

Chronic Disease & Environmental Toxins: Emerging Links



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Goals Today

- Summarize areas of concern about environmental toxins
- Review Healthy People 2010
- CDC's Nat'l Report on Human Exposure
- Pesticides & Parkinson's
- Women of Child-bearing Age and Mercury
- Oregon Climate
- Everyday practice

Chronic Disease: a Snapshot

- #1 overall killer in U.S. (7 of 10 deaths per year).
- ~90-100 million Americans (1/3 of population).
- >75% of U.S. \$1.4 trillion medical care costs.
- Account for 1/3 of the years of potential life lost before age 65.

Modifiable Risk Factors & Death United States, 2000

Percentage of all deaths

Tobacco use: 18.1%

Poor diet/lack of exercise: 16.6%

Alcohol use: 3.5%

Infectious agents: 3.1%

Pollutants/toxins: 2.3%

Motor vehicle crashes: 1.8%

Firearms: 1.2%

Risky sexual behavior: 0.8%

Illicit drug use: 0.7%

Poor environmental quality accounts for 25% of all preventable world illness.



WHO 1997

Environmental Illness: a Snapshot

- Environmental illness in U.S. children: \$55 billion/yr.

- In OR, all citizens: \$1.5 billion/yr.

Lead Asthma

CAD birth defects

Cancer Developmental Disabilities



Healthy People 2010

National objectives

Most significant preventable threats to health & goals to reduce them

Includes environmental health objectives

Providers role in prevention

Healthy People 2010: Environmental Health

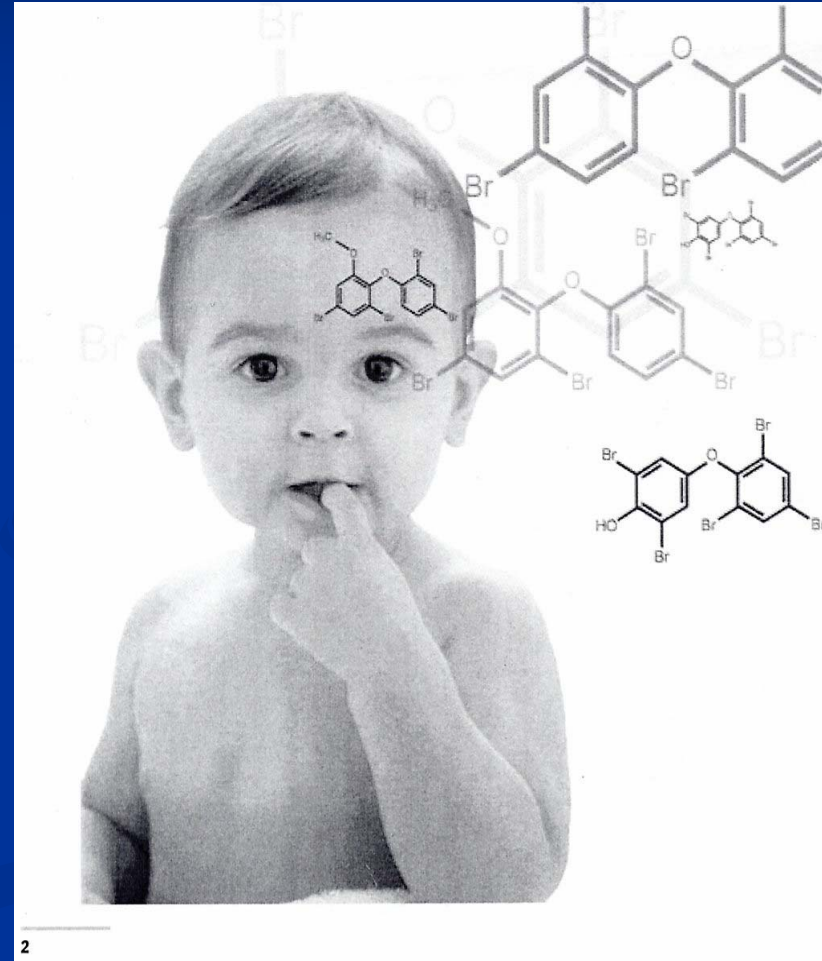


Healthy People 2010: Toxic Wastes

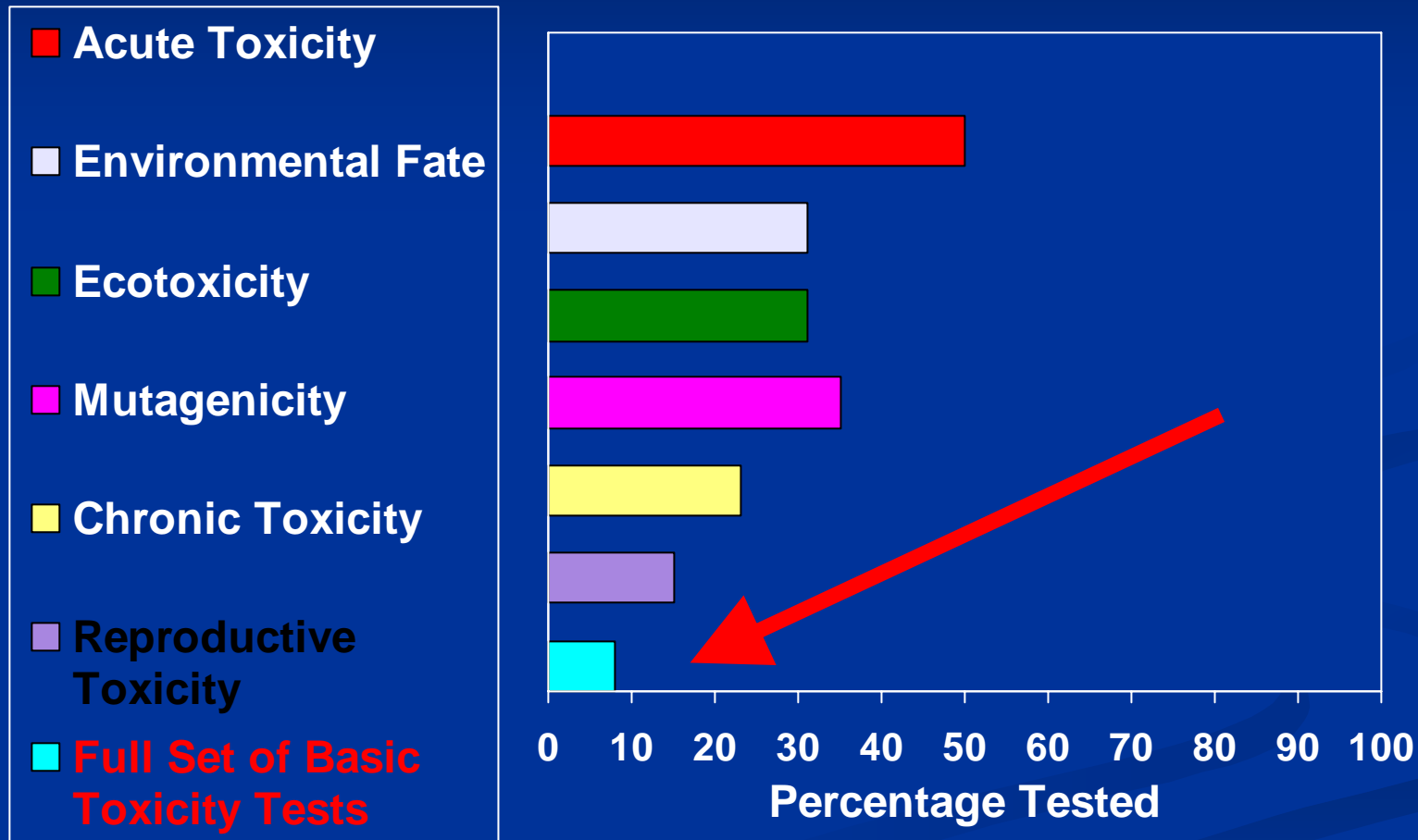
- Lower elevated blood lead levels to 1%
- Minimize risks from hazardous sites
- Reduce pesticide exposures
- Reduce toxic pollutants produced, disposed of, treated, or used for energy recovery
- Increase recycling of solid waste to 38%

State of Knowledge: Our Chemical Environment

- >75,000 chemicals in Federal inventory.
- 2,000 to 3,000 NEW chemicals per year.
- >4 billion lbs released into environment yearly; 72 million lbs of recognized carcinogens.
- Basic Screening Information Data Set (SIDS) avg. \$205,000 per chemical.



Hazard Data - Chemicals Produced @ > 1 Million Pounds/Year



Medical Waste



- 6,000 US hospitals~2 million tons waste per year
