
Environmental Impacts on Reproductive Health: Pesticide Exposure

Association of Reproductive Health
Professionals

www.arhp.org



Expert Medical Advisory Committee

- Kathleen Hill Besinque, PharmD, MSEd, FCSHP
 - Maureen Paul, MD, MPH
 - Barbara Sattler, RN, DrPH, FAAN
 - Ted Schettler, MD, MPH
 - Michael Thomas, MD (co-chair)
 - Tracey Woodruff, PhD, MPH (co-chair)
 - Sandy Worthington, MSN, WHNP-BC, CNM
-

Learning Objectives

At the conclusion of this course, clinicians should be able to:

- Discuss how pesticide exposure can affect reproductive health
- Identify critical windows of susceptibility when exposures can affect reproduction and reproductive outcomes

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Learning Objectives (continued)

- Counsel patients about risks and steps they can take to reduce risks
 - Refer patients for additional information about pesticide exposure and reproductive health risks
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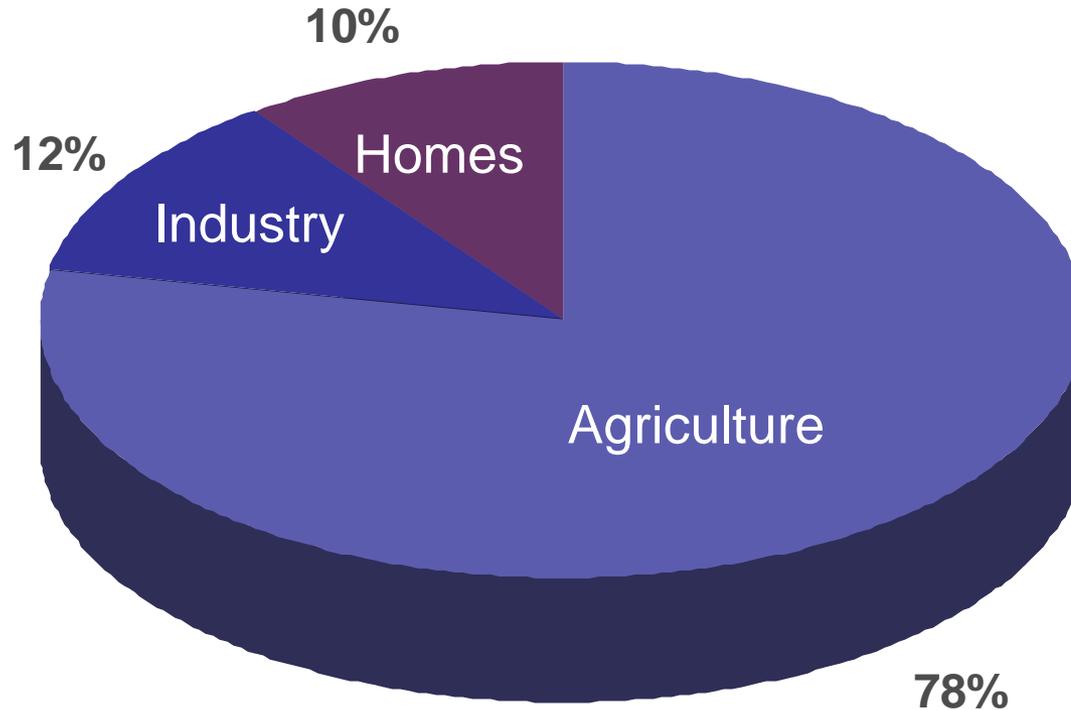
Pesticides Defined

Chemicals used against unwanted organisms:

- Insects
- Rodents
- Plants
- Fungi



Pesticide Use Is Widespread in United States



More than 1.2 billion pounds used annually

Household Use Is Common

75% of US households use at least 1 pesticide product indoors.

