

Endocrine disruption threatens the health of the Chesapeake Bay and the people living around it.

**Pete Myers, Ph.D.**  
**Environmental Health Sciences**  
and  
**Carnegie Mellon University**

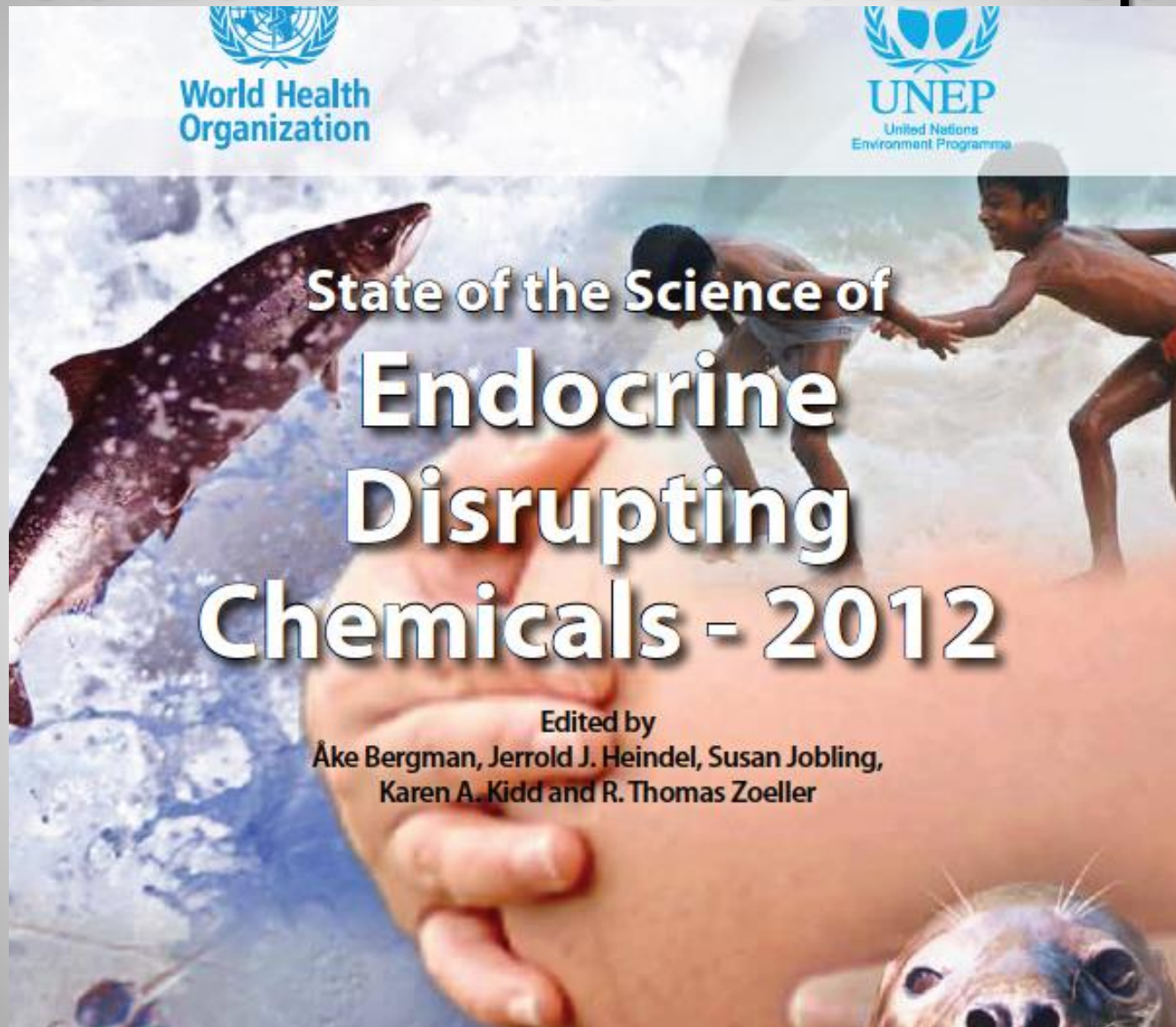


# Hormone-related cancers

ADHD  
Pre-term birth  
Learning disabilities  
Allergies  
Endometriosis  
**Infertility**  
Heart disease  
Diabetes  
Autoimmunity  
Degenerative diseases  
Autism  
Fibroids  
Obesity  
Asthma  
polycystic ovaries



# 19 Feb 2013: WHO – UNEP report



# ENDOCRINE REVIEWS

It simply is **not reasonable to assume a chemical is safe** until proven otherwise.

## Executive Summary to EDC-2: The Endocrine Society's Second Scientific Statement on Endocrine-Disrupting Chemicals

A. C. Gore, V. A. Chappell, S. E. Fenton, J. A. Flaws, A. Nadal, G. S. Prins, J. Toppari, and R. T. Zoeller

**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.**

Address all correspondence and requests for reprints to Andrea C. Gore, PhD,  
The University of Texas at Austin, 107 W. Dean Keeton, C0875, Austin, TX 78712  
. E-mail: [andrea.gore@austin.utexas.edu](mailto:andrea.gore@austin.utexas.edu).



