

## The Relationship of Environment and Human Health



**Tieraona Low Dog, MD**

Fellowship Director  
Academy of Integrative  
Health & Medicine

**[www.DrLowDog.com](http://www.DrLowDog.com)**

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## Environment Affects Us All



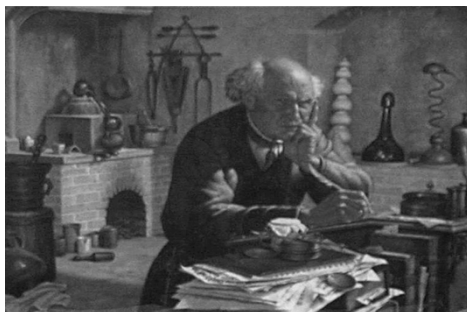
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## Environmental Toxins Impact Us All



- Environmental toxicants are industrial or naturally occurring, organic or inorganic, chemicals that harm human health across the lifespan and more so during critical developmental windows.

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*"All substances are poisons; there is none which is not a poison. The dose differentiates a poison and a remedy."*

*Paracelsus (1490-1541)*

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## *Safe Until Proven Dangerous*

- Unlike pharmaceuticals or pesticides, industrial chemicals do not have to be tested before they are put on the market.
- E.P.A. has mandated safety testing for only a small percentage of the 85,000 industrial chemicals available.
- Once chemicals are in use, the regulatory burden is so high that only five substances have been banned or restricted: polychlorinated biphenyls, dioxin, hexavalent chromium, asbestos and chlorofluorocarbons.

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## The First Environment



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## Toxins in Umbilical Cord Blood

- 10 newborns –an average 200 industrial chemicals and pollutants
- Of the 287 chemicals detected, 180 cause cancer in humans or animals, 217 are toxic to the brain and nervous system, and 208 cause birth defects or abnormal development in animal tests

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## Pregnancy

- birth weight, preterm delivery, decreased fetal growth, birth defects, pregnancy loss, and developmental delays.
- While lead levels have markedly decreased, chemicals like DDT and PCBs banned in the 1970's, are still present in a significant portion of the population, including pregnant women.

Stillerman KP, et al. Reproductive Sciences 2008;15 (7): 631-650.  
Woodruff TJ, et al. Environ Health Perspect. 2011;119(6):878–885.

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## Early Exposures

- *In-utero* and early life exposures contribute to neurodevelopmental disorders at doses much lower than those affecting adult brain function.
- Emerging evidence now linking exposures to manganese, high fluoride levels, certain pesticides and flame retardants with adverse neurodevelopmental outcomes.

Grandjean P, et al. *Lancet* 2014; 330–338

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- Many of the chemicals identified in the cord blood samples cause irreversible changes in the brains, reproductive systems and other vital organs of fetal and newborn test animals.
  - **Bisphenol A**  
scrutiny for a ban in baby bottles, infant formula cans and other food packaging;
  - **Perchlorate**, a rocket fuel component and ubiquitous water pollutant that undermines thyroid function crucial to brain development;
  - **Polychlorinated biphenyls (PCBs)**, probable human carcinogens and endocrine disruptors effectively banned during the Carter administration, yet still showing up in human and animal tissue worldwide;
  - **Lead**, found in older pipes and paint, toxic to the brain and nervous system;
  - **Mercury**, another neurotoxin, commonly ingested in contaminated seafood like tuna.

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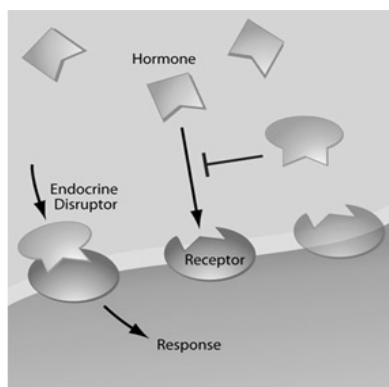
*"In our every deliberation, we must consider the impact of our decisions on the next seven generations."*



*Iroquois Confederacy*

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## Endocrine Disruptors



Chemicals that may interfere with the body's endocrine system and produce adverse developmental reproductive, neurological, and immune effects in both humans and wildlife.

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## Endocrine Disruptors

- curves do not follow the traditional paradigm (increasing concentrations of a compound leads to increasing toxic effects on organism).
- Paradoxically, exposure to miniscule amounts during vulnerable windows of development may be more damaging than higher exposures.