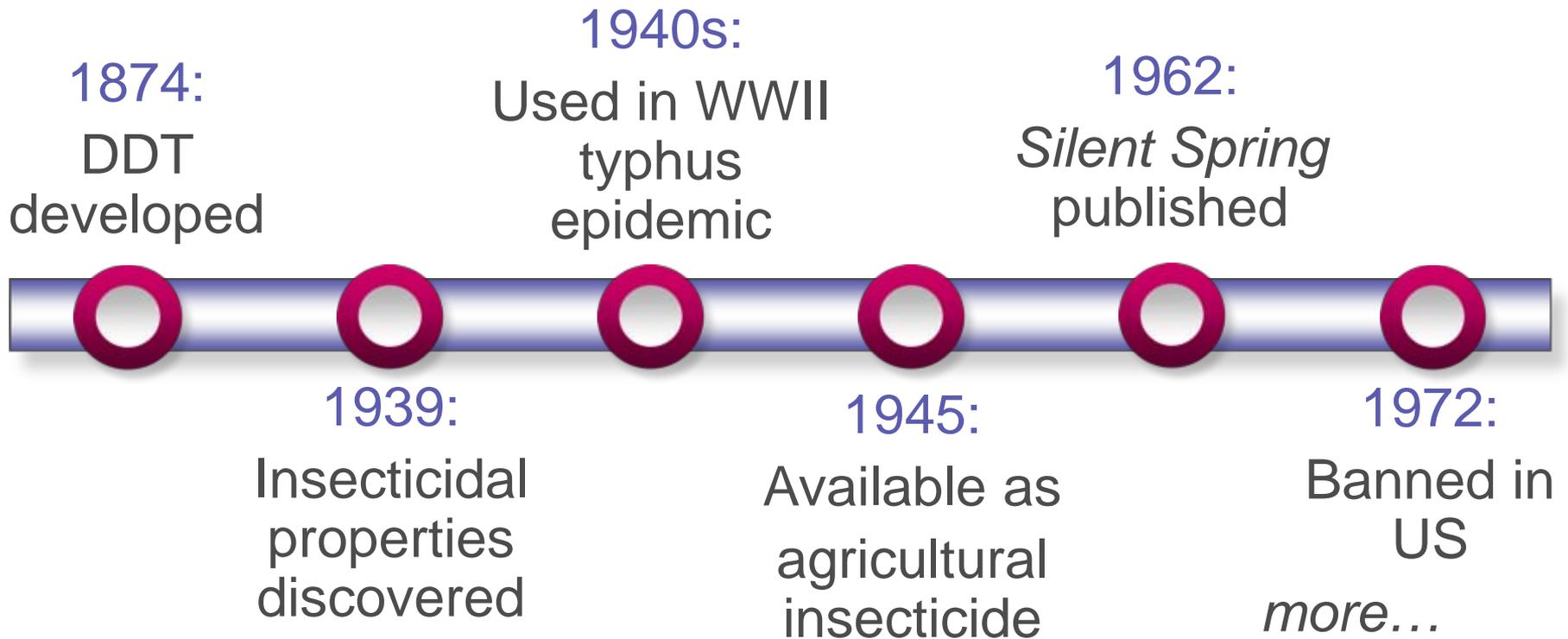
May be used to:

- Eliminate insects and rodents
- Care for lawn and garden
- Prevent fleas and ticks



Lesson Learned: DDT

A well-known harmful pesticide



DDT: Lesson Learned (continued)

“The most alarming of all man’s assaults upon the environment is the contamination of air, earth, rivers, and sea with dangerous and even lethal materials.”

Rachel Carson
Silent Spring

Types of Pesticides

Examples:

Type of Pesticide	Target Organisms	Chemical Class
Insecticide	Aphids, fleas, beetles	Organophosphates, pyrethroids
Rodenticide	Mice, rats	Coumarins
Herbicide	Invasive grasses	Acetyl-coenzyme A carboxylase inhibitors

Sources of Pesticide Exposure



Residues on
food



Tap water



Community
applications



Occupational
exposure

more...

Sources of Pesticide Exposure (continued)

Household uses:

- Insecticides
- Rodent traps
- Weed killers
- Pet flea products



Sources of Pesticide Exposure (continued)

Personal uses:

- Contaminated dust in the home
- Insect repellents
- Some herbal medications
- Pets tracking in chemicals from outdoors



Pesticides Contain Active and Inert Ingredients

INERT



BENIGN

more...

