:  
 reproductive, thyroid, immune, skeletal, cognition...


Dueck, C IJRN 1996 (Female Athletes)



## Female Athlete Triad

- ◆ Disordered Eating
- ◆ Amenorrhea
- ◆ Osteoporosis


SI 6-9-00



## Diet, Exercise, Stress

- ◆ “Energy restriction alone can trigger abnormal menstrual function in some otherwise healthy women.”
- ◆ Research supports: *Energy intake and stress* as critical in the etiology of menstrual disturbances in female athletes and infertile women.
- ◆ Diet + exercise has a *greater negative effect* than exercise alone.

Dueck C IJN 1996    Stress = physical, psychological, emotional



## Energy Balance

### Weight gain:

Energy input > Energy Output

*Positive Energy Balance*  
*Overweight, Obesity*  
*Polycystic Ovary Syndrome ( PCOS )*  
 Treatment: weight loss/physical activity




## Weight Loss Treatment

Wt loss of 7-22 lbs with BMI >25 related to return to fertility (F)

- ◆ Weight loss is the first therapeutic option
- ◆ Less costly, many health benefits
- ◆ Hormone therapy often does not work in the presence of obesity

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## Positive Effects of Exercise

*Nurses Health Study 70,102 females*

- ◆ Greater physical activity is associated with substantial reduction in risk of type 2 diabetes
- ◆ Walking at moderate intensity & duration was just as effective as vigorous activity.

*this could be important for PCOS & fertility*

Hu et al JAMA 1999



## Exercise & Group Therapy

- ◆ Australian study 1998
- ◆ German study 1996

Success with group supported weight loss and exercise  
 Inducing spontaneous ovulation, conception and successful pregnancy ... especially in women with PCOS.

Clark, A. Human Reproduction 1998; Hollman, M. Human Reproduction 1996



## Cost-effective therapy

*Clark et al 1998*


Diet and exercise program x 6months: small wt loss (10 Kg)  
 60/67 resumed spontaneous ovulation  
 52 achieved a pregnancy (18 spontaneously)  
 45 produced a live birth  
 Miscarriage rate dropped from 75% to 18%  
 Psychometric measurements improved  
 Big Cost Savings: \$4,600 vs \$275,000 per baby

*“Thus weight loss should be considered as a first option For women who are infertile and over weight.”*

## Yoga & Stress

*Brainard, G. Thomas Jefferson University\**

- ◆ Yoga (50 min/day) lowered cortisol  
Promoted strength, flexibility, balance
- ◆ Stress management  
Deep breathing, relaxation, meditation, massage
- ◆ ↑ physical activity ↑ good endorphins  
30 → 60 min/day walking, yoga, tai chi ...



Yoga lowers cortisol

\*Medical Post July 15, 2003

## Diet & Infertility

- ◆ Vegetarian diets
- ◆ Low fat intake
- ◆ High fiber intake
- ◆ Soy
- ◆ Carotene
- ◆ Caffeine
- ◆ Alcohol
- ◆ Dietary supplements

## Vegetarian Diets

High plant-based diets *often are:*

- ◆ Low Kcal, low protein
- ◆ Low fat, low cholesterol
- ◆ Low iron, zinc, B12
- ◆ Low in carbohydrate
- ◆ Low in high quality protein
- ◆ High in fiber, isoflavones, carotenoids

Vegetarian athletes: higher incidence of amenorrhea, higher risk of osteoporosis, bone fractures, low body fat/wt

Pederson, A. Am J Clin Nutr 1991

## High Fiber

- ◆ Women who regularly eat high fiber (>25 g/day), low fat, plant based diets and no red meat:
- ◆ have lower circulating estrogen levels
- ◆ are more likely to have irregular menstrual cycles than omnivores.

These results apply to vegetarians who are *thin, normal or overweight.*

Hill, P. Am J Clin Nutr 1996; Wyshak, G. J Women's Health 1993

## Low Fat ... quality vs quantity

Diets providing <20% Kcal from fat appear to lengthen menstrual cycles among women in general.\*

Low fat diets for men may not benefit since sperm are high in polyunsaturated fats.

