

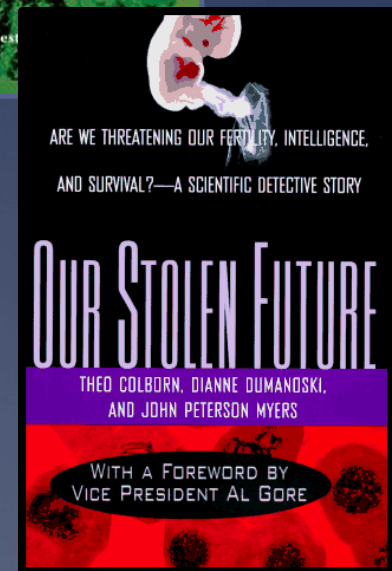
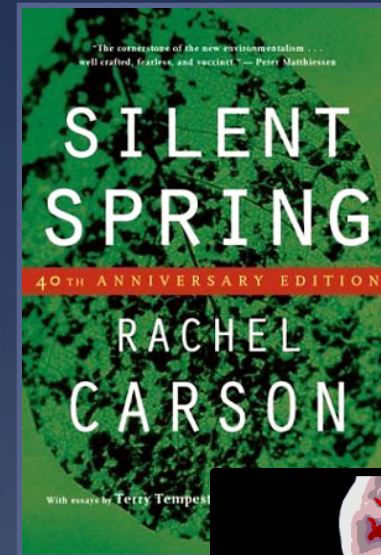
# Endocrine Disrupting Chemicals

**A Cause For Concern?**

# Endocrine Disrupting Chemicals

## Endocrine Disruptors

Chemicals that mimic/antagonize normal hormones and can have permanent effects in organisms as well as progeny



# Types of EDCs

## Natural

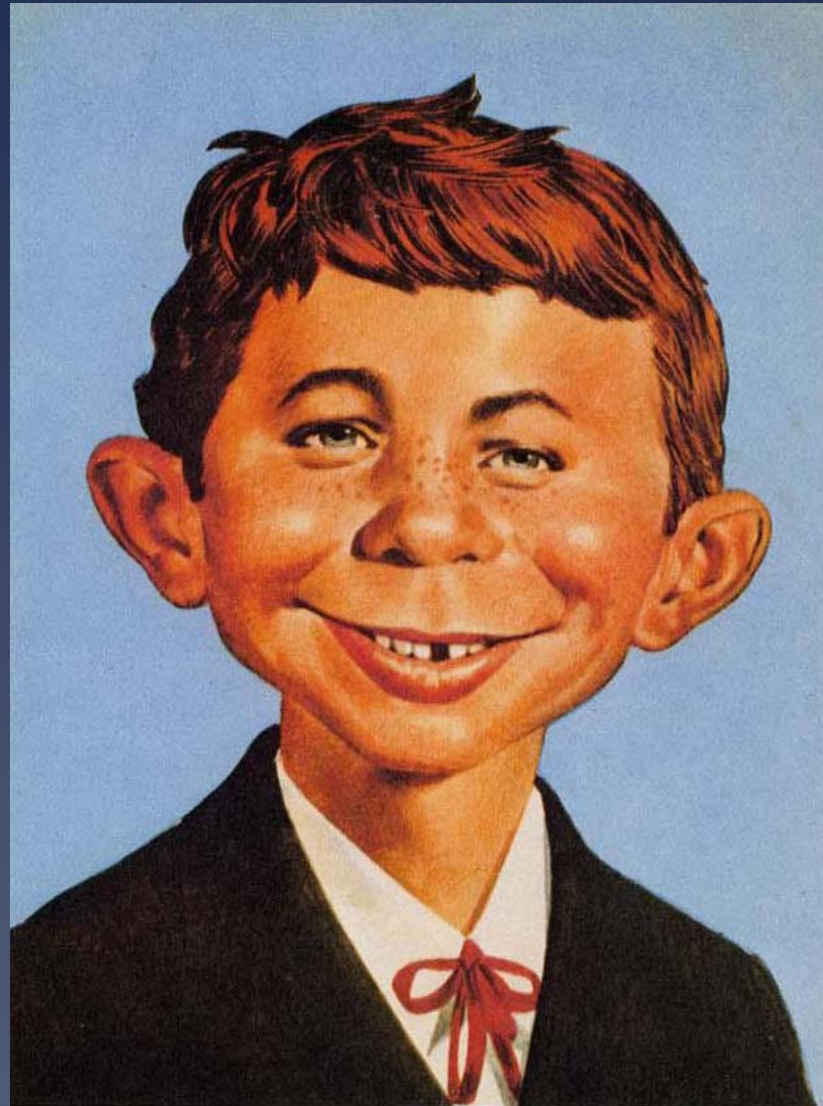
- Phytoestrogens
- Fungal estrogens

## Synthetic

- Hormones
- Some pesticides
- Industrial by-products
- Plastic components
- Some persistent organic pollutants (POPs)



**“What – me worry?”**





■ Acute Toxicity

■ Environmental Fate

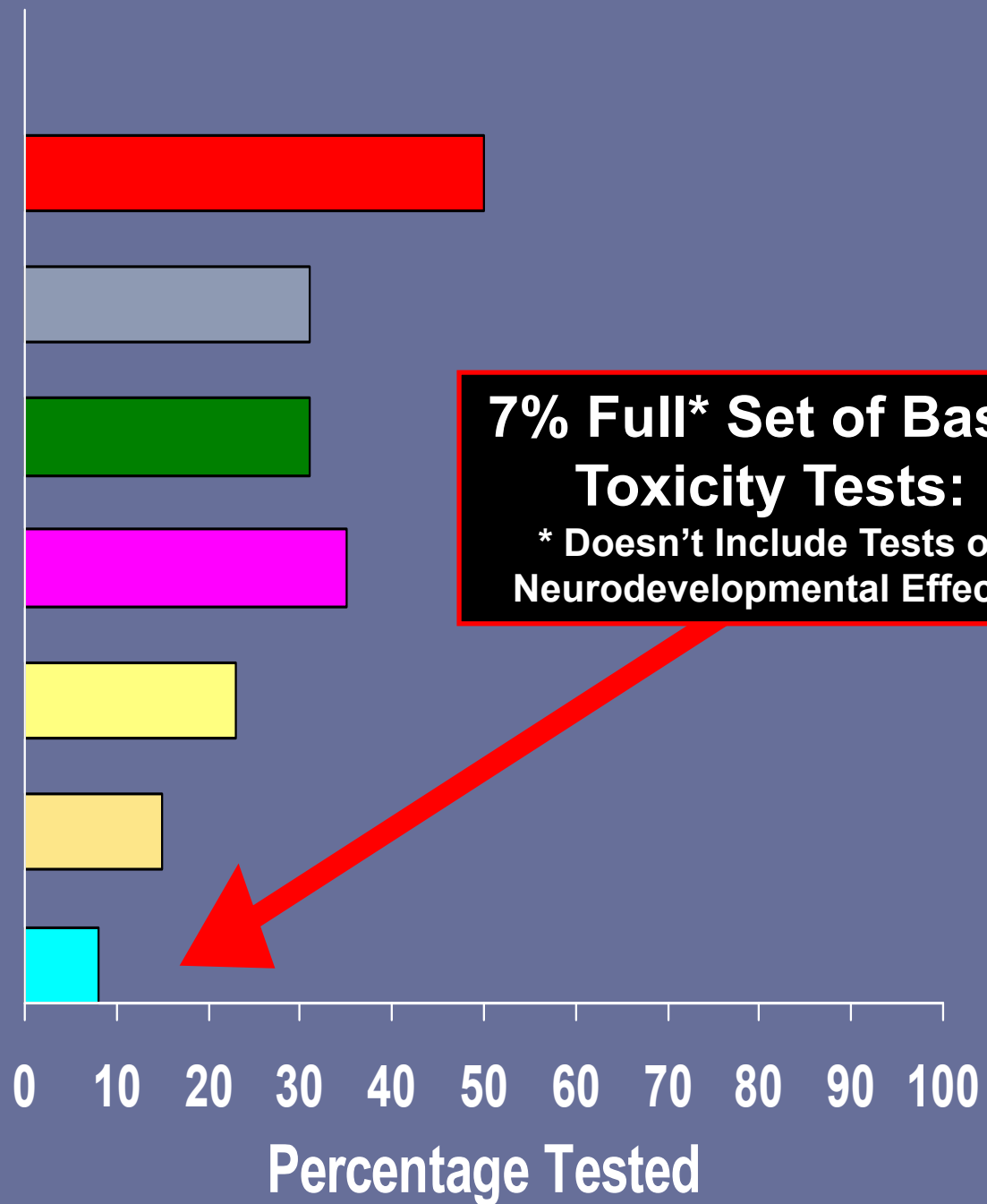
■ Ecotoxicity

■ Mutagenicity

■ Chronic Toxicity

■ Reproductive Toxicity

■ Full Set of Basic Toxicity Tests



# Lead - A Cautionary Tale

**6500 BC. - Lead discovered in Turkey,  
first mine**

**500 BC-300 AD.- Roman lead smelting  
produces dangerous emissions**

**100 BC. - Greek physicians give clinical  
description of lead poisoning**

**"Lead makes the  
mind give way."**

**Greek**

**Dioscorides - 2nd BC**



# Lead In Homes

WHAT BLACK CONSERVATIVES WANT

Clarence Thomas and the Court

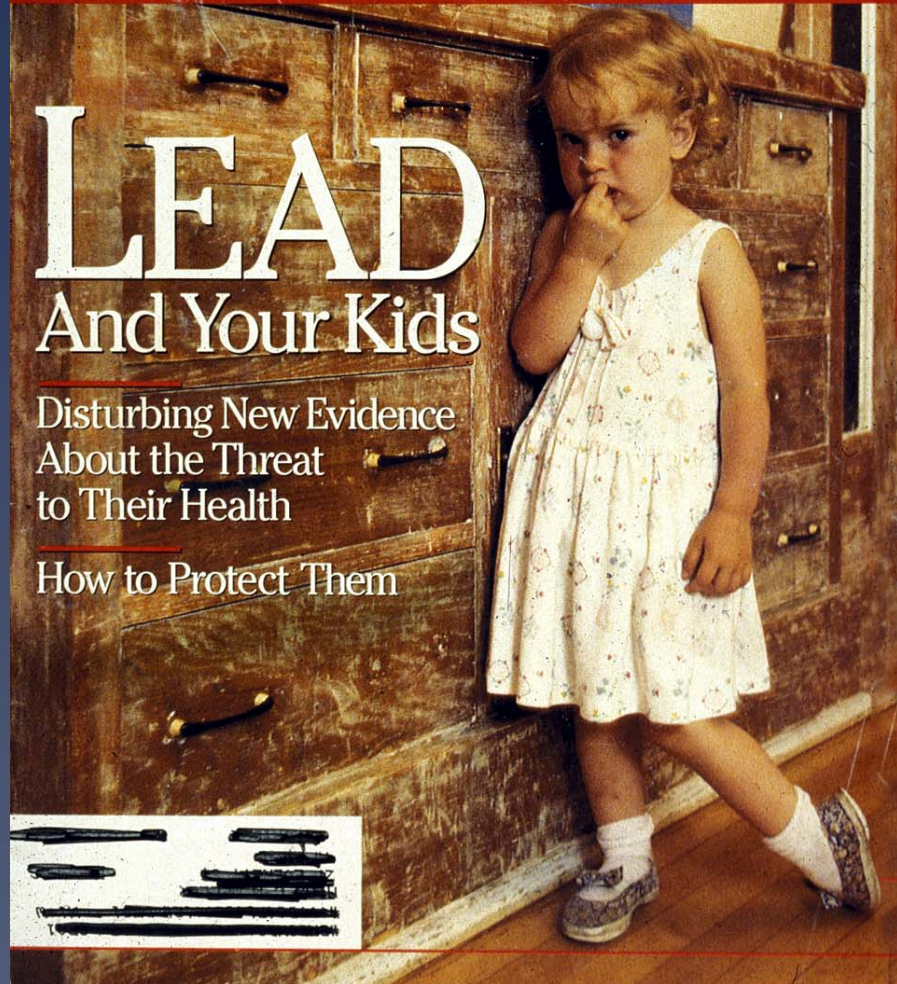
# Newsweek

July 15, 1991 • \$2.50

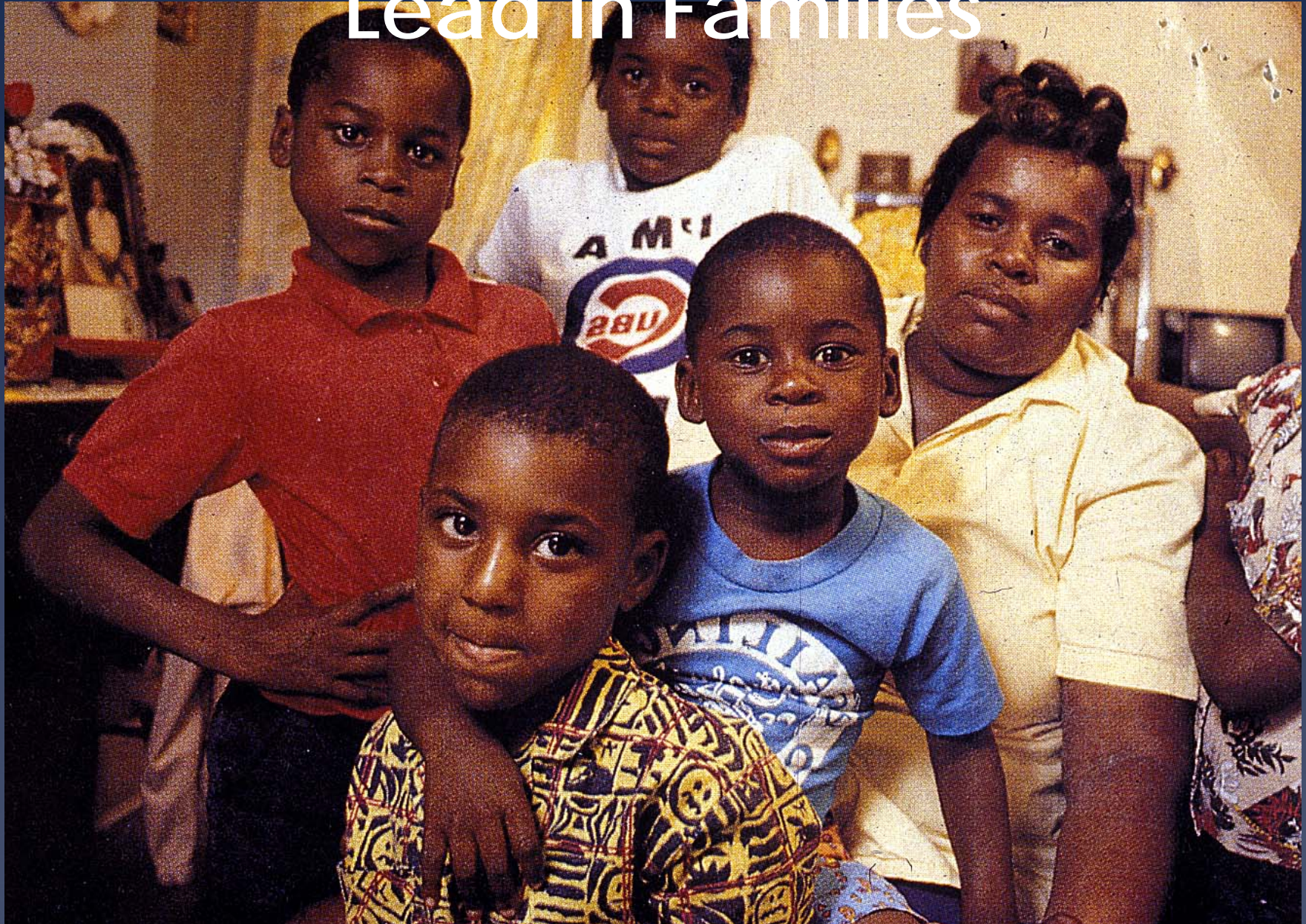
## LEAD And Your Kids

Disturbing New Evidence  
About the Threat  
to Their Health

How to Protect Them



# Lead in Families



~~TRUTH~~

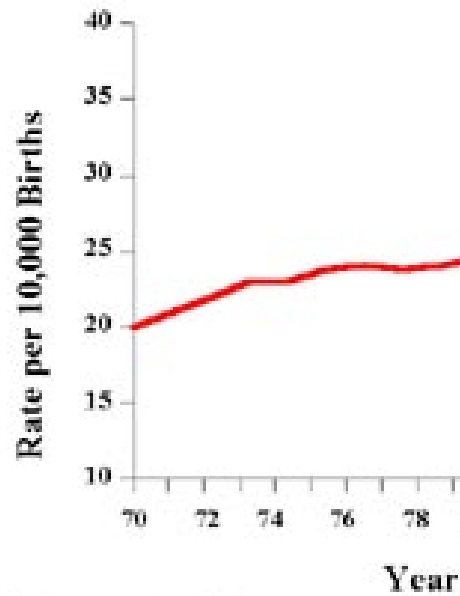
R

**EVIDENCE?**

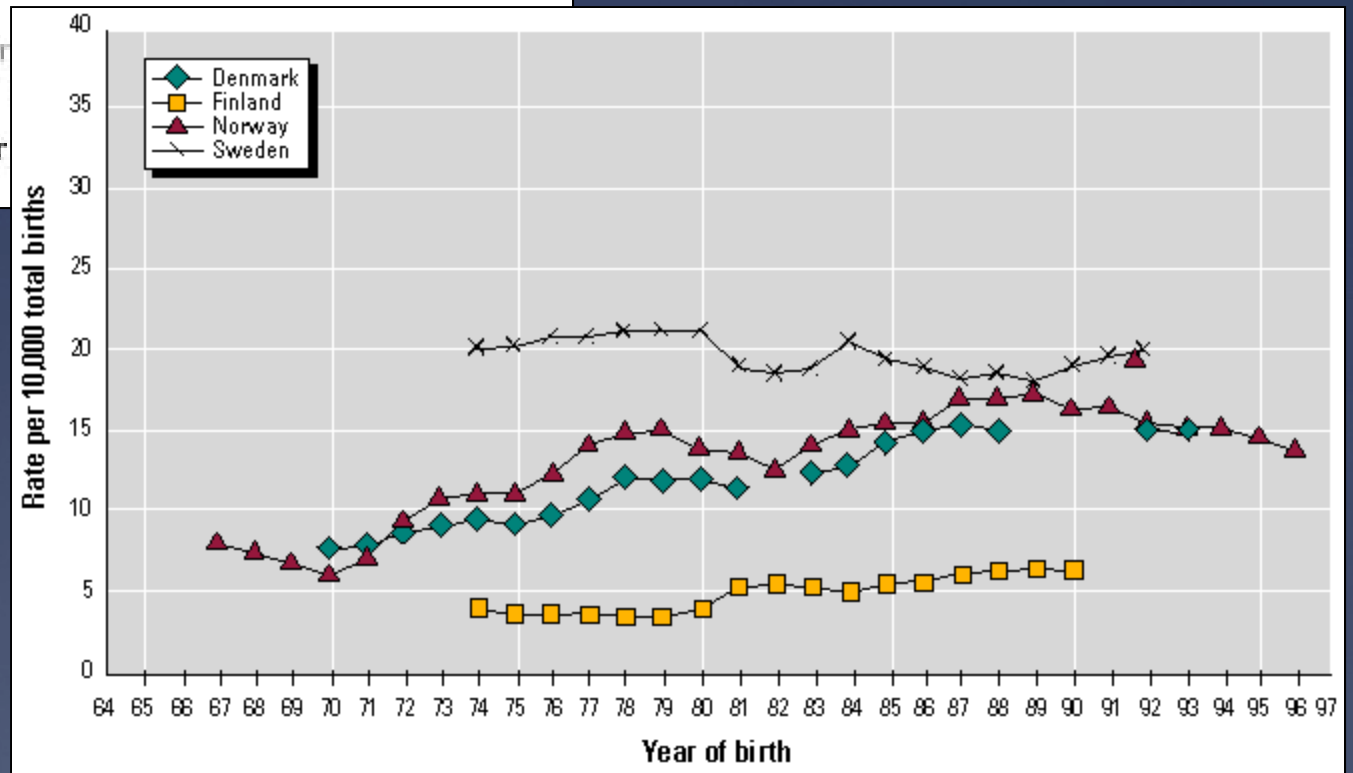
# Endocrine Disrupting Chemicals

- \* Overview
- \* Mechanisms
- \* Windows of Susceptibility
- \* What To Do About EDC's