Inert Ingredients: Examples of Effects

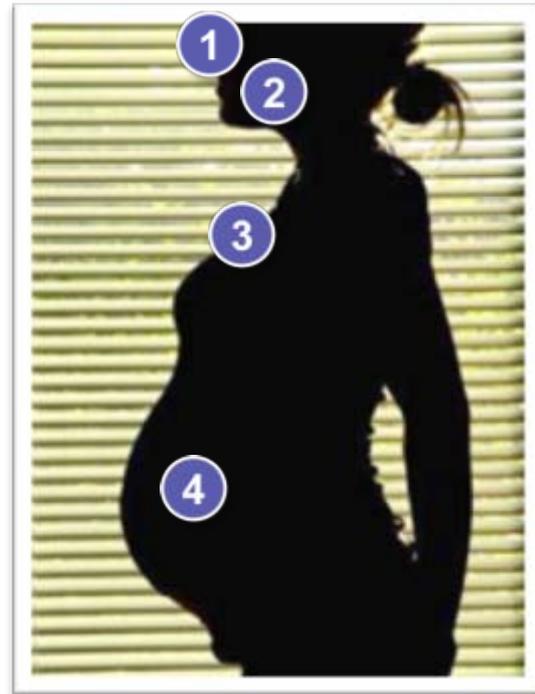
Some inert ingredients have been found to:

- Decrease heart rate and blood pressure
- Reduce mitochondrial activity
- Be toxic to human placenta cell cultures