Very low fat diets → deficiency of essential fatty acids


Cholesterol is essential for synthesis of estrogen, testosterone

\* Reichman, M. J Clin Endocrinol Metab 1992

## Soy

- ◆ 20-200 mg/day soy isoflavones delays menses\*
- ◆ decreases blood levels of gonadotropins, estrogen and progesterone
- ◆ 40-70 mg/day soy isoflavones showed few effects on androgen levels or semen quality

\* Karzer, M. J Nutr 2002



## Carotene

- ◆ Hypercarotenemia (high serum carotene) is associated with amenorrhea and menstrual dysfunction\*
  - > 12 mg beta-carotene consumed daily for 6 weeks (F) bright yellow-orange skin/palms return to normal after 2-6 weeks when high levels are discontinued
- ◆ Part of diagnostic criteria for Anorexia Nervosa
- ◆ Mechanism is unknown ... more research needed
- ◆ Is it the carotenoids or other food components?
- ◆ Is it an unbalanced diet low in energy and protein?
- ◆ Check all supplements, herbals, "juicing", Greens+

\* Weitz, Obstet. Gynecol. 1980; 56: 482-487



## Lifestyle habits


*"Lifestyle habits... smoking, drinking, exercise, diet may be an important link between BMI and sperm quality."*

Jensen, T. Fertility & Sterility 2004



## Lifestyle habits

- ◆ Caffeine
- ◆ Alcohol
- ◆ Smoking
- ◆ Sleep
- ◆ Meal skipping
- ◆ Medications
- ◆ Supplement use



## Caffeine

European study:  
4 cups coffee (>500mg caffeine)  
50% less likely to get pregnant vs low caffeine intake

U.S. study:  
>300 mg caffeine/day (coffee, sodas, tea) decreased fertility by 27% per cycle vs negligible caffeine intake in women

Caffeine effect is stronger in women who **smoke**


Bolunar, F. Am J Epidemiol 1997; Hatch, E. Am J Epidemiol 1993



## Caffeine ...recent report

- ◆ Caffeine is an important source of phytoestrogens which may bind to estrogen receptors
- ◆ Coffee consumption has been associated with higher circulating levels of sex hormone binding globulins which decrease the level of bioavailable estrogen
- ◆ *This may help explain why caffeine delays fertility*

Food & Fitness Advisor Weill Medical College of Cornell University March 2006



## Alcohol

- ◆ 66 % of Americans use alcohol
- ◆ 33% consume alcohol on a regular basis

Females:

- ◆ Fewer eggs retrieved
- ◆ Less chance of pregnancy
- ◆ Greater chance of spontaneous abortions
- ◆ Risk of Fetal Alcohol Syndrome

Males:

- ◆ Alcohol is a direct toxin to the testes
- ◆ Decreased sperm count, morphology, motility
- ◆ Decreased live birth rate

Sharnowski, S. Sertono Conference San Diego 2004

## Alcohol & Infertility

430 Danish couples attempting pg for 6 months

1-5 alcoholic drinks/week (women)  
39% lower chance of conception

>10 alcoholic drinks/week  
66% lower chance of conception

Jensen, J. Am J Hypertens 1999

## Smoking: Men

Smoking, alcohol and street drugs

- ◆ Increase Reactive Oxygen Species (ROS)
- ◆ Decrease fertilization
- ◆ Decrease sperm production
- ◆ Decrease sperm motility
- ◆ Decrease sperm morphology (DNA damage)

Sharnowski, S. Sermo Conference San Diego 2004  
Zenzes Fertility & Sterility 1999; Kauszle Fertility & Sterility 2003

## Smoking: Women

Smoking:

- ◆ Tubal abnormalities
- ◆ Alterations in immune system
- ◆ Menstrual cycle abnormalities
- ◆ Low estrogen production
- ◆ Low birth weight
- ◆ Higher risk of SIDS (Sudden Infant Death Syndrome)

Sharnowski, S. Sermo Conference San Diego 2004

## Smoking & IVF Success

8,400 women (Netherlands) 1983-1995 IVF Clinics

- ◆ Smoking ↓ live birth rate by 7.3% among those with unexplained fertility
- ◆ Smokers had lower Pg rates, more likely to miscarry
- ◆ For every type of fertility problem ...the delivery rate was higher for those who did not smoke.
- ◆ Smoking adds a decade to the reproductive age.  
Ie. 20 year old = 30 y/o non-smoker

