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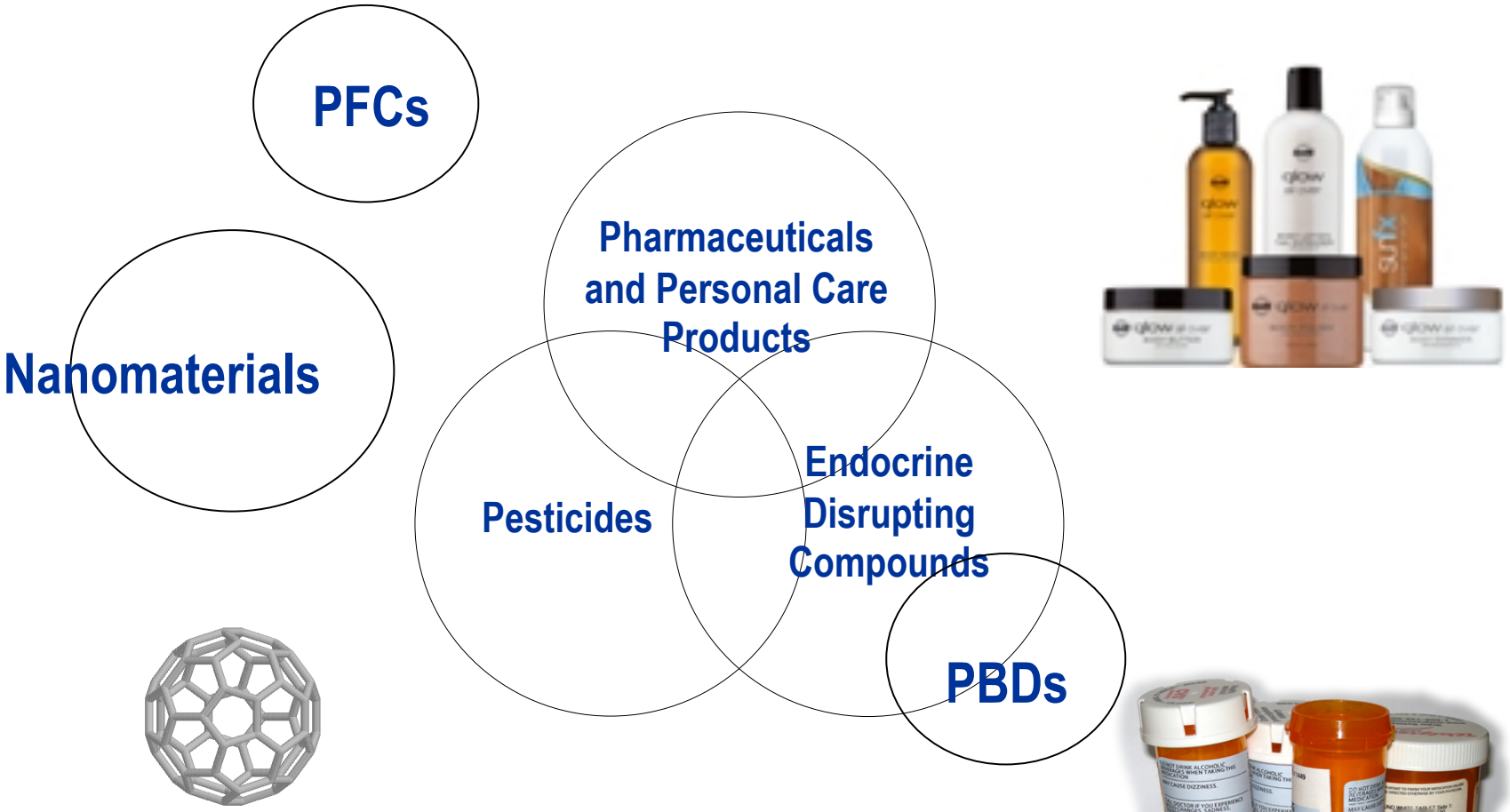
Outline of Presentation

- Introduction to Endocrine Disrupting Chemicals
- Human Exposure and Effects?
- Wildlife Exposure and Effects
- EPA's Four Pronged Strategy for CECs

Contaminants of Emerging Concern in Water*



*Not an exhaustive list.