# Revolution in science

1. Low doses matter a lot
2. Events in the womb don't stay in the womb
3. Testing methods are deeply flawed
4. Exposure is ubiquitous





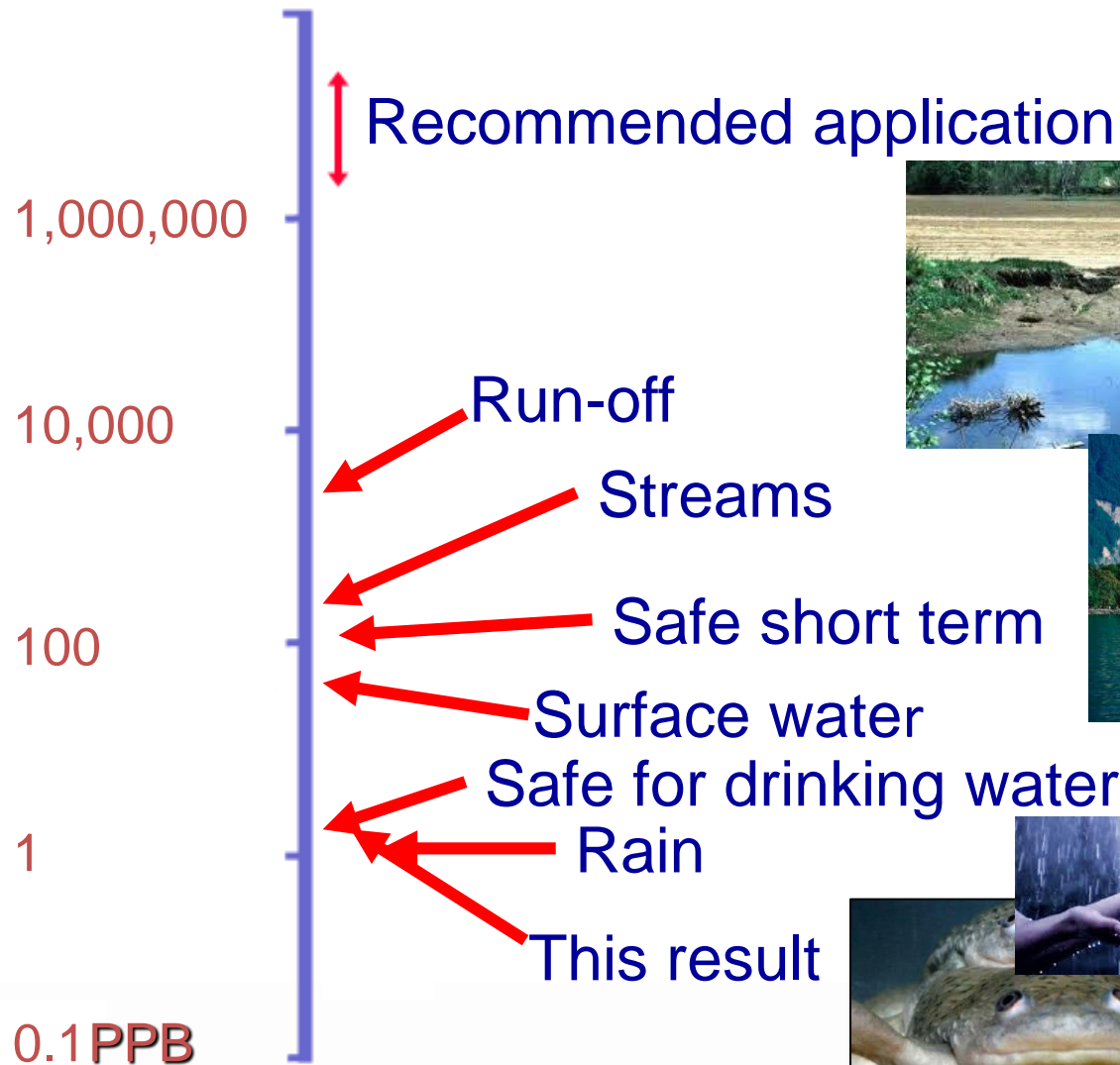