Lintsen, A. Human Reproduction 2005

## Balanced Plate



## Symphony ..as philosophy

- ◆ Think of nutrition as a symphony orchestra where nutrients are the players
- ◆ If some of the key players are missing there won't be as beautiful music

*variety, balance, moderation is key*

*body, mind, spirit*

Susie Langley MS, RD



## Key Players ... fertility


- ◆ Calories/Energy
- ◆ Protein
- ◆ Carbohydrates
- ◆ Essential fats
- ◆ Folic acid
- ◆ Iron
- ◆ Calcium
- ◆ Vitamin D
- ◆ Vitamin B12
- ◆ Vitamin C
- ◆ Zinc
- ◆ Selenium
- ◆ Other fat soluble vitamins: A, E, K
- ◆ Other water soluble vitamins: thiamin, riboflavin, niacin, B6, biotin, pantothenic acid ..
- ◆ Other minerals: magnesium, potassium, iodine .....
- ◆ Fluids: water, milk, juice ...

Savie Langley MS, RD



## Screening tools


### Assessing Body Weight & Fertility



## Body Fat

- ◆ Both high and low body fat are related to infertility and alternations in hormone levels
- ◆ Specific levels of body fat have not been identified for fertility but ...  
a critical mass of body fat determines the onset of menses ... and regulates gonadotropin secretion

Reichlin, R. *New Engl J Med* 2003; Am 1988; Reichlin, S. *N Engl J Med* 2003



## Body Mass Index

	BMI	Link to Infertility
Healthy range:	18.5 - 24.9	
Underweight:	< 20.0	yes
Overweight:	> 25	yes
Health Risk:	> 27	yes
Obese:	> 30	yes

Important to consider Family History and Frame size

www.ahlbisupport.com/bmi/ Reid & Van Vugt Fertility & Sterility 1987




## Girth: Waist Circumference

	Health Risk	WHR
◆ Men	≥ 40 in. (102 cm)	>0.8
◆ Women	≥ 35 in. (88 cm)	>1.0



BMI + Waist Circumference together are better predictors of body weight & distribution of body fat.  
WHR =Waist:Hip Ratio Apple & Pear shape

Canadian Guidelines for Body Weight Classification in Adults Health Canada 2003 www.healthcanada.ca/nutrition



## Waist:Hip Ratio

500 women (Netherlands) clinic: for artificial insemination  
0.1 unit increase in WHR → 30 % ↓ in probability of conception per cycle

-Increasing WHR is negatively correlated with fertility  
-Body fat distribution seems to have more impact on fertility than age or obesity.

Zaadstra, B. et al. *BMJ* 1993

## BMI a good indicator in infertility therapy

Medical Post July 3, 2001  
 Women with normal BMI & WHR have higher pregnancy rate  
 BMI = Body Mass Index WHR = waist : hip ratio

BMI	pg rate/cycle
Normal	37.9%
Abnormal	21.7%

WHR	Normal	Abnormal	Combined BMI & WHR	Normal	Abnormal
Normal	34%		Normal	38%	
Abnormal	21%		Abnormal	15%	

BMI 26-27 International consensus 20% overweight. Obesity has negative effect on reproductive system

Dublin, Ireland Rotunda Maternity Hospital

## BMI & Infertility: Female

Harvard Nurses Health Study 2

Higher risks for infertility

- ♦ very lean (BMI <20)
- ♦ moderately overweight (BMI ≥ 24)
- ♦ Overweight (BMI ≥25)
- ♦ Obese (BMI >30)

Ovulation-related Infertility:

Underweight	12%
Overweight	25%

Rich-Edwards, J. Epidemiology 2002

## BMI & IVF Success

Study on success rates and BMI in 5800 IVF attempts

**Obese women: Less success**

- ♦ BMI > 35 lower success rates  
vs Overweight (BMI 25-30) & Normal weight (BMI 20-25)
- ♦ Less likely to become pregnant via IVF  
22% vs 30% normal or underweight women
- ♦ Lower rate of successful embryo implantation  
13% vs 19% healthy weight women

Ryley, S. Presented at American Society of Reproductive Medicine Oct. 16-20, 2004

