

## Preconception Counseling: Lessons from Integrative Medicine



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6

## Fetal Origins Hypothesis



Barker DJ. Developmental origins of adult health and disease. *J Epidemiol Community Health* 2004; 58:114-5.

7



8

## March 2016 CDC National Health statistics report:

- ⌘ Autism rate: 1 in 54 children
- ⌘ Birth defects: 3 in 100 (CNS, heart, GI, musculoskeletal, orofacial, chromosomal)



[www.cdc.gov/ncbddd/birthdefects/data.html](http://www.cdc.gov/ncbddd/birthdefects/data.html)

9

## Can we prevent (some) autism?

- ⌘ Folic acid pre-conception and 1<sup>st</sup> trimester
- ⌘ SSRI use pre-conception and 1<sup>st</sup> trimester
- ⌘ Medications: valproate and acetaminophen
- ⌘ Air pollution
- ⌘ Environmental chemicals
- ⌘ Advanced paternal age

Schmidt et al. Prenatal Vitamins, One-carbon Metabolism Gene Variants, and Risk for Autism. *Epidemiology*. Vol 22 July 2011.  
Surén P et al. Association between maternal use of folic acid supplements and risk of autism spectrum disorders in children. *JAMA*. 2013 Feb 13;309(6):570-7.  
Roth, C et al. Folic Acid Supplements in Pregnancy and Severe Language Delay in Children. *JAMA*. 306(14): October 2011.  
Goh YI et al. Prenatal Multivitamin Supplementation and Rates of Congenital Anomalies: A Meta-analysis. *Journal of Obstetrical Gynecology Canada* 28(8) 2006.  
Croen LA. et al. Antidepressant use during pregnancy and childhood autism spectrum disorder. *Arch Gen Psychiatry*. 2011  
Volk HE. et al. Traffic-Related Air Pollution, Particulate Matter, and Autism *Arch Gen Psychiatry*. 2012

10



11

## Egg freezing

Oct 2012 American Society for Reproductive Medicine “no longer experimental”

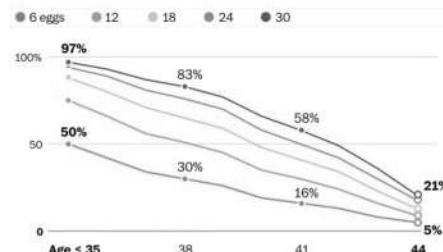
“Marketing this technology for the purpose of deferring childbearing may give women false hope and encourage women to delay childbearing. Patients who wish to pursue this technology should be carefully counseled.”



12

## Eggs frozen at an earlier age have a higher chance of success

Probabilities of at least one live birth, by woman's age at time of egg freezing and number of eggs frozen. Many clinics advise women to try to freeze 10 to 20 eggs.



Study uses mathematical model based on extrapolated data, not real-world percentages of successful live births.

Source: Human Reproduction, April 2017

SHELLY TAN/THE WASHINGTON POST

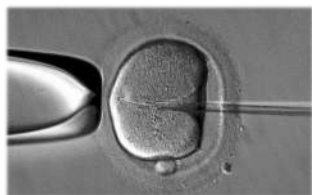
13

## IVF success rate

⊗ 47% effective overall in women who receive three IVF cycles

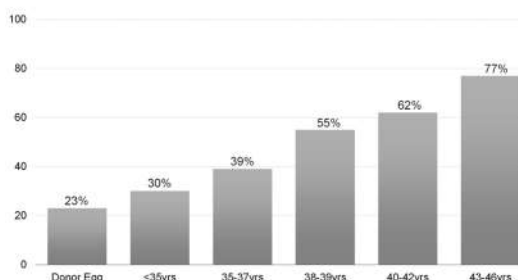
⊗ Women in their twenties: 58% success

⊗ Women aged 40-44: 22% success



14

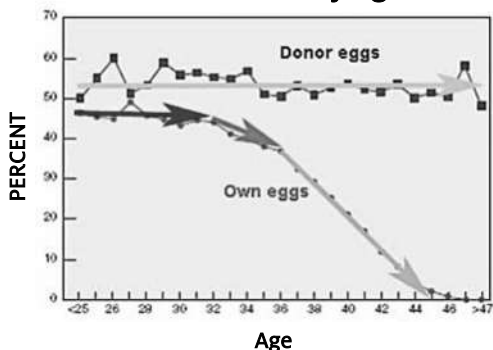
## % of Embryos that will be Chromosomally Abnormal