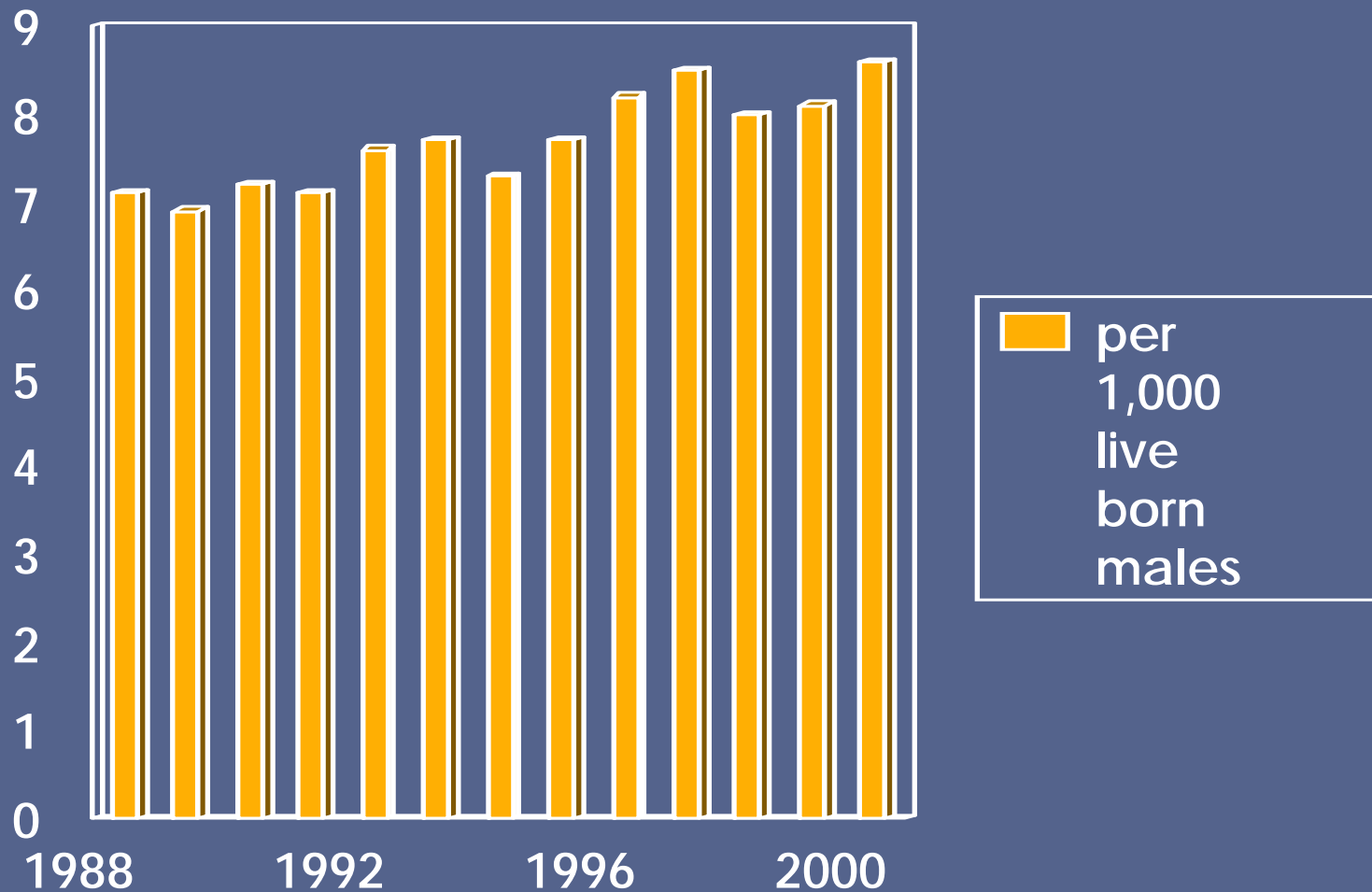
# HYPOSPADIAS in the US



Paulozzi et al., 1997

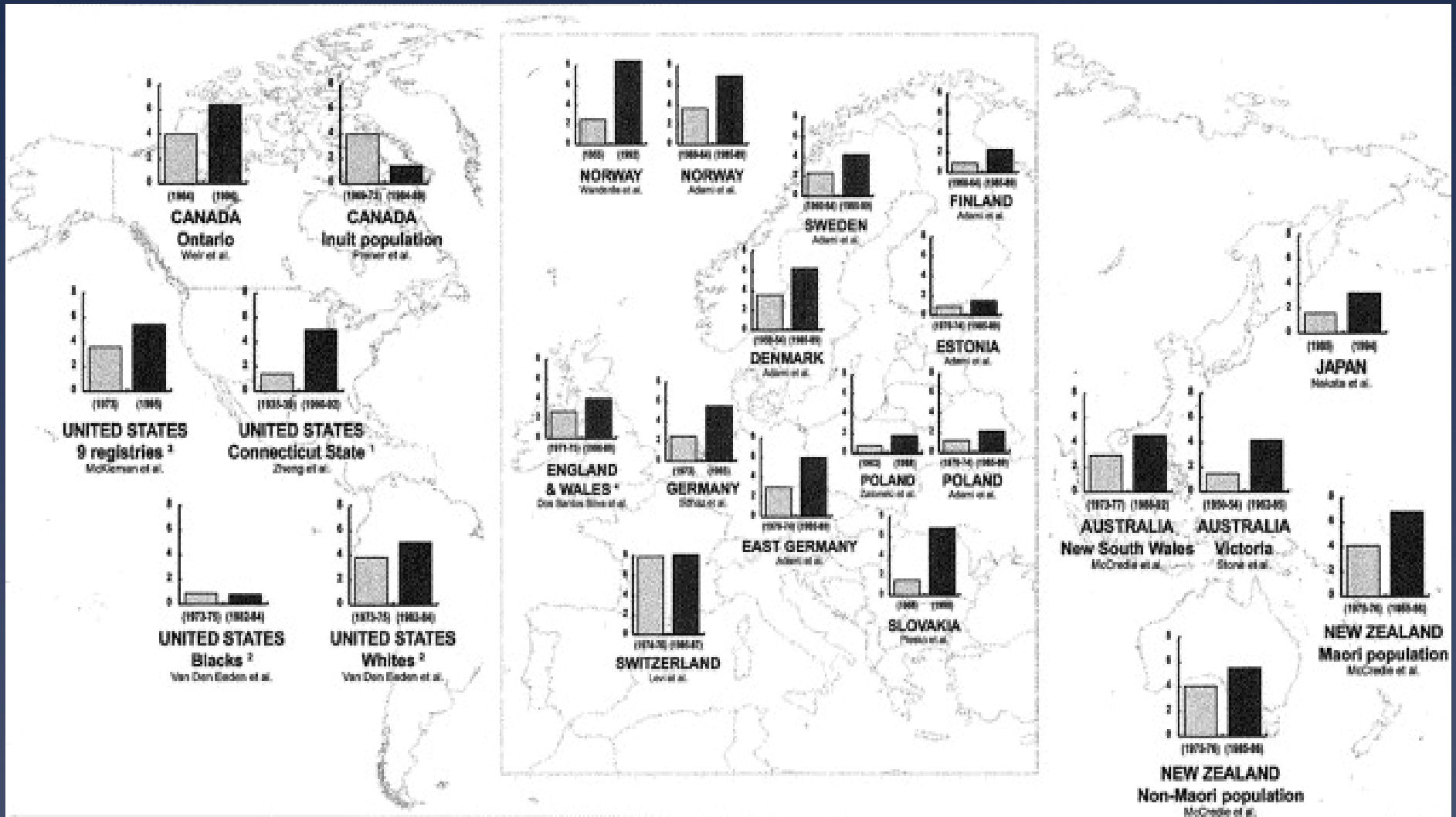


# Genital Anomalies – Human Epidemiology



Nelson et al, AAP 2005

# Testicular Cancer

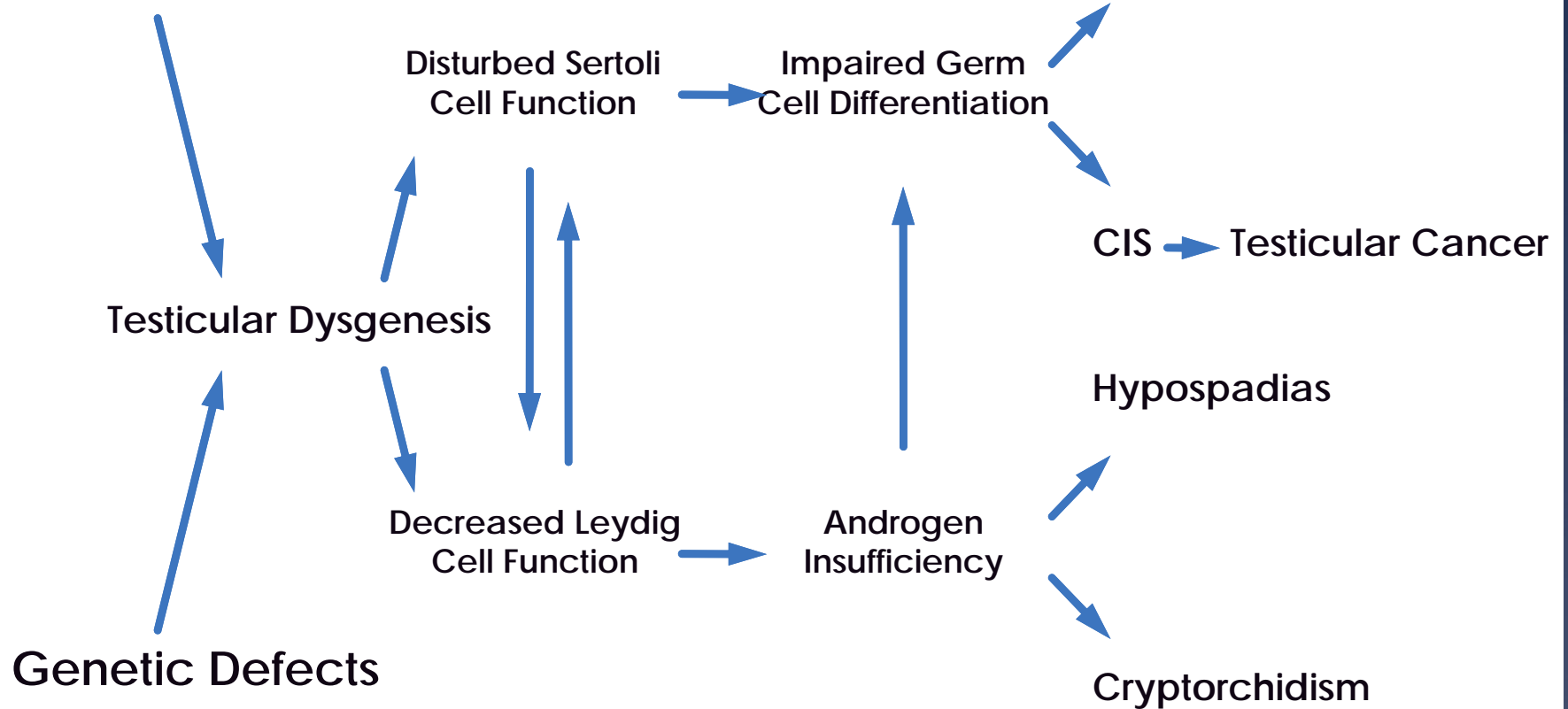




# Testicular Dysgenesis Syndrome

Environmental Factors  
(including Endocrine disruptors)

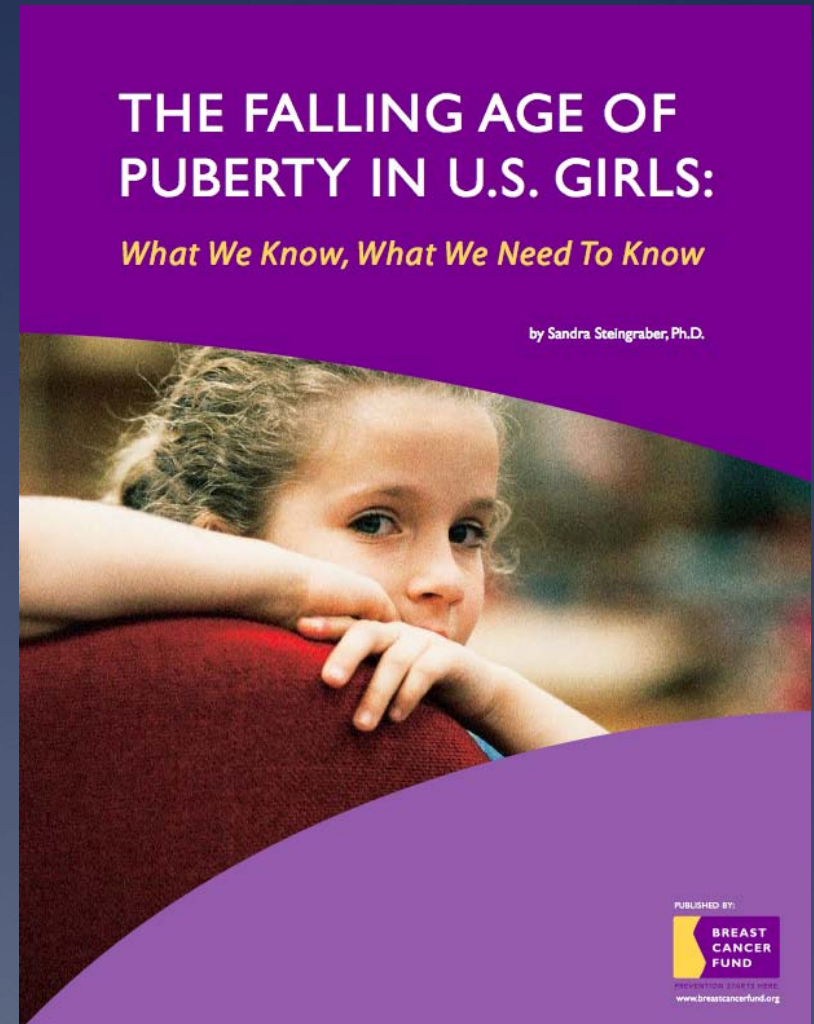
Reduced Semen Quality



From Skakkebaek *et al.*

# Pubertal Development

- \* **Unlinking Thelarche from Menarche**
- \* **Precocious Puberty?**
- \* **Increased Risk for Breast Cancer?**



