## Environmental Contaminants & Reproductive Health: Preconception Counseling for Lead Exposure?

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## **Objectives**

- Preconception counseling case
- Things our pts can do
  - Top Ten Changes to make

#### **ENVIRONMENTAL** CHEMICALS

Stay Safe During Pregnancy

Every pregnant woman in America is exposed to at least 43 different toxic chemicals.





Many chemicals can pass from a pregnant woman to her fetus.

Prenatal exposure to certain chemicals is associated with:

- Stillbirth
- Miscarriage
- Birth defects

Childhood cancers

 Impaired brain development in children

Toxic chemicals can have longlasting reproductive health effects.

> Reduce your exposure to environmental chemicals before and during pregnancy:

- Limit processed foods
  Use BPA-free products
  Limit foods high in animal fat
  Avoid pesticides and solvents
- Wash fresh fruits and vegetables
- Avoid fish with high mercury levels



Talk with your ob-gyn about how to avoid

acog.org/ToxicChemicals

ations, communications@acog.org

University of California San Francisco

## Flint: Lead in the Water

"Lead is a potent, known, irreversible neurotoxin." "in 10, 15, 20 years, we can see the consequences of lead poisoning — ...kids in special ed, ... problems in our mental health system, we can see the problems in our criminal justice system. "

> Mona Hanna-Attisha, MD NPR interview, 1/23/16



#### Hanna-Attisha M, AJPH 2016





Preconception counseling for a toxic exposure...

- What is the exposure(s)?
- What studies exist?
- Translation of population studies to individual women





## Mental Development Index Scores in Infants According to Umbilical-Cord Lead Level



Mean blood lead levels Low: 1.8 mcg/dl at birth, 4-6 later Medium 6.5 at birth, 7-8 later High 14.6 at birth, 7-8 later



Bellinger D et al. N Engl J Med 1987;316:1037-1043.



#### Blood Lead Levels in Infants Classified According to Cord-Blood Lead Group.

Cord-Blood Lead Group	BLOOD LEAD LEVEL (MEAN ±SD)						
	BIRTH*	6 MO	12 MOT	18 MO	24 MO		
	micrograms per deciliter						
Low	1.8±0.6	4.6±3.9	$5.8 \pm 5.1$	6.7±5.5	$5.4 \pm 4.8$		
Medium	6.5±0.3	7.0±7.8	8.5±7.6	8.3±5.8	7.2±5.0		
High	14.6±3.0	7.0±8.7	8.8±6.4	7.6±5.8	7.7±8.5		

\*Each value is significantly different from the other two (Tukey's studentized range test;  $\alpha = 0.05$ ).

<sup>†</sup>The value for the low-lead group is significantly different from the other two values (Tukey's studentized range test;  $\alpha = 0.05$ ).

Bellinger D et al. N Engl J Med 1987;316:1037-1043.





# 33 y/o G0 with a 7 year hx chronic abdominal pain, admitted for intractable abdominal pain

- CC: "Squeezing my guts from the inside"
- ROS: Associated with nausea, anorexia, 15 lbs weight loss
  - Mild constipation. Not associated with food or reflux.
  - Menses regular. No abnl discharge, no recent sex.
  - No dysuria or a change in urination.
  - Occasional headaches.
  - Generalized fatigue. Mild pain in multiple joints.





### Past Medical History:

- Chronic abdominal pain

  - □ Fibromyalgia
  - Endometriosis
- □ Appendectomy (2012)
- Repair of torn labrum right hip

#### **Meds:**

- Dicyclomine 10mg tid
- Zofran prn
- Oxycodone prn
- Hydromorphone prn

### 



### **Social History:**

- Single, no children.
- Parents from India
- Grew up in TX, moved to NY in 2002, then CA in 2007
- Hasn't worked outside the home since 2006, as she has been on disability. Previously was trained as an accountant, has recently been licensed a residential realtor
- No tobacco. 2 drinks/week. No elicits.
- Not sexually active



### Exam

Vitals: 36.4, 122, 90/58, 16, 100% RA, BMI 20

Gen: Alert, uncomfortable.

