



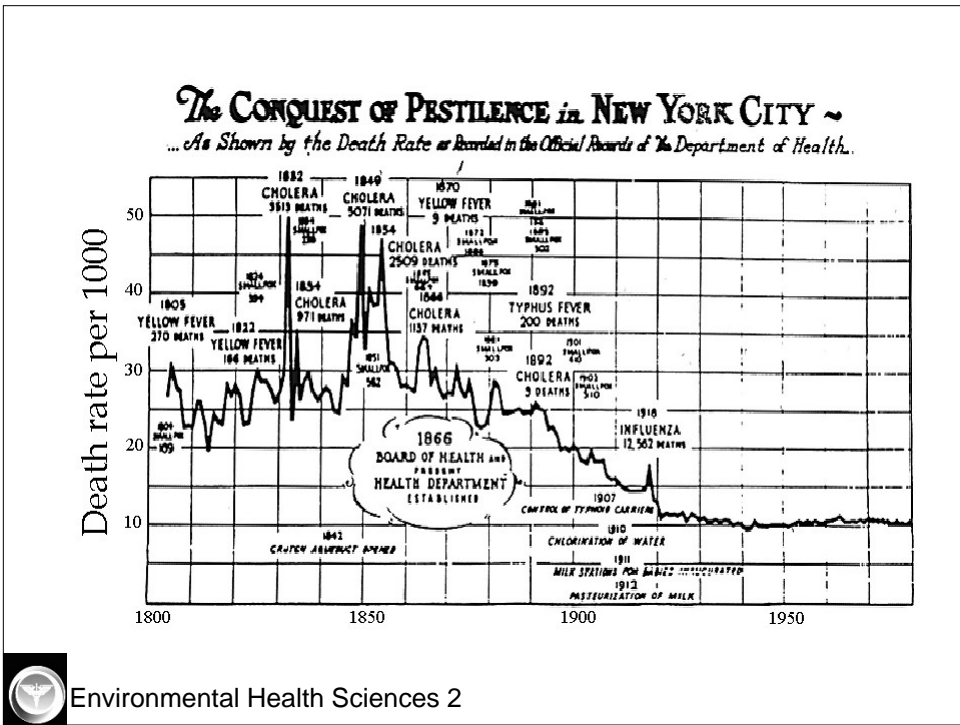
Midstream in a Revolution Linking Environment and Health