**POLLUTION**

# Toxicology

- \* Synthesis of Disciplines
- \* Evolved from the Ancient Poisoners



# Selective Toxicology

\* Pesticides

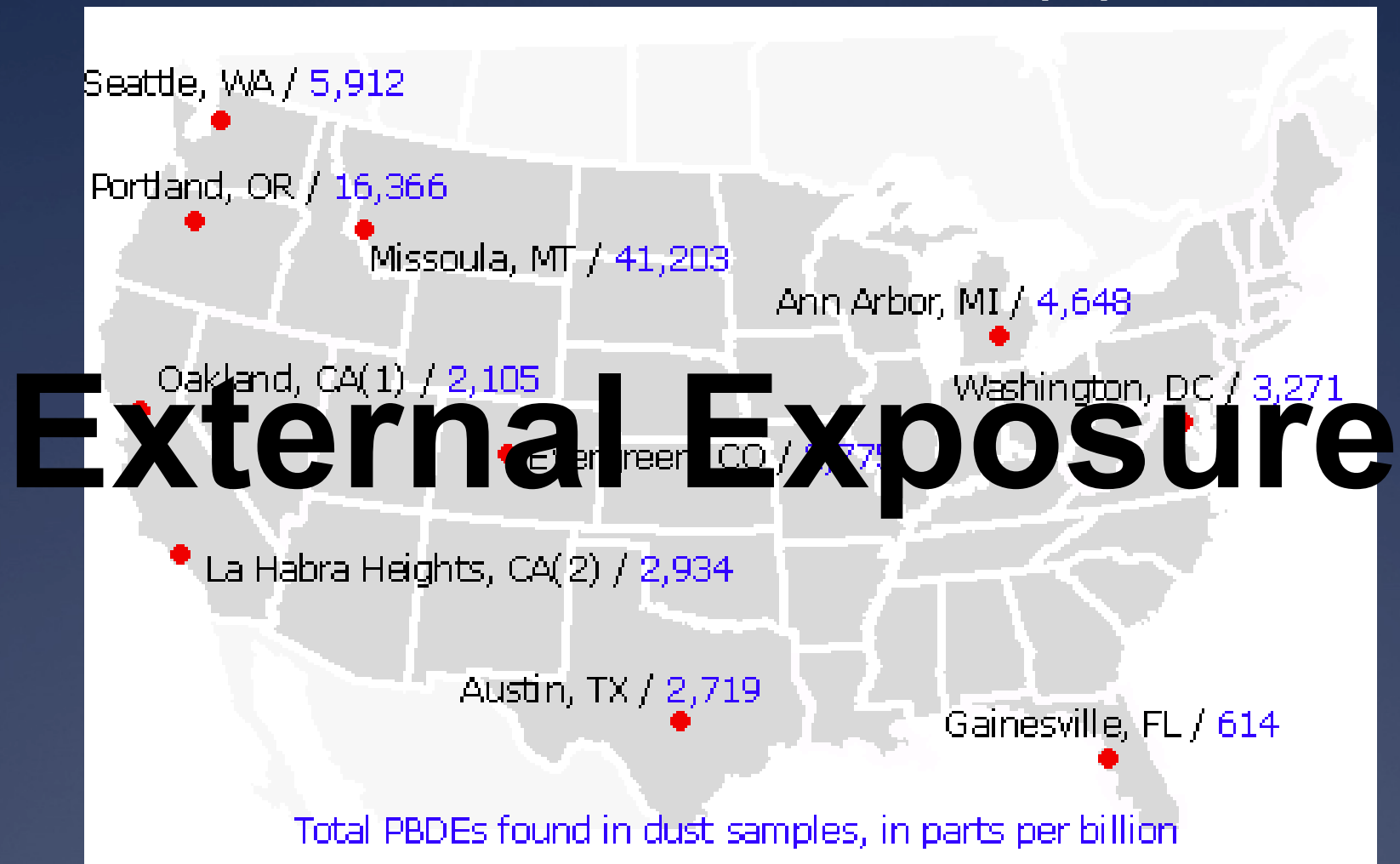
\* Herbicides

\* Antibiotics

# Exposure

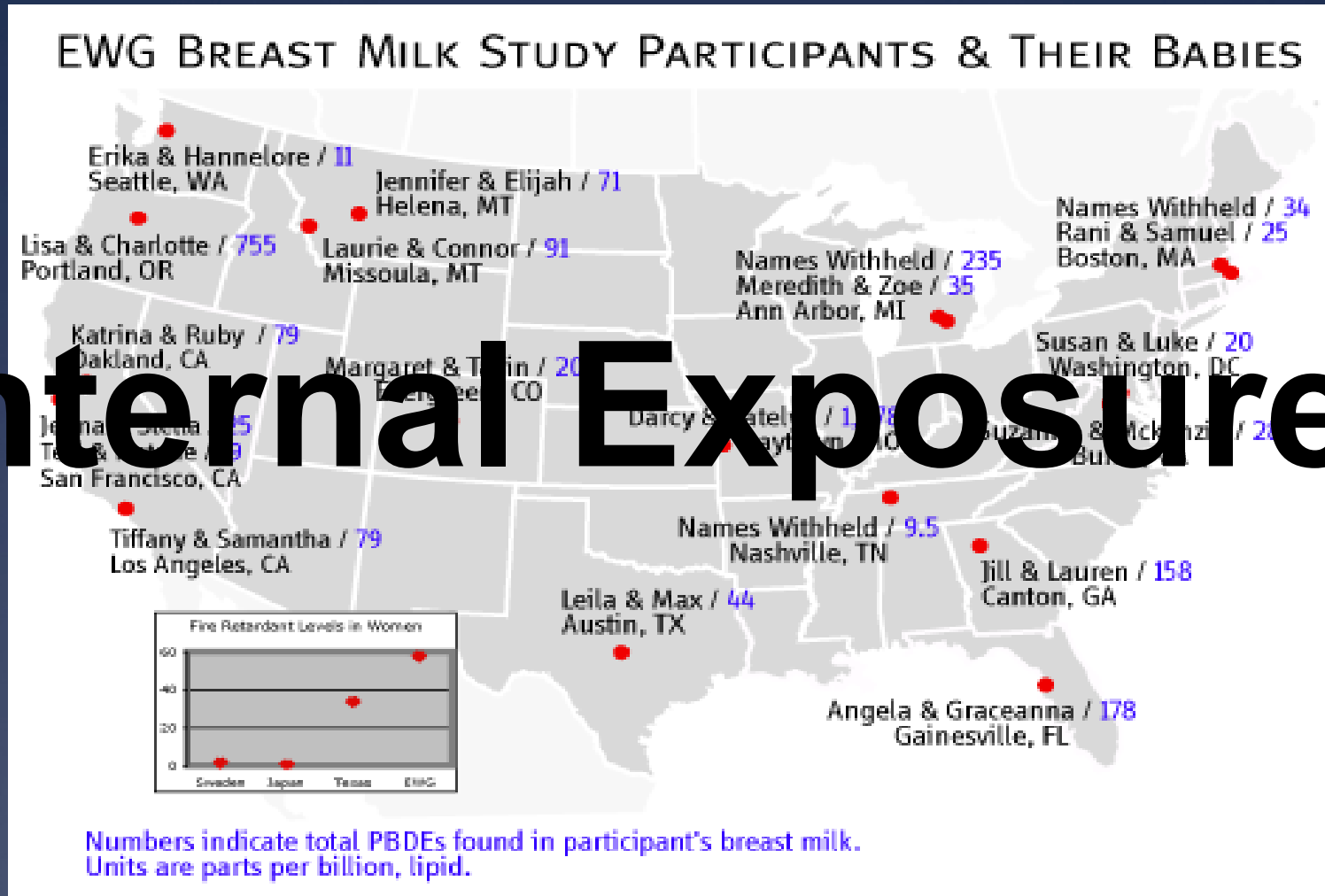
- \* External Dose
- \* Internal dose
- \* Target Organ dose

# PBDEs in House Dust (ppb)



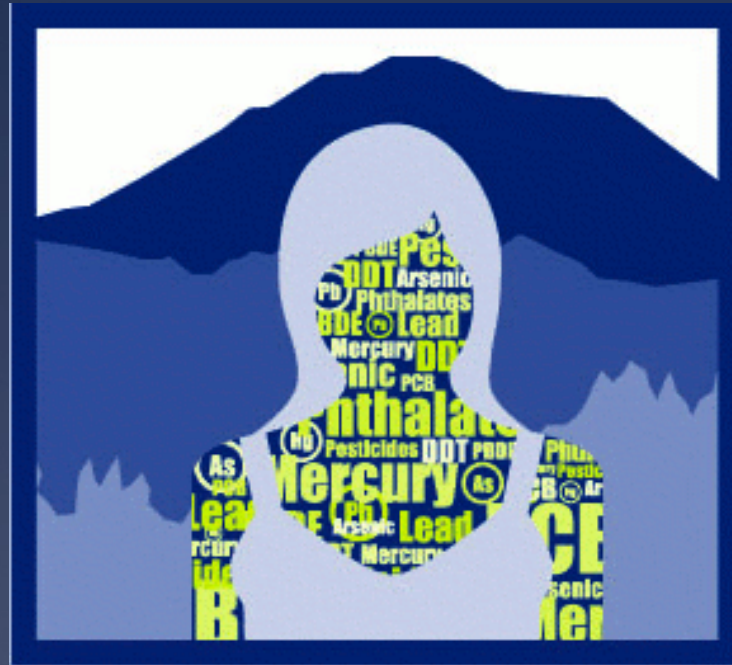
# PBDEs in Breast Milk (ppb)

# Internal Exposure





# Pollution in People

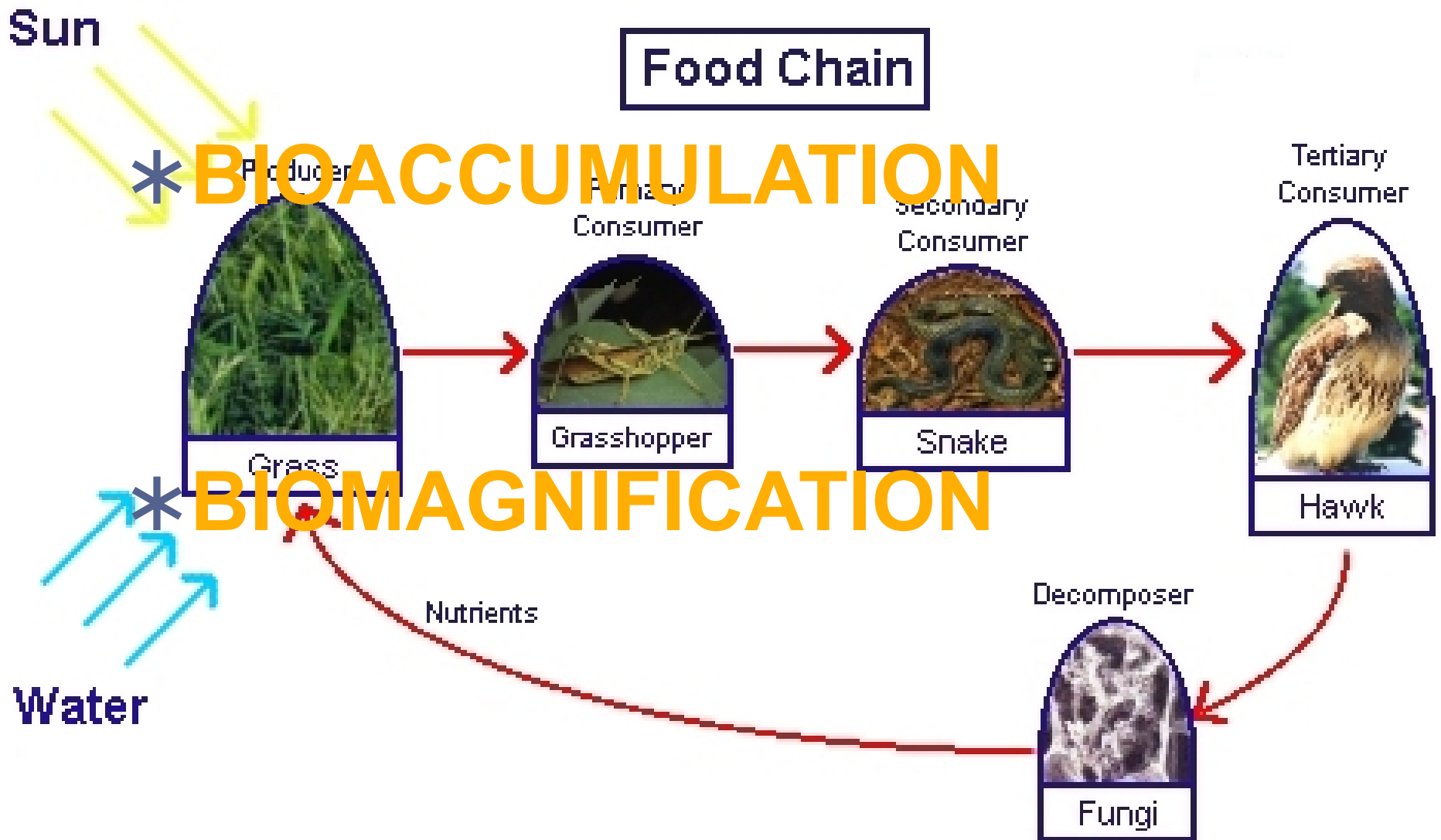


## A Study of Toxic Chemicals in Washingtonians

A project of the Toxic-Free Legacy Coalition:

Breast Cancer Fund, Healthy Building Network, People For Puget Sound, Washington Physicians for Social Responsibility, Washington State Nurses Association, Washington Toxics Coalition, WashPIRG, and more than 40 other organizations working together to eliminate persistent toxic chemicals in Washington State.

# Toxicology



# A Chemical Age

\* “Almost none of the **15,000 high volume chemicals**, widely used and found in the environment, have been tested during development for their endocrine-disrupting effects, either at high or background exposure doses.”

\* Baskin, et al

# A Chemical Age

- \* **82,000 Chemicals Approved for Use since the 1950's**
- \* **EPA Reviews 1,700 New Compounds Each Year**
- \* **90% Approval Rate**
- \* **25% Evaluated For Toxicity**

# Mechanisms

- \* Disrupt Hormone Synthesis
- \* Disrupt Hormone Metabolism
- \* Mimic/Antagonize Endogenous Hormone Effects
- \* Disrupt Hormone Receptor Synthesis
- \* Alter Target Cell Sensitivity

# Toxicologic Principles

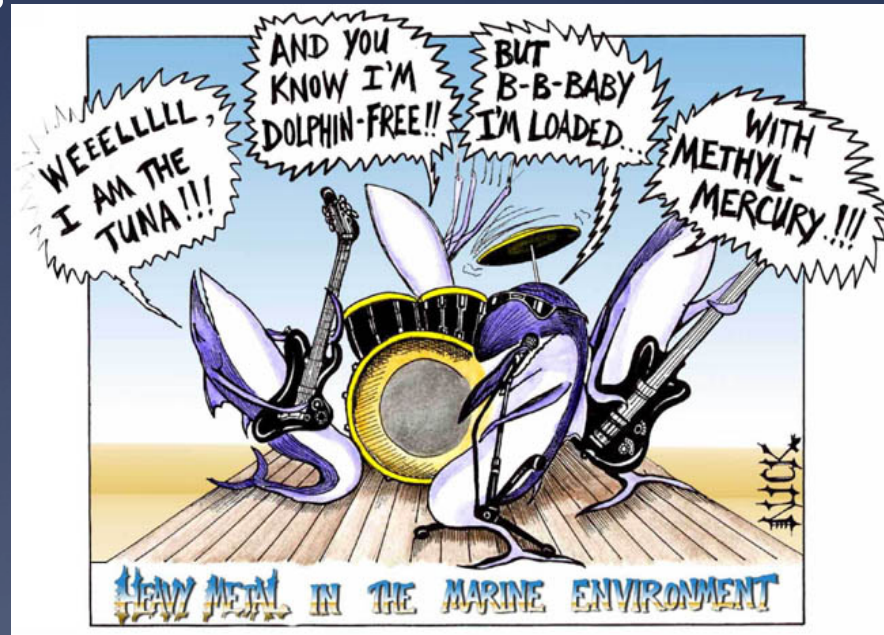
- \* Dose – Low dose vs. High dose
- \* Timing of Exposure – Sensitive Windows of Vulnerability
- \* Half-life – Short vs. Persistent
- \* Biological Availability - body storage, circulation
- \* Toxicity – a standard battery of animal studies
- \* Genetics

## Risk Assessment

“Safe Dose” determined by formula that uses NOAEL (No Observed Adverse Effect Level) and multiplies by a safety factor

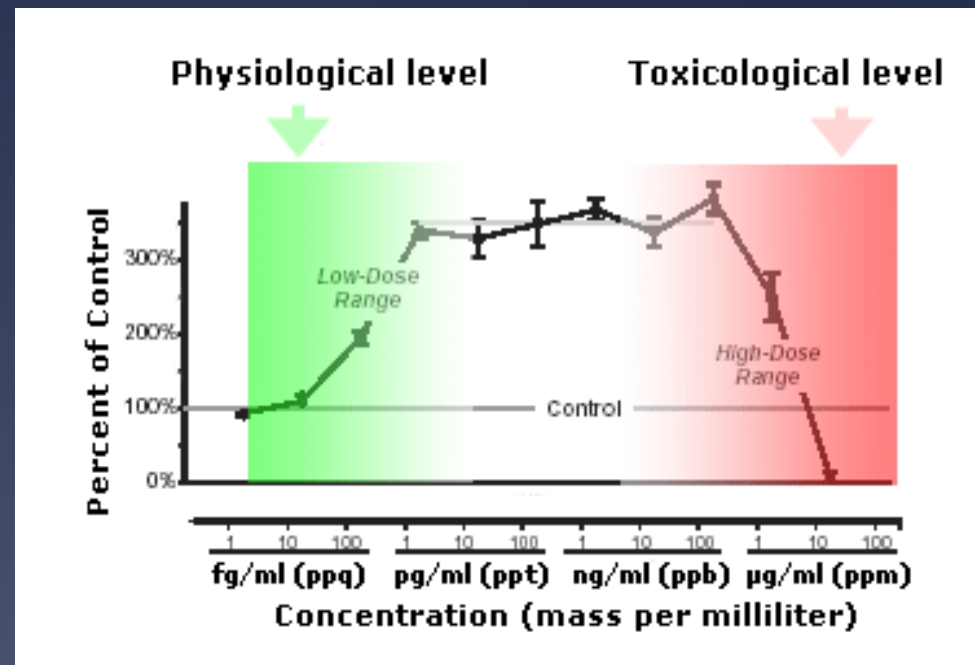
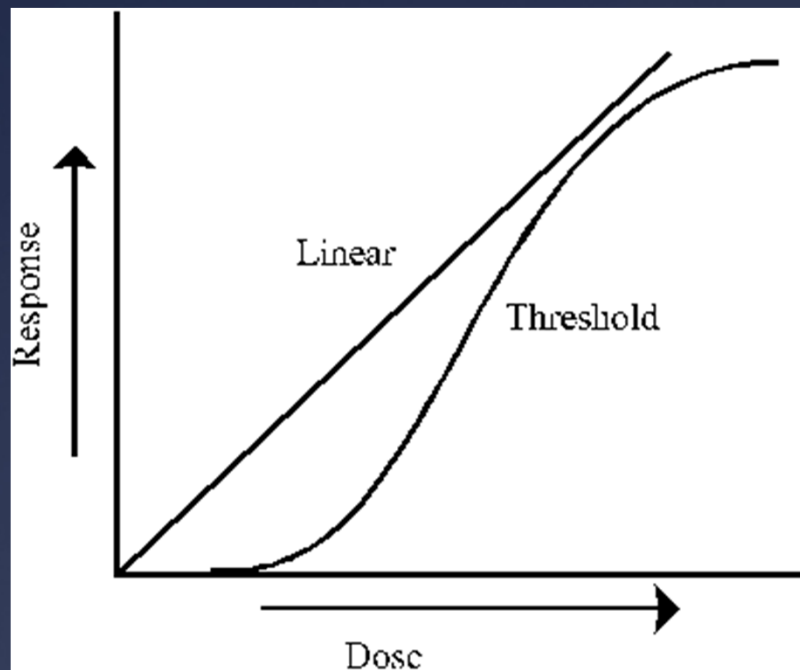
# Toxicology - Assessment

