Pesticides, endocrine disruptors and a look toward the future.

Pete Myers, Ph.D.
Environmental Health Sciences
and
Carnegie Mellon University
Hormone-related cancers

ADHD

Learning disabilities

Endometriosis

Infertility

Heart disease

Degenerative diseases

Obesity

Autoimmunity

Fibroids

Asthma

polycysticovaries

Diabetes

Allergies

Autoimmunity

ADHD

Learning disabilities
19 Feb 2013: WHO – UNEP report

State of the Science of Endocrine Disrupting Chemicals - 2012

Edited by Åke Bergman, Jerrold J. Heindel, Susan Jobling, Karen A. Kidd and R. Thomas Zoeller
Many endocrine related disorders are on the rise, far too rapidly to be a change in gene frequency.

~800 chemicals in common use are known to disrupt endocrine function.

Human and wildlife exposure is ubiquitous.

Numerous laboratory, wildlife and epidemiological studies are consistent with endocrine disruption impacts on human health.

Disease risk due to EDCs may be significantly underestimated.

Significant opportunities for disease prevention by reducing exposures may be within reach.
Costly

HEALTH EFFECTS FROM ENDOCRINE DISRUPTING CHEMICALS COST THE EU 157 BILLION EUROS EACH YEAR. This is the tip of the iceberg: Costs may be as high as €270B.

€157B Cost by Health Effect

4 | Male Reproductive Disorders
6 | Premature Death
15 | Obesity & Diabetes
132 | Neurological Impacts (including ADHD)

€157B Cost by EDC Type

120 | Pesticides
26 | Plastic: Phthalates & BPA
9 | Flame Retardants
2 | Other

NOTE: The economic estimates do not include all costs associated with these conditions.

ENDOCRINE DISRUPTING CHEMICALS (EDCs) interfere with hormone action to cause adverse health effects in people.

THE TIP OF THE ICEBERG

The data shown to the left are based on fewer than 5% of likely EDCs. Many EDC health conditions were not included in this study because key data are lacking. Other health outcomes will be the focus of future research.

See Trasande et al. The Journal of Clinical Endocrinology & Metabolism
http://press.endocrine.org/ecd
Emerging evidence ties endocrine-disrupting chemical exposure to two of the biggest public health threats facing society—diabetes and obesity.

In 2015, there is far more conclusive evidence about whether, when, and how EDCs perturb endocrine systems, including in humans. Thus, it is more necessary than ever to minimize further exposures, to identify new EDCs as they emerge, and to understand underlying mechanisms.

Transgenerational effects of EDCs mean that even if a chemical is removed from use, its imprints on the exposed individual’s DNA may persist for generations and possibly forever.

It simply is not reasonable to assume a chemical is safe until proven otherwise.
Revolution in science

1. Low doses matter a lot
   …and non-monotonicity is common

2. Events in the womb don’t stay in the womb

3. Mixtures are ubiquitous and amplify effects
2.5 parts per billion of atrazine
ATRAZINE

Recommended application

Run-off

Streams

Safe short term

Surface water

Safe for drinking water

Rain

This result

Hayes et al. 2002
Revolution in science

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Revolution in science

1. Low doses matter a lot
   …and non-monotonicity is common

2. Events in the womb don’t stay in the womb

3. Mixtures are ubiquitous and amplify effects
   …or create them out of nothing
Halifax Project: Low Dose Theory Symposium
All day symposium – morning session webcast
Tuesday, August 25, 2015
Volume 36 Suppl 1 June 2015
Glyphosate-based herbicides

Ubiquitous use
“Under present and expected conditions of use, Roundup herbicide does not pose a health risk to humans.” “Roundup is placed in U.S. EPA’s least toxic category (IV) for acute oral, dermal and inhalation toxicity. Thus, the Roundup formulation is considered to be practically nontoxic by all these routes of exposure. …

Roundup herbicide, like glyphosate, has very low acute toxicity, which means very high exposure is required to cause an adverse effect.

Glyphosate does not adversely affect reproduction or development.

There is no evidence of endocrine disruption.
Glyphosate-based herbicides

Independent assessments...

Inconvenient data...

Teratogenic

Regulatory

Glymphosate induces human breast cancer cells growth via estrogen receptors

Siriporn Thongprakaisang, Apinya Thiantanawat, Nuchanart Rangkadiok, Tawit Suriyo, Jutamaad Satayavivada, b, c, d
Glyphosate-based herbicides

COVER STORY

Rocky Road For Roundup
Resistant weeds, fears of health effects drive market for alternatives to widely used herbicide

By Britt E. Erickson, Melody M. Bomgardner

As the World Health Organization’s research arm declares glyphosate a probable carcinogen,
September 9, 2015

California to Put Four Pesticides on Cancer List

French minister asks shops to stop selling Monsanto Roundup weedkiller

PARIS

U.S. lawsuits build against Monsanto over alleged Roundup cancer link

BY CAREY GILLAM

Environmental Health Sciences
RoundUp is an EDC

Huge implications
For health
For policy
For GMOs
Small number of exposures reduced
2. Small number of significant public health wins
That revolution in science…
3. Against an onslaught of chronic disease epidemics
4. And the continued use and de novo synthesis of thousands of chemicals about which we know almost nothing.
What’s wrong with that picture?

1. Tools agencies use for establishing safety are outdated, mostly irrelevant and based on false assumptions

2. Laws and regulations outdated

3. They stay that way because of the financial stakes and the effectiveness of manufactured doubt
Environmental Health Sciences
Non-monotonicity of tamoxifen

Welshons, in Vandenberg et al. 2012
What’s wrong with that picture?

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Where’s the good news?

1. The science grows ever stronger
2. The medical community is getting on board
3. Consumers are demanding safer materials
4. We have the science to help chemists make those safer materials
5. The states are improving policies; so is Europe
Looking forward: a caution

Much more is underway than toxification of the planet

These planetary forces are growing

And their interactions are force multipliers
What happens when shit hits the FAN?