John Peterson Myers, Ph.D.
Environmental Health Sciences

www.EnvironmentalHealthNews.org

www.OurStolenFuture.org

www.ProtectingOurHealth.org



Environmental Health Sciences 2

Today's epidemics

Hormone-related cancers

Endometriosis

Learning disabilities, ADHD

Autism

Degenerative diseases

Pre-term birth

Obesity and diabetes

Asthma

Infertility



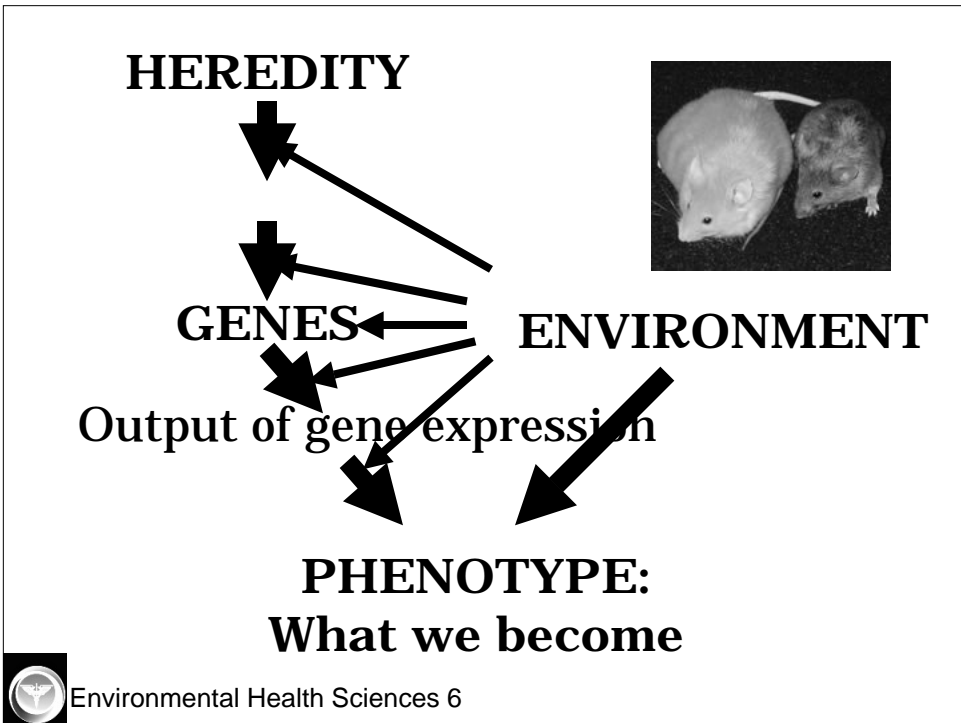
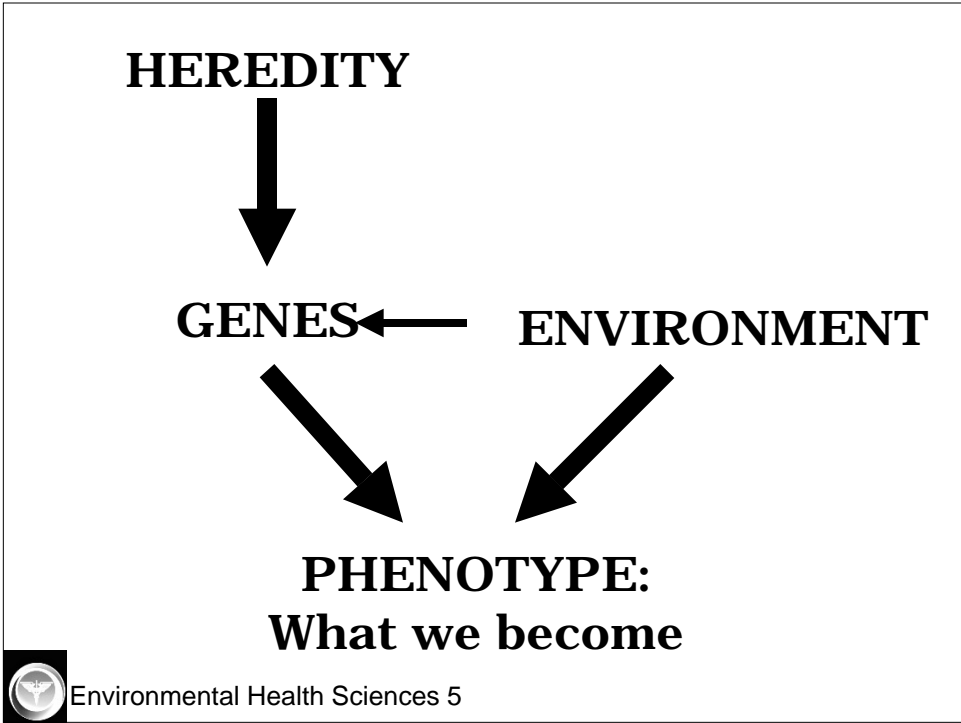
Environmental Health Sciences 3

MIDSTREAM IN A SCIENTIFIC REVOLUTION

This scientific revolution is causing profound changes in how we think about the links between contamination and human health.



Environmental Health Sciences 4



MIDSTREAM IN A SCIENTIFIC REVOLUTION

By the time it is complete and fully incorporated into public health and medicine, its impacts will be as profound as that wrought by Pasteur's germ theory.



Environmental Health Sciences 7

CONCEPTUAL SHIFTS

Old... a disease that is linked to genes is a disease under hereditary control.

New... a disease linked to genes is one vulnerable to environmental causes.