HEENT: NC/AT. No icterus. PERRL.

Neck: Supple, no LAD, nl thyroid. No JVD.

Chest: Breathing comfortably. CTAB.

CVR: RRR. NI S1, S2. No m/r/g. No LE edema.

Abd: NABS. Soft, diffuse ttp w/o rebound, guarding. No masses. No HSM.

Extrem: Warm, no cyanosis or clubbing. No joint deformities, effusions or warmth.

Skin: No rash.

Neuro: A&O x 3. Non-focal. No asterixis.



### Laboratories

WBC 6.4 Hgb 9.9, MCV 84 Platelets 379 Total Bilirubin 0.8 AST 39 ALT 63 Alk Phos 62 Albumin 4.3 Lipase 16 Urinalysis neg Pregnancy test neg Gallbladder and biliary tree normal on ultrasound



**Differential Diagnosis?** 

## Chronic Abdominal Pain? – Very Broad

- Gallstones
- Appencitis
- Endometriosis
- PCOS
- Anemia
  - Iron Deficiency
- **Abdominal Pain + Anemia** 
  - Porphyria





A diagnostic test returned...

Fractionated urinary porphyrins:
 Uroporphyrin 31 (ref <22)</li>
 Coproporphyrin 2060 (ref 23-130)
 Porphobilinogen 2 (ref <2)</li>





## 1 week after discharge from hospital: Another diagnostic test returned(!)

- Lead level: 82 mcg/dL
- Arsenic & mercury levels were negative
- Repeat lead level 90 mcg/dL
- Environmental History Obtained:
  - Condo built in 1977
  - Copper pipes, municipal water
  - No pottery or ceramics, No hobbies: jewelry making, stained glass, painting, or exposure to battery or radiator recycling.
  - 20 herbal preparations





## Course

- 2005: Abdominal pain, Rx: Opioids
- 2007: Abdominal pain worse
- 5/2013: Seen at an OSH  $\rightarrow$  appy
- 11/2013: Eval for pelvic pain → dx with endometriosis & PCOS
- 2/2014: Hospitalized for abdominal pain, with N/V, constipation & 15# weight loss
- 3/2014: Referral to UC for treatment of porphyria







## Lead Levels

BLL (mcg/dL)	Hgb (g/dL)	Date	Event
83		3/23/14	
92		4/2/14	Start IV Ca EDTA
70	9	4/5/14	
50		4/8/14	Completed Ca EDTA
68		4/9/14	Started Succimer 1 <sup>st</sup> round
22		4/15/14	
10		4/29/14	Completed 1 <sup>st</sup> Round
30	14.5	6/10/14	
29		6/24/14	
27		//8/14	
8		8/5/14	Completed 2 <sup>nd</sup> Round
18		9/5/14	
18		9/23/14	
5		10/23/14	Consultated 2rd Down d
8		11/4/14	Completed 3 <sup>rd</sup> Round
12		11/23/14	
16		1/0/15	
2		2/13/15	
10		3///15	Completed 4 <sup>th</sup> Dound
12		4/1/15	Completed 4" Round





## **AOEC Guidelines: Lead & Pregnancy**

- "On a population basis it is important to reduce fetal exposure to lead, & <u>maternal</u> <u>lead levels less than 5 μg/dL</u> are optimal."
- "Because fetal blood contains ~ 80% of the blood lead concentration of the mother, & because of the risk of spontaneous abortion, the panel's recommendation is that the mother's BLL should be kept below 5 μg/dL (0.24 μmol/L) from the time of conception through pregnancy."