## Toronto Infertility Clinic: BMI

Nutrition Screening Form: 300 female infertility patients

	BMI
♦ 17 % below healthy range	<20
with 11% of these	<19
♦ 64 % healthy weight	20-25
♦ 4 % caution zone/overweight	25-27
♦ 15 % above healthy range	>27
with 10 % of these	>30

Langley, S. Presented at Canadian Fertility & Andrology Society 2003  
 Data: START Clinic Weight, History of Dieting and Nutritional Status of Female Infertility Patients

## BMI & Unrealistic Weight Goals

Overall: 300 female infertility patients \*

- ♦ 40% had unrealistic weight goals  
based on standard Ht/Wt calculations
- ♦ 25% chose a desired wt goal BMI <20
- ♦ 6% chose a desired wt goal BMI <19


\*Langley, S. Presented at CFAS 2003 Data START Clinic Toronto

## Disordered Eating & Fertility

300 female infertility patients\*:

- ♦ 81% wanted to lose wt prior to work-up
- ♦ 49% had a history of "dieting" and had followed one or more fad diets or weight loss programs
- ♦ 5.4% reported a history of an eating disorder

\*Langley, S. Presented at CFAS 2003  
 Data: START Clinic, Toronto




## Male Infertility Data: BMI

Data on 118 male infertility patients\*

	BMI
◆ 4 % below healthy range	<20
◆ 32 % healthy range	20-25
◆ 27 % overweight	25-27
◆ 37 % above healthy range	>27

◆ 17.4 % had a history of dieting (*vs 49% in females*)

\*Langley,S. Presented at CFAS 2004 Data START Clinic Toronto  
A Nutrition & Lifestyle Profile of Male Infertility Patients



## BMI & Infertility: Male

Study: 1558 young Danish men

	Sperm count*
Low BMI (<20)	36% lower
High BMI (>25)	25% lower

compared to normal weight men  
\* <20 million sperms/ml semen

As BMI ↑ testosterone ↓  
Low & High BMI ↑ risk for infertility

Jensen,T. Fertility & Sterility 2004



## BMI & Sperm Quality


Lower BMI (underweight)	Higher BMI (overweight)
Poor semen quality	Poor semen quality
Suggested reasons:	Suggested reasons:
◆ Malnutrition	◆ Hormonal effects
◆ "Subclinical" health problems	
◆ Hormonal imbalance	

Jensen,T. Fertility & Sterility 2004




## Case#1: Underweight

Energy Drain  
Avoidance of major food groups  
Inappropriate supplements



## Case #1: Underweight


A 29 y/o married female professional in a high stress job was referred by a infertility specialist for elevated serum carotene and nutrition assessment. She had eliminated wheat and dairy from her diet was taking 15,000 I.U. of beta-carotene/day on the advice of an alternative health professional. She was amenorrheic but did not consider herself underweight. Her exercise level was "active" but she noted she was no longer a marathon runner due to a nagging "hip problem".



## Case #1: Underweight

Age: 29 yrs Ht: 5'4" Wt: 107 lbs BMI: 18 Frame: small Date: 5-03-00  
Highest adult wt: 115 lbs Lowest adult wt: 99 lbs  
Activity level: "active" (bike, aerobics, weights, ultimate frisbee)  
Medical Hx: "hip problem... can't run any more". Female Athlete Triad?  
Menstrual Hx: menarche age 14. No menses currently  
Serum carotene: 5.7 (0.9-3.7 μmol/L)  
Goal: achieve fertility & healthy pregnancy

Diet Hx: avoids wheat and dairy. Underweight. Low Keal & protein  
Naturopathic supplements: 15,000 IU B-carotene; calcium 250 mg/day  
Non-smoker Alcohol: 0 Caffeine: 1/day Water: 1-2 liters/day  
Sleep: 7.5 hrs/day  
Perceived Stress level: high



## Dietary Intake: Before


Initial visit: no wheat or dairy for past year\*

B Oatmeal  
OR Kamut bread with almond butter & honey

L Vegetable sandwich on kamut bread  
OR vegetable salad OR veggies & rice

D Veggies & rice/noodles (curried, Thai or stir fry)  
OR spelt pizza with pesto & veg (occasional goat's cheese)  
OR chicken (~ 3x/week)