- Clinics and doctors' offices add 700,000 tons
- EPA regulations weak-HCWH/h2e
- 850,000 tons incinerated:
 - Pollutants inc. dioxin, Hg, cadmium and Pb
 - Segregation & alternatives to incineration would cost 93 cents/patient/day

Our Chemical Environment

- **1305 Superfund sites; 2,500** are eligible; **>80k** hazardous sites known.
- ~11 million people live within 1 mile.
- ~25% live within 4 miles.
- **OR ranks #24-12** Superfund sites.
- **3 in PDX:** Harbor Oil; Portland Harbor; McCormick & Baxter Creosoting Co.

Multnomah & Washington Co.

Shared Pollutants 2002

Links to Disease

- **Methanol (>240k lbs)**

Strong ATN & vision problems;

Good Pancreatitis & Parkinson's/movement disorders.

- **Ammonia (>100k lbs)**

Strong Asthma, acute/chronic bronchitis, olfactory disorders & rhinitis;

Good Pulmonary edema.

Links to Disease, cont.

- **Xylene (>95k lbs) & Toluene (>83k lbs)**

Good Scleroderma, arrhythmias, menstrual d/o, cognitive impairment, hearing loss & fetal death (miscarriage/stillbirth).

- **Glycol Ethers (>20k lbs)**

Strong Reduced male fertility, abnormal sperm (morphology, motility & count) & fetal death (miscarriage/stillbirth);

Good ATN, reduced female fertility, general congenital and craniofacial malformations.

National Report on Human Exposure to Environmental Chemicals (CDC 7/05)

- Random selection from NHANES survey
- 148 chemicals from 2001-2002, inc. data on 116 chemicals from 1999-2000.
- Criteria for chemical inclusion:
 - wide exposure;
 - serious health effects;
 - adequate blood & urine samples;
 - efficacy of attempts to reduce exposure;
 - availability of reliable bio-monitoring method.



CDC Report Goals

- Which chemicals are present & concentrations;
- How many people have levels above known toxicity thresholds;
- Establish reference ranges;
- Determine if levels are higher in at risk populations;
- Track trends over time;
- Set priorities for research.

CDC Report Highlights

- First time data for 38/148 chemicals.
- BLL declining: 4.4% of children early 1990s; 1.6% of children from 1999-2002*.
- Hg in women of childbearing age: 5.7% have concerning levels.
- Pyrethroid insecticides (common home use): 76% of population.