- \* Dose-Response Analysis
- \*  $LD_{50}$
- \* NOEL or NOAEL



Traditional: "The dose makes the poison"

New Paradigm: The dose + timing =  
poison





# Endocrine Disrupting Chemicals

**\*Problematic Assessment!**

# Mechanism of Action

- \* **Hormone Mimicry**
- \* **Endogenous Hormones Blocking**
- \* **Mixture Effect**

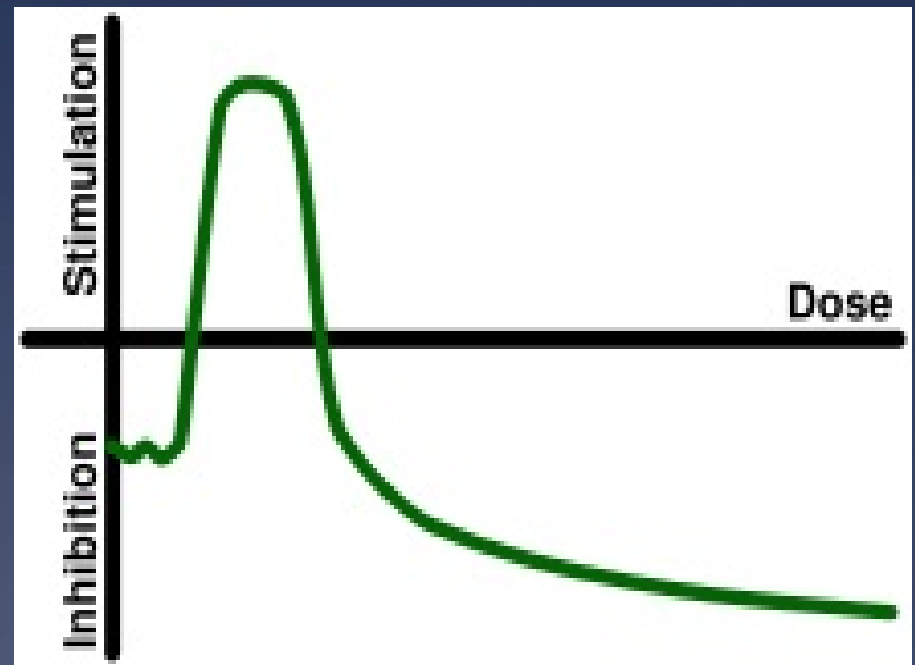
# Endocrine Disrupting Chemicals

- \* **Function at Extremely Low Concentrations**
- \* **Inverse Effects at Low and High Doses Possible**

**CONTROVERSIAL PHENOMENON**

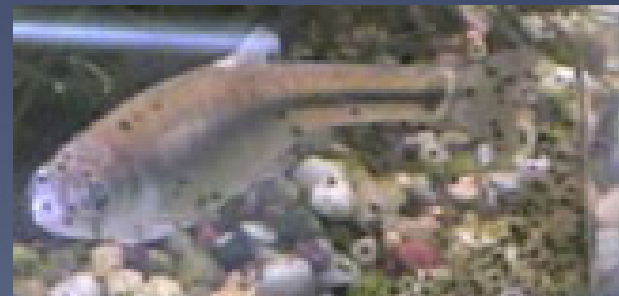
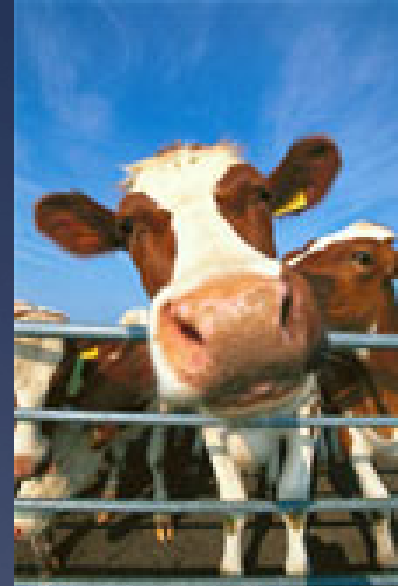
# Hormesis

- \* Definition: Dose Response Phenomenon Characterized by:
- \* Low Dose Stimulation
- \* High Dose Inhibition



# Hormesis

- \* **Nonlinear Dose Effect of 17-B-Trenbolone on Fathead Minnow\***
- \* **J Or U-Shaped Relationships**



\*Ankley, 2003

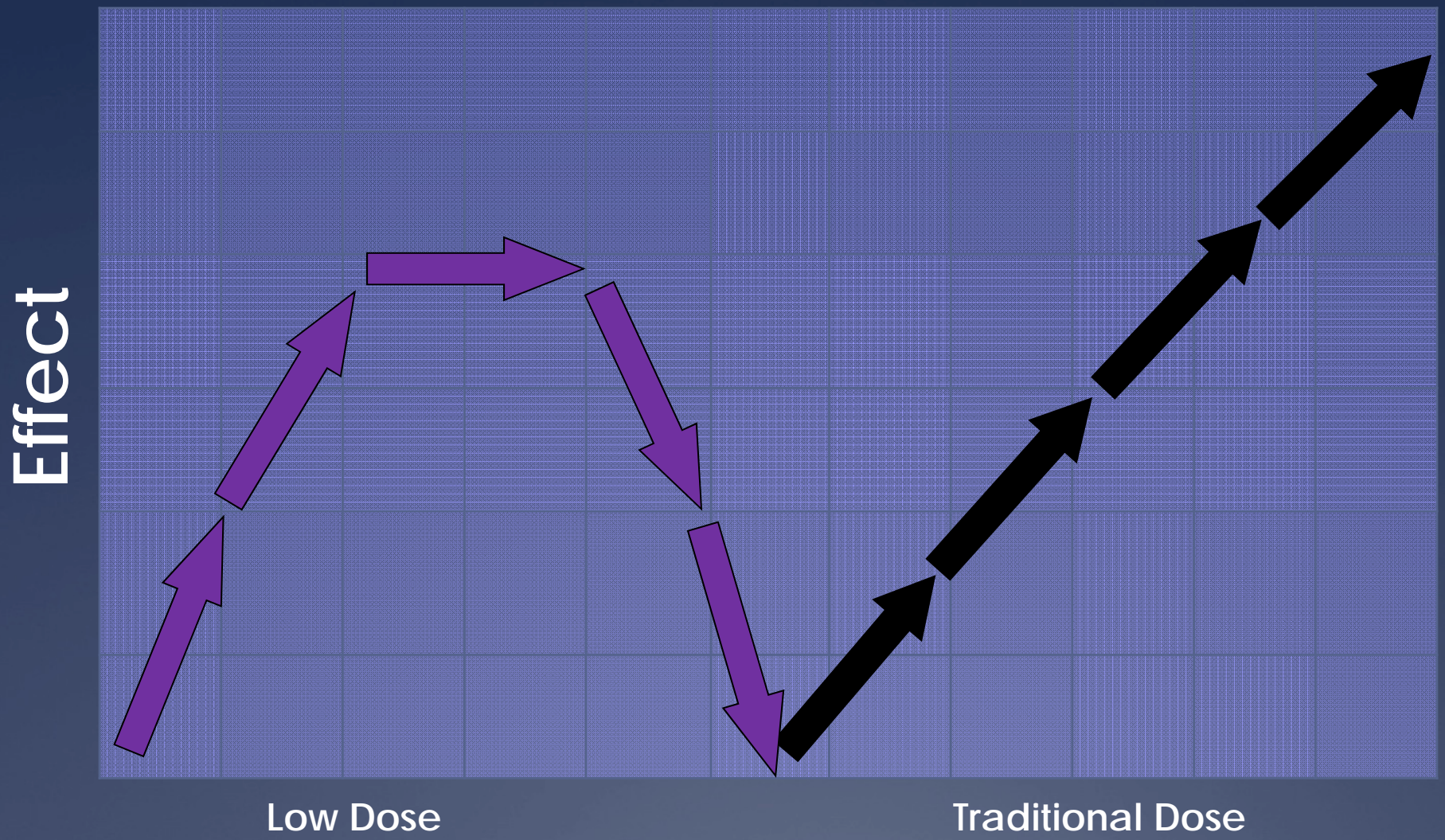
# Hormesis

The “Norm”\*

\*Kayajanian, 2002

Calabrese and Baldwin, 2003

# Low Dose and Traditional Dose



# Diethylstilbestrol (DES)



- \* 1st Gen: 40x Increased risk of breast cancer
- \* 2nd Gen: vaginal adenocarcinoma in females, hypospadias in male
- \* 3rd Gen: possible increased risk of ovarian cancer, hypospadias
- \* 4th Gen: ?



"Really?"



Yes...

**desPLEX**<sup>®</sup>

to prevent ABORTION, MISCARRIAGE and  
PREMATURE LABOR

*recommended for routine prophylaxis  
in ALL pregnancies . . .*

96 per cent live delivery with **desPLEX**  
in one series of 1200 patients\*—  
— bigger and stronger babies, too.<sup>1, 2</sup>

No gastric or other side effects with **desPLEX**  
— in either high or low dosage<sup>3, 4, 5</sup>

(Each **desPLEX** tablet starts with 25 mg. of diethylstilbestrol, U.S.P., which is then ultramicrotonized to smooth and accelerate absorption and activity. A portion of this ultramicrotonized diethylstilbestrol is even included in the tablet coating to assure prompt help in emergencies. **desPLEX** tablets also contain vitamin C and certain members of the vitamin B complex to aid detoxification in pregnancy and the effectuation of estrogen.)

For further data and a generous  
trial supply of **desPLEX**, write to:  
Medical Director

REFERENCES

1. Conner, E. M., et al. — *Am. J. Obst. & Gynec.* 55:1798, 1953.
2. Gilman, L., and Kaplan, A. — *N. Y. St. J. Med.* 50:2811, 1950.
3. Kamm, R. J. — *South. M. J.* 45:1166, 1952.
4. Fink, S. F. — *Med. Times* 82:921, 1954. *Am. J. Surg.* 87:65, 1954.
5. Ross, J. W. — *J. Nut. M. A.* 43:30, 1951; 43:233, 1952.

**GRANT CHEMICAL COMPANY, INC.**, Brooklyn 26, N.Y.

**Figure 2**

Medical journal advertisement for prenatal tablets with vitamins and diethylstilbestrol

# Epigenetics

- \* **First Defined in 1940s**
- \* **Covalent DNA Modification Proposed in 1975 as Mechanism**
- \* **Revelation That X-Inactivation and Genomic Imprinting Regulated by Epigenetic Factors**

# Epigenetics

- \* **Environmental Influences Linked To Disease Phenotypes**
- \* **Epigenome Modification**
- \* **Meta-stable epialleles**

# Epigenome Re-Programming

- \* Erasure of Epigenetic Marks As Primordial Germ Cells Migrate Along Genital Ridge
- \* Mark Re-establishment During Gametogenesis
- \* 2nd Erasure During Fertilization

Am J Hum Genet 74, 2004

# Epigenetic Transgenerational Actions

- \* **Creates Opportunity for Environmental Factors To Reprogram The Germ Line**
- \* **Implications for Evolutionary Biology**

# Plastics: Phthalates/Bisphenol A Everywhere Chemicals

## Baby powder, shampoo linked to chemical risk

### Researchers find phthalates

By Liz Szabo  
USA TODAY

Parents who use baby powder, lotion or shampoo on their infants may unknowingly expose their children to controversial chemicals with hormone-like effects, a study shows.

Researchers found the chemicals — called phthalates — in the urine of all 163 babies tested, according to the study in today's *Pediatrics*. Most of the babies, whose average age was 13 months, had seven or more types of phthalates in their urine. Concentrations of phthalates were higher in infants who

were exposed to lotion, powder and shampoo than in other infants, the study shows.

Doctors are concerned about phthalates because many animal tests and a few human studies link the chemicals — a broad class of ingredients found in everything from vinyl toys and hospital tubing to cosmetics — to reproductive abnormalities, allergies and eczema, says Sheela Sathyanarayana, acting assistant professor at the University of Washington. Unborn children and infants are especially vulnerable to chemicals that disrupt their hormonal balances because their reproductive systems are still developing, she says.

"It's hard to trace where these chemicals are coming from," Sathyanarayana says. "They could be causing harm

"It's hard to trace where these chemicals are coming from. They could be causing harm, but we don't know to what extent."

but we don't know to what extent."

A 2006 Danish study found that babies exposed to certain phthalates in breast milk had altered levels of reproductive hormones in their blood. So of the same phthalates were found in the urine of babies today's *Pediatrics* study.

The new study suggests that phthalates are absorbed through the skin, says Schettler, an expert on hormone-disrupting chemicals and science director for an advocacy group called the Endocrine and Environmental Health

ates to be safe. Bailey says the *Pediatrics* study "makes no sense," noting that only one of the phthalates found in babies'

## Baby bottle danger

### Chemical in plastic may be harmful

By Stacy Downs  
McClatchy Newspapers

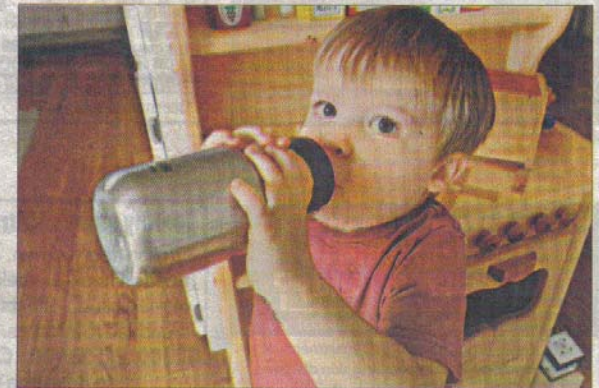
Parents, stores and the entire country of Canada are ditching polycarbonate baby bottles and sippy cups.

That's because the hard plastic that most baby bottles are made from contains the chemical bisphenol-A, which some researchers believe poses health risks.

On Friday, Canada banned BPA, as the chemical is commonly known, from baby bottles and drinking cups, based on a review of worldwide studies. Wal-Mart and other retailers in Canada have removed children's products containing BPA from shelves.

Also last week, Wal-Mart announced plans to stop selling children's products containing BPA by next year in U.S. stores.

"Good," said Aubrey Isevis, a Blue Springs, Mo.,



Many parents are switching from plastic bottles to those made of other materials to avoid chemical exposure. (McClatchy Newspapers)

teacher and mother. "It's better to be safe than sorry."

BPA also is found in some pacifiers and teething.

Studies show a possible link between BPA and cancer, diabetes, hyperactivity and other disorders. Frederick vom Saal, a professor at the University of Missouri-Columbia and one of the key researchers of BPA, says the

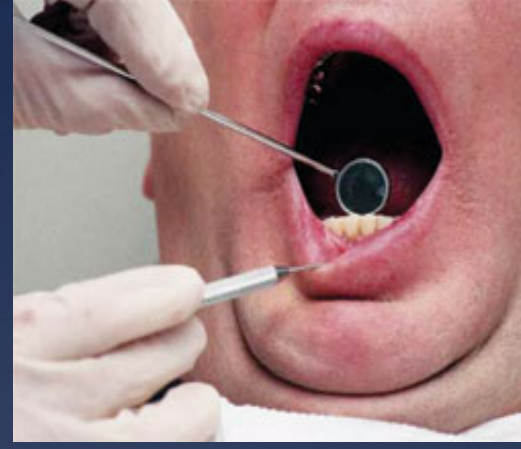
chemical can cause reproductive problems.

Industry groups for plastics, chemicals, juvenile products and grocery manufacturers maintain that BPA is safe, based on evidence and findings of the Food and Drug Administration.

But last week the National Toxicology Program, an office of the National Insti-

tutes of Health, in a draft report expressed concern. The office does not regulate BPA, but its findings are used to set safe exposure limits for chemicals.

In reaction, Sen. Charles Schumer said he would file a bill to ban BPA from baby products, dental sealants and any bottle or container that holds food and drink.