Supplement: 15,000 I.U. B-carotene \* advice from ND (naturopath)



## Dietary Intake: After

Recommendations from Registered Dietitian (RD):

B Bowl cereal (iron-fortified ie. Raisin Bran or Cream of Wheat)  
 1 % Milk, banana, Orange juice


Sn Blueberry bran muffin

L Sandwich: multigrain bread, lean meat, chicken, fish + mayo  
 Garden salad, Olive oil & vinegar dressing  
 Fresh fruit

Sn Vanilla yogurt, almonds/walnuts OR fruit or grain & cheese

D Chicken, lean beef, salmon/seafood or legumes  
 Potato, rice or starchy veg + butter/soft margarine/oil  
 Spinach Salad + olive/canola oil & vinegar dressing

Sn Strawberries & yogurt (or frozen yogurt)  
 Asked to discontinue B-carotene supplement



## Weight Gain Progress

Date	Weight	BMI
5-03-00	107 lbs	18
7-26-00	115 lbs	20

went off med; first monthly cycle got pregnant. Delivered healthy baby

Serum carotene

Date	Weight	BMI
5-03-00	5.7 (0.9-3.7 μmol/L)	
6-27-00	3.4 normal range	

Supplements


Date	Supplements	Notes
5-03-00	15,000 IU B-carotene	Asked to discontinue
7-26-00	1 Calcium:magnesium tab/day; Folic acid 1 mg/day	
7-26-00	1000 mg calcium from dairy/food; Prenatal Vit 1/day	



## 2nd Pregnancy ... same target weight

Date	Weight	Notes	BMI
5-3-02	103 lbs	Wants to have second child	17.7
6-27-02	106 lbs	Stopped breast feeding Jan.02 Back to work x 2 mos. No menses Meal skipping, high stress job Diet unbalanced again. Underweight.	18.2
10-24-02	115 lbs	Balancing diet with all food groups Eating more lean red meat Wants to get Pg naturally before MD visit Getting closer to her target wt (as before)	20

Stopped exercising and gained more wt Pregnant (BMI 20). Prenatal visit today Outcome: Healthy mom & healthy baby




## Weight gain ... success!

"I strongly believe it was my improved nutrition and weight gain that got me pregnant ... the first time ... and the second time too!" patient's parting comments




## Case #2: Overweight

### Polycystic Ovary Syndrome




## Case #2: PCOS

A 31 y/o married female career professional is referred for PCOS and weight management during her infertility workup. She had a long history of dieting without permanent weight loss success. She was highly anxious on the first visit due to an impending pregnancy test. Her history of multiple miscarriages had her depressed and she was also worried that she would develop diabetes like her mother. She had a chaotic eating pattern --high in refined starch and sugar. Her activity level was low but she enjoyed walking the dog. She was ready to "break free" from the craving and bingeing she experienced on the Atkin's diet.



## Case #2: PCOS


- ◆ Age: 31 yr Ht: 5'9" Wt: 240 lbs Frame: large
- ◆ BMI: 35 WHR: 0.9 Girth: >40" "Apple" shape
- ◆ Dx: PCOS Meds: Metformin
- ◆ Serum free testosterone: 14 (0.1-13.5) pMol/L
- ◆ FBS: 6.1 (3.3-6.1) mMol/L
- ◆ LH:FSH ratio: "high"
- ◆ Fasting Insulin: 227 (30-175) pMol/L
- ◆ Prolactin: 18.8 (1.0-18.0)
- ◆ Total Chol: 4.8 TG: 2.4 HDL↓ BP: 138/90
- ◆ Hb: 114 (115-165) g/L Hct: 0.35 (0.37-0.47) %



## Case #2: PCOS

**Dietary Supplements:**  
 Calcium carbonate 500-1000 mg (occasional)  
 Pallifer 1/day as per MD (30 mg elemental iron)  
 Folic acid: 1 mg/day


**Medical History:**  
 Two miscarriages; highly anxious re impending Pg Test  
 Iron deficiency anemia  
 Juvenile arthritis in remission x several years  
 Borderline high blood sugar  
 Lipid profile less than desirable for age  
 High blood pressure  
 Mother has PCOS, DM II, psoriatic arthritis, anemia