Diamanti-Kandarakis E, et al. *Endocrine Reviews* 2009; 293-342

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## Bisphenol A

- One of highest volume chemicals produced worldwide with > 8 billion pounds/annually.
- Used to manufacture polycarbonate plastics.
- Found at detectable levels in the blood of more than 93% of U.S. population.
- May be major contributing factor to increased incidence of infertility, genital tract abnormalities, obesity, ADHD, prostate and breast cancer observed in European and U.S. human populations over the last 50 years.

Vandenberg, et al. *Environ Health Perspect.* 2010;118(8):1055-70

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## BPA and Estradiol

- BPA is an environmental estrogen used in the manufacture of polycarbonate plastics and epoxy resins used to make food and beverage packaging.
- Increasing evidence suggests that BPA mimics estrogens in the body and may be associated with breast cancer risk.
- Food and Drug Administration barred BPA in baby bottles and children's cups in June 2012.

McGuinn LA, et al.

2015; 136:381-6.

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## Dental Sealants

- Resin-based dental sealants and composites contain a BPA derivative.
- Researchers examined urinary BPA measurements and oral examination data for 1,001 children aged 6 to 19 years from 2003-2004 NHANES.
- Children with 7 to 42 restorations had mean BPA concentrations 20% higher than those of children with no restorations, this did not reach statistical significance.

McKinney C, et al.

Assoc 2014 Jul;145(7):745-50.

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## Canned Soup

- Researchers at the Harvard School of Public Health found that volunteers consuming one serving of canned soup each day for five days had a more than **1,000% increase** in urinary BPA concentrations compared with when the same individuals consumed fresh soup daily for five days.

Carwile JL, et al. JAMA 2011; 306(20):2218-20.

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## Limit Exposure



- Look for those that are BPA free (e.g., Eden Foods, Muir Glen, etc)
- Eat fresh or frozen foods.
- Opt for glass packaging, especially for tomatoes.
- Don't microwave plastic.
- Don't store acidic foods in plastic. Use glass.
- Get rid of old/scratched plastic.
- Use BPA free water bottles.

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## Infants

- BPA passes through breast milk. Limit exposure.
- Powdered formula contains less or no BPA when compared to liquid.
- If your baby needs liquid formula, look for brands sold in plastic or glass containers.



Zimmers SM, et al. Chemosphere 2014; 104:237-43.  
Ackerman LK, et al. J Agric Food Chem 2010; 58(4):2307-13.

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## Canadian Food Inspection Agency

- Remove food from *plastic wrap, freezer cartons, and/or styrofoam trays* before defrosting and cooking. They are not heat stable and could leach hazardous compounds from the container or plastic wrap to the food.
- Do not reuse trays and containers that came with microwave convenience foods. They may be designed for one-time use only.

[www.inspection.gc.ca](http://www.inspection.gc.ca)

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## Phthalates



- Phthalates group of chemicals used to make plastics more flexible and harder to break.
- Widely used in polyvinyl chloride plastics (e.g., plastic bags, garden hoses, inflatable toys, blood-storage containers, medical tubing, and children's toys), solvents, and synthetic fragrances.
- CDC found 84% population have six or more phthalates in our system. Adult women had higher levels of urinary metabolites than men for those phthalates that are used in soaps, body washes, shampoos, cosmetics, and similar personal care products.

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## Male Reproductive Harm

- Phthalates are potent endocrine disruptors.
- Peer-reviewed scientific journals over the past forty years have linked phthalate exposure to serious health effects in children, including reduced testosterone levels, lowered sperm counts, and genital defects in baby boys.
- Two studies report shorter anogenital distance among male infants with higher gestational phthalate exposure.

Braun JM, et al. Curr Opin Pediatr 2013; 25(2):247-54.

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## EDC and Puberty

- The observed age of menarche has fallen, which may have important adverse social and health consequences, such as breast cancer.
- Early puberty has been associated with exposure to certain endocrine disruptors, especially phthalates.

Hart R, et al. *Reproduction* 2014; 147(4):379-90

Watkins DJ, et al. *Environ Res* 2014; 134:233-41

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## Phthalate and Asthma

- Epidemiological review found childhood phthalate exposure increased the risk of allergic disease and airway inflammation, while prenatal exposure significantly increased the risk of childhood asthma.

Whyatt RM, et al. *Environ Health Perspect.* 2014;122(10):1141-1146.