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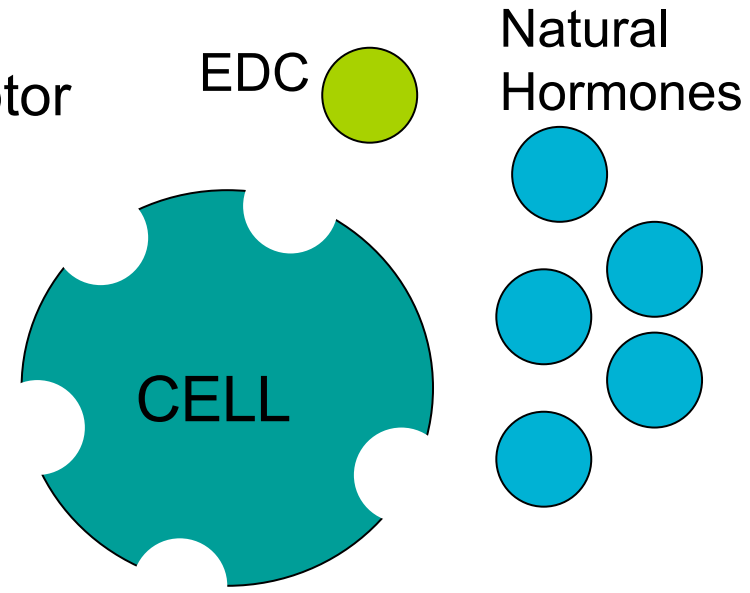
What is Endocrine Disruption?

Endocrine system secretes hormones to regulate growth, development, tissue function, metabolism and behavior.

- Binding to and activating estrogen receptor
- Binding to and blocking the estrogen receptor
- Binding to other receptors (androgen)
- Modifying the metabolism of natural hormones
- Modifying the production of natural hormones
- Modifying the number of hormone receptors



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What chemicals are suspected to be EDCs?

- Persistent organohalogens- dioxins and furans, PCBs
- Pesticides- atrazine, DDT, dieldrin, heptachlor, mirex
- Phthalates- dibutyl phthalate (DBP), diethyl-hexyl phthalate
- Metals- arsenic, cadmium, lead, mercury
- Misc- bisphenol A, PFOS
- Pharmaceuticals- contraceptives and hormone replacement therapy

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Endocrine Disruption in Humans

- Diethylstilbestrol (DES)- estrogen prescribed to pregnant woman from 1938- 1971 to prevent miscarriages
- Prescribed to 5- 10 million women
- DES daughters- higher risk of clear cell adenocarcinoma vaginal cancer in women and girls and infertility
- DES sons- increased risk of non-cancerous cysts on testicles
- Beginning to study the DES grandchildren- third generation from initial consumption

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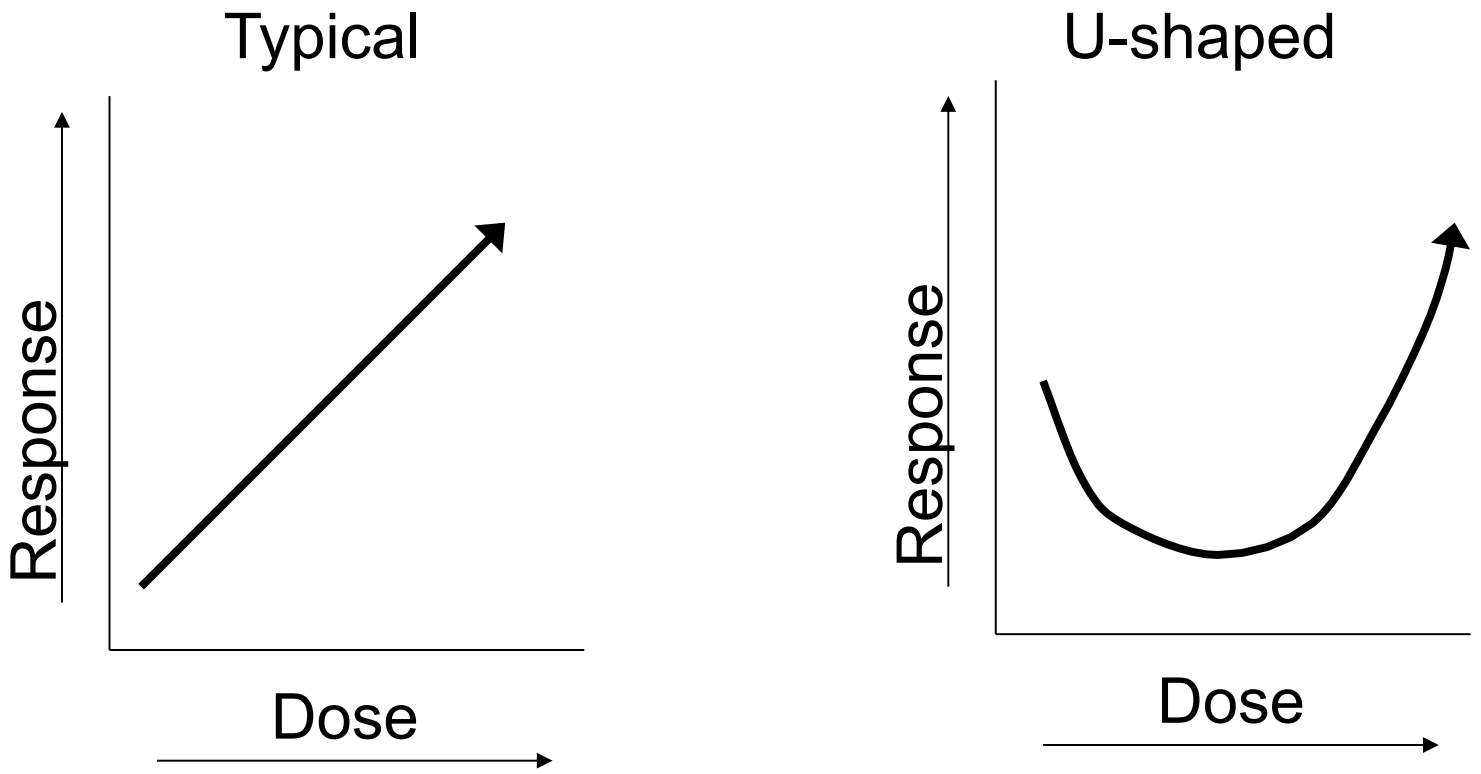
Dose-Response Curves