## Case #2: PCOS

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## PCOS Case

**Nutrition History:**

- ◆ chronic dieter
- ◆ no success with permanent wt loss (PCOS)
- ◆ very low Kcal/carb diet: ↓40 lbs down to 160 lbs (1996)
- ◆ off diet, rebound weight gain to 240 lbs (1999-2001)
- ◆ High protein, low carb (Atkin's diet)  
 decided against this diet due to past failure (crave & binge)
- ◆ low physical activity ... but enjoys walking the dog
- ◆ Chaotic meal pattern, high in sugar, refined starch, sat'd fat, sodium
- ◆ symptoms of Metabolic syndrome: high risk for DM II, Heart disease and hypertension
- ◆ Iron deficiency anemia pre-conception



## Dietary Intake: Before

**Initial Food records:**

- ◆ Pattern of eating: meal skipping, restricting, craving & bingeing
- ◆ High in saturated & trans fats: Fast foods ... burger & fries
- ◆ High in refined starch, sugar, sodium: convenience foods, chips, instant noodle soup, mashed potatoes, low fat cookies, crackers
- ◆ Low Protein intake: low lean red meat, poultry, fish, low fat dairy
- ◆ Fiber intake: low in vegetables, fresh fruit, whole grains & legumes
- ◆ Low fat approach to eating: low in essential fatty acids
- ◆ Social: ate dinner with husband only on week-end; not motivated to make meals for self when alone ... poor choices eating "out"
- ◆ Perceived Stress level: High
- ◆ Fear of developing chronic disease inherited from mother

## Dietary Intake: After

Nutrition recommendations from RD:

- ◆ Structured meals & snacks: diabetic style meal plan
- ◆ Controlled carbs: Complex vs simple carbs (low vs High G.I.)
- ◆ Timing & spacing of balanced meals/snacks over the day
- ◆ Increase fiber: whole grains, vegetables, fruit, legumes
- ◆ Decrease or avoid: refined starches, sugar, saturated & trans fats from steady diet of fast & convenience foods
- ◆ Assure adequate protein from lean meat/alt & lower fat dairy
- ◆ Fat quality vs quantity (assure essential fats daily)
- ◆ Adequate fluids (avoided caffeine, alcohol)
- ◆ Walking program & yoga for weight and stress management

Fibre 30 g  
Calcium: 1000 mg  
Na+:  
E200 mg  
Fat: 26%  
Mono:  
10%  
Poly:  
10%  
Sat:  
6%

## Diabetic-Style Meal Plan: PCOS, Weight Loss

BKF	Shredded wheat	1 1/2 cups	2 Grains
	Milk 1%	1 cup	1 Milk
	Banana	1/2	1 Fruit
	Orange juice	1/2	1 Fruit
LCH	Sandwich: Turkey	3 oz	3 Meat/Alt
	Multigrain bread	2 slices	2 Grains
	Mayo, real	1-2 tsp	1-2 Fats
	Garden salad	2 cups	2 Veg
	Olive oil & vinegar	2 Tbsp	2 Fats
SN	Yogurt 1% vanilla	175 g	1 Milk
	Pear	1 med	1 Fruit
	Almonds	4 Tbsp	4 Fats, 1 Meat/Alt
DIN	Sockeye Salmon, broil	4 oz	4 Meat/Alt
	Wild rice, cooked	1 1/2 cups	3 Grain
	Broccoli & red pepper	2 cups	2 Veg
	Soft marg/canola oil	2 tsp	2 Fat
	Fresh strawberries	1 cup	1 Fruit
SN	Yogurt 1%	3/4 cup	1 Milk
	Oatmeal cookie	2 small	1 Grain

Grain: 8 Milk: 3 Meat/Alt: 2 sv (7 oz) Fruit: 4 Veg: 4 Fat: 8

## Team Approach: Infertility

- ◆ Strong support from health care team
- ◆ Stress management
- ◆ Physical activity: yoga & walking program
- ◆ Nutrition education:
  - Diabetic-style meal plan: time & space carbs over day
  - Sources of fiber: soluble & insoluble
  - Glycemic Index: discuss pros and cons
  - Quality vs quantity of fats MUFA, PUFA, omega-3 fats
  - Lean protein + starch/fiber to stabilize blood glucose
- ◆ Monitor weight, glucose, B.P., iron, lipids, hormones