<https://www.oregonreproductivemedicine.com/wp-content/uploads/2017/02/Issue-36-Science-Failed-Transfers.pdf>

15

## Percent of transfers that resulted in live birth by age



16

## Father's Age Matters Too!

Swedish cohort study of >2.6 million births  
Children born to fathers ≥45 years were at heightened risk compared to those who's fathers were 20 – 24:

- ⊗ 13x higher risk of developing ADHD
- ⊗ 25x risk of bipolar
- ⊗ 2x risk of developing psychosis
- ⊗ 2x risk of having a substance abuse problem
- ⊗ 60% higher likelihood of failing grades in school



D'Onofrio BM. Paternal Age at Childbearing and Offspring Psychiatric and Academic Morbidity *JAMA Psychiatry* 71(4):432-438 2014

17

"I am reaching out to you about a personal matter given your expertise in women's health and reproductive health. My husband (35 years old) and I (32 years old) have been trying to conceive for about 10 months now and recently got a full workup done at a fertility clinic. The main abnormalities that have come up are that my husband's sperm parameters are quite low and my AMH came back in the low reserve category (measuring 11.9 pmol/L). My husband's parameters are as follows: Concentration - 6.9mil (normal >20mil) Motility - 2% (normal >50%) Morph - 1% (normal >4%) Total - 0.5 (normal >20)

The fertility clinic said with those sperm numbers, we will likely need to undergo IVF

18

## Integrative approaches

- ☞ Nutrition
- ☞ Supplements
- ☞ Exercise
- ☞ Stress management
- ☞ Acupuncture
- ☞ Spirituality
- ☞ Environmental precautions



19

## Does Diet Matter?



20

## Mediterranean Diet

- ☞ Prospective cohort study, 244 women (age 22–41; BMI < 30 kg) undergoing first IVF treatment
- ☞ Women in the lowest tertile Med Diet Score compared with highest ( $\leq 30$  vs  $\geq 36$ ) had significantly lower rates of clinical pregnancy (29.1 vs 50.0%,  $P = 0.01$ ) and live birth (26.6 vs 48.8%,  $P = 0.01$ )
- ☞ Among women <35 years, a 5-point increase in the MedDietScore was associated with ~2.7 times higher likelihood of clinical pregnancy and live birth

Karayiannis D. Adherence to the Mediterranean diet and IVF success rate among non-obese women attempting fertility. *Human Reproduction*, Vol.33, No.3 pp. 494–502, 2018

21

## Mediterranean Diet and Fertility

- ☞ Spanish case-control study
- ☞ 485 women, age 20–45, who reported difficulty getting pregnant 1,669 age-matched controls who had at least one child
- ☞ Results:
  - ☞ "Mediterranean-type" and "Western-type" dietary patterns
  - ☞ 44% less difficulty conceiving in the highest quartile Mediterranean pattern compared with the lowest quartile (odds ratio 0.56, 95% CI 0.35–0.95)

Toledo E et al Dietary patterns and difficulty conceiving: a nested case-control study *Fertility and Sterility*, Vol 96, No.5, November 2011, 1149–1153

22

## The Nurse's Health Study II on Fertility:

- ☞ Onset 1989
- ☞ 116,000 female RNs ages 24–42
- ☞ Diet first measured in 1991 and updated every 4 years
  - ☞ 18,555 married women to conceive
  - ☞ 438 women reported infertility



Chavarro JE. Et al. Caffeinated and alcoholic beverage intake in relation to ovulatory disorder infertility. *Epidemiology*. 20(3):374–81, 2009 May.