Highlights, cont.

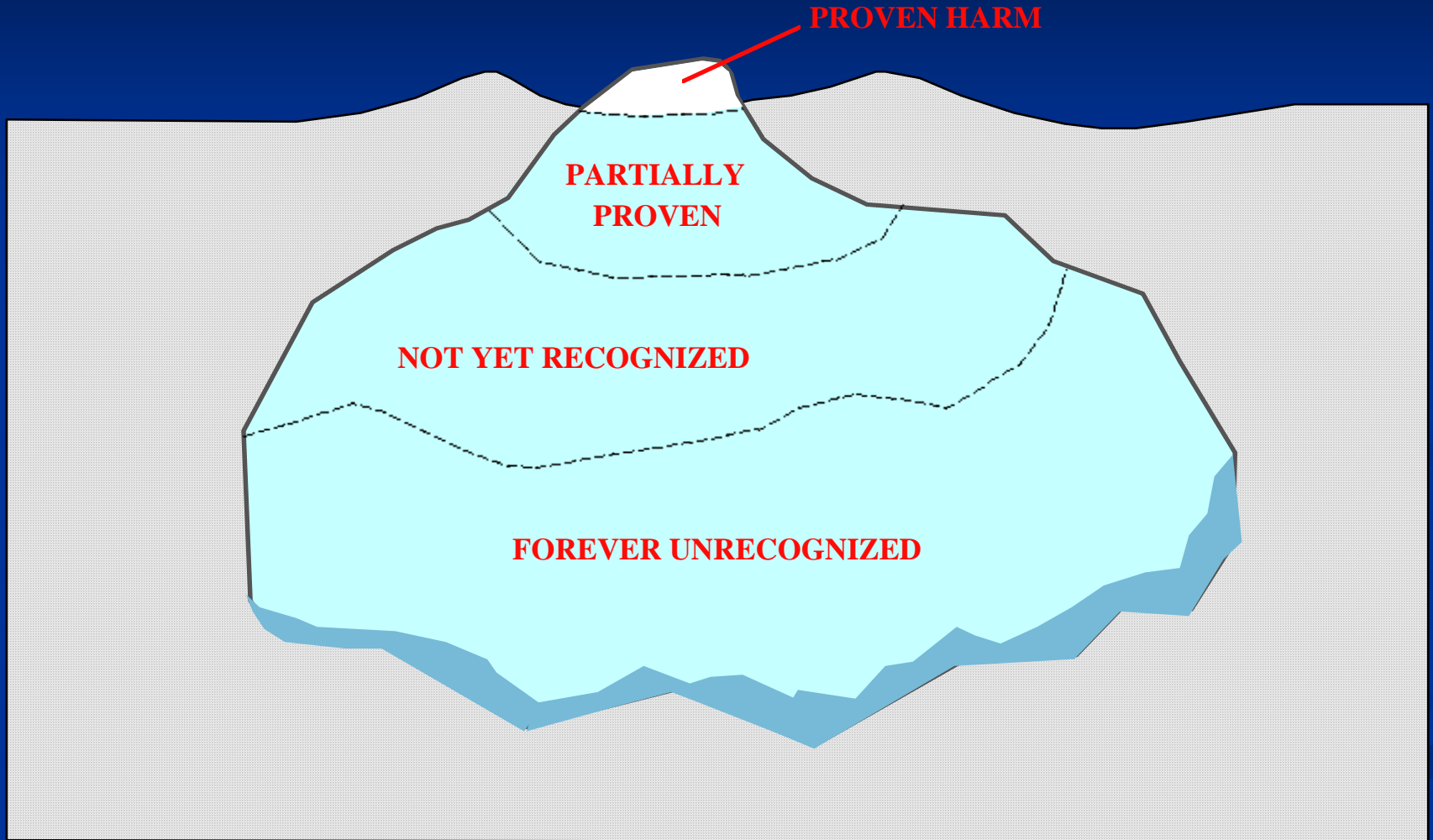


- Levels of 3 toxic pesticides- Aldrin, Dieldrin & Endrin-very low.
- 29 Dioxin-like compounds levels are declining.
- Cadmium: 5% population >20yrs age levels near toxic limit (kidney dz, low BMD).
- Phthalates: widespread, higher in women & children.

Limitations of Current Data

- Exposure to chemical mixtures common-research more complex.
- Data available for only minority, single agents.
- Epidemiological & animal studies often only data available.
- Result: links btw Chronic Diseases & low dose, chronic, complex exposures hard to “prove”.

THE TOXIC ICEBERG



Oregonians' Health

12 CHEMICALS OF KEY CONCERN

- □ acrolein
- □ benzene
- □ benzo(a)pyrene
- □ bisphenol-A
- □ brominated flame retardants (BFRs)
- □ diesel
- □ dioxin
- □ formaldehyde
- ▯ lead
- ▯ *mercury*
- *home & garden pesticides*
- □ phthalates

Pesticides & Parkinson's

A 52 yr-old pt c/o increasing tremor. On PE, the tremor is pill-rolling and resolves with intention; +Romberg sign; unstable tandem gait.

You make a preliminary diagnosis of early Parkinson's disease.

Wife mentions reading about environmental links to PD; pt is a farmer and has used pesticides for years. Could this be related to his disease?

Pesticides & Parkinson's

- Paraquat, rotenone, organophosphates, dieldrin and fungicides maneb & mancozeb implicated.
- MPTP, a designer heroin-like drug, causes Parkinsonian syndrome in addicts.
- Higher incidence in industrialized countries; greatest risk in rural areas/farms, prolonged pesticide use.
- Case control studies: herbicide or insecticide exposure 3-4x likely.