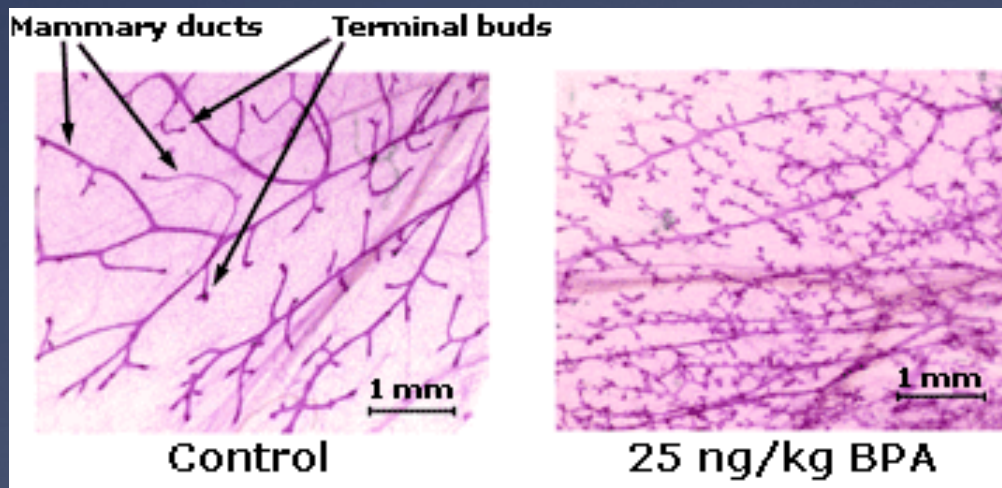
# Summary of Findings

- \* BPA is a weak estrogen and an anti-androgen, rapidly metabolized (4-6 hours)
- \* Upregulates estrogen alpha receptor in human body
- \* Binds to  $\alpha$ -fetoprotein which normally binds to estrogen  $\alpha$  increased estrogen circulation
- \* Animal studies
- \* Male reproductive tract
- \* Neurocognitive disorders
- \* Diminishes differences in sexually dimorphic behavior
- \* Early puberty
- \* Increased body size
- \* **Low Doses: Breast, Uterine and Prostate Tumor Cell Proliferation**



# Bisphenol A and Mammary Gland

- \* Dosed pregnant mice at 25ng/kg from Day 9 of pregnancy through birth.
- \* Examined mammary glands of offspring at Day 30
  - \* Found increased terminal bud growth/density
  - \* Decreased number of apoptotic cells



# Bisphenol A and Obesity

## \* **Obesogens** – Promote Adipogenesis at LOW DOSES

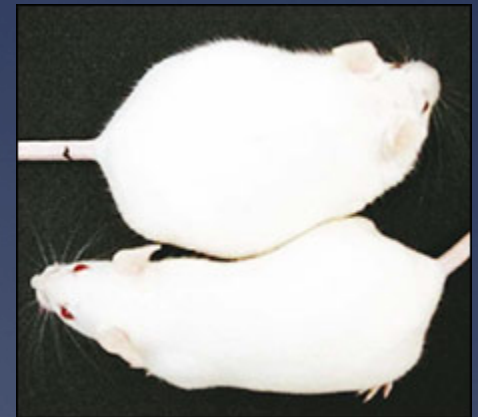
### • **DES** – synthetic estrogen

- Exposure in utero → obese offspring that continued to be obese with restricted caloric intake/increased exercise → 3rd generation also obese (increases in leptin, adiponectin, TG)

### • **Bisphenol A**

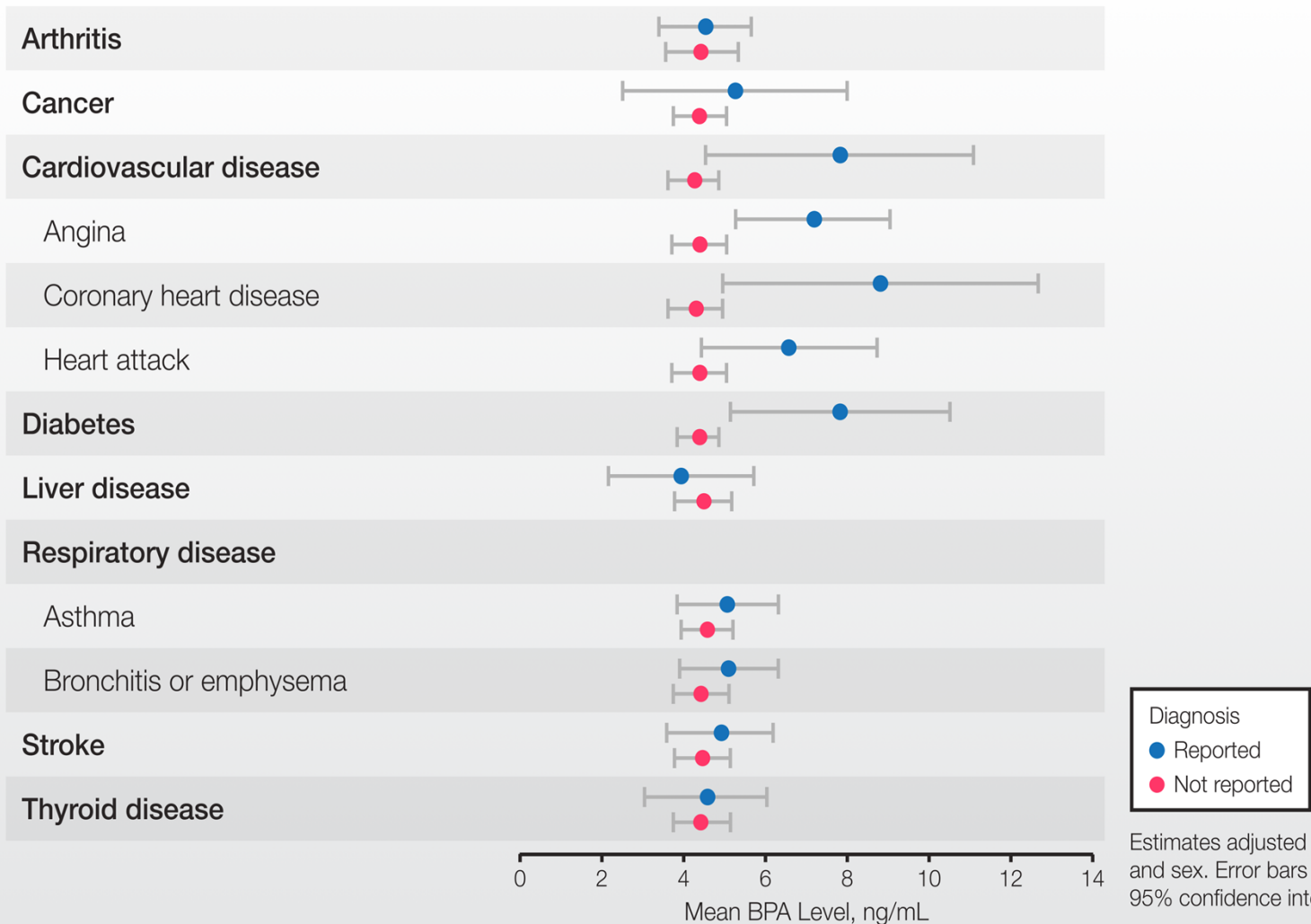
- Alonso-Magdalena, P, et al. 2006. **The Estrogenic Effect of Bisphenol-A Disrupts the Pancreatic  $\beta$ -Cell Function *in vivo* and Induces Insulin Resistance.** *Environmental Health Perspectives* 114:106-112.

Masuno, H, et al. 2002. **Bisphenol A in combination with insulin can accelerate the conversion of 3T3-L1 fibroblasts to adipocytes.** *Journal of Lipid Research* 3:676-684.



# Bisphenol A (BPA) Concentrations

Conditions



# Phthalates



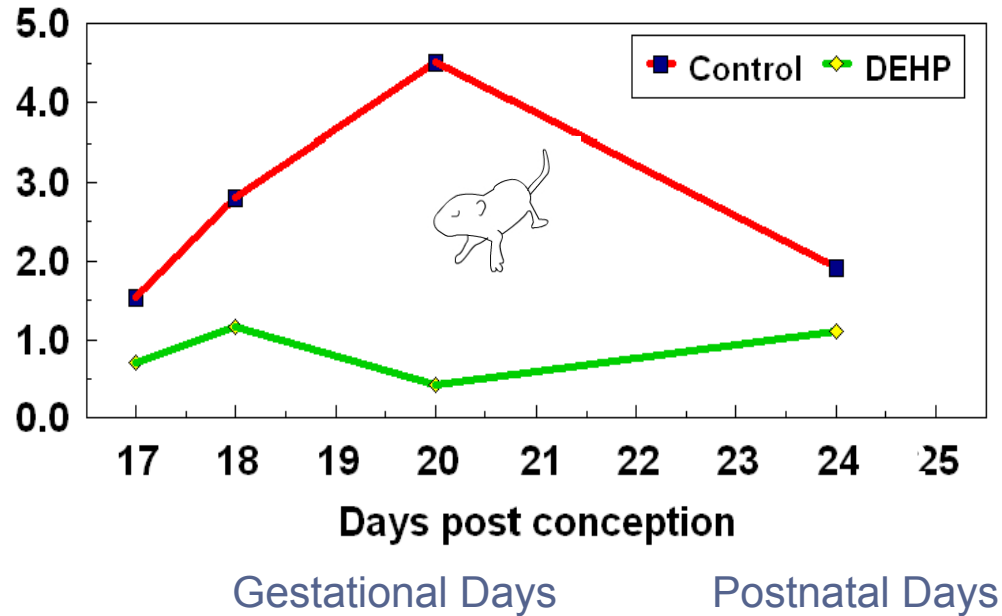
# Phthalate Exposure in Utero



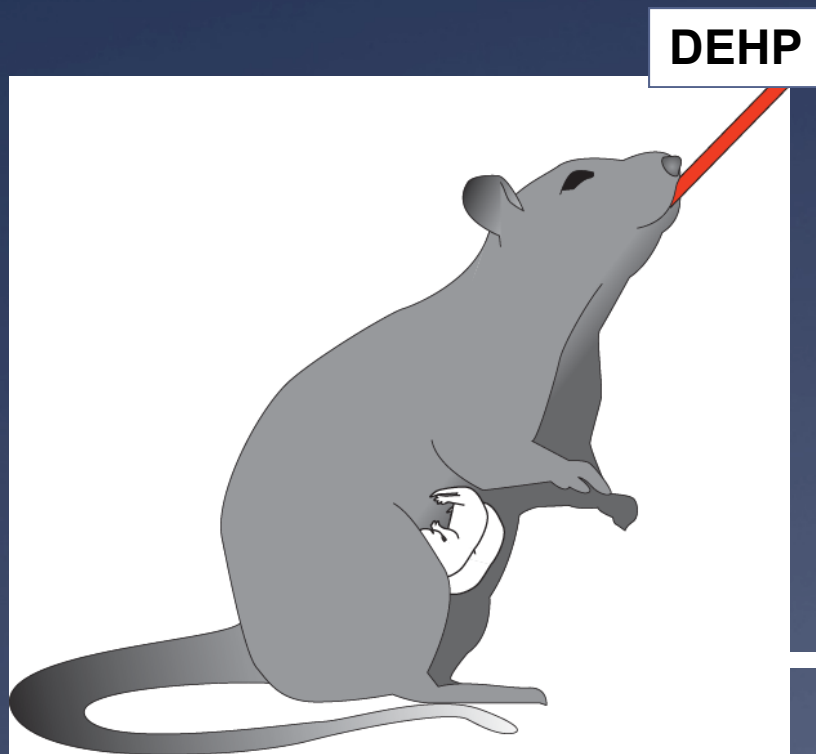
Maternal Phthalate Exposure

Testosterone (ng/testis)

Testis Testosterone Production (ng/testis)



# "Phthalate syndrome"



- \* Malformations of Epididymis, Vas deferens, Seminal Vesicles, Prostate
- \* Hypospadias  
Undescended Testicles
- \* Nipple retention



Reduced AGD

Gray and Foster 2003, Foster 2005

# Testicular Dysgenesis Syndrome

Environmental Factors  
(including Endocrine disruptors)

Reduced Semen Quality

Disturbed Sertoli  
Cell Function

Impaired Germ  
Cell Differentiation

Testicular Dysgenesis

CIS → Testicular Cancer

Hypospadias

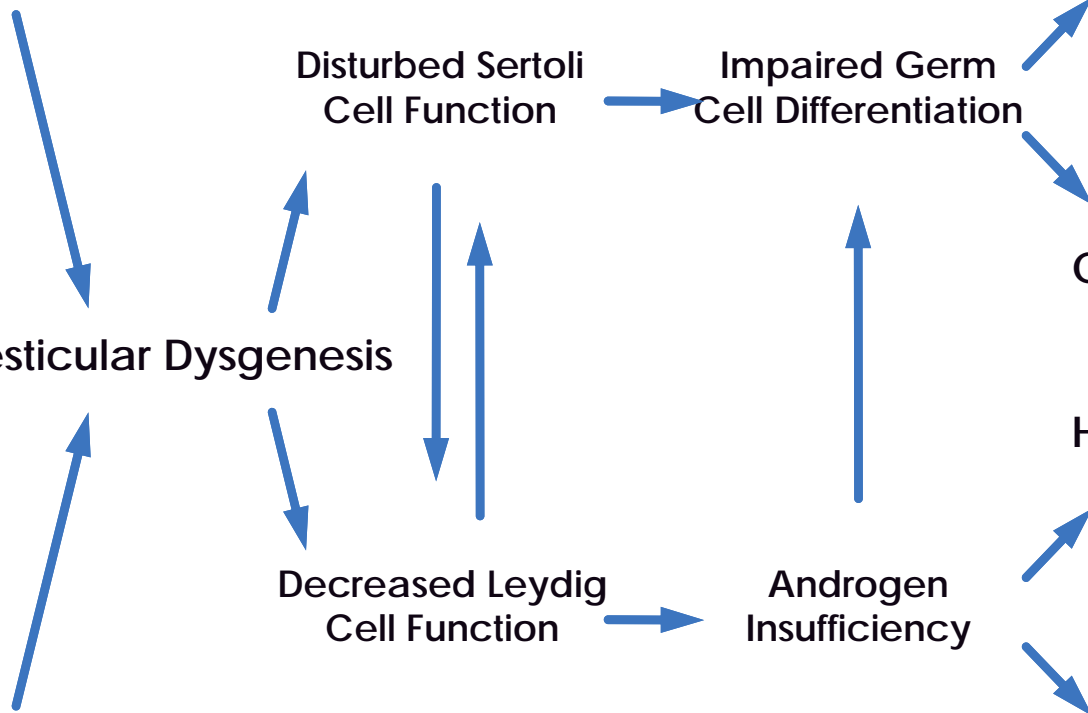
Decreased Leydig  
Cell Function

Androgen  
Insufficiency

Cryptorchidism

Genetic Defects

From Skakkebaek *et al.*



# Phthalates in Childhood

Hauser et al 2005 NICU Setting  
– found urinary levels of DEHP to be 50x higher in preterm neonates as compared to levels in children from NHANES

\*\*FDA has released a statement saying that premature infants may be adversely affected by these chemicals





# Why are We Concerned?



Main et al – 2006

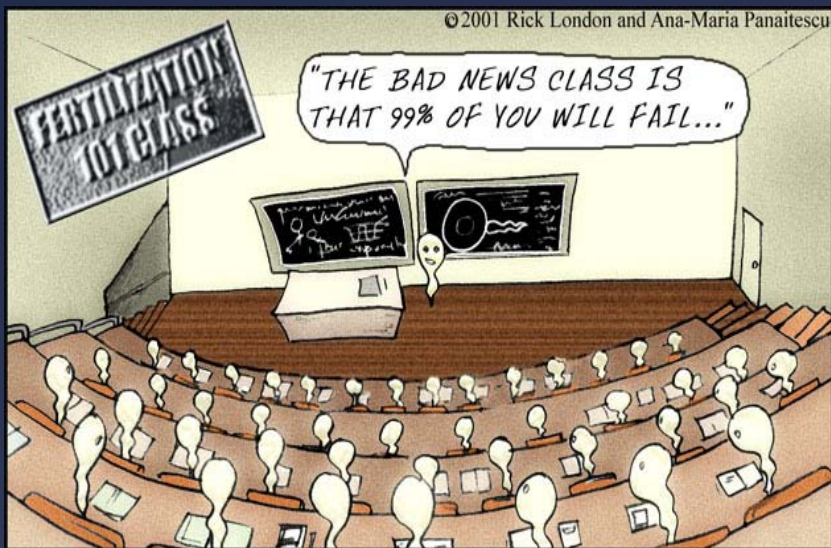
- \* Found a **significant association** between **breastfeeding phthalate exposures** and luteinizing hormone (positive) and free testosterone levels (negative) in **newborn boys with cryptorchidism**

Swan et al – 2008

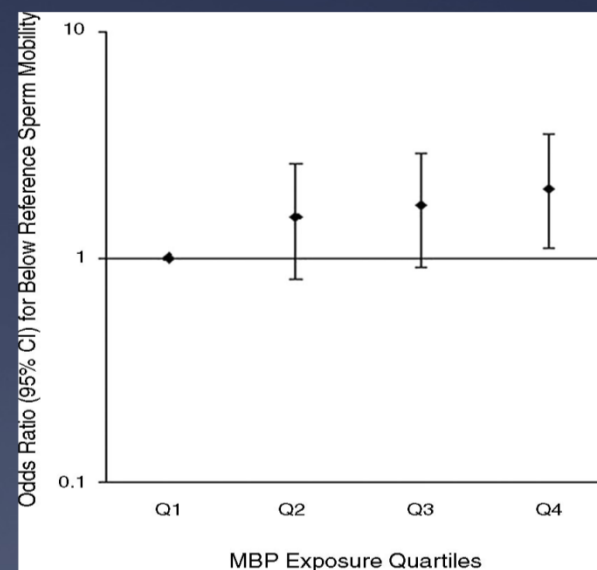
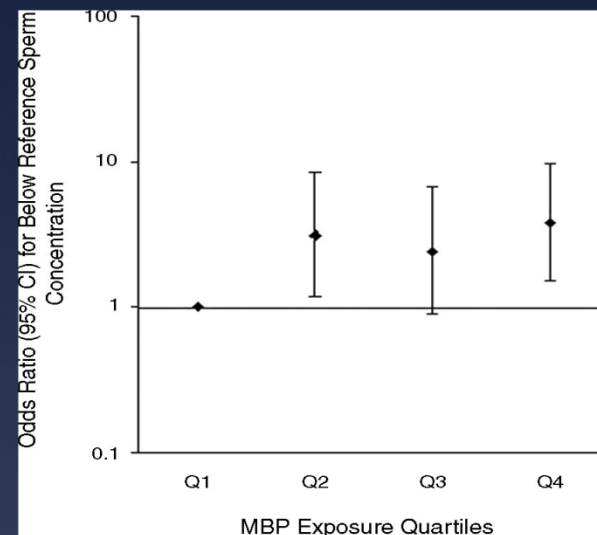
- \* Found a significant association between **prenatal phthalate levels and decreased anogenital distance**, reduced testicular descent, decreased penile width in infants