23

## Carbohydrates and Infertility

Total carbohydrate intake not related to ovulatory infertility

⌘ High glycemic index (GI) foods

↑ risk: RR was 1.92 (CI =1.26-2.92)

⌘ Low GI foods associated with ↓ risk

⌘ Specific foods: only cold breakfast cereal and soda statistically significant



Chavarro JE, et al. A prospective study of dietary carbohydrate quantity and quality in relation to risk of ovulatory infertility. *European J of Clin Nutrition*. 63(1):78-86, 2009 Jan.

24

## Insulin Sensitivity:

⌘ High glycemic index/load increases insulin

⌘ Insulin decreases SHBG

⌘ SHBG preferentially binds testosterone – less SHBG means more free testosterone



A prospective study of dietary carbohydrate quantity and quality in relation to risk of ovulatory infertility. Chavarro JE, et al. *European J of Clin Nutrition*. 63(1):78-86, 2009 Jan.

25

## Protein and Infertility

⌘ NHS II: Each additional daily serving of red meat, chicken, or turkey increased the risk of ovulatory infertility by nearly one-third

⌘ Fish, eggs neutral effect

⌘ Vegetable protein reduced risk by 50%

⌘ Soy protein is safe and appears to enhance fertility



Chavarro JE, et al. Protein intake and ovulatory infertility. *Amer J of Ob Gyn*. 198(2):2008  
Gaskins AJ, Chavarro JE. Diet and Fertility: A Review. *American Journal of Obstetrics and Gynecology* (2017)  
Vanegas JC, et al. Soy food intake and treatment outcomes of women undergoing assisted reproductive technology. *Fertil Steril* 2015;103:749-55. e2.

26

## 2017 FDA/EPA guidelines:

⌘ Do not eat shark, swordfish, king mackerel, or tilefish because they contain high levels of mercury

⌘ Eat 8-12 ounces (2-3 average meals) a week of fish that are lower in mercury

⌘ Shrimp, canned light tuna, salmon, pollock, and catfish.

⌘ Albacore ("white") tuna maximum 6 ounces per week

⌘ Check local advisories about the safety of fish caught locally

<http://www.fda.gov/Food/FoodborneIllnessContaminants/Metals/ucm393070.htm>

27

## Fish Facts

Avon Longitudinal Study of Parents and Children (ALSPAC)

⌘ 11,875 pregnant women - food frequency questionnaire assessing seafood consumption at 32 weeks gestation

⌘ Compared developmental, behavioral, and cognitive outcomes of the children in women consuming none, some (1-340 g per week), and >340 g per week

⌘ Maternal seafood intake during pregnancy <340 g per week associated with children in the lowest quartile for verbal IQ

⌘ (no seafood consumption, odds ratio

1.48, CI 1.16-1.90; some, 1.09,

0.92-1.29; overall trend, p=0.004)

⌘ May have been the iodine



Hibbeln JR, et al. Maternal seafood consumption in pregnancy and neurodevelopmental outcomes in childhood (ALSPAC study): an observational cohort study. *Lancet*. 2007 Feb 17;369(9561):578-85

28

## Public Health message is more complex: choose healthier fish

⌘ Smaller fish, plant eating

⌘ Less bioaccumulation of mercury and PCBs

⌘ Omega 3 rich fish

⌘ Sardines, wild salmon, herring, black cod

⌘ Resources for choosing fish:

⌘ Natural Resource Defense Council

⌘ Monterey Bay Aquarium

29

### Special diets and detox?

4-6 months prior to conception:

- ⌘ Stop consuming unhealthy foods
- ⌘ Avoid environmental pollutants
- ⌘ Increase excretion with fluids, fiber, saunas, cruciferous vegetables
- ⌘ Consider an elimination diet
- ⌘ Consider celiac testing
- ⌘ Consider testing for mercury

30

### Micronutrients



31

### Reasons to Take Multi-nutrients

- ⌘ NHS II: 41% lower risk of infertility
- ⌘ Fewer miscarriages
  - ⌘ 79% risk reduction
- ⌘ Fewer birth defects
- ⌘ Less pediatric cancer
- ⌘ Less autism