### Course

- 4/2016: Preconception consult: 34 years old, married, interested in pregnancy
- Lead levels stable at 12-16 mcg/dL, not a candidate for further chelation
- Counseling re: age related decline in fertility, risk associated with elevated lead level
  - For women w/ hx lead exposure, Ca2+ supplements to minimize release of lead from bone stores
  - Increase dietary Fe, vit C





## **Translating Population-Wide Risks into Individual Risks**

- Clinicians work with individuals, not populations
- Elevated population-wide risks may be extremely small for an individual



### Lead levels in US Repro-aged Women



University of Californi San Francisco

Health and the Environment

## Course

- 6/2016: Lead level stable at 11 mcg/dL
- Spontaneous conception
- 8/2016: Counseling re: risk associated with elevated lead level, including preterm birth
  - Ca2+ supplements to minimize release of lead from bone stores, iron, PNV
  - Serial lead levels
  - Plan for breastfeeding (BLLs <40 µg/dL should breastfeed)</li>
- 2/2017: Healthy baby





## So what can we do today?-Top 10

## **1.** Choose fresh or frozen fruits & vegetables

- Canned foods may contain toxic chemicals
- Wash produce
- Buy organic if you can \$\$\$
- Avoid fast food & processed food
- Limit foods high in animal fat \$





- Avoid food w/ substantial plastic contact: canned foods/sodas, wet foods in plastic pouches/ boxes)
   \$\$
  - <u>Avoid:</u> #3: PVC or vinyl, #6: PS (Styrofoam),
    #7 (= other): polycarbonate (some water bottles, & 5-gallon jugs) or may be untested

## හු හු හු

 <u>Choose:</u> #1 PETE, #2 HDPE, #4 LDPE or #5 PP, likely lower health risks. But, if your community does not recycle these, try to avoid them



## 2. Avoid plastic: Don't microwave it! \$

 Heating increases leaching of chemicals, especially w/ fatty foods. Use a paper towel or glass lid to cover food in the microwave





### http://www.healthandenvironment.org/



## **3.** Eat low-mercury fish \$-\$\$\$

- Smaller fish generally have lower mercury levels
- Up to 12 oz/wk of shrimp, catfish, pollock, canned light tuna, salmon
  - Consumer Reports says no tuna!
- <u>http://www.montereybayaquarium.org/cr/seafoodwatc</u>
   <u>h.aspx</u>
- <u>http://www.ewg.org/research/ewgs-good-seafood-guide</u>
- Check local advisories if eating local fish <u>http://oehha.ca.gov/fish/so\_cal/index.html</u>



## 4a. Wash hands prior to eating \$

- Use plant-based soap (no fragrance!)
- Especially important when hands are exposed to toxins
  - Agricultural areas
  - Use of fragranced lotion, etc.
  - Pt or spouse works in occupation w/ pesticides, solvents, lead, etc.





## 4b. Avoid carbonless receipts \$

- Many contain phthalates or BPA
- Don't take receipt if you don't need it
- If your patient works as a cashier, recommend:
  - wear gloves
  - wash hands thoroughly prior to eating





Urinary BPA after handing receipts JAMA. 2014;311(8):859-860<sub>26</sub>doi:10.1001/jama.2013.28



# 5. Limit pesticide & solvent use in home \$

- Clean with soap, vinegar
- Baking soda for ants, etc.
- Keep counters clean
- Use integrated pest management strategies in the garden







## 6. Be thoughtful about body products \$-\$\$

- avoid phthalates, fragrances, triclosan
- risk stratify ("windows of susceptibility," dosage, water vs. fat soluble chemicals)
- www.ewg.org (Skin Deep)
- https://safecosmetics.cdph.ca.gov/search/ (CA Safe Cosmetics Program Database)



### http://www.ewg.org/skindeep/app/



## 7. Bust the Dust!



- Dust/damp mop/vacuum daily
- Take shoes off outside
- Especially important when dust is particularly likely to have toxins
  - Agricultural areas
  - Urban neighborhoods
  - Pt or spouse works in occupation w/ pesticides, solvents, lead, etc