# Phthalates and Human Health

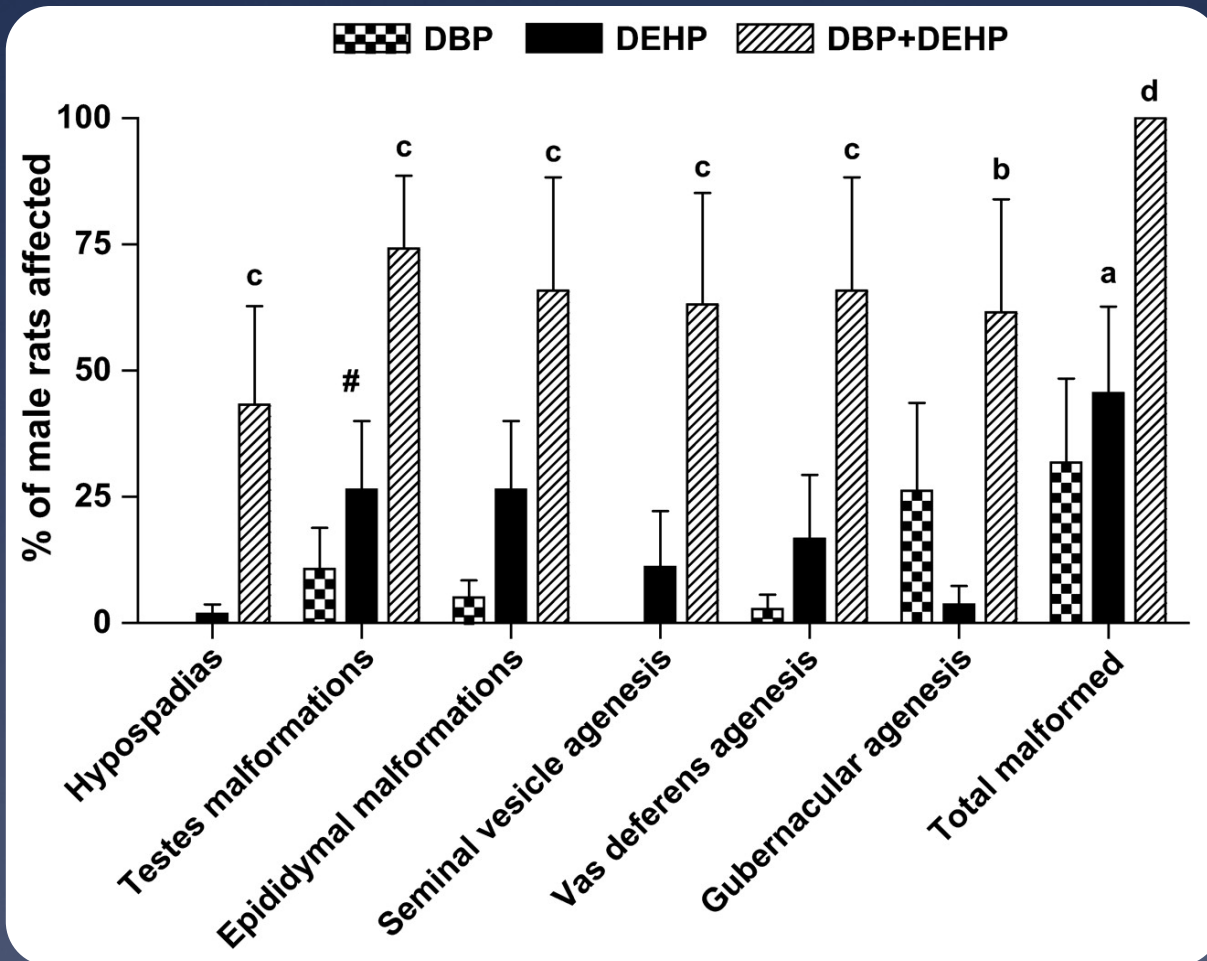
- \* Altered sperm quality in adult males



Duty et al. 2004, Hauser et al. 2008



# Abnormalities in Response to Cumulative Phthalate Exposure



# Endocrine Society Statement

**“Scientific societies such as the Endocrine Society should partner with other organizations with the scientific and medical expertise to evaluate effects of endocrine disrupting chemicals in humans”**

Diamanti-Kandaris E et al. 2009. Endocrine-Disrupting Chemicals: An Endocrine Society Scientific Statement. Endocrine Reviews 30(4):293-34

It's All About

The Timing

\*Fetus - Most Sensitive Life Stage



Weeks 0

8

16

24

32

40

Pronephros

Mesonephros

Kidney

Cloaca

UG Sinus

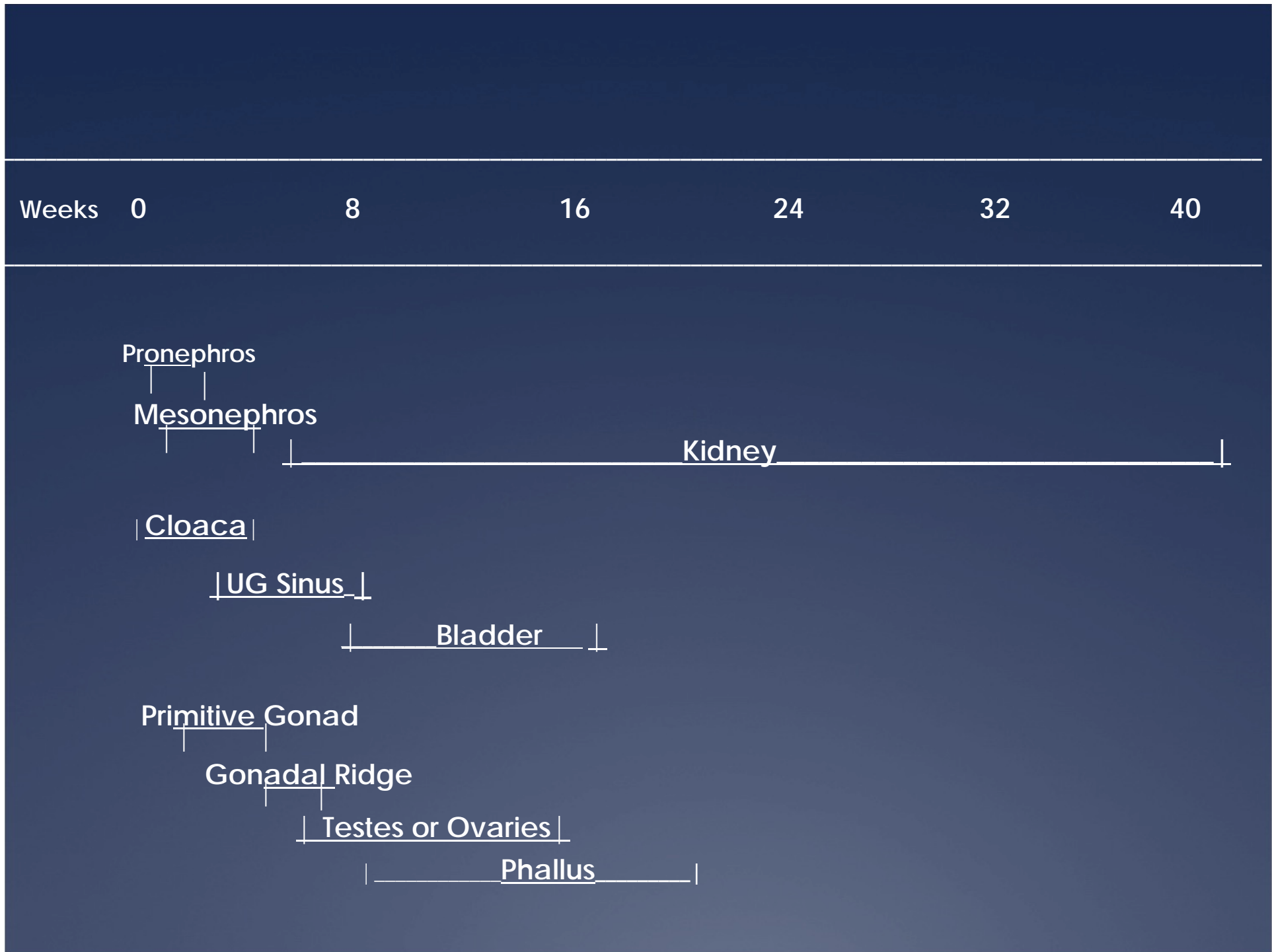
Bladder

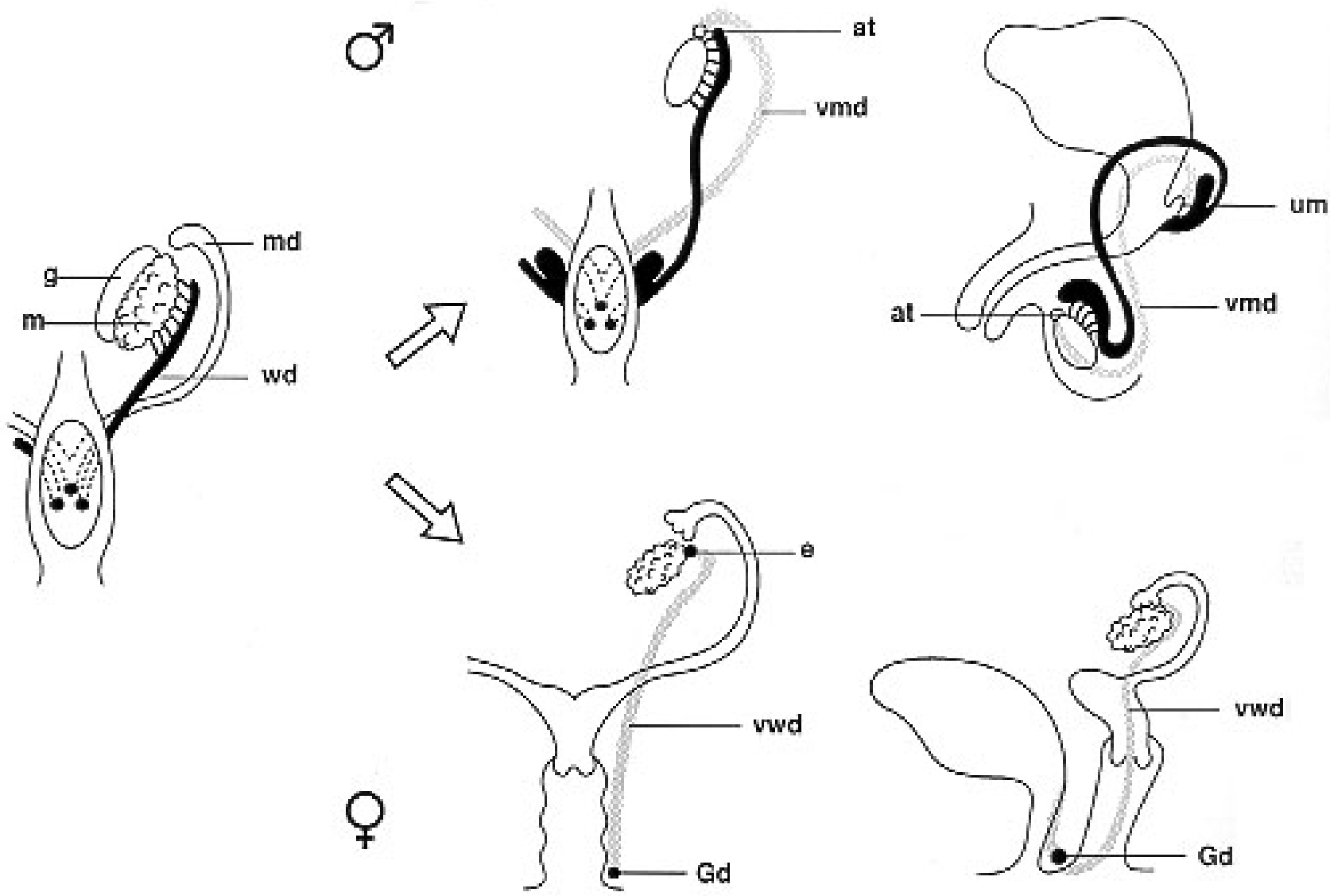
Primitive Gonad

Gonadal Ridge

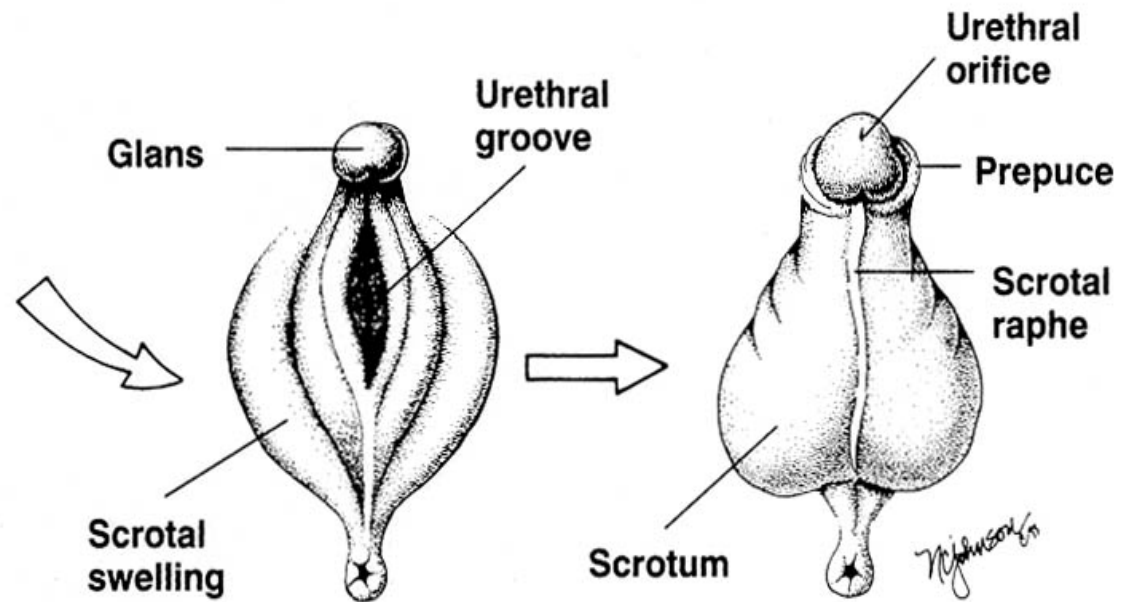
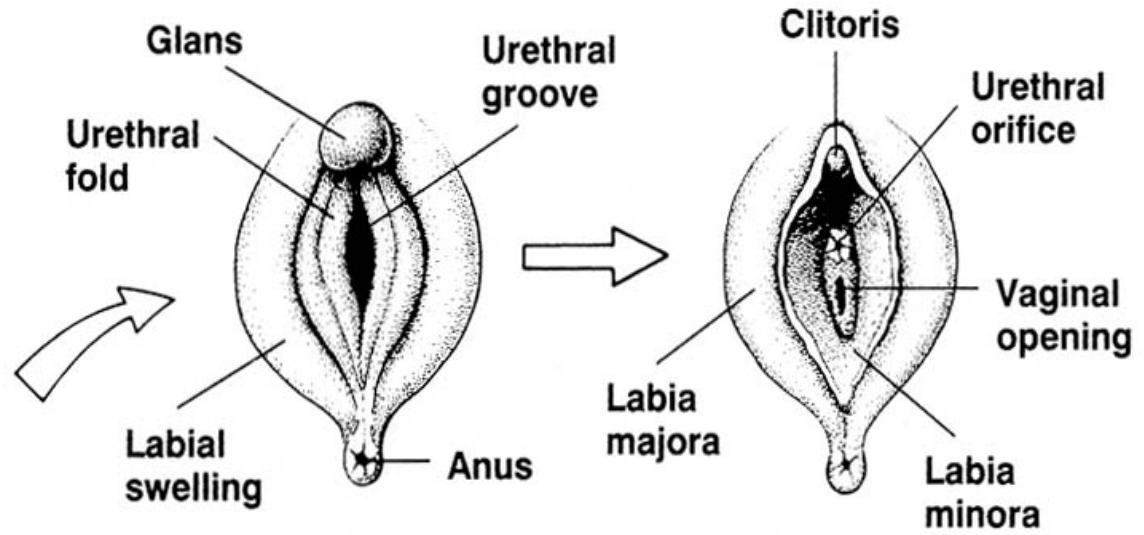
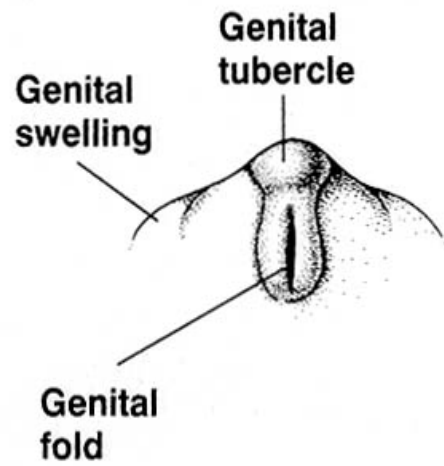
Testes or Ovaries