Data come primarily from animal studies

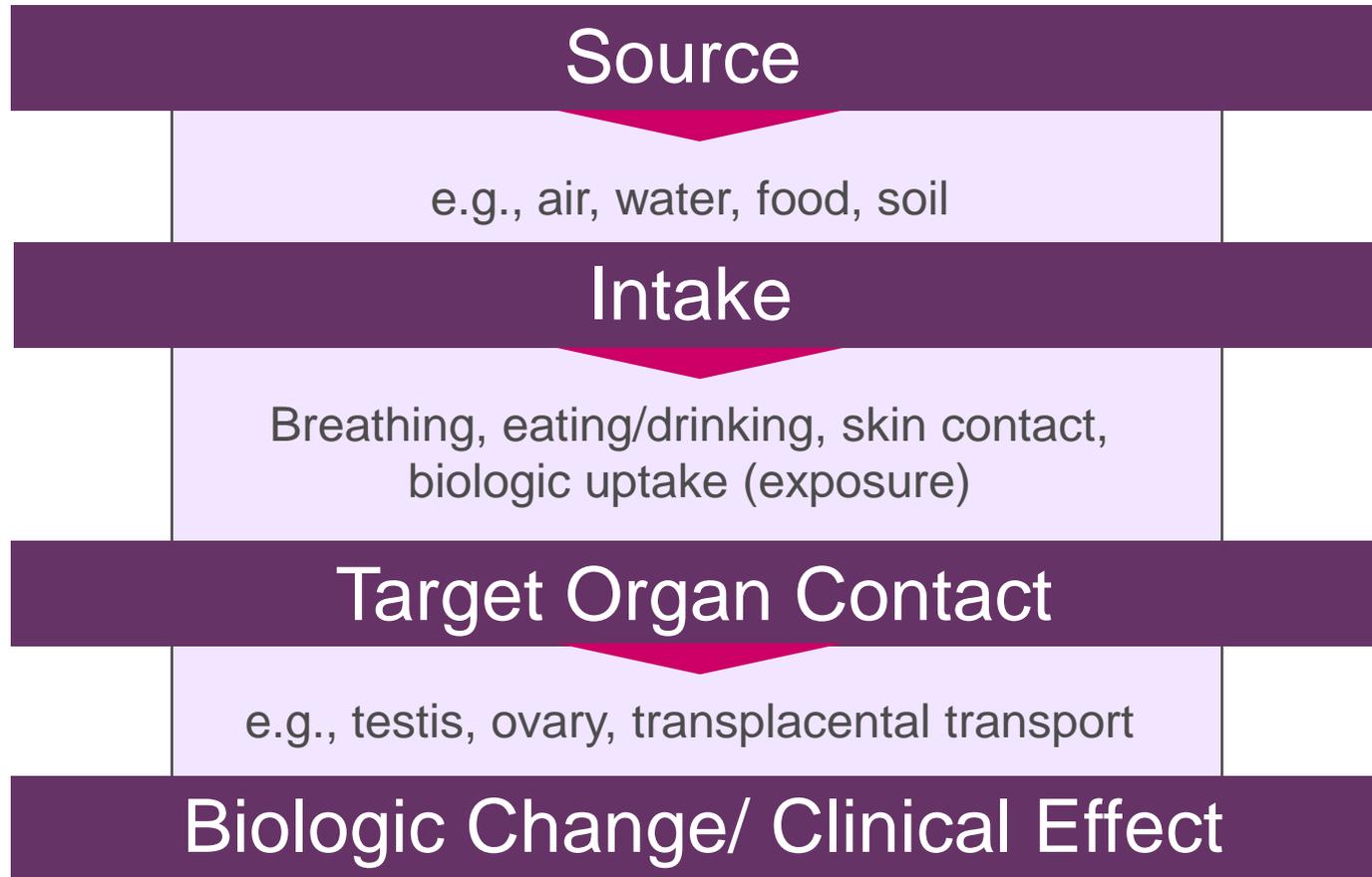
Routes of Exposure

- 1 Inhalation
- 2 Ingestion
- 3 Skin contact
- 4 In utero exposure (fetus)



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Exposure-Effect Continuum



Reproduction-Related Effects

“Every chemical class of pesticides has at least one agent capable of affecting a reproductive or developmental endpoint in laboratory animals or people.”