Environmental Health Sciences 8

CONCEPTUAL SHIFTS

**Old... toxins work by
overwhelming the body's
defenses...by brute force.**

**New... toxins work by
hijacking control of gene
expression.**



Environmental Health Sciences 9

CONCEPTUAL SHIFTS

Parkinson's:

**One of the hallmarks of PD is mid-brain
loss of dopaminergic neurons.**

**Studies of families have linked some
cases to specific gene mutations**

**Now research is focusing on what may
alter expression of specific genes
important to keeping mid-brain neurons
alive**



Environmental Health Sciences 10

CONCEPTUAL SHIFTS

Old... only high levels matter

New... impacts at everyday levels...

levels people had become accustomed to calling “normal,” background levels.



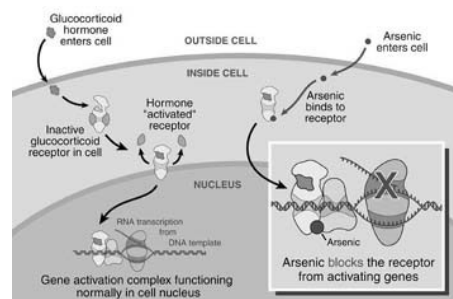
Environmental Health Sciences 11

ARSENIC: high vs. low

At high levels... it kills people

At moderately low levels... it causes a range of diseases

At truly low levels ... it interferes with hormone signals



Environmental Health Sciences 12

CONCEPTUAL SHIFTS

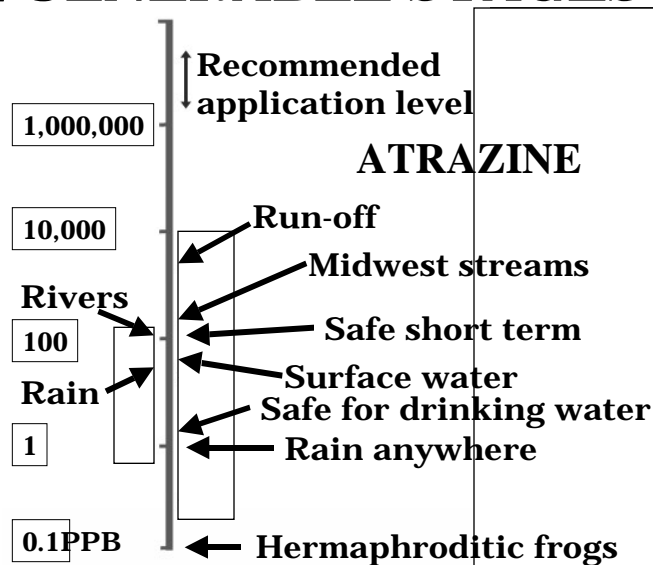
Old... focus on adults

New... children and the developing fetus are most at risk



Environmental Health Sciences 13

VULNERABLE STAGES



Environmental Health Sciences 14

Hayes et al. 2002

CONCEPTUAL SHIFTS

**Old... only high levels
matter**

**New... impacts at everyday
levels...**

**levels people had become
accustomed to calling
“normal,” background levels.**



Environmental Health Sciences 15

BACKGROUND LEVELS

**Background PCBs/dioxin in Dutch
mothers**

Decrease immune function in toddlers

Impair cognitive development

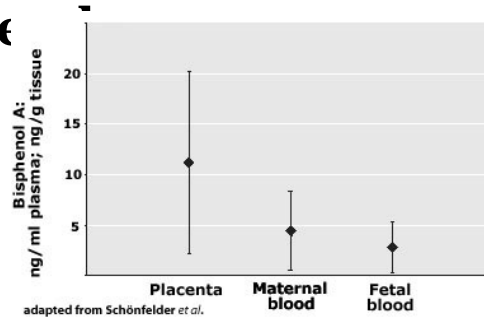
Alter play behavior of children...