Phallus





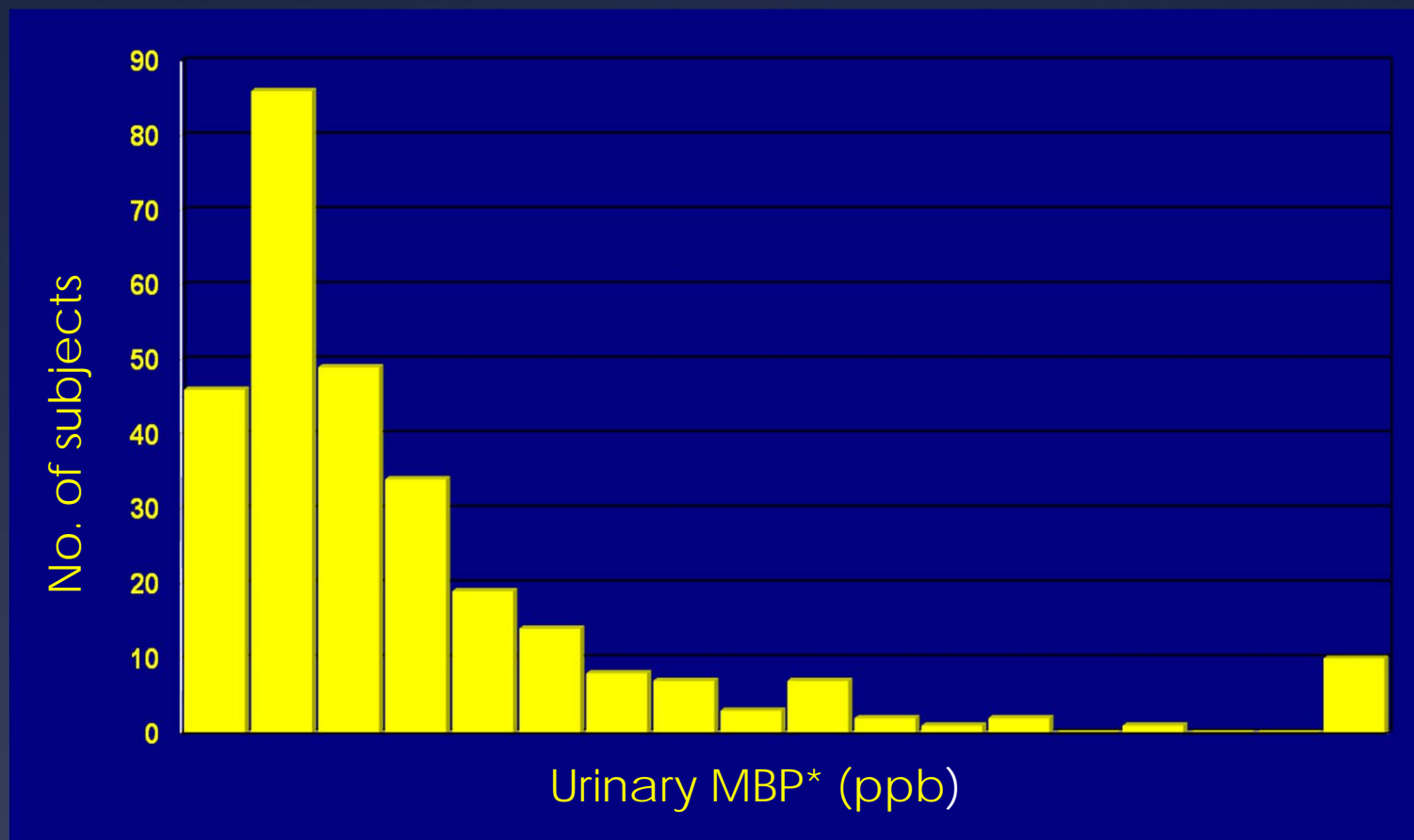




# Prenatal Exposure

[www.criticalwindows.com/go\\_display.php](http://www.criticalwindows.com/go_display.php)

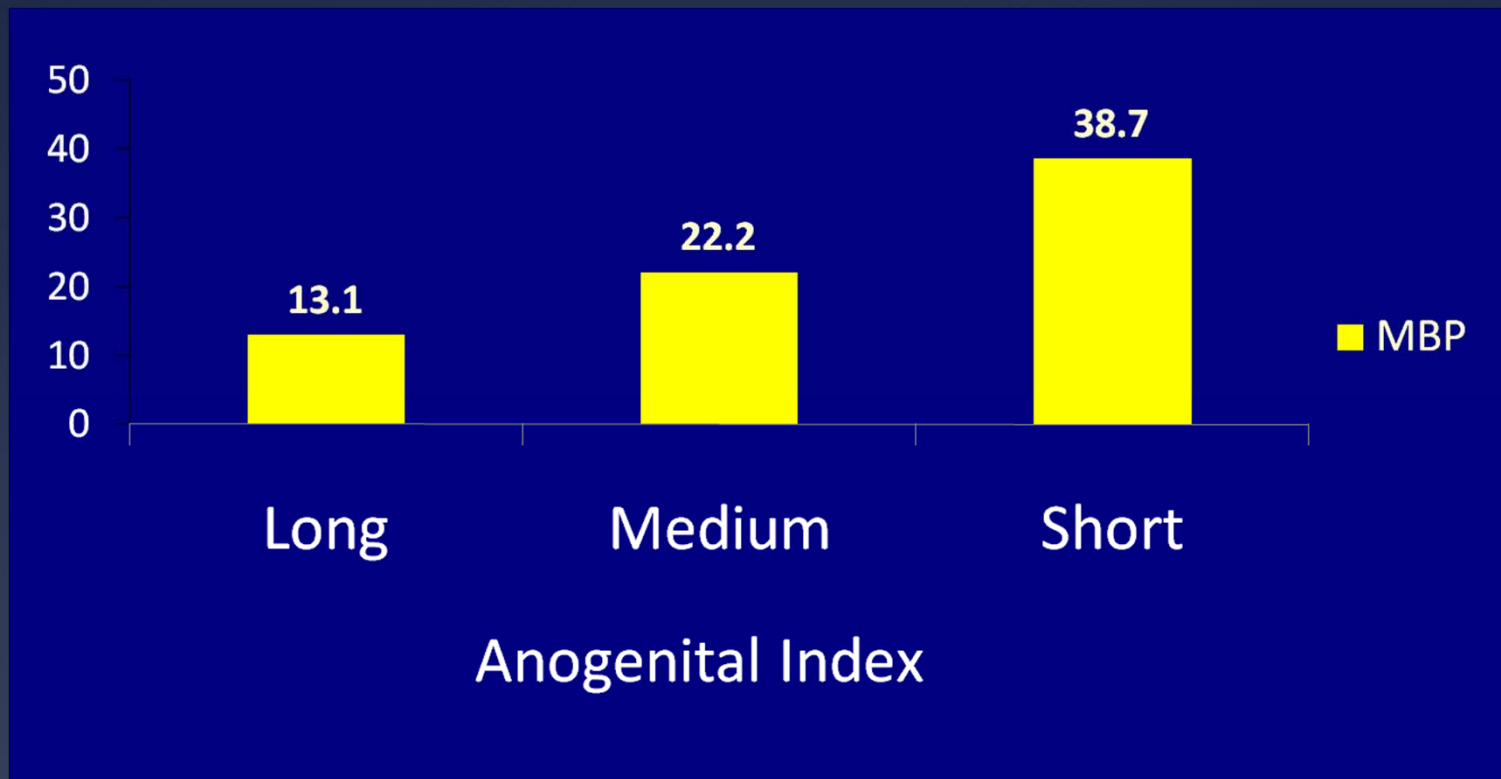
# Monobutyl Phthalate in Spot Urine Samples



\* A metabolite of dibutyl phthalate

Source: Blount, B.C. et al. 2000 EHP 108: 979-982

# Mean phthalate (MBP) metabolite levels (ppb) by AGI category



# Population Health

- \* Effects of EDC Can be Subtle
- \* Increased Variance from the Mean\*
- \* Individual Effect May Be More Difficult to Detect

\*Orlando and Guillette, 2001

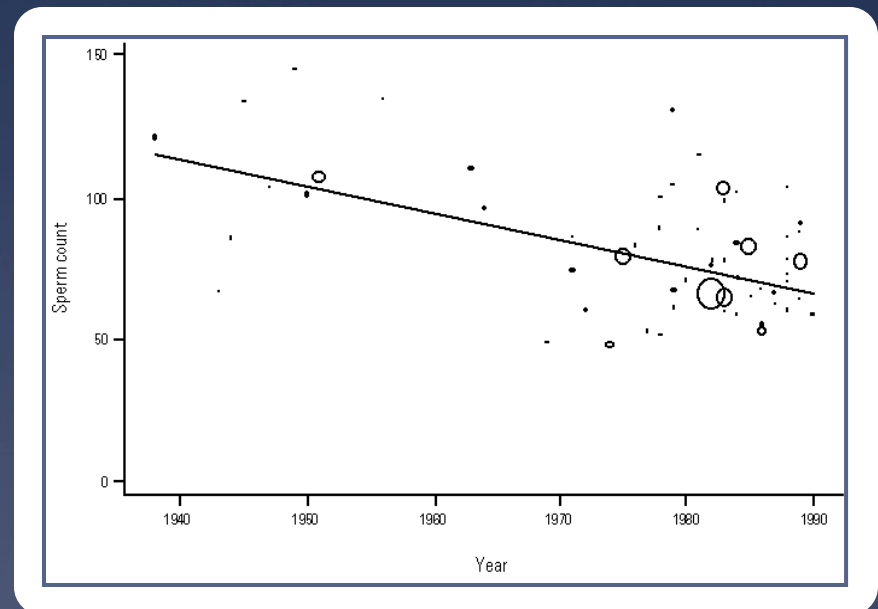
# Sperm Density

## Declines:

- \* United States (1938-1988)
- \* Western Europe (1971-1989)

## No Change:

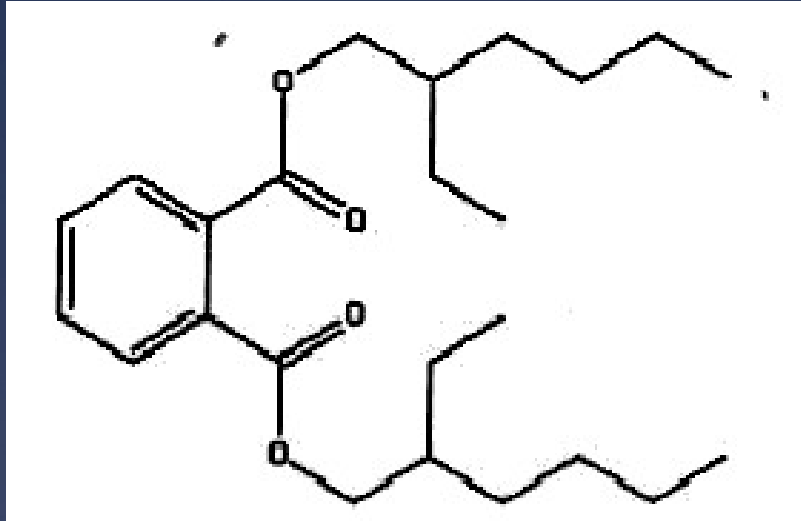
- \* Non-Western Countries(1978-1990)



# Risk Assessment

\* **Phase 1 - Hazard Identification**

# Di-ethylhexyl phthalate (DEHP)



- **Phthalate Plasticizer**
- **2 million tons/year**
- **Ubiquitous exposure**
- **General Uses**
  - Building materials
  - Clothing
  - Packaging
  - Medical Devices

**"EVERYWHERE CHEMICAL"**



# Prenatal Exposure

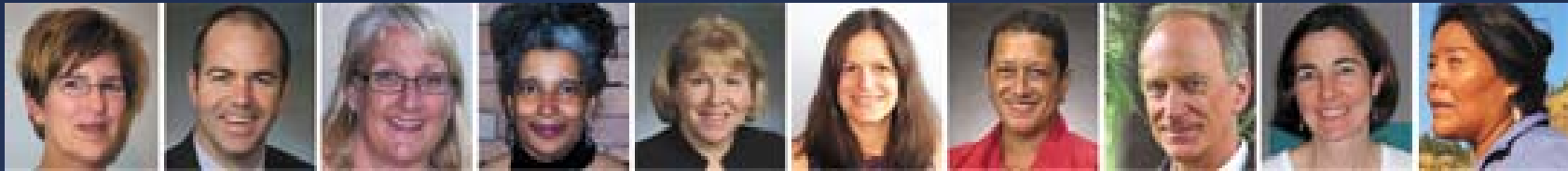
\* [www.criticalwindows.com/go\\_display.php](http://www.criticalwindows.com/go_display.php)

# Risk Assessment

\* Phase 1 - Hazard Identification

\* Phase 2 - Exposure Assessment

# Toxic Chemicals Found



## Toxic Pollution Found In Washingtonians

Toxic Chemicals	Fam Tazloll	Bill Finkbeiner	Karen Bowman	Ann Holmes Redding	Lisa Brown	Laurie Valeriano	Patricia Dawson	Denis Hayes	Allyson Schrier	Deb Abrahamson
PFCs ("Teflon chemicals")	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
FRDEs (toxic flame retardants)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Phthalates (plasticizers and fragrance carriers)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Pesticides		✓		✓	✓		✓		✓	✓
DDT (banned pesticide)	✓		✓	✓	✓		✓	✓	✓	✓
PCBs (banned industrial coolant)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Mercury	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Lead			✓							
Arsenic	✓		✓		✓		✓	✓		

# Phthalate Exposure Dose

- \* Neonates
- \* 54 Infants Classified by Exposure to DEHP Based on Medical Products
- \* MEHP Levels 5.1 fold  in High Exposure Group

# Phthalate Exposure Dose

## Pregnancy Exposure

**Table C2 Summary statistics for phthalate monoester metabolites in PPWC and NHANES**

Monoester Metabolite	NHANES <sup>2</sup>	PPWC <sup>3</sup>			
	50 <sup>th</sup>	25 <sup>th</sup>	50 <sup>th</sup>	75 <sup>th</sup>	% > LOD
MEHP	<b>4.1</b>	1.3	<b>3.2</b>	8.8	80.2
MEOP	<b>13.0</b>	5.1	<b>10.8</b>	21.5	95.3
MEHHP	<b>18.2</b>	6.0	<b>11.2</b>	22.3	98.1
MEP	<b>167</b>	50	<b>115</b>	437	98.1
MBP	<b>21.6</b>	7.3	<b>14.3</b>	32.2	96.2
MBP	<b>2.5</b>	0.9	<b>2.6</b>	4.8	76.4
MMP	<b>1.3</b>	0.7	<b>0.7</b>	2.9	55.6
MBzP	<b>15.4</b>	3.5	<b>8.9</b>	24.4	95.3
MOPP	<b>3.0</b>	0.7	<b>2.1</b>	3.6	69.8

<sup>1</sup> Not creatinine corrected

<sup>2</sup> NHANES 2001-02, Female age 6 and over

<sup>3</sup> Maternal prenatal samples

# Risk Assessment

- \* Phase 1 - Hazard Identification
- \* Phase 2 - Exposure Assessment
- \* Phase 3 - Dose Response Assessment

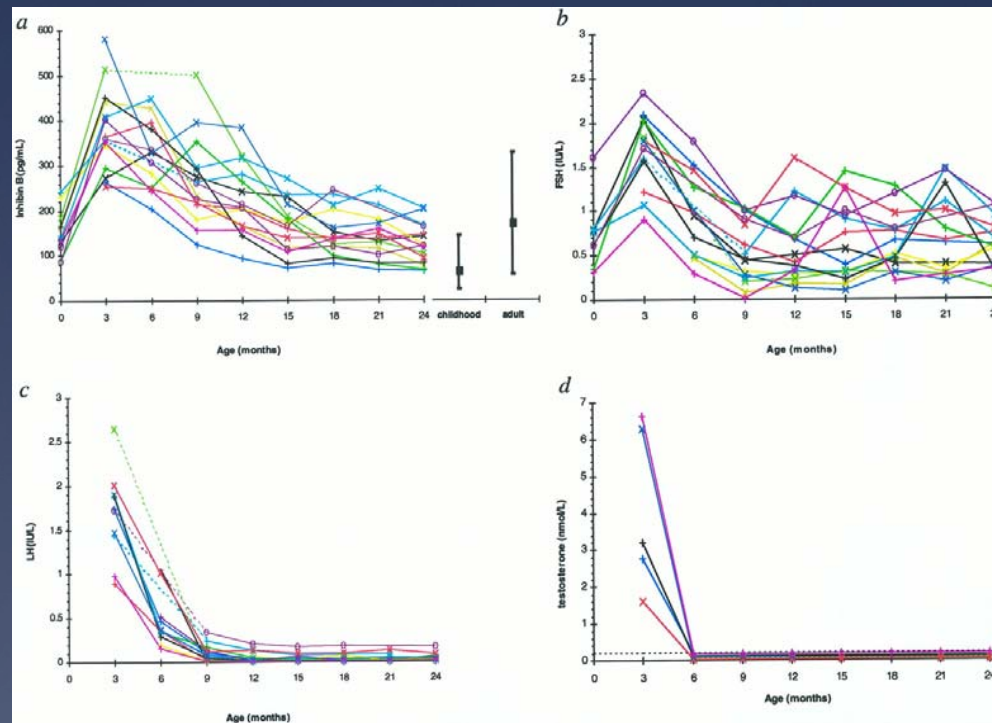
# Testosterone Production

\* Large Variations in Breast Milk mEHP Levels

\*  SHBG Levels

\*  LH Levels

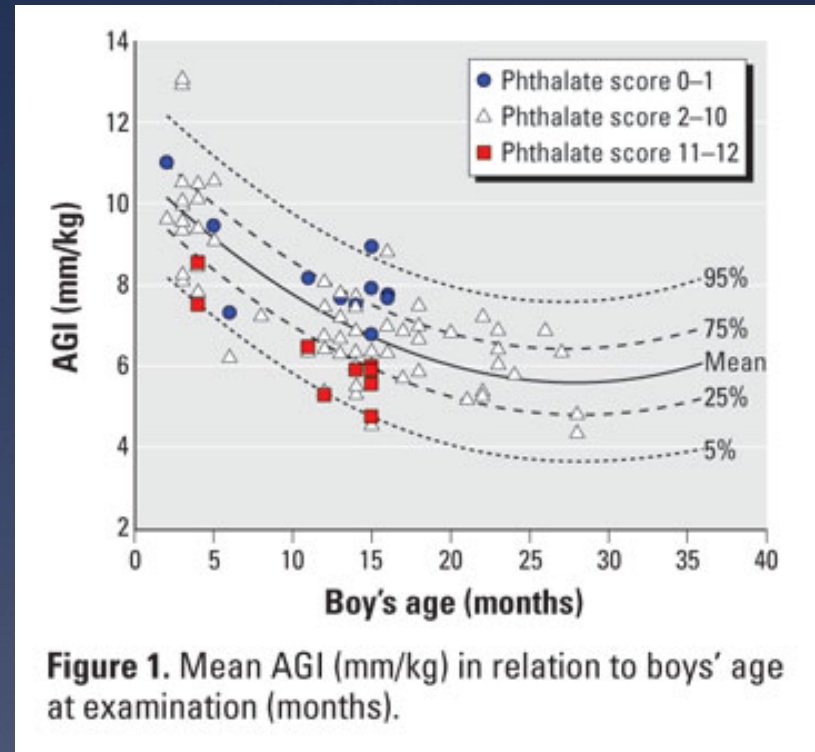
\*  Free Testosterone



Andersson, A.-M. et al. J Clin Endocrinol Metab 1998;83:675-681

# Prenatal Phthalate Exposure

- \* **Anogenital Index Decreased With Increased Phthalate Exposure**
- \* **Correlated With**
  - \* **Penile Volume**
  - \* **Cryptorchidism**
- \* **Concentrations Below That Found in 25% of Female Population in the U.S.**