Y. I. Goh et al. Prenatal Multivitamin Supplementation and Rates of Congenital Anomalies: A Meta-analysis. *Journal of Obstetrical Gynaecology Canada* 28(8): 680-89, 2006.  
 Chavarro JE, et al. Use of multivitamins, intake of B vitamins, and risk of ovulatory infertility. *Fertility & Sterility*. 89(3):668-76, March 2008.  
 Buck L, et al. Lifestyle and pregnancy loss in a contemporary cohort of women recruited before conception: The LIFE Study. *Fertility and Sterility*. In press. DOI: <http://dx.doi.org/10.1016/j.fertnstert.2016.03.009>  
 Showell MG et al. Antioxidants for Male Subfertility. *Cochrane Database of Systematic Reviews* 1 (CD007411), doi: 10.1002/14651858.CD007411.pub2, 2011.  
 Siew S, Lim, et al. Dietary Effects on Fertility Treatment and Pregnancy Outcomes, Current Opinion in Endocrinology, *Diabetes & Obesity* 14(6): 465-69, December 2005.  
 Goh YI et al. Prenatal Supplementation with Multivitamins and the Incidence of Pediatric Cancers: Clinical and Methodological Considerations. *Pediatric Blood & Cancer* 50(2) Supplement, doi: 10.1002/pbc.21403 Feb 2008.

32

### Multi-vitamin use

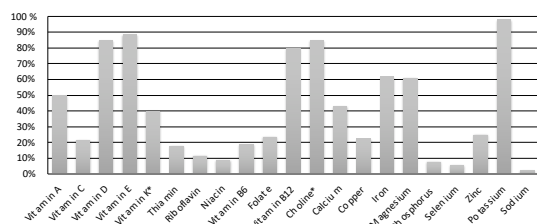
- ⌘ NHS II: compared with women who did not take multi-vitamins, RR of ovulatory infertility was:
  - ⌘ 0.88 for women taking  $\leq 2$  tabs/week
  - ⌘ 0.69 for 3-5 tabs/week
  - ⌘ 0.59 for  $\geq 6$  tabs/week
- ⌘ Micronutrients impact fertility, embryogenesis and placentation



Chavarro JE, Et al. Use of multivitamins, intake of B vitamins, and risk of ovulatory infertility. *Fertility & Sterility*. 89(3):668-76, 2008 Mar.  
 Cetin L, et al. Role of micronutrients in the periconceptional period. *Human Reproduction Update*. 16(1):80-95, 2010 Jan-Feb.

33

### Percent of 19-30 year old women who do Not attain the Dietary Reference Intake (2009-10 NHANES)



<http://www.nutrition.org/asn-blog/2014/01/multivitamins-is-the-debate-over/>

34

### Supplements in young women

2011 National Health and Nutrition Examination Survey (NHANES):

- ⌘ Only 34% of women ages 20-39 get the recommended amount of supplemental folic acid



35

34-year-old woman married for 1 year wants to conceive

- ☞ Generally healthy
- ☞ Daily exercise
- ☞ Broad, mostly organic, omnivorous diet

History of sub-clinical Hypothyroidism

- ☞ Longstanding – TSH usually around 3.2
- ☞ Symptoms – cold intolerance, constipation, long periods (6-7 days), tired, nails break easily

36

What would you do?

37

- ☞ Saw ND – tested urinary iodine – low
  - ☞ Treated with Lugol's iodine (24 mg) → TSH =6
- ☞ Saw her PCP – begun on .025mg levothyroxine - TSH 3.2
- ☞ Saw endocrinologist –
  - ☞ “it will take time to correct iodine – you don't need thyroid”
  - ☞ When heard TTC – recommended she stay on the thyroid. “Babies like TSH to be 1”

38

- When I saw her in my clinic she had been on low dose Synthroid (25mcg) for 8 weeks
  - ☞ Periods now last 4-5 days
  - ☞ Constipation improved
  - ☞ Energy improved
  - ☞ Nails better

Leung AM. Consequences of excess iodine. *Nat Rev Endocrinol.* 2014 March; 10(3): 136–142.