## Weight loss progress

Over the next 6-9 months she:

- Increased dietary fibre & protein
- Ate more structured meals/snacks -- did not crave as many sweets
- Tapered soft drinks to 0-1/day
- Increased calcium-rich milk/products (1000 mg calcium/day)
- Was still afraid to use fats -- but agreed to try some healthy fats

Wt: 225 lbs (lost 15 lbs) BMI: 33

All labs returned to "normal"

After ~1 year she was pregnant via IVF ... avoided gestational DM

Delivered healthy triplets ... and continues her prevention meal plan

## PCOS: bottom line

- ◆ Refer to Registered Dietitian early
- ◆ Avoid fad diets: high protein/low carb/low Kcal
- ◆ Variety of foods from ALL food groups
- ◆ Emphasize fiber-rich carbs with lower Glycemic Index.
- ◆ Educate re reliable nutrition resources/advice
- ◆ Monitoring and positive re-inforcement
- ◆ REGULAR physical activity is KEY to manage weight, stress, disease risk

Resources:  
Brand-Miller et al. The New Glucose Revolution 2003  
Woodruff.S. The Good Carb Cookbook 2001  
[www.pcossupport.org/living/nutrition/tips.php](http://www.pcossupport.org/living/nutrition/tips.php)


## Male Infertility

- ◆ Lifestyle habits are often neglected



## Male Infertility & Nutrition

- ◆ Underweight & overweight at risk
- ◆ Nutrients in spotlight: zinc, selenium, vitamins B, C, E  
Educate about adequacy and safety. Data is lacking.
- ◆ Lifestyle habits: smoking, drinking, recreational drugs
- ◆ Physical activity: body builders, runners, other athletes  
Promote moderate physical activity for health
- ◆ Medications: Rx, OTC check nutrient/drug interactions
- ◆ Chronic diseases ...assure nutrition counseling as checkpoint
- ◆ Supplements: Avoid megadoses; steroids; herbals
- ◆ Assure nutrient adequacy. Assess diet & educate.
- ◆ Promote nutrition awareness & link to optimum fertility



## Multivitamin/mineral Safety

	DRI	UL
Vitamin A	700-900 mcg	3,000 mcg
B-carotene	ND	ND
Vitamin C	75-90 mg	2,000 mg
Vitamin D	200 I.U.	2,000 I.U.
Vitamin E	15 I.U.	1,000 I.U.
Vitamin B6	1.3 mg	100 mg
Folic acid	400 mcg	1,000 mcg
Vitamin B12	2.4 mcg	ND
Calcium	1000 mg	2,500 mg
Magnesium	320-420 mg	350-450 mg
Iron adult male	9 mg	45 mg
adult female	18-27 mg	anemia/see MD
Zinc	8-11 mg	40 mg
Selenium	55 mcg	400 mcg

DRI = Dietary Reference Intake ND = Not Determined above is not complete list  
UL= Upper Limit Dietary Reference Intakes 2002 Washington DC: Academic Press



## What about supplements?

Consider protocol for safe use of supplements:

- ◆ Folic acid (1 mg/day) often recommended
- ◆ Prenatal multivitamin 1/day- best overall choice
- ◆ Iron as per MD if iron deficiency/anemia
- ◆ Calcium 1000 mg/day Vitamin D 200 IU/day
- ◆ Antioxidants- below Upper Limits of safety
- ◆ Herbals- not recommended; unregulated
- ◆ Essential fatty acids (omega-3) 300-500 mg/day safe Pg
- ◆ Others (trace minerals, herbals, designer supplements)



## Is there a diet for infertility?

- ◆ Individual approach
- ◆ Refer for dietary assessment/RD
- ◆ Sensible weight goals in advance
- ◆ Moderate physical activity
- ◆ Safe use of supplements
- ◆ Nutrient & medication interactions
- ◆ Check & manage level of stress
- ◆ Assure adequate rest & relaxation
- ◆ Avoid caffeine, nicotine, alcohol, herbals
- ◆ Pills without real food energy are NOT the answer



## That's all folks!

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