ENDOCRINE DISRUPTION: ARE MALES AT RISK?

Theo Colborn, Ph.D.

TEDX

“The first 38 weeks of human life spent in the allegedly protected environment of the amniotic sac are medically more eventful and more fraught with danger than the next 38 years in the lifespan of most human individuals.” Dr. Ian Donald
“Disease Mongering” for Profit
Male Bass Across Region Found to Be Bearing Eggs

Pollution Concerns Arise In Drinking-Water Source

By David A. Fahrenthold
Washington Post Staff Writer
Wednesday, September 6, 2006; A01
HORMONE POLLUTION
Estrogen threatens minnow manhood
Released into an Ontario lake as an experiment, tiny amounts of the hormone wreak havoc on male fish

MARTIN MITTELSTAEDT
ENVIRONMENT REPORTER
May 22, 2007
ASK YOUR DOCTOR IF TAP WATER IS RIGHT FOR YOU.
## Human Reproductive Tissues in which Endocrine Disruptors Have Been Detected

<table>
<thead>
<tr>
<th>Tissue</th>
<th>References</th>
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<tbody>
<tr>
<td>amniotic fluid</td>
<td>Bradman <em>et al.</em> (2003); Foster <em>et al.</em> (2000)</td>
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<td>blood serum</td>
<td>Brock <em>et al.</em> (1998)</td>
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<td>blood, maternal blood</td>
<td>Dorea <em>et al.</em> (2001); Saxena <em>et al.</em> (1983); Siddiqui <em>et al.</em> (2003); Simonetti <em>et al.</em> (2001)</td>
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<td>blood, umbilical cord placenta</td>
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<td>breast milk</td>
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<td>colostrum</td>
<td>Waliszewski <em>et al.</em> (2002)</td>
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<td>meconium</td>
<td>Whyatt and Barr (2001)</td>
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<td>ovarian follicular fluid</td>
<td>Jarrell <em>et al.</em> (1993)</td>
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<td>semen</td>
<td>Arbuckle <em>et al.</em> (1999); Swan <em>et al.</em> (2003b)</td>
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<td>urine</td>
<td>Coronado <em>et al.</em> (2004); Curl <em>et al.</em> (2003)</td>
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Increased Prevalence of Human Disorders Since 1970s

- ADHD
- Autism
- Learning Disabilities
- Asthma
- Juvenile Cancer
- Juvenile Diabetes
- Juvenile Delinquency
- Juvenile Violence
- Autoimmune Diseases
- Cryptorchidism
- Hypospadias
- Endometriosis
- Obesity
- Osteoporosis
- Early Testicular Cancer/Mortality
- Male Dysgenesis Syndrome
- Breast Cancer
- Prostate Cancer
- Parkinson’s Disease
- Alzheimer’s Dementia
"The dose makes the poison"
Inverted U-Shaped Curve
Agonist

EFFECT

Low Dose  Traditional Dose
Timing and/or stage of development is as critical as dose.
1940’s: WWII -- fire retardants, pesticides, resins, plastics – derived from fossil fuels

1950’s: Indoor exposure begins to exceed outdoor exposure
1950’s
First generation exposed in womb
1970’s
1990’s
2010’s
4th generation - great, great grandchildren
Relationship between cord PCB and errors of commission as a function of splenium volume

Adapted from Stewart, et al. 2003, EHP
Percent Errors of Commission by Sex

Percent

Splenium size

All sizes

Smallest

Boys

Girls
Prevalence of medication treatment for attention deficit-hyperactivity disorder among elementary school children in Johnston County, North Carolina.

HEL...L000?!
M/F Ratio of Fetal Deaths and Neonatal Deaths

- from Vital Statisticas of Japan -

M/F Ratio

M/F Ratio of Neonatal Deaths

M/F Ratio of Fetal Deaths

From Mizuno, 2001, NEJM; Updated by permission.
Declining Sex Ratios in Canada

Declining sex ratio in a First Nation community

Sex differences in the prevalence of human birth defects: A population-based study


Paulozzi et al., 1997
Hypospadias in sons of women exposed to diethylstilbestrol in utero: A cohort study.

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

Male Dysgenesis Syndrome

- Increased incidence of undescended testicles and hypospadias
- Decreased semen quantity and quality
- Increased incidence in testicular cancer
- Increased need for assisted reproduction
### Critical Windows of Development

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<th>First Trimester</th>
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#### Central Nervous System
- General Development
- Spinal Cord & Hindbrain
- Forebrain & Midbrain
- Limbic System

#### Endocrine Glands & Organs
- Thyroid
- Pituitary
- Hypothalamus
- Parathyroid
- Pancreas
- Adrenals

#### Female Reproductive System
- Ovaries & Eggs
- Ductal System & Vagina
- Breast

#### Male Reproductive System
- Testes & Sperm
- Ductal System & Penis
- Prostate

#### Multi-system Endpoints
- Body Weight
- Behavior
- Serum Hormones
## Critical Windows of Development

### Chemical Filters
- Choose chemical(s) to display:
  - **BPA**
  - Phthalates

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Decreased testes weight and rate of testosterone production in adulthood.

Study details
Subjects: Long-Evans rats
Doses tested: 2.4 µg/kg bw/d
Chemical: BPA
Route: delivered through gavage
From gestational day 12 to 21 (comparable to human prenatal weeks 4.65 to 38)
Effects measured in adulthood (90 days of age)

Akingbemi, et al., 2004.
Think about us – think about prevention!
Vast numbers of widely dispersed chemicals, derived from fossil fuels, could pose a more imminent threat than climate change to the survival of humans and all living organisms on earth.
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