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*Not Too Pretty*  
Phthalates,  
Beauty Products  
& the FDA

Jane Houlihan  
Charlotte Brody  
Bryony Schwan  
July 8, 2002

ENVIRONMENTAL  
WORKING GROUP™

Health Care  
Without Harm



**A Little Prettier**

Cosmetic  
companies deny  
health problems  
related to  
phthalates, but are  
they secretly  
reformulating?

A Follow-Up to the 2002  
"Not Too Pretty" Report

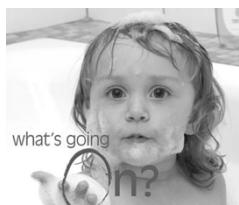
The Campaign for  
Safe Cosmetics  
[www.SafeCosmetics.org](http://www.SafeCosmetics.org)

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## Progress

- OPI, the leading manufacturer of professional nail products worldwide, has removed DBP from nail lacquers, treatments, hardeners.
- Body Shop phased out phthalates including DMP, DEP, DEHP, and DBP.
- Origins and Burt's Bees are free of phthalates
- Whole Foods Premium Standard Seal does not go on any product containing phthalates.

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## Reduce Your Exposure

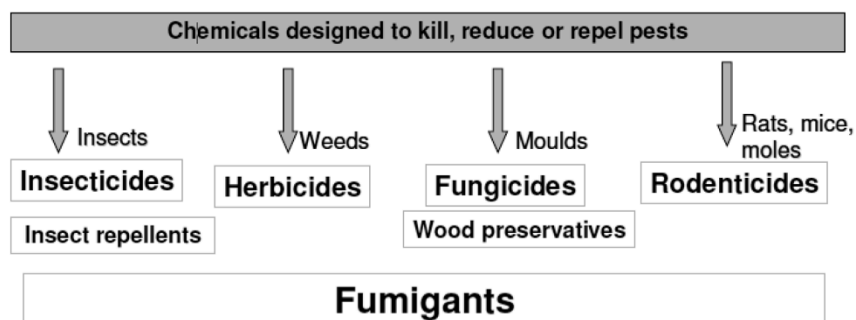
- Be a smart shopper – especially if you are a woman of reproductive age or you are buying products for your child.
- A great website to look up ingredient information is:

[www.ewg.org/skindeep/](http://www.ewg.org/skindeep/)

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## Pesticides

### PESTICIDES – CLASSIFICATION BY USE



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*“If we are going to live so  
intimately with these  
[agricultural] chemicals--  
eating and drinking them--  
taking them into the very  
marrow of our bones—  
we had better know  
something about their  
nature and their power.”*



Rachel Carson,  
*Spring*

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## Atrazine

- Exposure to even low levels of herbicide atrazine can turn male frogs into females that produce completely viable eggs.
- Atrazine widely used on US corn crops in the United States, and consequently it's a pervasive drinking water contaminant.
- Linked to breast tumors, delayed puberty and possibly prostate cancer.

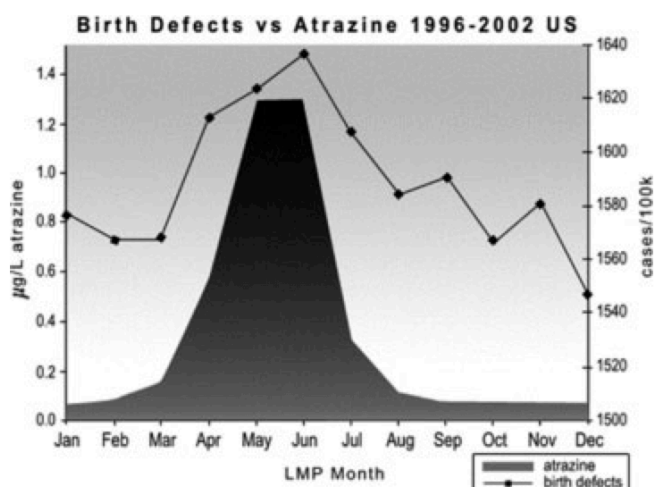
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## Lymphoma and Drinking Water?

- Incidence of non-Hodgkin lymphoma has increased more rapidly in rural than urban areas and has been consistently higher in Nebraska than US as a whole.
- Atrazine increases lymphocyte chromosomal abnormalities.
- Drinking water containing nitrate was associated with a *NHL if atrazine* was also present in drinking water.