Pesticides & Parkinson's

- 2005 Brown, T. et al meta-analysis of epidemiologic & toxicologic studies since 1983.
- Verified most of these links, noting limitations in study designs.
- Conclusion: “generic association btw pesticide exposure & PD exists, but is insufficient to...conclude...a causal relationship.”

Pesticides, Genes & PD

- Dr. W Langston of Parkinson's Institute:
“Accelerating Research on Genes and Environment in Parkinson's Disease” (2005)
- Two PD studies underway: one in pesticide applicators; other, in two CA counties with known heavy exposure.

Other Health Impacts of Pesticides

Arrhythmias

Asthma

Lymphomas, Brain tumors

Abnormal sperm counts

Birth defects & developmental delays

Hyperactivity & behavioral problems

Decreased endurance & coordination

Neurocognitive problems

Peripheral neuropathies

Pesticides: a Persistent Problem

Major classes: insecticides, fungicides, herbicides, rodenticides.

1997 Market: US \$11.9 billion, World \$37 billion.

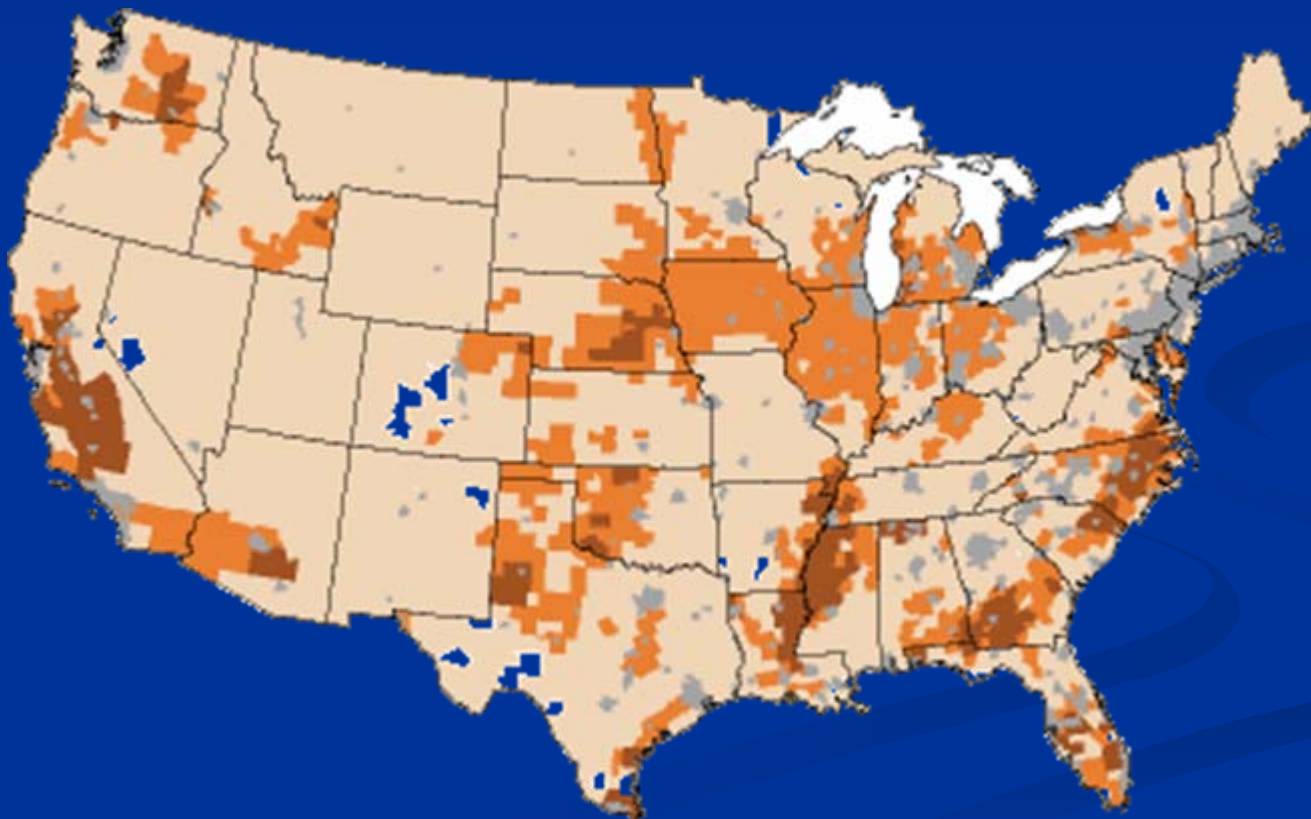
History: synthetic-new to humans & environment since 1940s; >800 licensed “active” ingredients.

Manufacturers: Bayer, Aventis, other drug co.

Inherent toxicity: 140 pesticides considered neurotoxic, 37 are used on food &/or feed.

Organophosphate Pesticides

Occurrence and distribution in surface & ground water of the United States, 1992-97



Background Pesticide Exposures

Widespread

Reported use: 98% of families, 80% during pregnancy.

In Humans: detectable chlorpyrifos metabolites in 92% of children's, 82% of adults' urine samples.

In Food: residues of at least one pesticide on 72% fruits & vegetables.

In Homes: 3 to 9 pesticide residues found.

In Air: indoor levels 10-100X higher than outdoor.

In Water: >90% stream samples, 50% of wells.