Frazier LM.
J Agromedicine. 2007
more...

Reproduction-Related Effects (continued)

“...every child conceived today in the Northern hemisphere is exposed to pesticides from conception throughout gestation and lactation regardless of where it is born.”

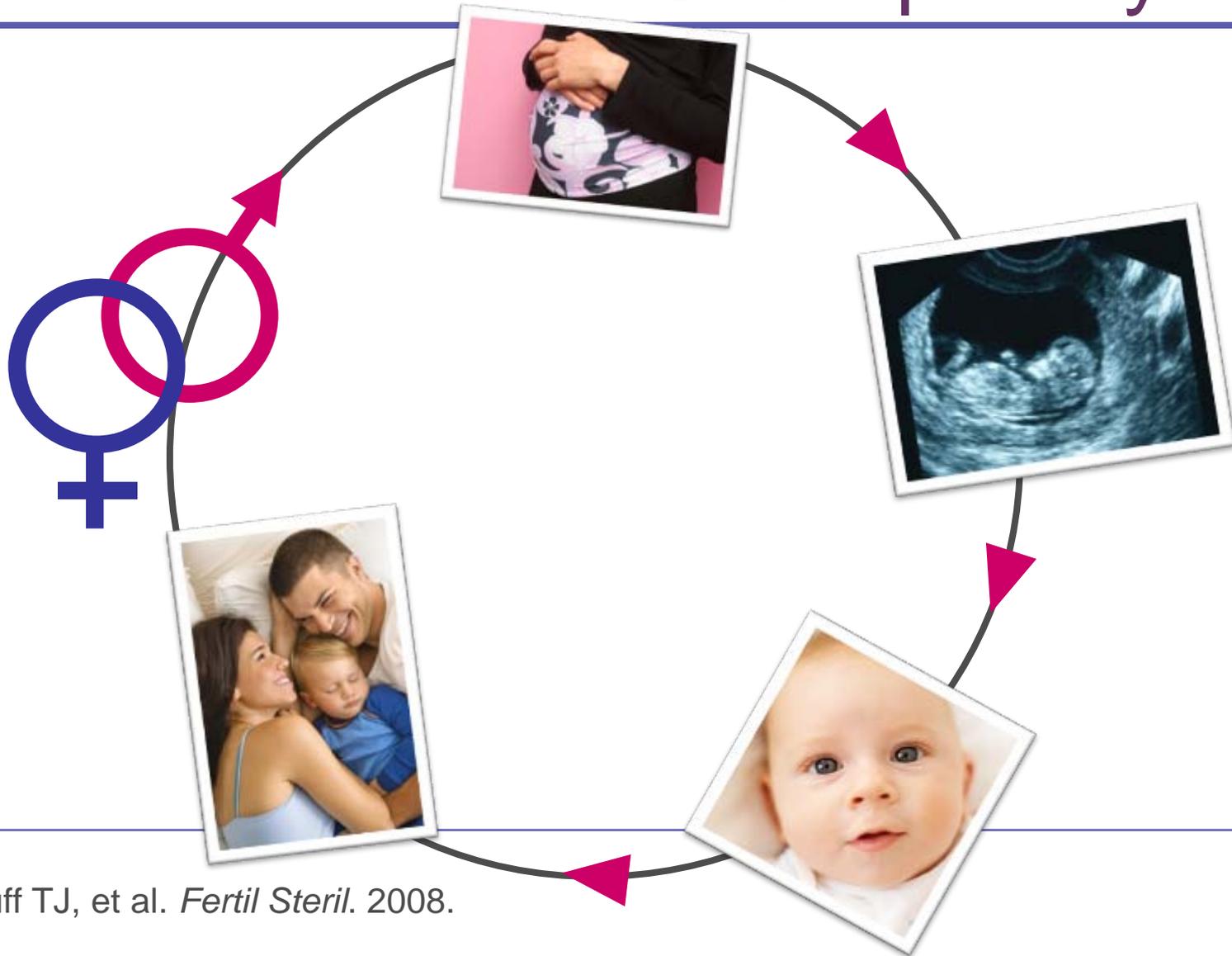
Colborn T.
Environ Health Perspect. 2006