2.5 parts per billion of atrazine



Environmental Health Sciences



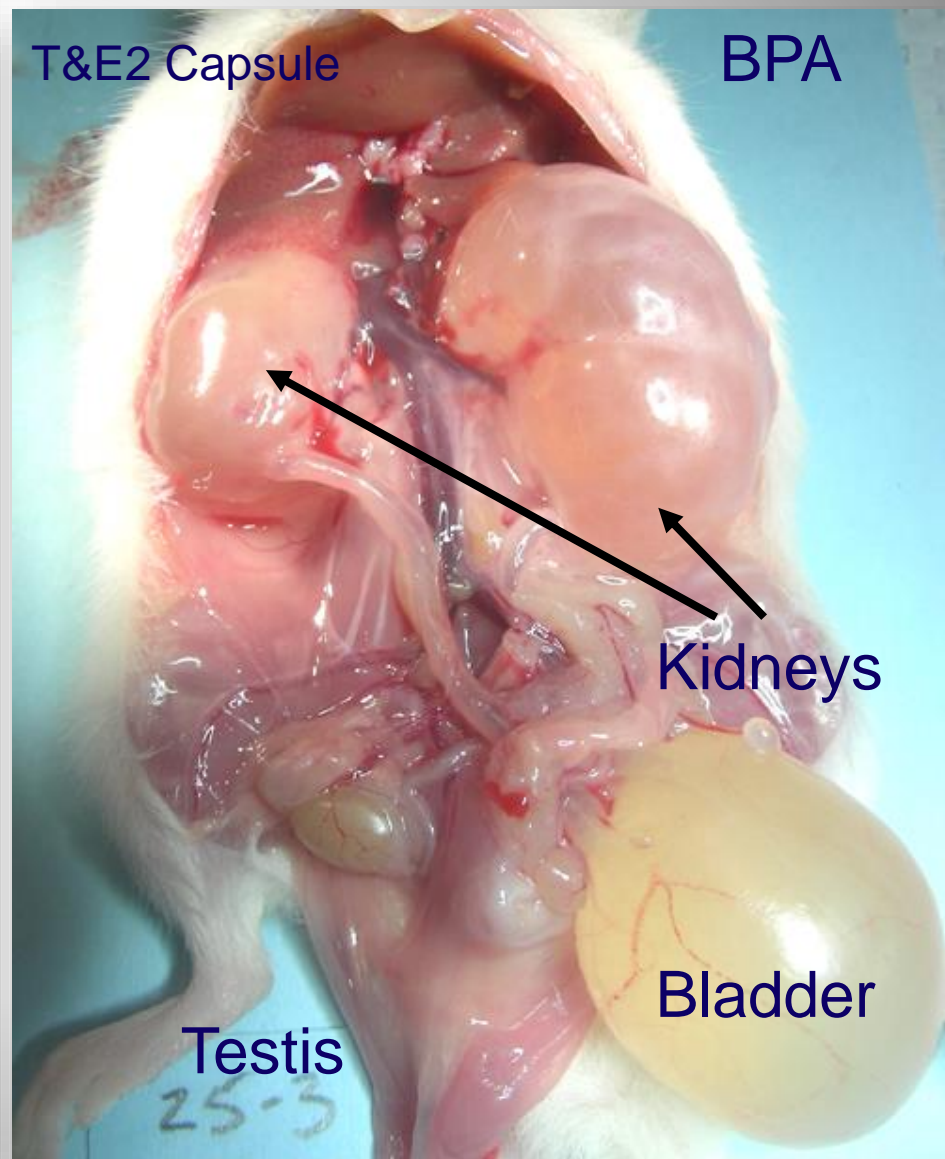
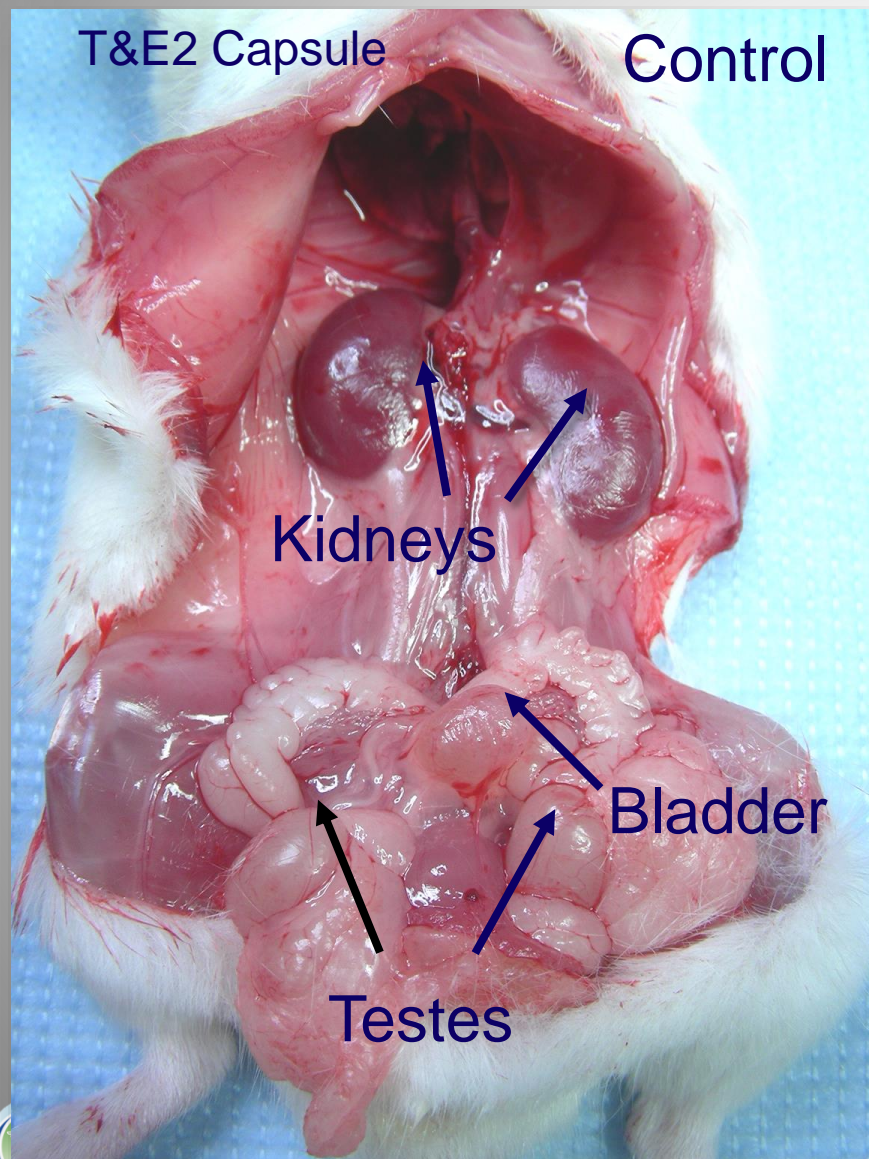
# ATRAZINE