39

### Iodine Insufficiency in the UK

- ☞ ALSPAC reexamined maternal iodine levels
  - ☞ 1,040 first-trimester pregnant women
  - ☞ Mild to moderate iodine deficiency
    - ☞ median urinary iodine concentration of 91µg/L (optimum range of 150–249 µg/L)
  - ☞ Women with urinary iodine : creatinine ratio <150 µg/g had children with significantly lower verbal IQ (odds ratio 1.58, 95% CI 1.09–2.30), reading accuracy (1.69, 1.15–2.49), and reading comprehension (1.54, 1.06–2.23)

Bath SC, et al. Effect of inadequate iodine status in UK pregnant women on cognitive outcomes in their children: results from ALSPAC. *Lancet.* 2013 May

40

### Iodine Insufficiency in the US

- ☞ LIFE Study (prospective cohort) enrolled 501 women who had discontinued contraception
- ☞ 44.3% of participants were iodine deficient
  - ☞ Those whose iodine–creatinine ratios were <50 µg/g (moderate to severe deficiency) had a 46% reduction in fecundity (P = 0.028) compared with those whose iodine–creatinine ratios were adequate (OR of becoming pregnant per cycle, 0.54 (95% CI 0.31–0.94))

Mills JL et al. Delayed conception in women with low-urinary iodine concentrations: a population-based prospective cohort study. *Human Reproduction*, pp. 1–8, 2018

41

### Iodine intake recommendations:

- ☞ WHO: 150 mcg/d for adults & adolescents, 200 mcg/d for pregnant or lactating women
- ☞ IOM: 150 mcg/d for adults, 220 mcg/d for pregnancy, and 290 mcg/d for lactating women
- ☞ Historical levels:
  - ☞ NHANES I (1971-1974) - median urine iodine was 320 mcg/L, reflecting adequate dietary iodine intake
  - ☞ NHANES III (1988-1994) - median urinary iodine had fallen to 145 mcg/L - insufficient
  - ☞ NHANES 2001-2002 = 167.8 mcg/L
  - ☞ NHANES 2007-2014 the median UIC for pregnant women was 144 mcg/L - insufficient

42

### Iodine

- ☞ Only 51% of prenatal multivitamins contain iodine
- ☞ Replacement of iodine
  - ☞ use iodized salt in cooking and at the table
- ☞ Food sources include:
  - ☞ Milk
  - ☞ Egg yolks
  - ☞ Saltwater fish
  - ☞ Garlic
  - ☞ Lima beans and soybeans
  - ☞ Mushrooms
  - ☞ Seaweed, dulse and kelp
  - ☞ Sesame seeds
  - ☞ Asparagus, spinach, summer squash, Swiss chard, turnip greens



43

### Iron and Fertility:

- ☞ NHS: Women who consumed iron supplements had a significantly lower risk of ovulatory infertility than those who did not (RR 0.60, CI 0.39-0.9)
- ☞ Ideal dose appears to be 40-80 mg of iron



Chavarro JE, et al. Iron intake and risk of ovulatory infertility. *Obst&Gyn*.108(5):1145-52, 2006 Nov.

44

### Multivitamin ingredients:

- ☞ Vitamin A: max 2500 IU as Vitamin A palmitate or acetate, or retinol palmitate
- ☞ Iron 18 mg
- ☞ Iodine 150 mcg
- ☞ Folic acid 400 or more mcg
- ☞ Vitamin D 1000 IU
- ☞ Vitamin B12 2.4 mcg
- ☞ Vitamin E 24.2 IU
- ☞ Calcium 1000 mg from food +supplements
- ☞ Trace minerals: small amounts of copper, zinc, magnesium, potassium