Studying Pesticide Exposure Has Inherent Problems

Limitations impeding research:

- Human trials precluded by ethical considerations
 - Difficulties in assessing impacts
 - Difficulties in measuring outcomes
-

Environmental Exposures and Critical Windows of Susceptibility

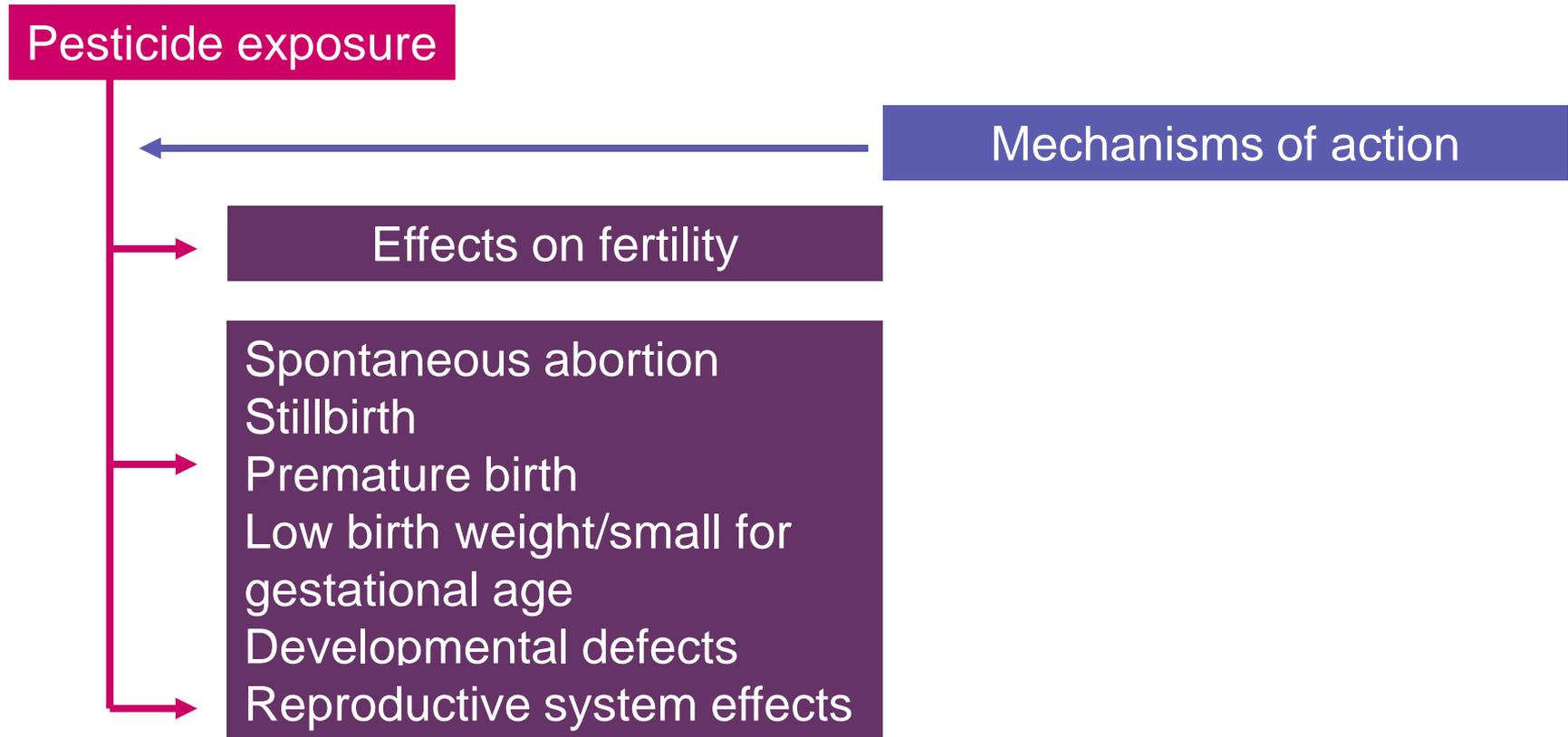


Woodruff TJ, et al. *Fertil Steril*. 2008.

Identified Reproductive Endpoints in Animal and/or Human Studies

Female	Male
<ul style="list-style-type: none">• Effects on:<ul style="list-style-type: none">▪ Oocyte & follicle development & function▪ Ovary formation, cell organization▪ Uterine development▪ Corpus luteum development & function▪ Pubertal development▪ Menstrual & ovarian function• Increased risk of:<ul style="list-style-type: none">▪ Cervical/vaginal cancer▪ Infertility▪ Miscarriage	<ul style="list-style-type: none">• Effects on:<ul style="list-style-type: none">▪ Sertoli cell differentiation▪ Spermatogonia formation, sperm count▪ Testis, prostate, penis development• Increased risk of testicular germ cell cancer• Low serum testosterone levels

Reproduction-Related Effects: Women



Reproduction-Related Effects: Men

- Testicular damage:
 - Azoospermia, oligospermia
 - Damage to germinal epithelium
 - Genetic alterations in sperm
 - Reduced fertility
- Altered hormone function



Pesticide: DBCP

- Soil fumigant used in US agriculture
- Banned in 1979

Linked to male reproductive effects:

Decreased sperm counts (humans)

Altered sex ratio (humans)

Infertility (humans)

Testicular effects (humans)

Pesticide: Organophosphates

Findings on reproductive effects are inconsistent/inconclusive

insecticides in
the 1930s

Nerve agents
in WWII

lawn and garden
sprays in U.S.

