Endocrine Disruptors Research Program and CAFOs

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US EPA Workshop on Fate and Effects of Hormones in Waste from Concentrated Animal Feeding Operations

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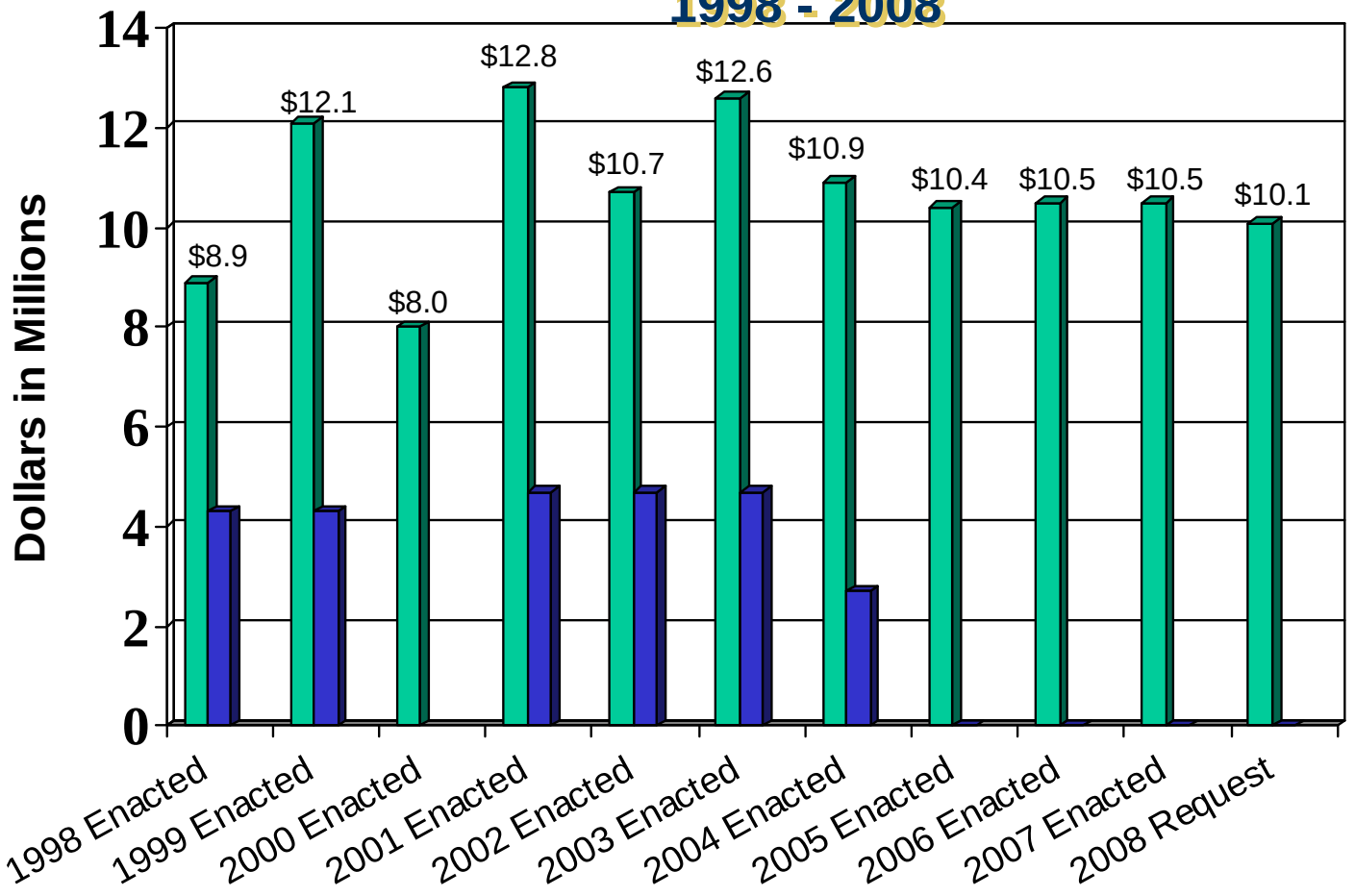
Annotated History of EPA's EDCs Research Program

Endocrine Disruptors Research
1998 - 2008



40.7 Total FTEs ('08)

31.8 NHEERL

3.9 NERL

2.0 NRMRL

3.0 NCER

Funding levels reflect total program including payroll, travel, WCF, and operating expenses.
STAR: Science to Achieve Results extramural grants

EDCs Extramural Research Program

- Supported through STAR Program since '96
  - EPA-only RFAs in 1996, 1997, 2004, 2005, 2006
  - Multi-Agency participation in 1998/99 and 2000
  - EPA-only Computational Toxicology RFAs in 2002 and 2003
- Portfolio includes 55 grants (www.epa.gov/ncer)
  - Broad array of topics, species, chemicals
  - Support approximately $41 M total
    - PIs have received > $15.5 M in additional funding
  - Comp Tox supporting 7 grants ($4.8 M)
  - Grants awarded in other research programs - >18 (>$4.6 M)