<http://ods.od.nih.gov/factsheets/HealthProfessional/>

45

### Male Factors



46

### Diet and Male Fertility

- ☞ Danish male recruits who ate the most saturated fats had 38% lower sperm concentration and 41% lower sperm counts than those eating the least fat
  - ☞ Similar findings in US study of sub fertile men
- ☞ Walnuts (2.5 ounces per day) increased sperm counts
- ☞ Alcohol and cannabis impair male fertility



Jensen T et al. High dietary intake of saturated fat. *Am J Clin Nutr* 2013  
 Attaman JA, et al. Dietary fat and semen quality among men attending a fertility clinic. *Hum Reprod* 2012;27:1466-74.  
 Robbins WA et al. Walnuts improve semen quality in men consuming a Western-style diet. *Biol Reprod* 2012 Oct 25;87(4):101.

47

## Fertility in men

80% of men don't get 5 servings of fruits and vegetables per day



Cabler S, et al. *Asian Journal of Andrology*. 12(4):480-9, 2010 Jul.  
Du Plessis SS, et al. *Nature Reviews Urology*. 7(3):153-61, 2010 Mar.

48

## Cochrane Review of Anti-oxidants in Men

- ⌘ 30-80% of male subfertility due to effects of oxidative stress on sperm
- ⌘ 34 RCTs, 2876 couples
  - ⌘ antioxidant supplements (single or combined) taken by the male partner of a couple seeking fertility assistance compared with placebo, no treatment, or another antioxidant
- ⌘ Outcomes:
  - ⌘ *Live birth*: 3 trials. Antioxidant use associated with increase in live birth rate (OR 4.85, 95% CI 1.92 to 12.24; P = 0.0008)
  - ⌘ *Pregnancy rate*: 15 trials. 96 pregnancies in 964 couples. Antioxidant use was associated with increased pregnancy rate (OR 4.18, 95% CI 2.65 to 6.59; P < 0.00001)

Showell MG, et al. Antioxidants for male subfertility. *Cochrane Database of Systematic Reviews* 2011, Issue 1.

49

## Supplements for Men

- ⌘ Multivitamin (without iron)
- ⌘ Omega 3 (EPA 1.1 g + DHA 700 mg)
  - ⌘ Increased sperm concentration from 16.2 to 28.7 million per mL (P < .001) and morphology from 7.5% to 12.8% (P < .002)
- ⌘ Zinc 15 mg + Folic acid 5 mg
  - ⌘ normal sperm count 74%



Safarinejad MR. Effect of omega-3 PUFA supplementation in infertile men with idiopathic oligoasthenoteratozoospermia. *Andrologia* 2011;43:38-47.  
Wong WY et al. Effects of folic acid and zinc sulfate on male factor subfertility. *Fertil Steril* 2002;77:491-8.

50

## Exercise and Fertility



51

- ⌘ 1-44% of athletic women have amenorrhea
- ⌘ 79% of recreational athletes have luteal phase dysfunction (*consistently 33%, inconsistently 46%*)
- ⌘ Norwegian population survey:
  - ⌘ Women who exercised most days had a 3.2 times higher risk of being infertile
  - ⌘ Women who at any point exercised to exhaustion had a 2.3 times increased risk
- ⌘ In contrast NHS II found less ovulatory infertility in women who exercised at least thirty minutes daily
  - ⌘ Each hour per week of vigorous activity was associated with a 7% lower RR of infertility

Physical Activity, Body Mass Index, and Ovulatory Disorder Infertility Rich-Edwards J et al. *Epidemiology* 2002;13:184-190  
Physical activity and fertility in women: the North-Trondelag health study. Gudmundsdottir SL, et al. *Hum Reprod* 2009; 24:3196-3204.