**boys engaging in less masculine behaviors
and girls more feminine.**



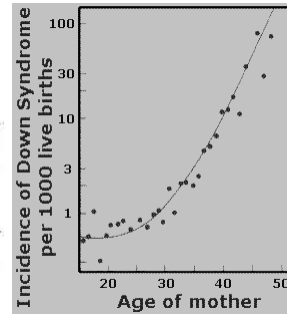
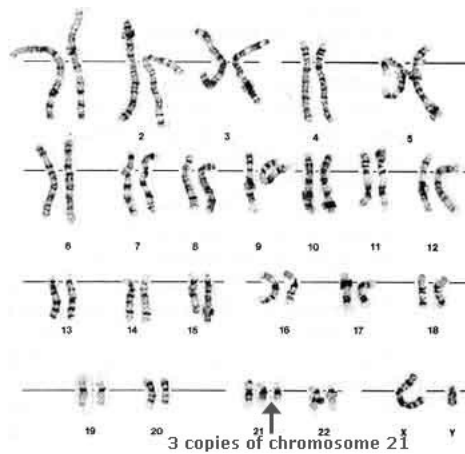
Environmental Health Sciences 16

Bisphenol A exposure in people at relevant levels is



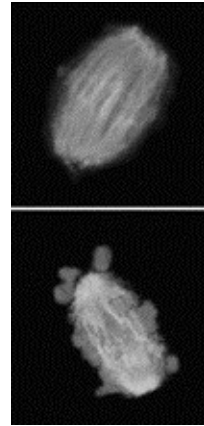
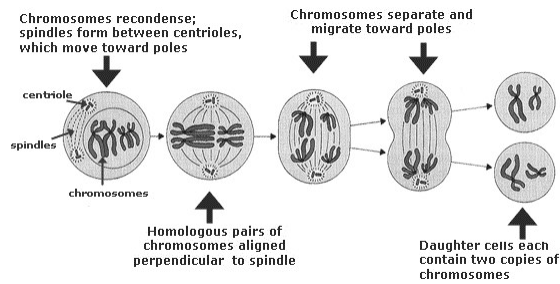
Environmental Health Sciences 17

Aneuploidy in people



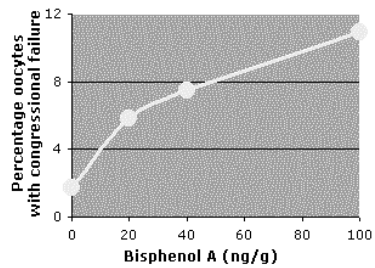
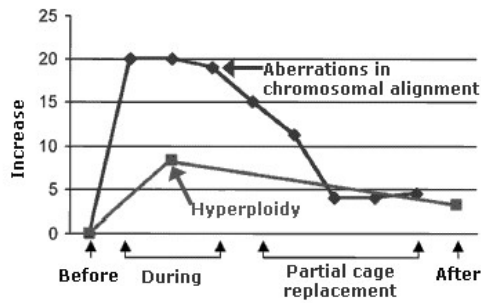
Environmental Health Sciences 18

What causes meiosis to lead to aneuploidy?



Environmental Health Sciences 19

Bisphenol A causes aneuploidy



Environmental Health Sciences 20

CONCEPTUAL SHIFTS

Old... the dose makes the poison

**New... timing is crucial,
individual variation in
susceptibility important, and
low doses can have effects not
predicted by high dose studies.**



Environmental Health Sciences 21

CONCEPTUAL SHIFTS

Old... immediate cause and effect

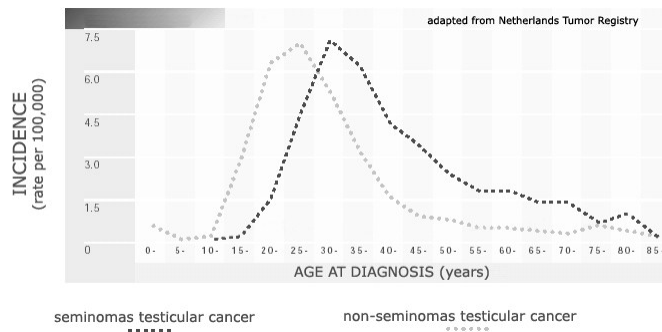
**New... long latencies following
developmental exposure.**