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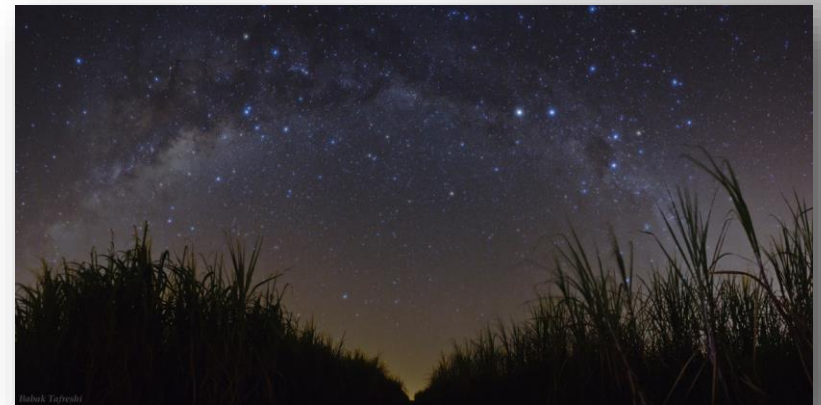
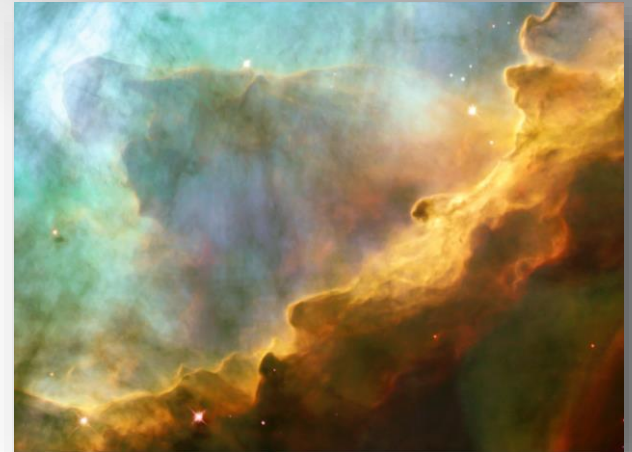