Rhoades MG, et al. Environ Health Insights 2013; 7:15-27.

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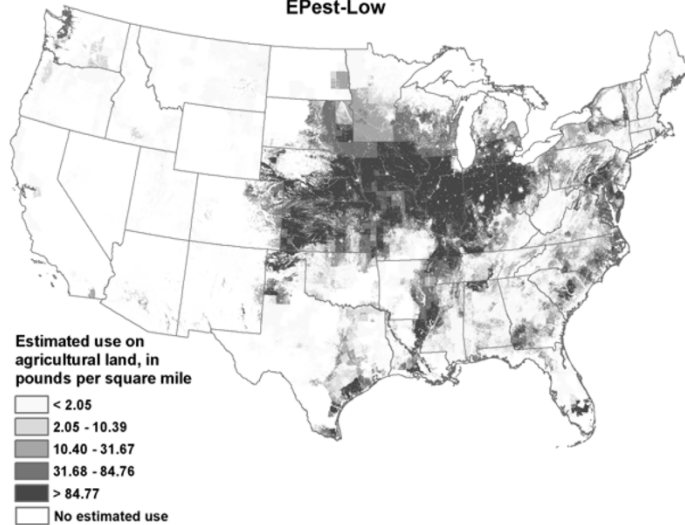
Acta Paediatrica, Vol. 98, Issue 4, 2009

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### Estimated Agricultural Use for Atrazine , 2011

E Pest-Low



[http://water.usgs.gov/nawqa/pnsp/usage/maps/show\\_map.php?year=2011&map=ATRAZINE&hilo=L&disp=Atrazine](http://water.usgs.gov/nawqa/pnsp/usage/maps/show_map.php?year=2011&map=ATRAZINE&hilo=L&disp=Atrazine)

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## [www.ewg.org/report/ewgs-water-filter-buying-guide](http://www.ewg.org/report/ewgs-water-filter-buying-guide)

WHAT IS MOST IMPORTANT TO YOU IN A WATER FILTER?

1 Least expensive

2 Most effective

3 Soften hard water

4 Remove specific contaminants

Several Options

Use the search function to find filters certified to reduce particular contaminants. Not all technologies are equally effective.

Search below

Important tips on filter maintenance

More about filters

Donate to EWG

Find a filter that works best for you:

Water filter type: Pitcher

Filter technology: all filter technologies

Certified to reduce: ATRAZINE

[see more contaminants](#)

Search

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## Pesticide and Pediatric Cancer

- Studies suggest that pesticide exposures in utero and throughout childhood increases the risk of childhood cancers.
- Parents exposed to pesticides within the year before a child is conceived may increase child's risk of leukemia and brain tumors.

Bailey HD, et al. Int J Cancer 2014; 135(9):2157-72.  
Greenop KR, et al. Cancer Causes Control 2013; 24(7):1269-78.

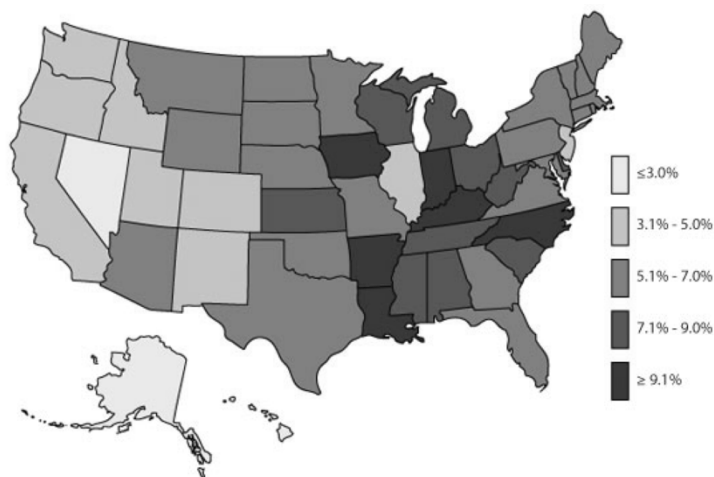
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## Organophosphates

- Organophosphates first synthesized and used as nerve gas in World War II.
- Their chemical structures and properties significantly modified to alter their toxicity and other physical/chemical properties but they are all neurotoxic. That's how they work as insecticides.