52

- ⌘ Exercise and IVF:
  - ⌘ Women who exercise >four hours per week for the past one to nine years
    - ⌘ Were less likely to have a live birth
    - ⌘ Were three times more likely to experience a cycle cancellation and twice as likely to have an implantation failure
- ⌘ Exercise in overweight women:
  - ⌘ An important part of weight loss plan and enhances fertility

Morris SN, et al. Effects of Lifetime Exercise on the Outcome of In Vitro Fertilization. *Obstetrics and Gynecology* 108, no. 4 (2006): 938-45  
Wise LA et al. A prospective cohort study of physical activity and time to pregnancy. *Fertility and Sterility* (Vol.97, Issue 5) May 2012

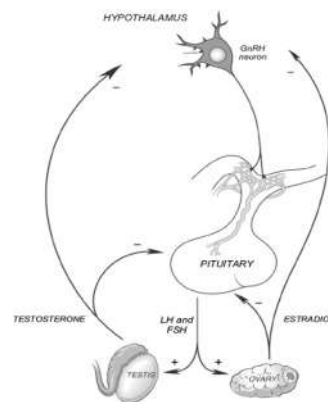
53



## Stress and fertility – chicken or egg?



54



55

## Stress management

- ☞ Mind body groups
  - ☞ Educational programs more effective than counseling
  - ☞ Most effective content: stress management, relaxation, and coping skills
  - ☞ Groups better than individual therapy
  - ☞ 6 sessions minimum
- ☞ Hypnosis
- ☞ Meditation
- ☞ Breath work
- ☞ Guided imagery
  - ☞ [www.healthjourneys.com](http://www.healthjourneys.com)
  - ☞ [www.tranceformation.com](http://www.tranceformation.com)



Domar AD, et al. The impact of group psychological interventions on distress in infertile women. *Health Psychology*. 19(6):568-75, 2000 Nov.  
 Boivin J et al. A review of Psychosocial Interventions in Infertility *Social Science & Medicine* 57, no. 12 (December 2003): 2325-41

56

## Effectiveness of mind body interventions for fertility

- ☞ Meta-analysis of 39 studies with 3,064 women and 347 men
- ☞ Psychosocial interventions lasting from 1 week to 6 months, including CBT, emotional disclosure, psychoeducation and Mind Body Interventions
- ☞ Results:
  - ☞ Improved rates of pregnancy (risk ratio=2.01; CI 1.48 to 2.73;  $p < 0.001$ )
  - ☞ Better psychological outcomes (Hedges  $g = 0.59$ ; CI 0.38 to 0.80;  $p = 0.001$ ).

Frederiksen Y, et al. Efficacy of psychosocial interventions for psychological and pregnancy outcomes in infertile women and men: a systematic review and meta-analysis. *BMJ Open*. 2015;5(1):e006592.

57

## TCM and fertility

- ☞ Acupuncture
- ☞ Herbs
- ☞ Meditation
- ☞ Qi gong



58

## Acupuncture research: contradictory conclusions

- ☞ 2008 meta-analysis 1,356 women undergoing IVF acupuncture at embryo transfer
  - ☞ 65% increased likelihood of pregnancy
  - ☞ 91% increase in live births
- ☞ 2012 Meta-analysis - Zheng
  - ☞ Acupuncture increases live birth rates
  - ☞ Eliminated Streitberger control (blunt acu at true points)
- ☞ 2013 Meta-analysis - Manheimer
  - ☞ No significant difference

Manheimer E, et al. "Effects of acupuncture on rates of pregnancy and live birth among women undergoing in vitro fertilisation: systematic review and meta-analysis." *British Medical Journal* (2008)  
 Zheng CH, et al. Effects of acupuncture on pregnancy rates in women undergoing in vitro fertilization: a systematic review and meta-analysis. *Fertil Steril* 2012a;97:599 – 611.  
 Manheimer E, et al. The effects of acupuncture on rates of clinical pregnancy among women undergoing in vitro fertilization: a systematic review and meta-analysis. *Human Reproduction Update*, July 2013