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1 part per billion

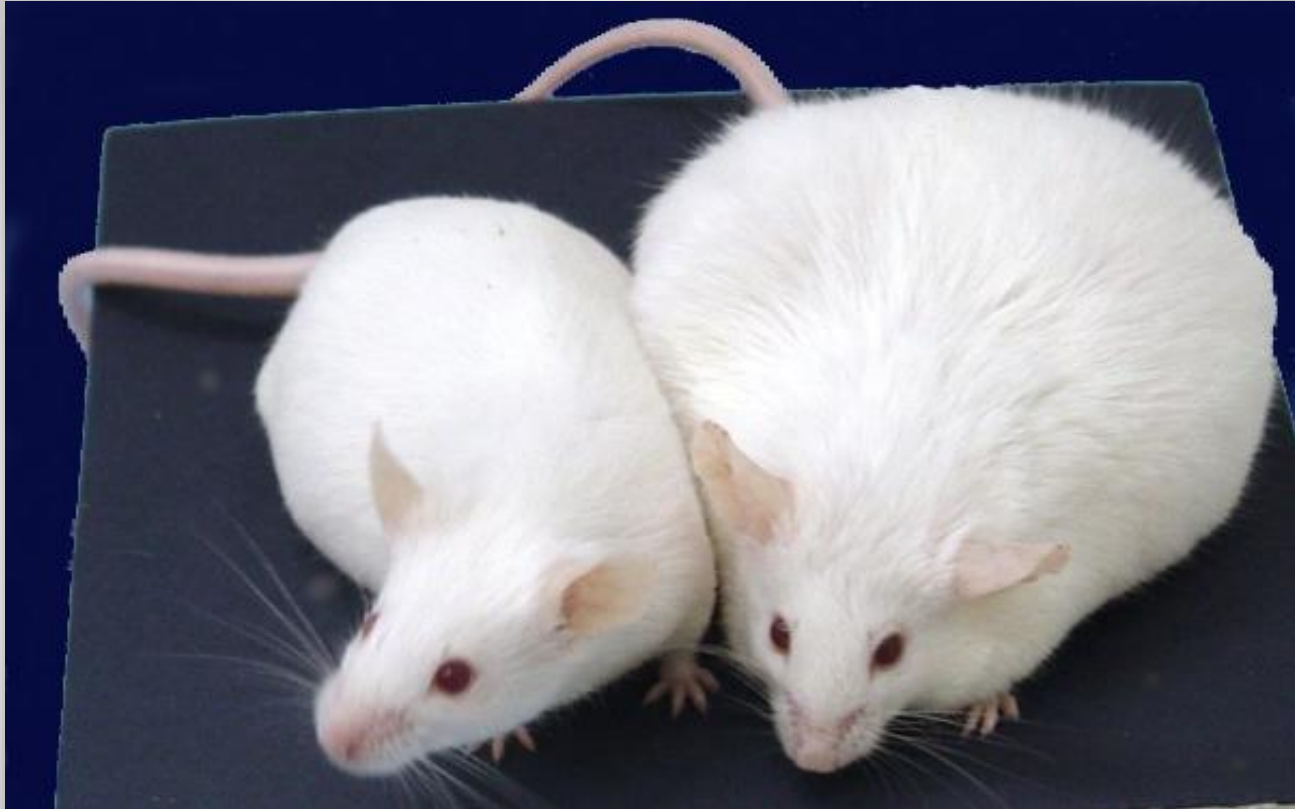


Same strain of mice  
Same caloric intake  
Same activity levels



1 part per billion

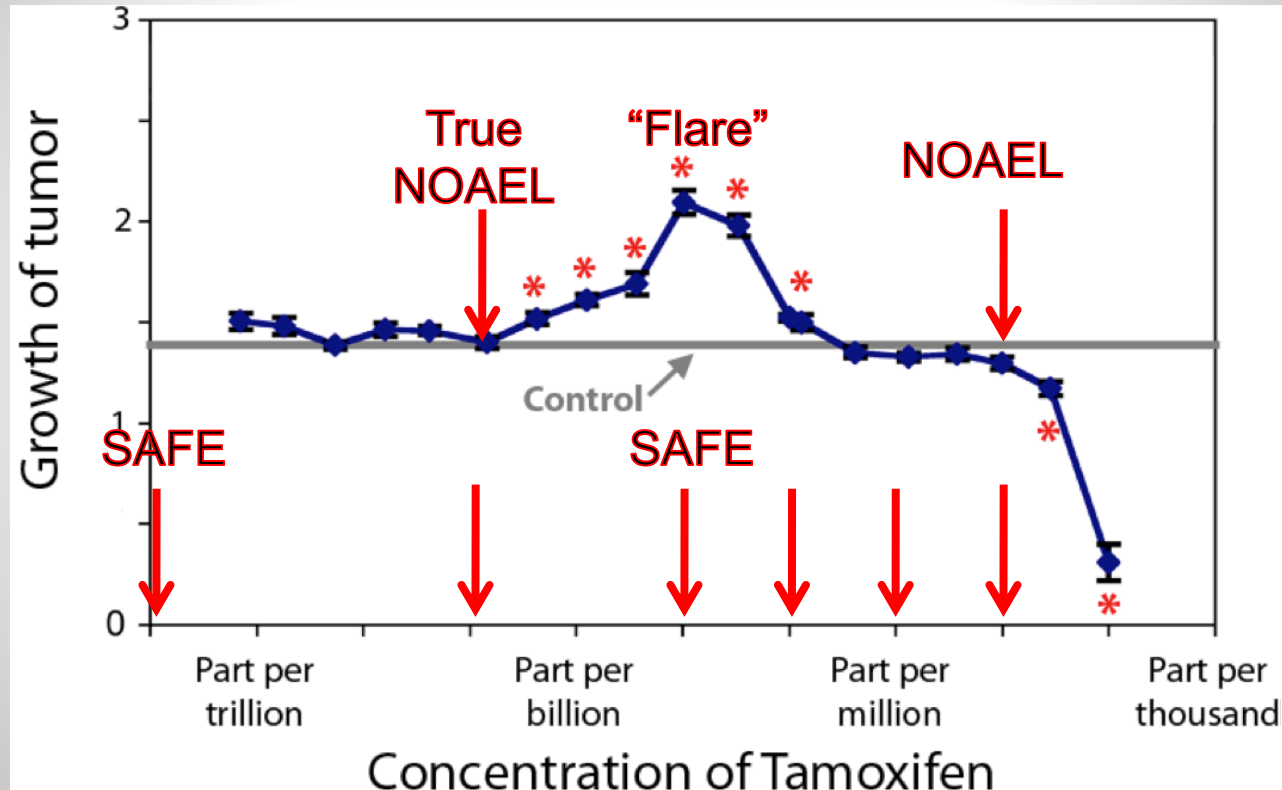
What about 1000 ppb?