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## Children on ADHD Medication (2011-12)



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## Pesticide Exposure and ADHD

- Pound for pound, children drink 2.5 times more water, eat 3-4 times more food, and breathe 2 times more air. They are exposed to more pesticide.
- Using data from NHANES – children with typical levels of pesticide exposure from eating pesticide-treated fruits/vegetables, have higher risk of developing ADHD.
- Children ages 8-15 with higher urinary levels of dimethyl alkylphosphate (DMAP), had twice the odds of ADHD when compared with children with low or undetectable levels.
- Organophosphate exposure, at levels common among US children, may contribute to ADHD prevalence.

Kuehn BM. JAMA. 2010 Jul 7;304(1):27-8.

Bouchard, et al. Pediatrics. 2010 Jun;125(6):e1270-7.

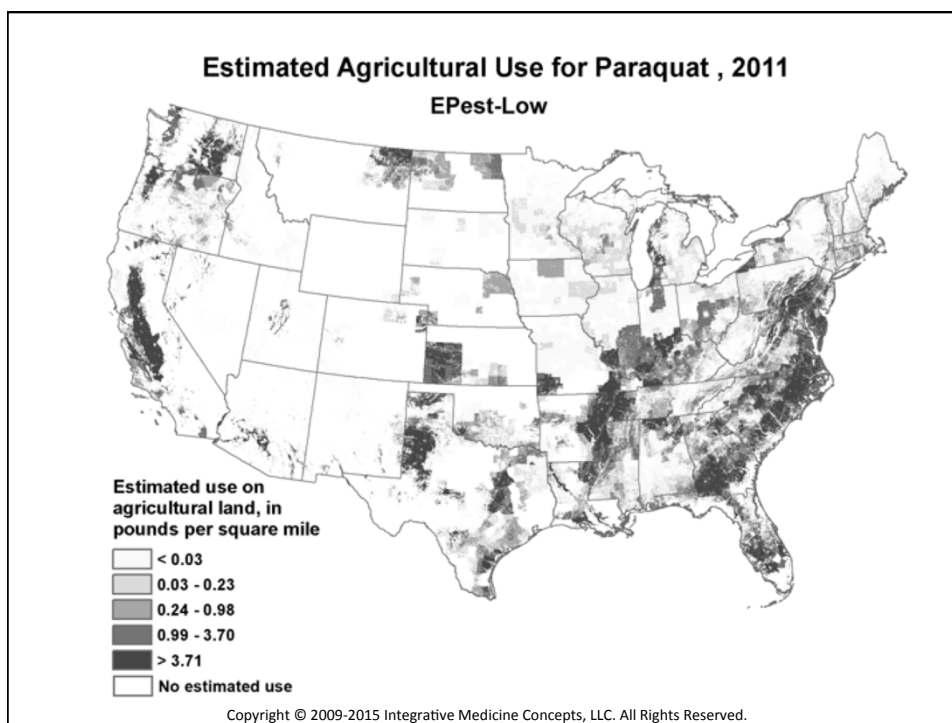
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## The Adult Brain

- There is evidence linking neurodegenerative diseases such as Parkinson's disease and Alzheimer's with long-term/low-dose exposure to pesticides such as paraquat, maneb, dieldrin, pyrethroids and organophosphates.

Baltazar MT, et al. Toxicol Lett 2014; 230(2):85-103.

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- The consumption of an organic diet for one week significantly reduced OP pesticide exposure in adults as measured by urinary metabolites.
- Mean total OP metabolites in the organic phase were 89% lower than when participants were eating conventional foods.

Oates L, et al. Environ Res 2014; 132:105-11

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**SHOPPER'S GUIDE TO PESTICIDES**

<b>DIRTY DOZEN</b> <i>Buy These Organic</i>		<b>CLEAN 15</b> <i>Lowest in Pesticides</i>	
<b>WORST</b>	1 Celery	<b>BEST</b>	1 Onions
	2 Peaches		2 Avocado
	3 Strawberries		3 Sweet Corn
	4 Apples		4 Pineapple
	5 Blueberries		5 Mangos
	6 Nectarines		6 Sweet Peas
	7 Bell Peppers		7 Asparagus
	8 Spinach		8 Kiwi
	9 Kale		9 Cabbage
	10 Cherries		10 Eggplant
	11 Potatoes		11 Cantaloupe
	12 Grapes (Imported)		12 Watermelon
	13 Grapefruit		
	14 Sweet Potato		
	15 Honeydew Melon		

**E** ENVIRONMENTAL WORKING GROUP  
www.foodnews.org

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## Mercury

- Bacteria in water can transform inorganic mercury into bio-active, organic form, called methylmercury, which concentrates to very high levels in fish.
- US Geological Survey of 291 freshwater streams between 1998-2005 found 100% of the larger fish tested positive for significant mercury exposure.
- Majority of mercury entering US rivers stems from emissions from coal mining. The emissions enter the air and then are precipitated back into water systems.