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Environmental EDC Effects to Humans?

- Decrease in sperm quality (Carlsen et al., BMJ 1992)
  - Decreased sperm count and seminal volume from 1938 to 1991
  - Other studies have found no decreases, and show high variability
- Breast and testicular cancer?
- Sex ratios?
- Hypospadia and cryptorchidism?

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Human Exposure to Pharmaceuticals Through Drinking Water

- Kostich (http://www.clu-in.org/conf/tio/ppcp2_101006/)
- Used a bioinformatics approach to determine which pharmaceuticals have the most potential for impacting humans
  - Sales data used to estimate mass dispensed per year
  - Calculated predicted environmental concentration (PEC)
  - Divided PEC by the daily dose to determine the number of liters of water one would have to drink to have the equivalent of one dose
  - For most chemicals, the volume of water ranged from several hundred to several thousand liters

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Summary

- Certain natural and synthetic chemicals may interact with the endocrine system, and are known as endocrine disrupting chemicals (EDCs).
- There is evidence to suggest that aquatic organisms may be affected by EDCs.
- Some of the effects in wildlife include genital and gender characteristic malformations, intersex organisms, skewing of gender ratios and vitellogenin induction.
- Humans have shown EDC related health issues from DES, but there is a great debate if chemicals at environmental concentrations are also having an effect.

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Office of Water's Strate

EPA/OW is pursuing a four-pronged strategy:

- Strengthening Science
- Improving Public Understanding
- Identifying Partnerships and Promoting Stewardship Opportunities
- Taking Regulatory Action When Appropriate

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Completed Activities

- Office of Water website for PPCPs in Water
- Analytical methods
- Exploratory occurrence studies
  - Targeted National Sewage Sludge Survey
  - Nine POTW Study
  - Fish Tissue Pilot Study
- National Academy of Science workshop
- SAB review of draft Methodology for Aquatic Life Criteria for Contaminants of Emerging Concern
- Federal disposal guidelines
- Treatment Technology Compendium
- Third Contaminant Candidate List (CCL3)

Ongoing Activities

- **Occurrence**
  - National Rivers & Streams Assessment
- **Techniques for risk assessment**
  - Methodology for Aquatic Life Criteria for Endocrine Disruption
  - Human Health Risk Assessment Screening
- **Guidance**
  - Health Care Industry Best Management Practices Guidance Document

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For more information

Visit our websites:

Pharmaceuticals & Personal Care Products in Water

http://water.epa.gov/scitech/swguidance/ppcp/index.cfm

EPA's Research on Pharmaceuticals

www.epa.gov/ppcp

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