**Figure 1.** Mean AGI (mm/kg) in relation to boys' age at examination (months).

**Table 2.** Percentiles of phthalate monoester metabolites.

Monomer metabolite	Percentile (ng/mL)			
	5th	50th	95th	Percent >100*
<b>Phthalate monoester metabolites</b>				
MBP	1.2	13.5	30.9	99.5
MBP	3.0	8.3	23.9	94.1
MBP	0.1	2.1	3.8	99.4
MBP	13.3	126.6	426.9	93.9
MBP	0.1	2.5	5.1	94.1
MBP	0.7	9.7	1.2	99.4
<b>Metabolites of DEHP</b>				
MBzBP	0.0	11.8	20.1	93.9
MBzP	1.2	3.3	10.0	93.9
MBzBP	0.1	11.0	19.0	94.1

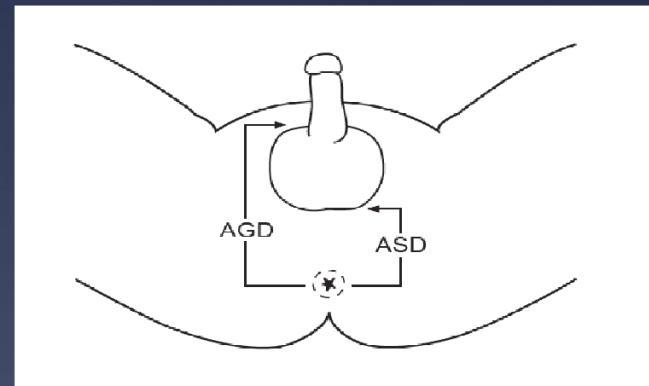
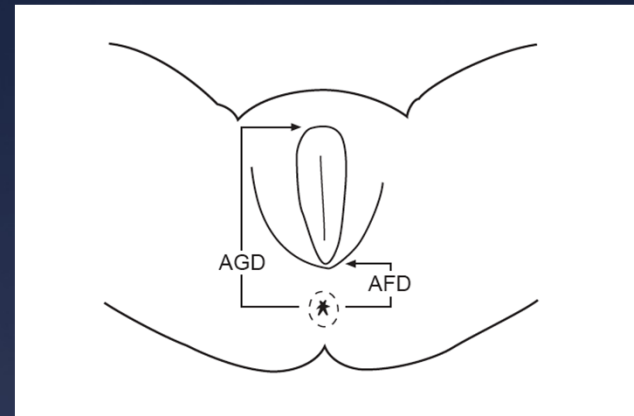
\*100% of metabolites was detected (100 and 1.07 ng/mL).

Swan, EHP: 113(8), 2005



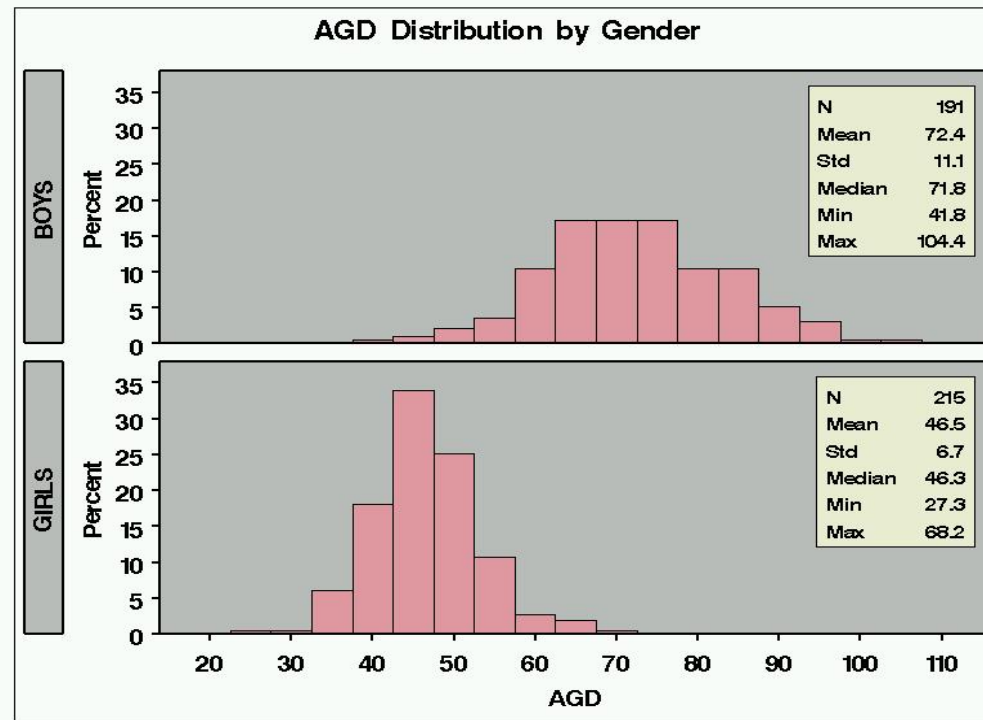
# Anogenital Distance

- \* Bioassay of Fetal Androgen Activity in Animal Studies
- \* Sexual Dimorphism Suggested in Humans<sup>1</sup>
- \* Prima Facie Evidence For *In Utero* Exposure in Humans as Well



<sup>1</sup>Salazar-Martinez, Env Health 3:2004

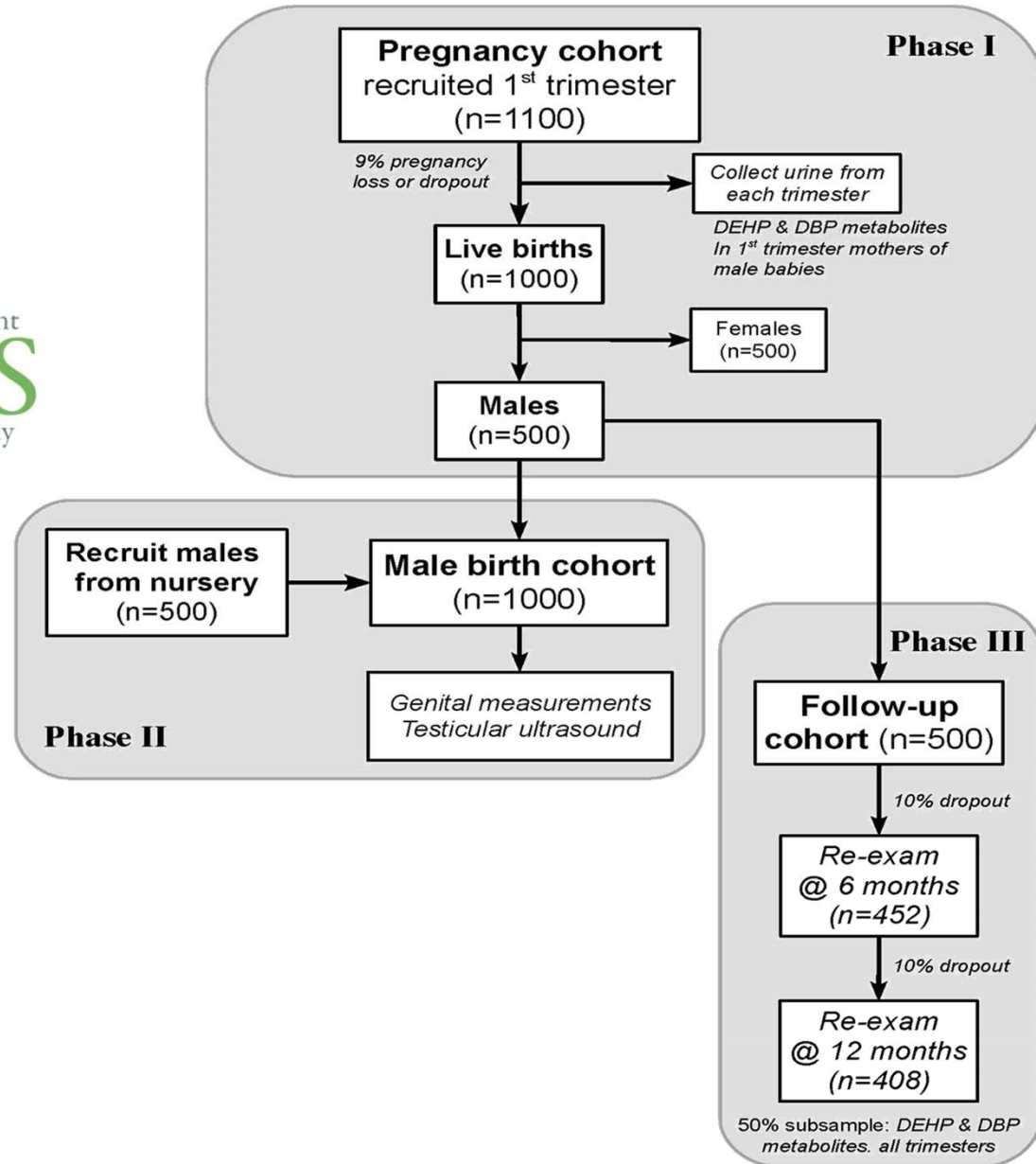
# AGD - Sexual Dimorphism



Beard, Sathyanaryana, Grady, 2008

# Ongoing Studies at Children's and UW

- \* Newborn AGD – completed in UW newborn nursery
- \* Case Control of AGD in cases of children with male reproductive abnormalities and controls
- \* PRIME – Premature Infants in the Medical Environment (NICU) @ Swedish/Prov Everett



# How Do We Avoid These Chemicals?

## Plastic #3 on recycling codes

- \* do not microwave food in plastic
- \* do not place hot liquids in plastic containers
- \* do not dish wash your plastics – leads to degradation
- \* use alternatives to plastic packaging when possible

## Toys/Personal Care Products

- \* some are labeled phthalate free but difficult to know true content
- \* support product labeling – CA Prop 65



## Precautionary Approach: Alternative Products



- \* Look for recycling code and avoid use of #7 (may or may not contain Bisphenol A) when possible
- \* Use safe alternatives such as glass or polyethylene plastic
- \* Choose canned foods from makers who don't use BPA (i.e. Eden foods)
- \* Try to buy soups/milk/milk products in cardboard cartons
- \* Choose alternatives to canned foods: Fresh fruits and vegetables
- \* Stainless Steel Water Bottles
- \* Bisphenol A free bottles



# How to Counsel Families

- \* Recognize Limited data on health impacts of modern chemicals
- \* Not useful to conduct body burden testing
- \* Work on decreasing exposures as much as possible (can never get to zero)
  - \* Env Working Group (pesticide in foods)
  - \* Env Defense Fund (safe seafood)
  - \* Clean Indoor Air (American Lung Association)
- \* Educate with appropriate resources

# Policy Implications

2005 European Union, Banned use of DEHP, DBP, and BBzP in all children's toys and childcare articles

- \* banned the use of DiDP, DnOP, and DINP in toys and childcare articles which can be placed in the mouth by children.

2007 Washington, Passed state law – Children's Safe Products Act

- \* Restricts phthalates in children's toys
- \* Also, decreases amount of lead/cadmium in toys

2008 US Federal Legislation, Toxic Toys Bill

- \* Restricts phthalates in children's toys



# PEHSU: Pediatric Environmental Health Specialty Unit (US EPA/ATSDR)

- \* Serve health care providers, public health professionals, communities, and families
- \* Unique interface of pediatric medicine-toxicology-teratology-epidemiology-exposure sciences
- \* Evidence-based Consultation and Education
- \* UW PEHSU: OR, ID, AK, WA
- \* Creates informational handouts for families
- \* 1-877-KID-CHEM  
<http://depts.washington.edu/pehsu/>



# A Turning Point

*“Many are turning to the government for assurance that these chemicals have been assessed using the best available science. Current law doesn't allow us to give those assurances.”*

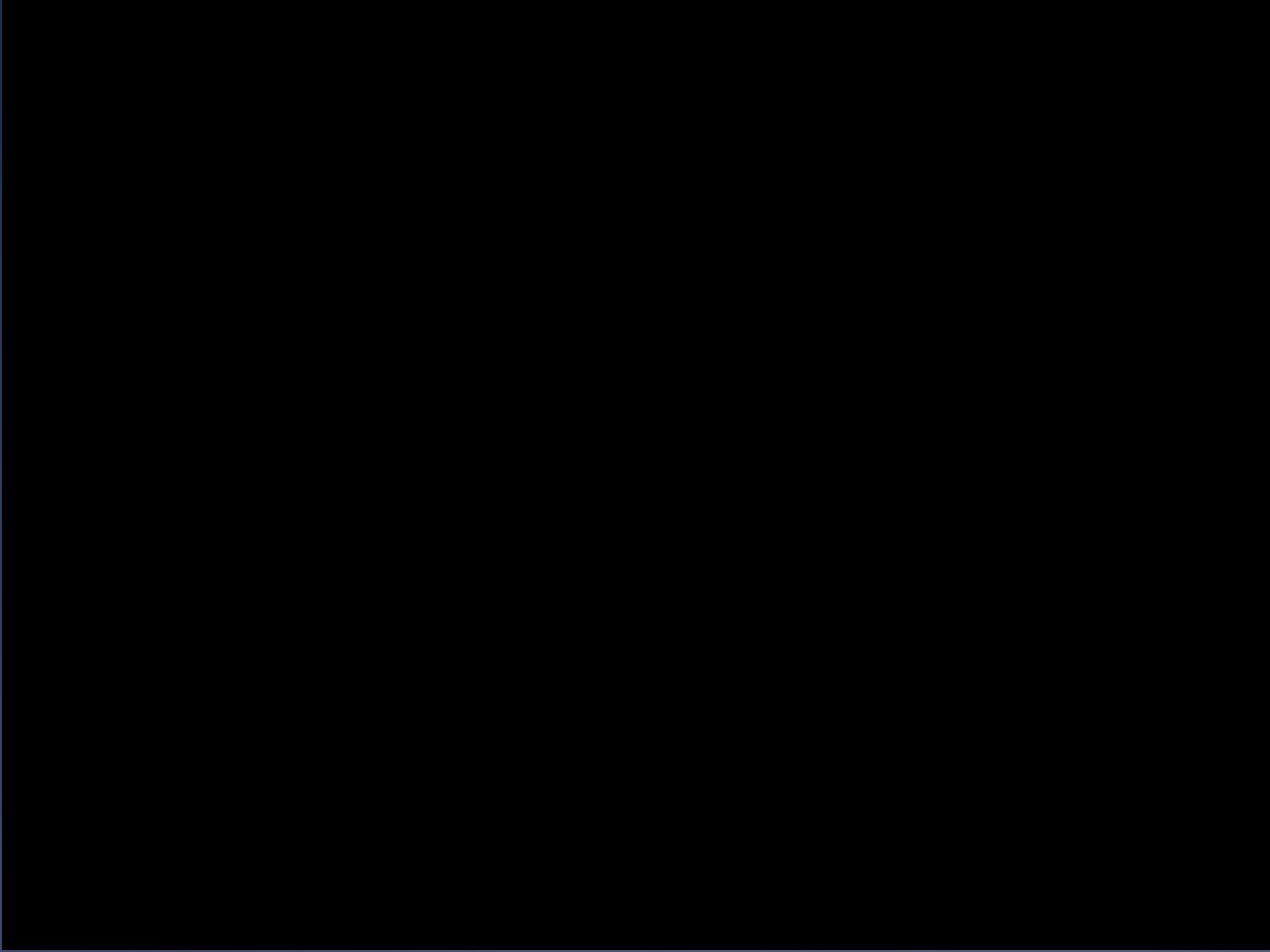
Lisa Jackson, Chief, US EPA

*Paradigm Shift: A chemical is harmful until proven otherwise; Precautionary Principle*



Reductionism

**As Physicians We Have a  
Special Knowledge and Duty to  
Use it to Enhance Public Health**



And all that the  
Lorax left here in  
this mess was a  
small a pile of  
rocks, with the one  
word, “UNLESS.”

UNLESS someone like you cares a whole  
awful lot, nothing is going to get better. It's not.

# Get Involved

- \* Learn More About the Topic
- \* Investigate
- \* Advocate
- \* Join Washington Physicians for Social Responsibility

# Acknowledgements

- \* Bill Bremner/John Amory
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- \* Shanna Swan
- \* Catherine Karr
- \* Center for Clinical and Translational Research
- \* Academic Enrichment Fund