Scudder BC, et al. U.S. Geological Survey Scientific Investigations Report 2009–5109, 74 p.

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## FDA Advice

- Women of childbearing age and young children:
  - NO swordfish, shark, king mackerel, or tilefish.
  - Eat 12 ounces (340 g) fish and shellfish low in mercury per week.
  - Omega 3 crucial for optimal neurological development in the fetus and infant.
  - Take a prenatal vitamin with DHA.

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## Heavy Metals in Pregnancy

- Heavy metals cadmium, mercury, lead, and selenium readily cross the placental barrier.
- Inner city cohort found mercury cord RBC levels were 1.5 times greater than maternal RBC levels.
- Higher mercury levels associated with preterm births, low birth weight and lower IQ.
- Mercury exposure likely from fish consumption, and environmental contamination.

Chen Z, et al. J Expo Sci Environ Epidemiol 2014; 24(5):537-44.







Solan TD, et al. J Perinat Med 2014; 42(6):725-9.


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## Seafood Calculator

[www.ewg.org/research/ewg-s-consumer-guide-seafood/seafood-calculator](http://www.ewg.org/research/ewg-s-consumer-guide-seafood/seafood-calculator)

Calculations are based on 4 oz. serving size

CATEGORY	SPECIES	WEEKLY MERCURY	SUSTAINABILITY	CONCLUSION
 <b>EWG'S BEST BETS!</b> Very High Omega-3s, Low Mercury, Sustainable	SALMON	NaN%	Best Choice: Wild Alaska	
	SARDINES	NaN%	Best Choice: Pacific	
	MUSSELS	NaN%	Best Choice: Farmed	
	RAINBOW TROUT	NaN%	Best Choice: Farmed	
	ATLANTIC MACKEREL	NaN%	Best Choice: Not Trawled	

 = should eat less than 1 per week and no other seafood

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## Dental Amalgams

- While seafood is principal source of mercury, concerns continue for patients who have dental amalgams, especially those with genetic variants.
- Canadian study found those with 7 or more amalgam surfaces had 30-50% higher urinary mercury levels than those without amalgams.
- The controversy continues.....

Dutton DJ, et al. J Occup Med Toxicol 2013; 8(1):22.

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## Perchlorate

- Perchlorate is both a naturally occurring and man-made chemical that is used to produce rocket fuel, fireworks, flares and explosives.
- Well-known to be higher in environments around military bases.
- Perchlorate can also be present in bleach and in some fertilizers.

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## Perchlorate Exposure

- CDC study found that more than one third of American women are deficient in iodine, and that for these women, exposure to perchlorate in food or water can cause a significant and dose dependent decline in thyroid hormone levels.
- Low thyroid levels are an established risk factor in fetal development and can cause IQ deficits, developmental delays, and in severe cases, cretinism.

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## Perchlorate and IQ

- 21,846 women at gestational age <16 weeks recruited in Cardiff, UK and Turin, Italy.
- Urine perchlorate was detectable in all women and iodine levels were low (median 72 µg/L).
- Maternal perchlorate levels in the highest 10% increased odds of offspring IQ being in lowest 10%. Maternal thyroid therapy did not reduce the negative impact of perchlorate on offspring IQ.

Taylor PN, et al. J Clin Endocrinol Metab 2014; 99(11):4291-8

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## Mt Sinai Study

- In New York City: 182 women were given 150 µg of potassium iodide daily (group A) and 183 women were not supplemented (group B).
- Based on WHO guidelines, 38.9% of Group B women were at risk for mild, moderate, or severe iodine deficiency. But even with supplementation, 22.8% were still deficient.

Pessah-Pollack R, et al. J Womens Health 2014; 23(1):51-6.

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- Take prenatal vitamin that provides 150-300 mcg iodine per day. Use iodized salt.