Same strain of mice  
Same caloric intake  
Same activity levels



# Non-monotonicity of tamoxifen



Welshons, in Vandenberg et al. 2012



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## HOUSEHOLD USE

We estimate that 808 trillion microbeads may be washed down household drains in the United States every day

## WASTEWATER TREATMENT

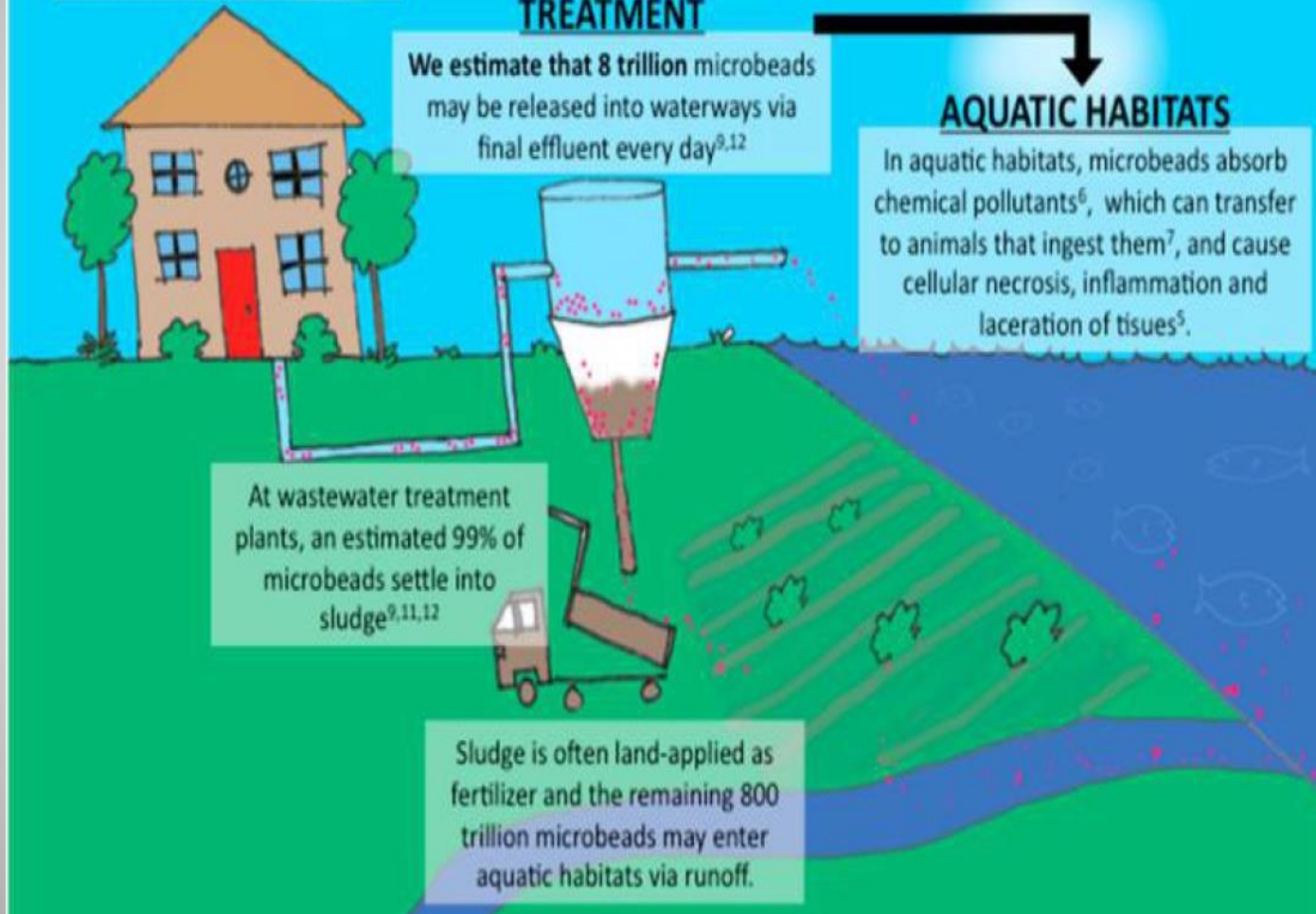
We estimate that 8 trillion microbeads may be released into waterways via final effluent every day<sup>9,12</sup>