Sources of Pesticides

Household uses: lawn & garden sprays,
exterminators, flea collars

Household dust (tracking in on shoes)

Public: schools, hospitals, parks, childcare facilities

Agricultural uses & workers' clothes

Non-organic foods

Breast milk

Strategies to Reduces Exposure to Home & Garden Pesticides in Oregon

Policy Solutions:

- OR pesticide use reporting system (1999) finally funded 2005.
- Educate homeowners re: nontoxic options.
- Enc pet owners to use flea combs and vacuuming to control fleas.
- Enc public places to use Integrated Pest Management (IPM), i.e. Pesticide Free Parks.

What YOU Can Do about Pesticides

Advise Patients:

- Regularly dust.
- Use Integrated Pest Management.
- Clean/remove shoes outside.
- Keep contaminated clothes separate.
- Buy sustainably grown food.
- Store food in secure nontoxic containers.

Mercury & Women of Childbearing Age

A 32 yo G0P0 woman of childbearing age (WCBA) presents for annual PE.

PMH negative.

Social hx: husband is recreational fisherman.

Contemplating pregnancy.

Should she avoid fish because of mercury risks to the fetus?



Mercury & WCBA

>10% of WCBA exceed safe limit of 1ug/kg/day.

50% of women *who eat fish* exceed limit.

5.7% of WCBA have Hg levels concerning for adverse effects (*CDC Nat'l Report 07/05*).

Higher risk: 60, 000 children/year; subsistence fishers, immigrants, Native Americans.

Mercury & WCBA

- Hg enters tissues, variable excretion.
- Breast Milk: PCBs, DDT & other pesticides, dioxins, dibenzofurans, toxic flame retardants & heavy metals (Pb & Hg).
- No bio-accumulation in milk, but levels in fish-eaters may exceed unexposed women by 100x.
- Scientific evidence indicates advantages of breast-feeding outweigh risks...

Neuro Effects of Mercury

Cerebral palsy

MR/DD

disequilibrium, ataxia

hearing loss/deafness

visual impairment/blindness

peripheral neuropathy

parasthesias

tremors, seizures

abnl reflexes & muscle tone

Psychiatric disturbances

one in six
women of
childbearing
age needs
to be worried
about mercury
pollution...

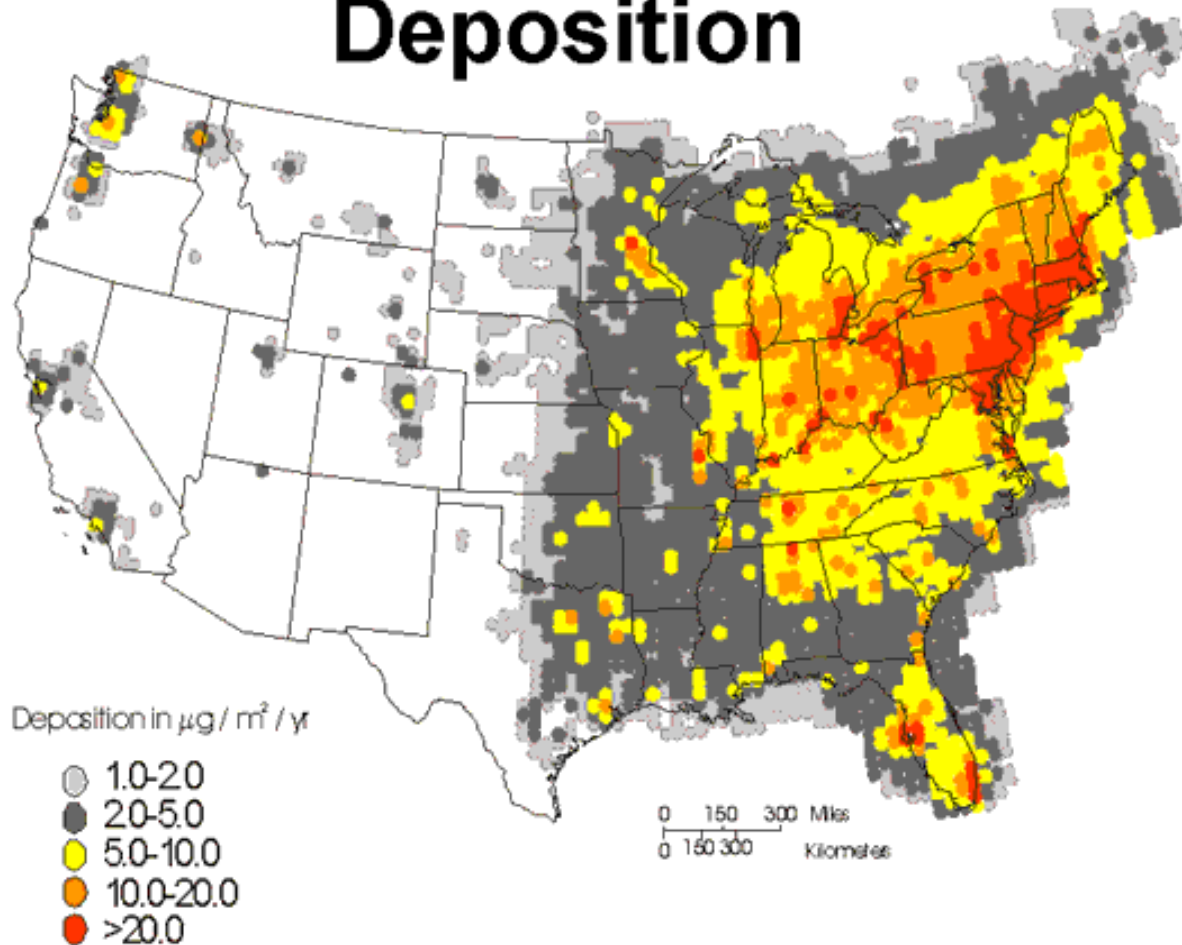


Mercury: a Persistent Problem

- **Poisonings:** Minamata 1950s & Iraq 1971.
- **Nationally:** ~160 tons of Hg annually.
- **In Oregon:** ~4,500 lbs annually.
- **Lack of regulation:** In OR, 10 facilities report Hg release-none has a permit or is required to monitor emissions by state.
- **Fish Advisories:** in 2004, 45 states had >2,000 warnings; Oregon lists advisories for 12 water bodies, inc. Willamette.