**Fetal programming can cause
life-long impacts**



Environmental Health Sciences 22

FETAL PROGRAMMING



...fetal origins of adult diseases



Environmental Health Sciences 23

CONCEPTUAL SHIFTS

Old... take chemicals one at a time

New... essential to consider the mixtures in which they *always* occur



Environmental Health Sciences 24

MIXTURES ARE THE RULE



- Site Contents -

210 chemicals sampled:

- Baltz: 106
- Brody: 85
- Hardin: 77
- Lerner: 101
- Martin: 95
- Moyers: 84
- Patton: 105
- Rome: 86
- Waletzky: 78

TEST RESULTS: BODYBURDEN PROFILES >> | NEXT PAGE

84 Contaminants Found

Bill Moyers



Environmental Health Sciences 25

CONCEPTUAL SHIFTS

Old... traditional health endpoints... mutagenicity, carcinogenicity, cell death

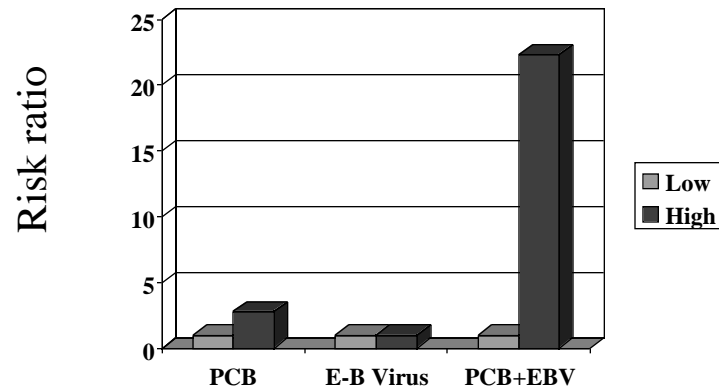
New... erosion of cognitive, immunological and reproductive function.



Environmental Health Sciences 26

NON-HODGKINS LYMPHOMA

Interaction between contaminant and virus



Environmental Health Sciences 27

Rothman *et al.* 1997

HEALTH QUESTIONS ABOUT BISPHENOL A

Impaired brain development

Aneuploidy

Prostate cancer

Low sperm count

Long-term memory formation

Weight control and obesity



Environmental Health Sciences 28

CONCEPTUAL SHIFTS

Old... a small number of bad actors

New... many chemicals implicated we thought were safe.



Environmental Health Sciences 29

THE BAD ACTORS

Old... DDT, PCBs, dioxin, lead, mercury and many more

New... “modern-use” pesticides like atrazine, plastics like bisphenol A, additives to plastics like phthalates, brominated flame retardants, surfactants like nonylphenol.



Environmental Health Sciences 30

BAD NEWS, GOOD NEWS

Bad news...

Widespread exposure to compounds that interfere with gene expression, sometimes at extremely low levels.



Environmental Health Sciences 31

BAD NEWS, GOOD NEWS

Good news...

A disease under genetic control may be one caused by environmental exposures.

We will have the opportunity to prevent many diseases that heretofore have not been perceived as preventable.



Environmental Health Sciences 32

BAD NEWS, GOOD NEWS

Good news...

