



ENDOCRINE **DISRUPTORS** RESEARCH PROGRAM
BUILDING A SCIENTIFIC FOUNDATION FOR SOUND ENVIRONMENTAL DECISIONS

www.epa.gov/ord

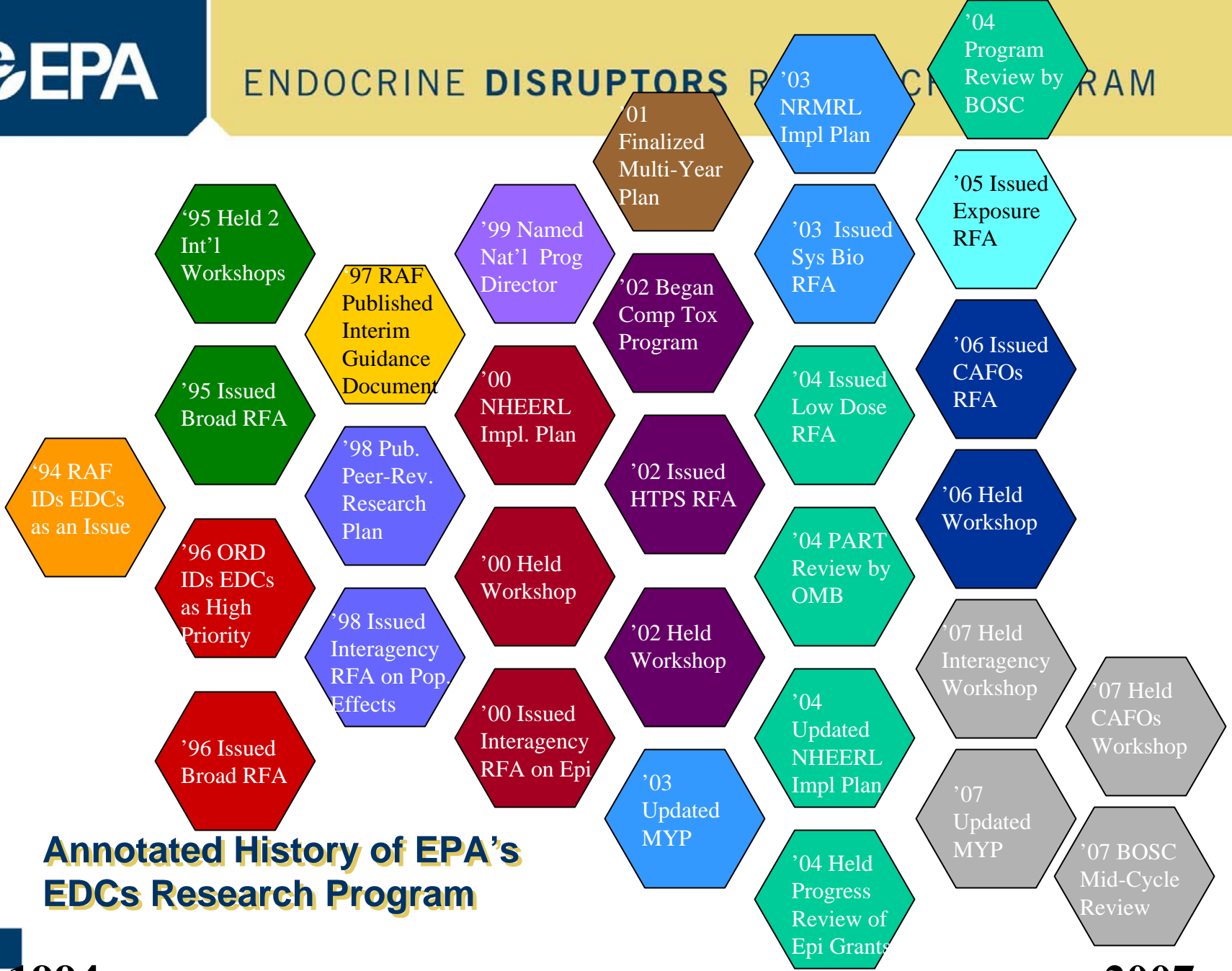
Endocrine Disruptors Research Program and CAFOs