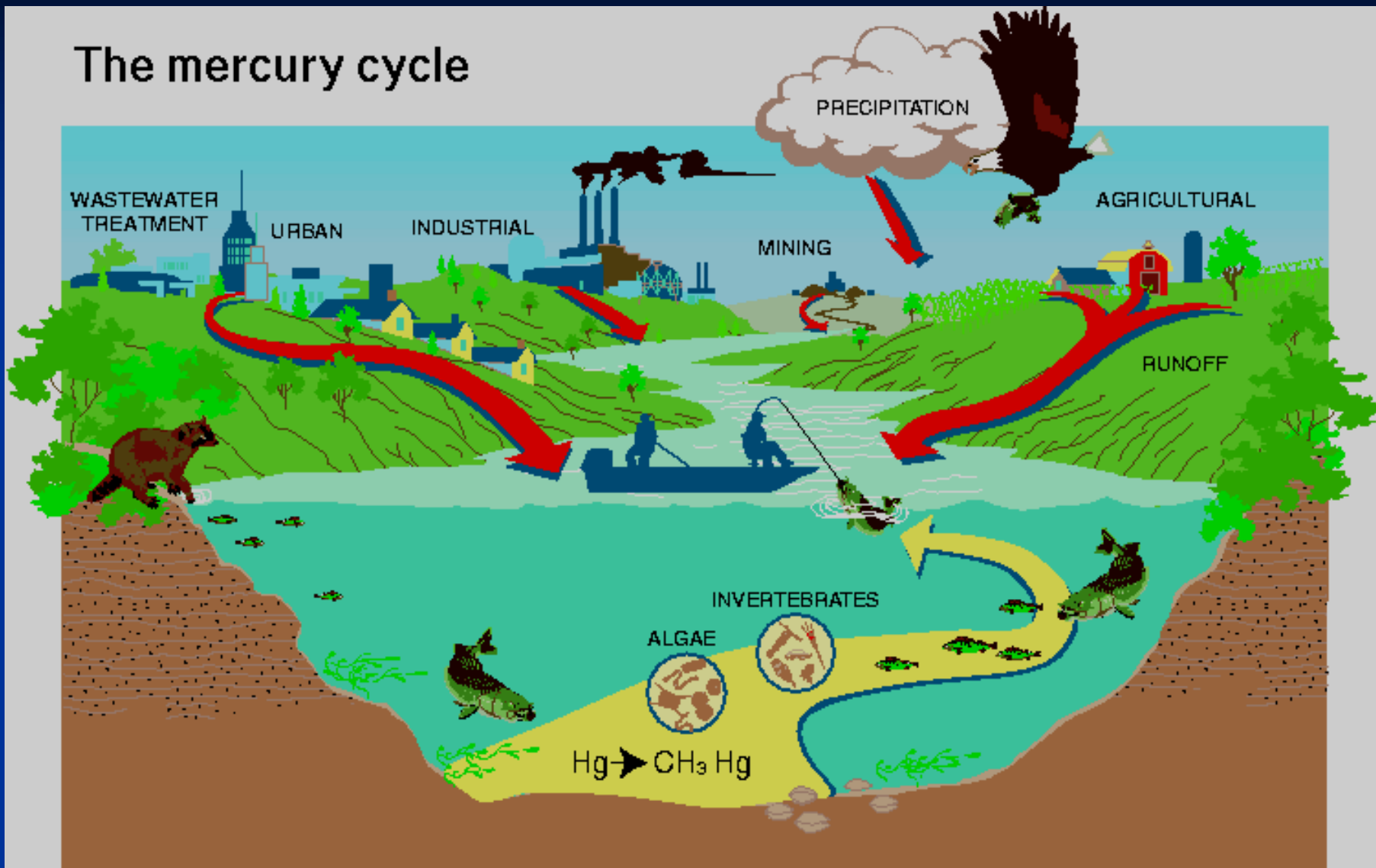
Atmospheric Hg

National Atmospheric Hg Deposition



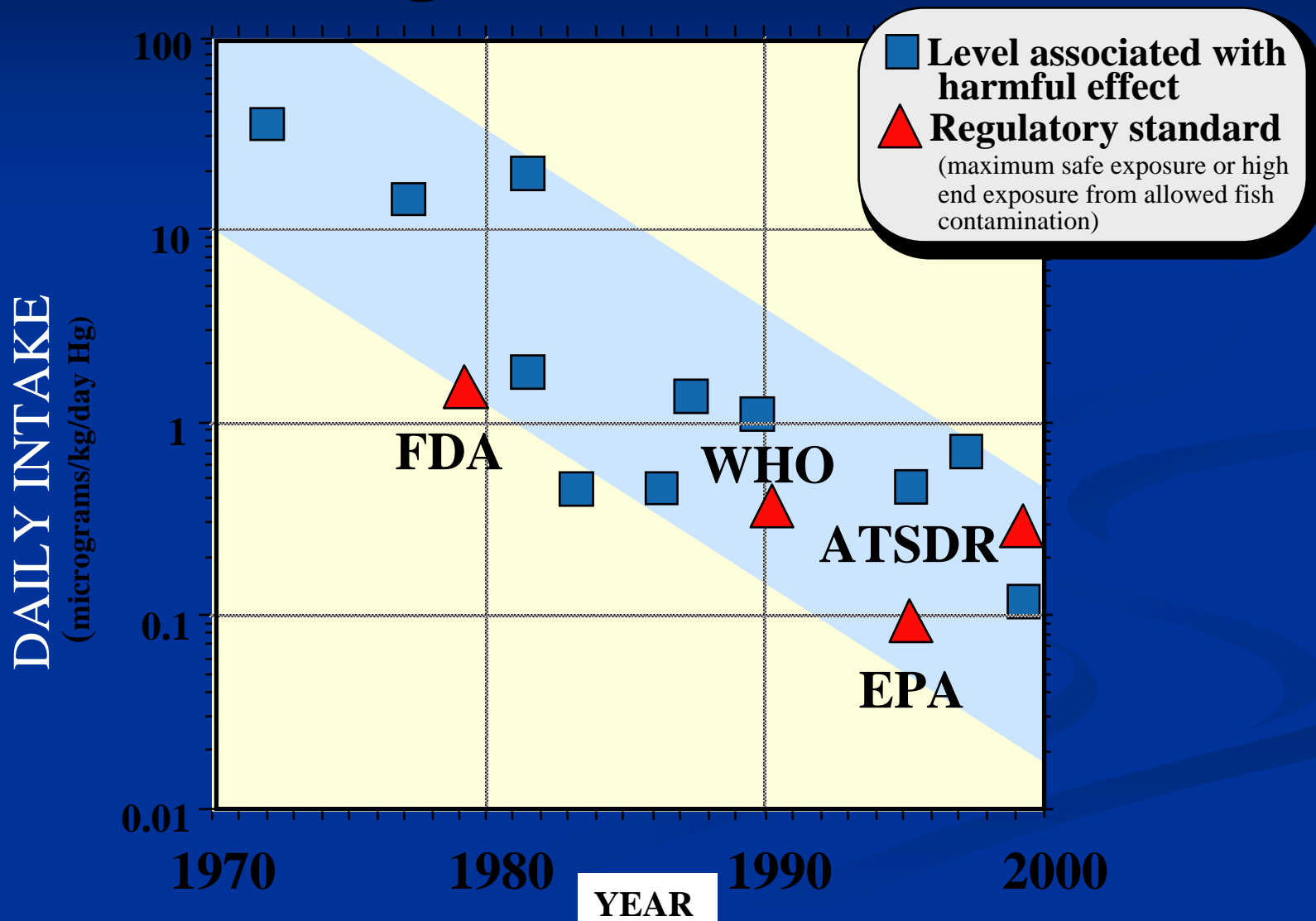