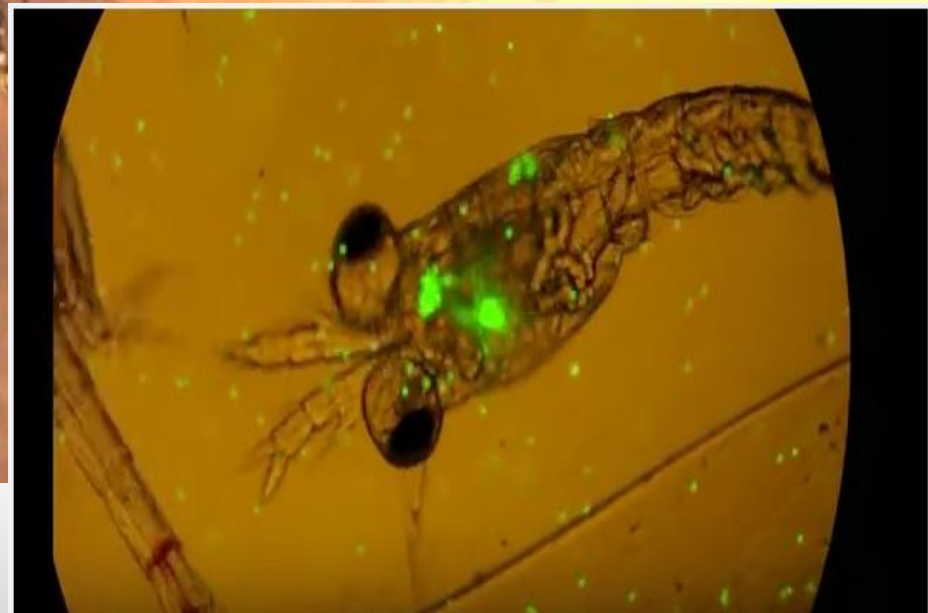
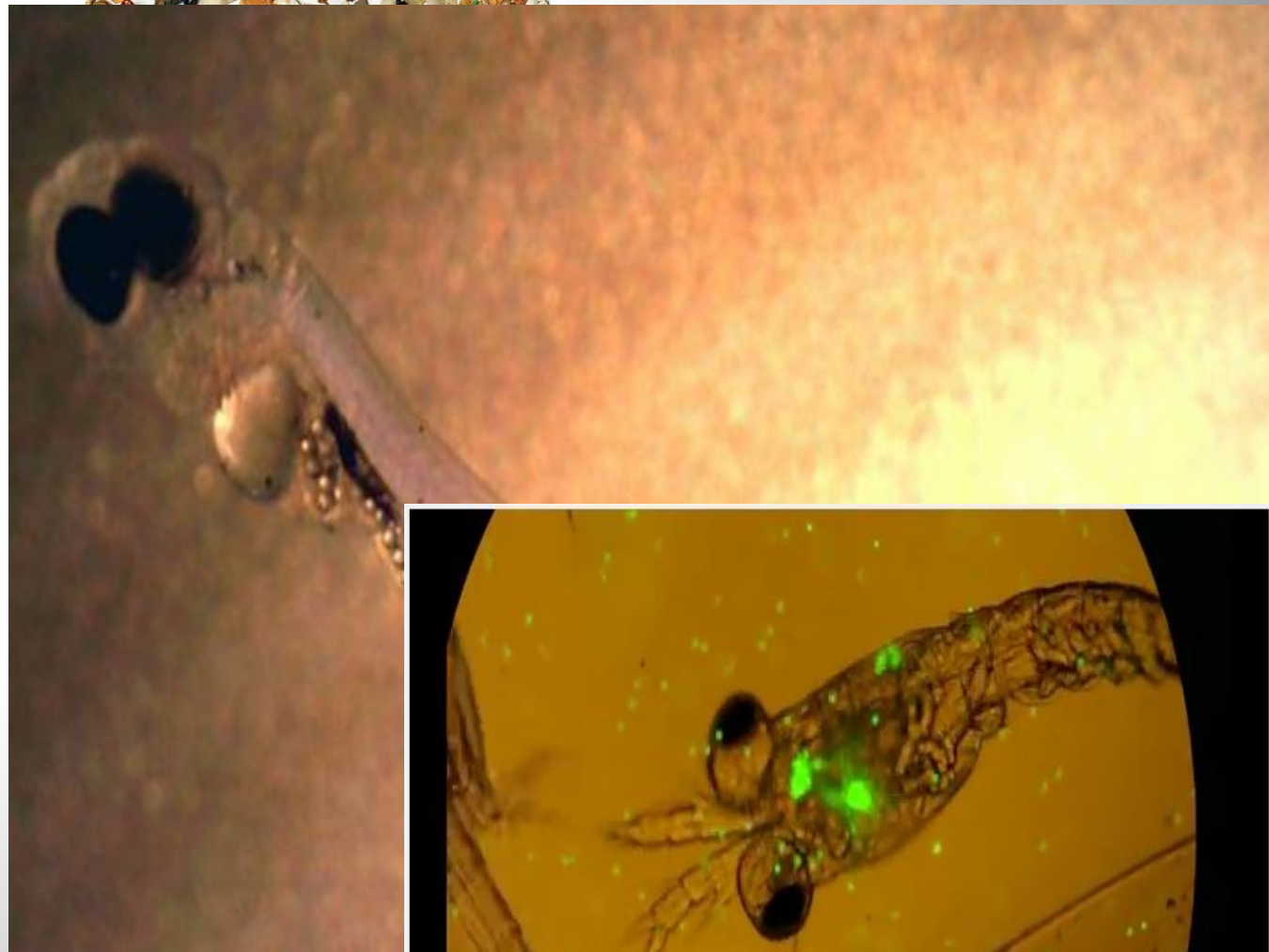
## AQUATIC HABITATS