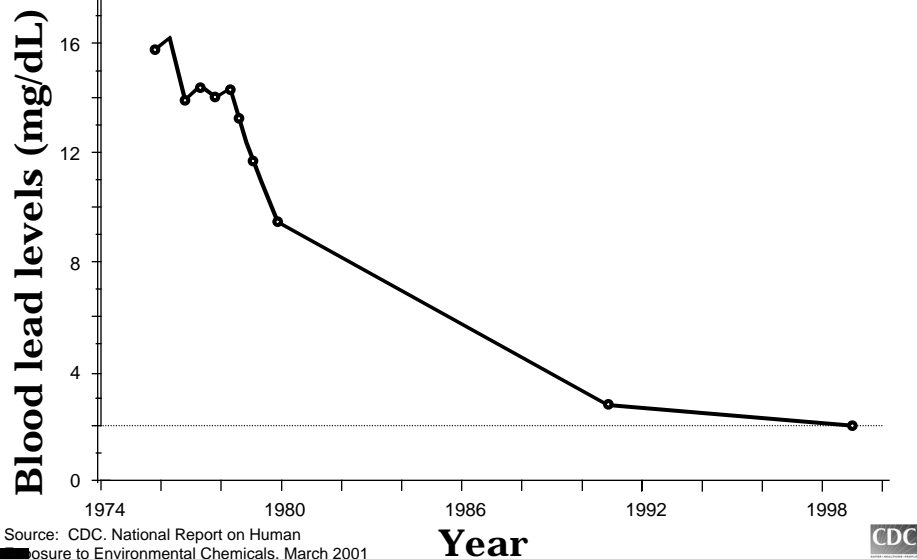
A disease under genetic control may be one caused by environmental exposures.

We have shown with lead and POPs that society can decrease exposures once it reaches political consensus



Environmental Health Sciences 33

Blood lead levels in the U.S.



Environmental Health Sciences 34

CDC

NEXT CHALLENGE

➤ **Identifying compounds that interfere with gene expression**

➤ **Incorporating this scientific revolution into a new generation of health standards**

**Collaborative for
Health and the Environment**



Environmental Health Sciences 35

Today's epidemics

Hormone-related cancers

Endometriosis

Learning disabilities, ADHD

Autism

Degenerative diseases

Pre-term birth

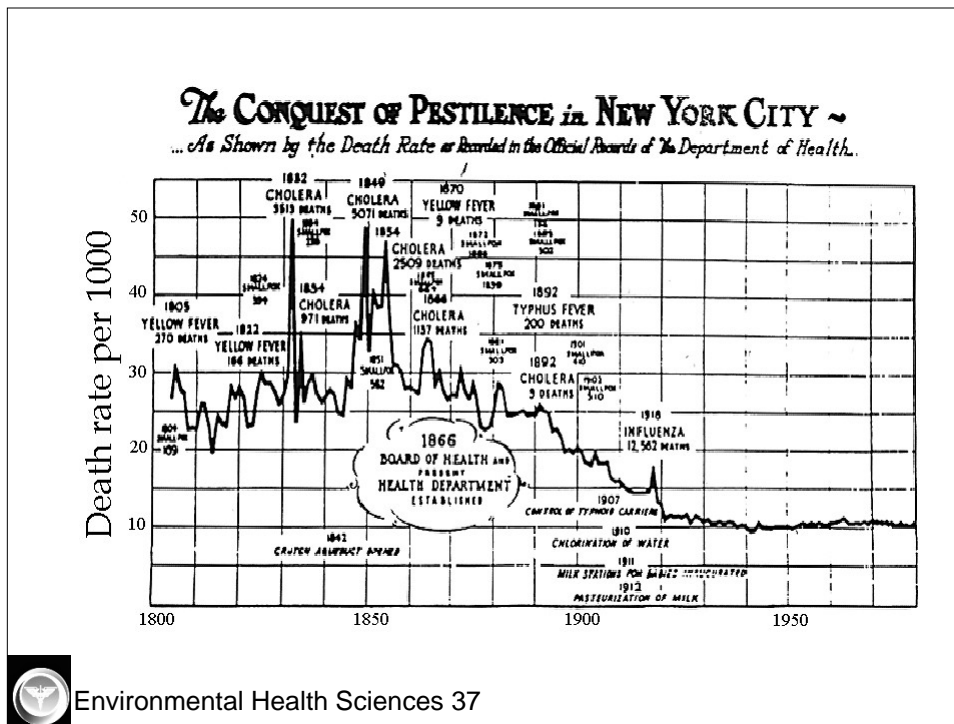
Obesity and diabetes

Asthma

Infertility



Environmental Health Sciences 36



Web resources

www.ProtectingOurHealth.org

www.OurStolenFuture.org

www.EnvironmentalHealthNews.org

Environmental Health Sciences 38