Lessons Learned in EDCs Extramural Research Program

- Value of STAR Grantee Workshops with EPA and other scientists
  - 1998 (with NIEHS); 2000; 2002; 2004 (epidemiology); 2006; 2007 (CAFOs)
- Topics of early RFAs were broad and cast a large net
  - Subsequent RFAs have been more targeted
- Where amenable, recently more awards have been made as cooperative agreements instead of grants
  - Provides a greater opportunity of sharing of data and leveraging resources
  - Appears to be a win-win situation

Multi-Year Plan: Long-Term Goals

- **LTG 1** - Provide a better understanding of the science underlying the effects, exposure, assessment, and management of endocrine disruptors
- **LTG 2** - Determine the extent of the impact of endocrine disruptors on humans, wildlife, and the environment
- **LTG 3** - Support EPA's screening and testing program

Assays Under Development Under LTG 3: Supporting Agency's Screening and Testing Program

*T1 - **In vitro***	T1 - ***In vivo***	***T2 - In vivo***
ER (rat cytosol)	Hershberger	Mammalian 2-gen
hrER binding [a]	Uterotrophic	Avian 2-gen
AR (rat cytosol)	Pubertal (female)	Amphibian dev, repro
hrAR binding [a]	Pubertal (male)	Mysid 2-gen
Steroidogenesis - rat sliced testes	Frog metamorphosis	Fish 2-gen
- H295R [a]	Fish screen	*In utero*/lactation -tier ? [a]
Aromatase - placenta		
- recombinant [a]		

[a] alternate

Examples of Research - LTG 1:
Understanding Underlying Science

- Determining classes of chemicals that act as EDCs, their modes of action, and their potencies
  - (Anti)androgens, (anti)estrogens, antithyroids
- Studying approaches to assess cumulative risk to EDCs
- Determining the dose-response curves for EDCs at environmentally relevant concentrations
- Studying the impact of developmental exposures in the short term and later in life
- Examining the ability to extrapolate across species

Examples of Research – LTG 1:

Understanding Underlying Science

- Identifying major sources of EDCs entering the environment, focusing on:
  - wastewater treatment plants
  - drinking water treatment plants
  - concentrated animal feeding operations
- Developing tools to characterize and minimize exposures to EDCs

Examples of Research – LTG 2: Determining Impacts

- Determining the magnitude of adverse impacts on wildlife
  - Evidence that EDCs are affecting wildlife at individual level
  - Evidence that EDC effects in individuals are causing population-level effects
  - What tools are needed to provide linkage between population level effects and diagnostic evidence of EDC impacts

- Determining the magnitude of adverse impacts of EDCs on human health
  - Supported 12 epidemiology studies across federal agencies
- Exposure to high levels of PBBs prenatally and via breast milk may impact puberty in girls
- Conducted large scale exposure studies to assess exposures of children to environmental chemicals, including some suspected EDCs

Examples of Research – LTG 2:
Determining Impacts

- Paper Mill Effluents
- Waste Water Treatment Effluents
  - Collaborations with: Office of Water, 10 EPA Regions; Global Water Research Coalition, state of Ohio, Chicago
- Sludge
- Drinking Water
- CAFOs
- Dosed Lake Study with Canada
- Developing novel methods to characterize exposures to mixtures


Calumet Water Reclamation Plant

Examples of CAFOs Research – LTG 2

- High levels of estrogens found in swine lagoons
- Androgenic activity found in run-off from cattle farms
- Characterized impact of exposures on current aquatic organisms and estimated future population-level effects
- Determined temporal patterns of androgenic activity and concentrations of both α- and β-trenbolone (metabolites of trenbolone acetate implanted in cattle) in feedlot discharge
- Using Kbluc, MDA-kb2
- Cross-Laboratory/Center Study: Assessment of the Occurrence and Potential Risks of EDCs in Discharges from CAFOs
  - Issued RFA and made 7 awards

What's in the Future?

- Updating Multi-Year Plan
  - Taking into consideration recommendations by BOSC Program Review
    - Mid-cycle review in September 2007
  - Continuing to develop new methods/tools and applying them to environmentally relevant issues – e.g., WWTP, CAFOs, pharmaceuticals
- Interest in expanding our partnerships and collaborations
- Communicating results
  - Informal interactions with client offices within EPA
  - Workshops
  - Developing a website
  - Synthesis document that summarizes intramural and extramural research

Summary

- There is global concern regarding exposures to some environmental agents that interfere with endocrine systems
- EPA has developed a research program that has three Long Term Goals and is addressing specific key science questions
- EPA's EDCs' program is unique among research organizations
  - Human health and wildlife
  - Effects, exposure, risk management
  - Intramural and extramural research
  - Core and problem-driven
  - Leveraged with collaborators in other federal agencies, academia, and industry