## 8. Get rid of old foam furniture \$\$

- Flame retardants worst in foam from prior to 2005 (less likely prior to 1975)
  - Risk higher if crumbling
- Dust mopping, vacuuming with HEPA filter
- Also, avoid fatty animal foods
  - Flame retardants are fat soluble
  - •Half-life 1-3 years in human fat





## 9. Avoid tobacco smoke

- Quit smoking
- Avoid 2<sup>nd</sup> hand smoke



- Who knows what's in e-cigarettes
  - Nicotine itself not good for reproduction
  - Phthalates, etc.
  - "E-Cigarettes Expose People to More Than 'Harmless' Water Vapor: First Comprehensive Analysis Shows that Industry Health Claims are Unsupported by Data"

\$







## **10.** Avoid lead \$-\$\$\$

- Frequent dust-mopping
- Avoid hobbies, lipstick, other sources
- Paint abatement for baby
- For women w/ hx lead exposure, Ca2+ supplements to minimize release of lead from bone stores
- Increase dietary Fe, vit C





## **10b.** Lead in unexpected places: ethnic products

- Mexican treatments: Azarcon and greta (also known as liga, Maria Luisa, alarcon, coral, rueda)
- Asian treatments: chuifong, tokuwan, ghasard, bali goli, kandu, bo ying\*
- Middle eastern, Ayurvedic treatments or cosmetics: alkohl, saoott, cebagin
- Lipstick: drugstore brands









## **PRHE: All That Matters Publications**

Cuestiones de salud

Cómo proteger a nuestra famili/

de las sustancias tóxicas



Are you pregnant? Or Areyoue

UCSF

Food Matte

Work Matters

When you work with or around toxic ch what you know really matters.



Toxic Matters

Protecting Our Families from

Toxic Substances

## **Special situations:**

- Patient with occupational or home exposures to lead, mercury, pesticides—or ?s you can't answer
  - Work Matters brochure
  - Local Pediatric Environmental Health Unit <u>http://www.pehsu.net</u> <u>UCSF/ Western States PEHSU</u>: 1-866-827-3478
  - CDC/ATSDR creating app for OBGYNs
  - Occupational Medicine resources, OSHA



# Many Reproductive Aged Women at Risk for Pregnancy

**Pregnancies by Intention Status** 

More than half of pregnancies are unintended.



- 6.6 million pregnancies/yr in US
- 51% of US pregnancies unplanned

https://www.guttmacher.org/pubs/FB-Unintended-Pregnancy-US.html#6

## Conclusions

- Concerning health trends may or may not be related to environmental toxins, but the basic science & epidemiology is concerning enough that the precautionary principle makes sense
- Specific chemicals of concern
  - Lead
- Things we can do
  - Top Ten Changes to make





## **Other Resources**

- ACOG/ASRM statement
- http://www.acog.org/Resources\_And\_Publications/Committee\_on\_Health\_Care\_for\_Underserv ed\_Women/Exposure\_to\_Toxic\_Environmental\_Agents
- Environmental Working Group (& Skin Deep website) <u>http://www.ewg.org/</u> <u>http://www.ewg.org/skindeep/</u>
- EPA/state Pediatric Environmental Health Specialty Units





## **Other Resources**

- Collaborative on Health and the Environment (Toxicant & Disease database) <u>http://www.healthandenvironment.org/</u>
- NIH NLM <u>http://householdproducts.nlm.nih.gov/products.htm</u>
- TEDX (includes List of Possible Endocrine Disruptors & Critical Windows of Development) <u>http://www.endocrinedisruption.com/home.php</u>
- CDC (esp re: lead) http://www.cdc.gov/nceh/lead/publications/LeadandPregn ancy2010.pdf
- Preconception Health Council of California
   <u>http://www.everywomancalifornia.org</u>