In aquatic habitats, microbeads absorb chemical pollutants<sup>6</sup>, which can transfer to animals that ingest them<sup>7</sup>, and cause cellular necrosis, inflammation and laceration of tissues<sup>5</sup>.

At wastewater treatment plants, an estimated 99% of microbeads settle into sludge<sup>9,11,12</sup>

Sludge is often land-applied as fertilizer and the remaining 800 trillion microbeads may enter aquatic habitats via runoff.





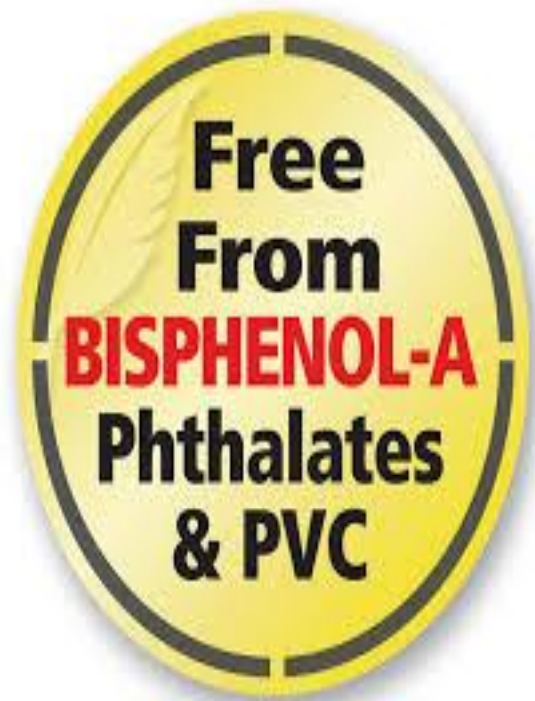
# Where's the good news?

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. New technologies to clean water are coming to market. TAML: Terry Collins, Carnegie Mellon

Univ.

Environmental Health Sciences





## Designing endocrine disruption out

T. T. Schug,<sup>\*a</sup> R. Abagyan,<sup>b</sup> B. Blumberg,<sup>c</sup> T. J. C.  
T. M. Edwards,<sup>h</sup> A. C. Gore,<sup>i</sup> L. J. Guillette,<sup>j</sup> T. H.  
K. A. Thayer,<sup>o</sup> L. N. Vandenberg,<sup>p</sup> J. C. Warner,<sup>q</sup>  
K. P. O'Brien<sup>\*g</sup> and J. P. Myers<sup>\*u</sup>

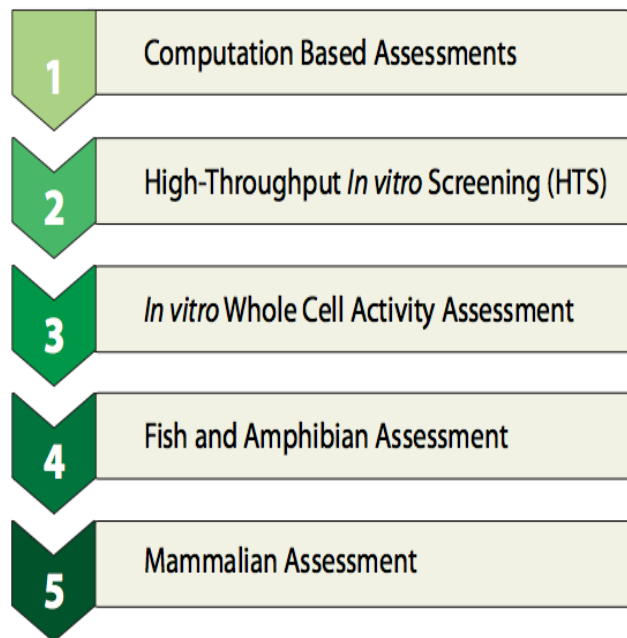
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A new voluntary testing protocol to aid chemists in the design of safer materials. Created by scientists, for scientists, TiPED is a dynamic tool to facilitate efficient and early identification of potentially problematic chemicals.

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# Hormone-related cancers