Source: US EPA, 1998, Mercury Report to Congress

The mercury cycle

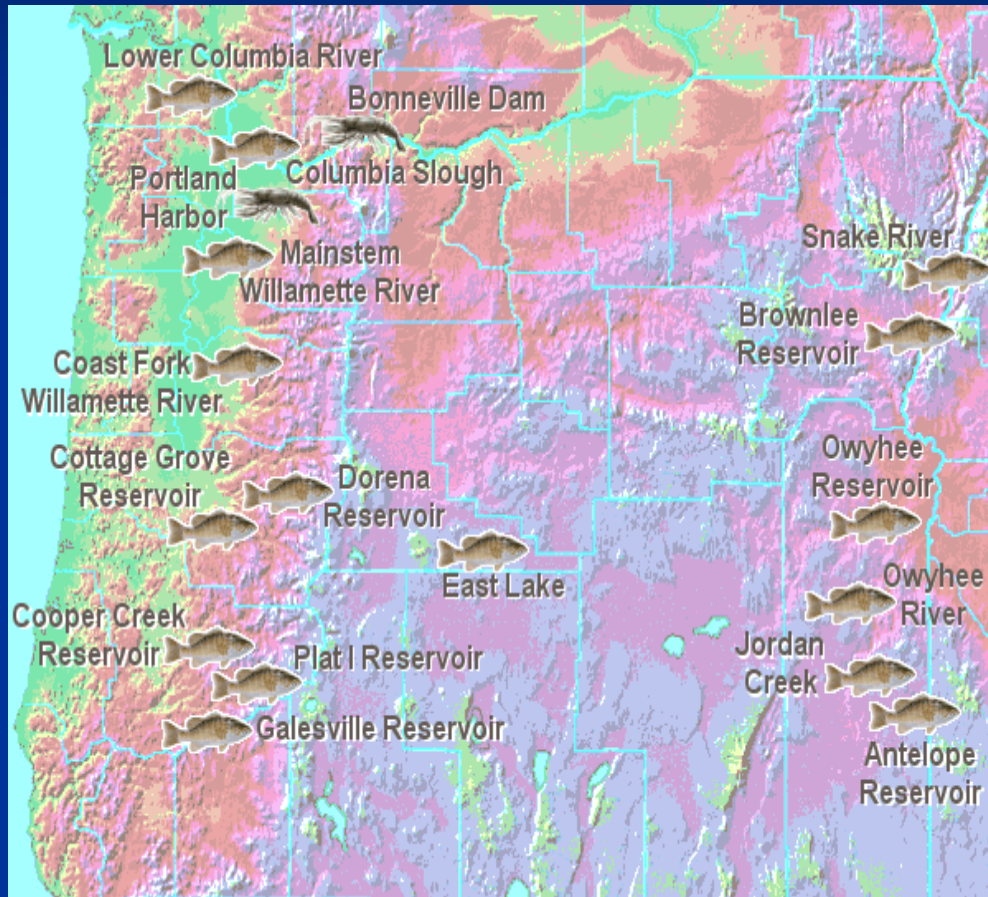


(Illustration by Connie J. Dean, U.S. Geological Survey)