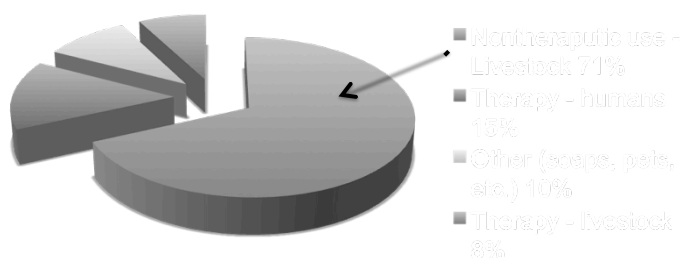
Supplement Facts			
Serving Size: 2 Capsules			
Servings Per Container: 60			
Amount Per Serving	% DV for Pregnant and Lactating Women		% DV
Vitamin A (as beta-carotene)	8000 IU	100%	160%
Vitamin C (as ascorbic acid)	120 mg	200%	200%
Vitamin D (as cholecalciferol)	400 IU	100%	100%
Vitamin E (as d-alpha tocopheryl acid succinate)	60 IU	200%	200%
Thiamin (as thiamin mononitrate)	3 mg	177%	200%
Riboflavin	3.4 mg	170%	200%
Niacin (as niacinamide)	40 mg	200%	200%
Vitamin B6 (as pyridoxine hydrochloride)	4 mg	160%	200%
Folic Acid	800 mcg	100%	200%
Vitamin B12 (as cyanocobalamin)	12 mcg	150%	200%
Biotin	600 mcg	200%	200%
Pantothenic Acid (as d-calcium pantothenate)	20 mg	200%	200%
Calcium (as calcium carbonate and calcium citrate)	400 mcg	31%	40%
Iron (as Ferrochel iron bisglycinate)	20 mg	111%	111%
Iodine (as potassium iodide)	300 mcg	200%	200%
Magnesium (as magnesium oxide and magnesium aspartate)	200 mg	44%	50%
Zinc (as zinc citrate)	15 mg	100%	100%
Copper (as copper gluconate)	2 mg	100%	100%
Manganese (as manganese gluconate)	2 mg	100%	100%

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*Knowing is not enough, we must apply.  
Willing is not enough, we must do.  
Goethe*

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### U.S. Antibiotics Consumption



As bacteria become increasingly resistant to one or more multiple antibiotics, treatments for common infections become “increasingly limited and expensive—and, in some cases, nonexistent.” More than 20,000 Americans die each year from resistant infections.

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## FDA and Antibiotic Use

- December 2013, the FDA introduced new policy to phase out indiscriminate use of antibiotics in cows, pigs and chickens raised for meat.
- The change, which is to take effect over the next three years, will effectively make it illegal for farmers and ranchers to use antibiotics to make animals grow bigger. A veterinarian prescription must be obtained for use of antibiotics, which can currently be purchased OTC at most feed stores.

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## Eco-Label



CERTIFIED  
HUMANE  
RAISED & HANDLED

- Meets the Humane Farm Animal Care Program standards, which include nutritious diet, without antibiotics, or hormones, animals raised with shelter, resting areas, sufficient space and the ability to engage in natural behaviors.

Food Alliance<sup>3</sup>

Highly meaningful

Highly meaningful

Highly meaningful

Prohibited

Animals raised on a diet without antibiotics.  
Antibiotics only used to treat sick animals

No feed additive  
(non- therapeutic)  
antibiotics.  
Antibiotics only used  
to treat sick animals

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## And Another Way of Thinking About Environmental Health



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*Where Would You Want  
to Play?*



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*Where Would You  
Want to Learn?*



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*Where would you  
want to heal?*



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*"Everybody needs beauty as well as bread, places to play in and pray in, where nature may heal and give strength to body and soul. "*

*John Muir*



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## Strategies

- Wash hands frequently with plain soap and water
- Eat hormone free meat and dairy
- Eat fish low in mercury
- Reduce consumption of animal fat
- Use stainless steel or glass containers
- Remove shoes before coming in the home

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## More Strategies

- Do not microwave in plastic containers
- Wet mop floors regularly and vacuum with HEPA filter
- Subscribe to Integrated Pest Management techniques if pest control needed
- Use non-toxic cleaning products
- Avoid chemical based dry cleaning
- Use water filtration

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*"Whatever befalls the earth  
befalls the sons of the earth.  
Man did not weave the web of life:  
he is merely a strand in it.  
Whatever he does to the web,  
he does to himself."*



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