59

## Ritual and Ceremony



60



61



62



## The 1<sup>st</sup> environment

Average baby has > 200 environmental chemicals in umbilical blood at birth

<http://www.ewg.org/reports/bodyburden/execsumm.php>

63

## Mechanisms of endocrine disrupting chemicals and thyroid function

- ⌘ Competitively inhibit iodine entry into thyroid gland
  - ⌘ Perchlorate (water, tobacco, multiple vitamins),
  - ⌘ Thiocyanate (tobacco)
  - ⌘ Nitrate (preservatives, water through nitrate fertilizers)
  - ⌘ Phthalates (plasticizers, adhesives, solvents)
- ⌘ Alter thyroid signaling
  - ⌘ BPA - epoxy resins in cans, plastics, and thermal receipts
- ⌘ Interfere with thyroid function
  - ⌘ Triclosan
- ⌘ Impacts deiodinase activity and bind to thyroid receptor
  - ⌘ PCBs (polychlorinated biphenyls)

64

## Pesticides and Sperm

- ⌘ 155 men enrolled in the Environment and Reproductive Health (EARTH) study
- ⌘ High pesticide residue fruit and vegetable intake was associated with poorer semen quality
  - ⌘ 49% lower total sperm count
  - ⌘ 32% lower normal sperm

Chiu YH et al. Fruit and vegetable intake and their pesticide residues in relation to semen quality among men from a fertility clinic. *Hum Reprod*. 2015.

65

### Does changing your diet help?

- ☞ Bisphenol A
  - ☞ Used in plastics and liners of cans
  - ☞ 90% of us have BPA in our urine when it is tested
- ☞ Pilot study of 5 SF families
  - ☞ Freshly prepared catered meals with minimal use of canned foods
  - ☞ Urinary levels of BPA and DEHP measured
    - ☞ BPA levels dropped by 66% in 3 days
    - ☞ DEHP levels dropped by 56%

Rudel, R et al. Food Packaging and Bisphenol A and Bis(p-Ethylhexyl) Phthalate Exposure: Findings from a Dietary Intervention. *Environmental Health Perspectives*. 2011; 119(7): 914-920.

66

### Impact of Lifestyle Behaviors

- ☞ 10 pregnant Mennonite women compared to 2007-2008 NHANES data on pregnant women
  - ☞ urine samples of 9 phthalate metabolites and BPA
  - ☞ survey of participants' household environment, product use, and lifestyle.
- ☞ Results:
  - ☞ Among Mennonite women, concentrations were significantly less for BPA and phthalate metabolites compared to NHANES pregnant women
  - ☞ Data suggests lower levels due to:
    - ☞ consuming mostly homegrown produce
    - ☞ no cosmetics and limited use of personal care products
    - ☞ transportation primarily by sources other than automobiles

Martina CA et al. Lifestyle behaviors associated with exposures to endocrine disruptors. *Neurotoxicology*. 33(2012) 1427-1433

67

### Recommendations:

- ☞ Discuss the impact of age on fertility and the health of the child
- ☞ Talk to all women of childbearing age about multivitamins and folic acid
- ☞ Stop all unnecessary medications
- ☞ Consider lab test of thyroid and celiac disease
- ☞ Encourage reduced environmental chemicals
- ☞ Recommend immunizations before pregnancy
- ☞ Recommend healthy lifestyle

68



69

### Advocate for Social Change

- ☞ Support adults to bear children at a younger age
  - ☞ Job security
- ☞ Farm bill to support organic vegetables, fruits, and other foods so that they are more affordable
- ☞ Environmental change
  - ☞ Reduce endocrine disruptors
  - ☞ Eliminate BPA from food packaging
- ☞ Vote with your dollars and with your votes
  - ☞ Write congress about environmental chemicals
  - ☞ Support green companies and products

70

### Resources

- ☞ Environmental Working Group: [www.ewg.org](http://www.ewg.org)
- ☞ UCSF – Program on Reproductive Health and the Environment: [prhe.ucsf.edu/prhe/pubs/shapingourlegacy.html](http://prhe.ucsf.edu/prhe/pubs/shapingourlegacy.html)
- ☞ Cosmetic database [www.cosmeticsdatabase.com](http://www.cosmeticsdatabase.com)
- ☞ [victoriamaizesmd.com](http://victoriamaizesmd.com)
- ☞ Healthy living phone apps



71