Elaine Z. Francis

National Program Director, Pesticides and
Toxics Research

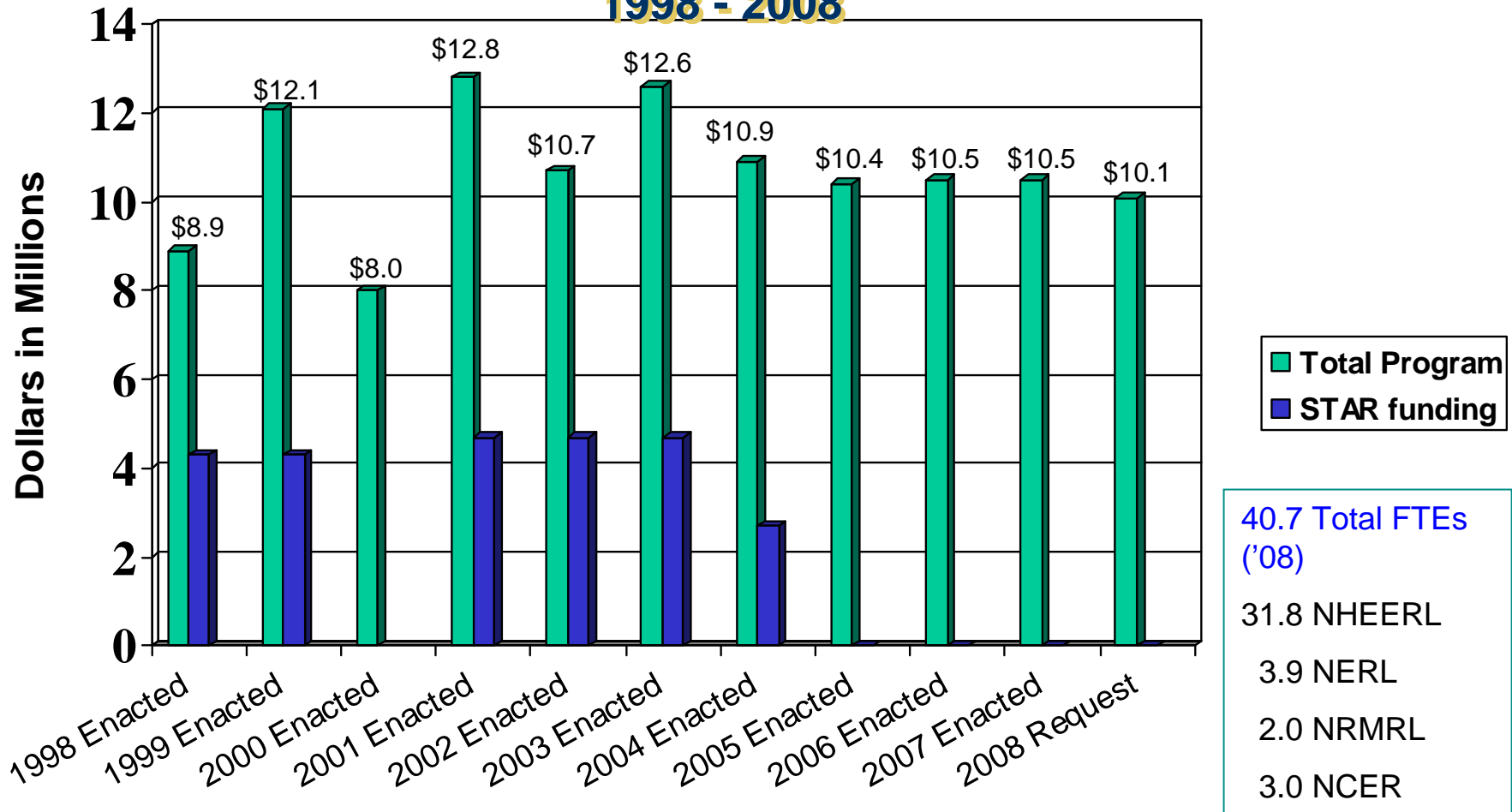
*US EPA Workshop on Fate and Effects of
Hormones in Waste from Concentrated
Animal Feeding Operations*

August 21, 2007



Annotated History of EPA's EDCs Research Program

Endocrine Disruptors Research 1998 - 2008



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

<i>T1 - In vitro</i>	<i>T1 - In vivo</i>	<i>T2 - In vivo</i>
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	<i>In utero/lactation -tier ? ^a</i>
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



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