Mercury: Declining Threshold of Harm



Sources of Mercury



Coal fired plants
Municipal & medical
incinerators
Abandoned Hg &
gold mines
Natural off-gassing
Dental amalgams
Bioaccumulation in
foods
Fluorescent lighting
Old thermometers,
BP cuffs, auto
switches

Strategies to Reduce Mercury Pollution in Oregon

Policy Solutions:

- Mercury Solutions Act of 2001.
- Ensure safe collection & recycling.
- Clean up abandoned mines and Superfunds.
- Reduce Hg emissions from health care facilities.
- Inc. Hg in applicable DEQ air & water permits.
- Coal burning power plant Boardman OR.
- Implement OR Executive Order.



















What YOU Can Do about Mercury

Advise Patients:

- Provide *An Expectant Mother's Guide to Eating Fish in Oregon (DHS)* in waiting rooms.
- Recommend WCBA and children avoid fish w/Hg.
- Recycle old Hg thermometers, thermostats & fluorescent light tubes.
- Have car checked for Hg switches at participating auto shop (free replacement).
- Use digital thermometers & thermostats.

What kinds and how much fish should I eat?

Safe eating guidelines for women who are pregnant, planning to be pregnant, or are breastfeeding and for children under age 6.

Sport caught: Fish you catch	Commercial: Fish you buy
 <p>CRAPPIE - BLACK & WHITE</p>  <p>SALMON & STEELHEAD</p> <p>Fish LOW in Mercury <i>Women of childbearing age:</i> Eat up to two 6 oz. meals per week <i>Children:</i> Eat up to two 4 oz. meals per week</p>	<p>SHELLFISH (SHRIMP, CLAMS, OYSTERS)* </p> <p>SALMON (FARM RAISED) </p> <p>SOLE, FLOUNDER </p> <p>COD, HADDOCK, OCEAN PERCH </p>
 <p>WALLEYE</p>  <p>CARP</p>  <p>CATFISH</p>  <p>STURGEON</p> <p>Fish MEDIUM in Mercury <i>Women of childbearing age:</i> Eat no more than one 6 oz. meal per week <i>Children:</i> Eat no more than one 4 oz. meal per week</p>	<p>LIGHT CANNED TUNA </p> <p>MAHI MAHI </p> <p>HALIBUT </p>
 <p>BASS LARGEMOUTH & SMALLMOUTH</p>  <p>BROWN TROUT</p> <p>Fish HIGH in Mercury <i>Women of childbearing age:</i> Avoid or eat no more than one 6 oz. meal per month <i>Children:</i> Avoid or eat no more than one 4 oz. meal per month</p>	<p>WHITE CANNED TUNA </p> <p>SHARK </p> <p>SWORDFISH </p>

These are general guidelines based on mercury levels measured in fish throughout Oregon and levels of mercury found in commercial fish. Special meal advice is available for eating fish from lakes and rivers that have been tested. See back of brochure.

*Harvest in areas without toxin alerts.

Summary

- Chronic Diseases are prevalent. Toxic exposures are possible *preventable* contributors.
- Pesticides & risk of Parkinson's, and Mercury risks to WCBA are more understood than most toxins and other chronic diseases.
- Apparent toxicity at high doses should be a red flag for possible harm from low dose, chronic exposures.
- Since “proof” of harm materializes slowly, generations are at risk and may be harmed before adequate regulatory response occurs.

Kaiser & HCWH/h2e

- Clean Diesel Hospital Zones Project
- Healthy Food in Healthcare Initiative
- Green Building: PVC and DEHP free NICU
- Environmentally preferable purchasing policy
- Making Medicine Mercury Free Award
- h2e Environmental Leadership Award 2002

What Can You Do???

- Be aware of environmental toxins & their possible links to chronic diseases.
- Provide advice & education on prevention and/or minimizing exposures or refer appropriately.
- Incorporate environmental questions into clinical history.
- Advocate: www.envirohealthaction.org

Local Advocacy

- **Oregon Environmental Council**

www.oeconline.org

Oregon Collaborative on Health & Environment
Healthy Environment Forums

- **Oregon Center for Environmental Health**

www.oregon-health.org

Healthcare without Harm

Hospitals for Healthy Environment (h2e)

- **Oregon PSR**

www.oregonpsr.org

Environmental Health-In Harm's Way



THE COLLABORATIVE ON HEALTH AND THE ENVIRONMENT



- www.healthandenvironment.org

Conference calls on Environmental Health

- CHE Oregon (OEC)
 - Working group on Provider education
 - Media & Research Group

Knowledge - Responsibility

- Hippocratic Oath & *primum non nocere* reflect philosophy of prevention and minimizing harm.
- Precautionary Principle: when evidence points toward potentially significant, widespread or irreparable harm to health or the environment, options to avoid harm should be pursued, even if harm is not yet fully understood or proven.
- Ethical Responsibility to share and use knowledge to prevent and minimize harm.
- Duty to promote health and well being of patients and community.
- Possible to be a thoughtful public health advocate in *everyday practice*.