Disrupts cholinergic
nervous system

Pesticide: Pyrethroids

Some animal studies show reduced male and female fertility

Synthetic versions
of pyrethrins

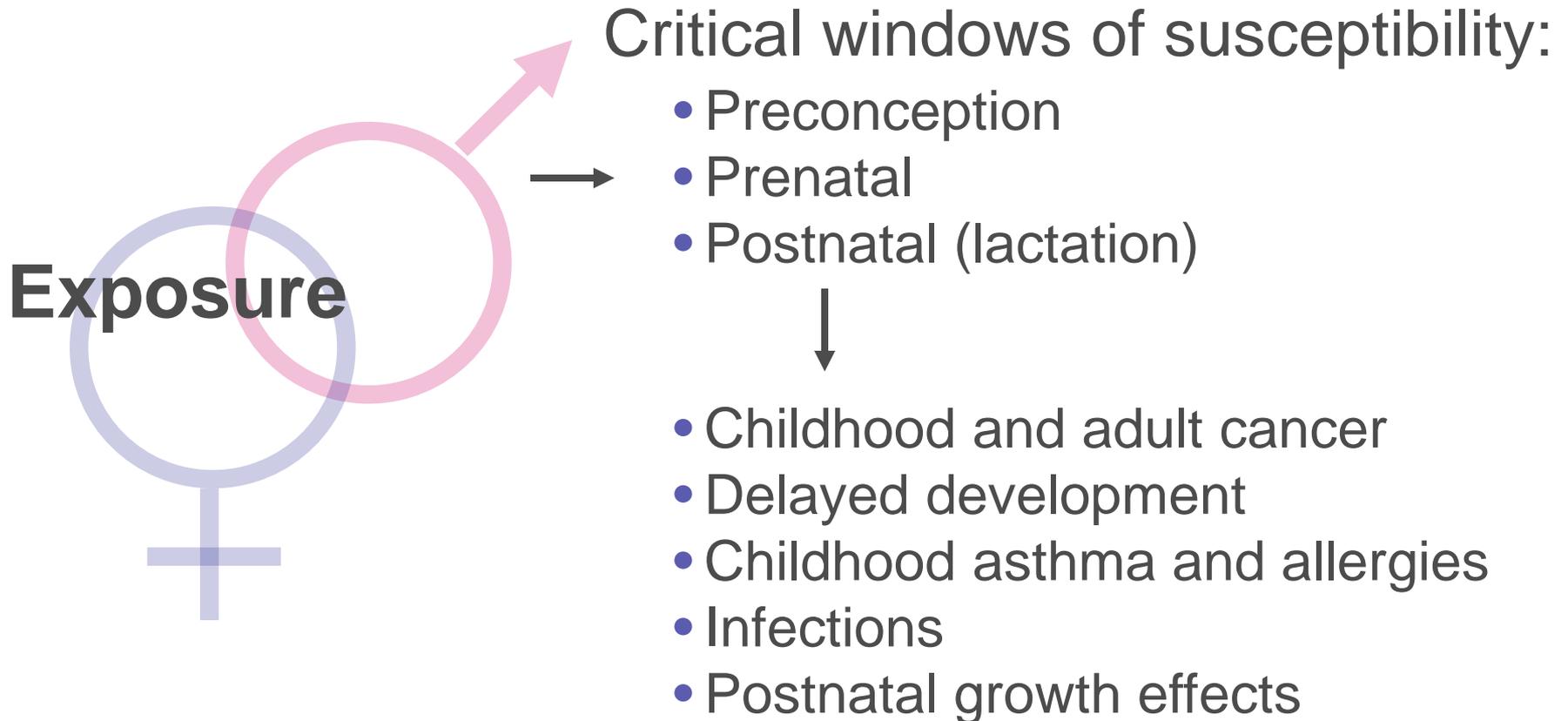
Control mosquitoes
and other insects

1,000 developed;
< dozen used in U.S

Endocrine-Disrupting Chemicals (EDCs)

- Include pesticides, industrial chemicals and byproducts, ingredients in manufacture of plastics
 - Interfere with hormonal function
 - Effects observed from animal studies and epidemiological observations

Delayed Effects of Exposure



Preconception and Prenatal Exposures: Examples

Pesticide	Potential Reproductive Effect
Organophosphates	Neurological development
Ethylene oxide	Spontaneous abortion
DBCP	Reduced male fertility

“So What Do I Do?”

- Science regarding environmental exposures and reproductive health is:
 - Primarily based on animal studies
 - Warrants guidance to limit/avoid exposure
- Approach patients on case-by-case basis
- Exposure is unavoidable, but specific changes can make a difference

Focus on Windows of Susceptibility

- For male and female adolescents
- For male and female patients who experience unintended pregnancy
- For women and men during pregnancy planning
- For pregnant women
- For male and female patients with newborns and children

Environmental Health History Should Be Routine

The Environmental Health History

HOW?

Incorporate into reproductive health history

WHEN?

Vulnerable Stages:

- Early childhood
- Puberty
- Adolescence
- Preconception planning (men & women)
- Pregnancy

WHY?

Identify and reduce or eliminate potentially harmful exposures

Guide patients in making decisions

One Tool for Conducting an Environmental History: CH₂OPS



Community



Home/**H**obbies



Occupation/
School



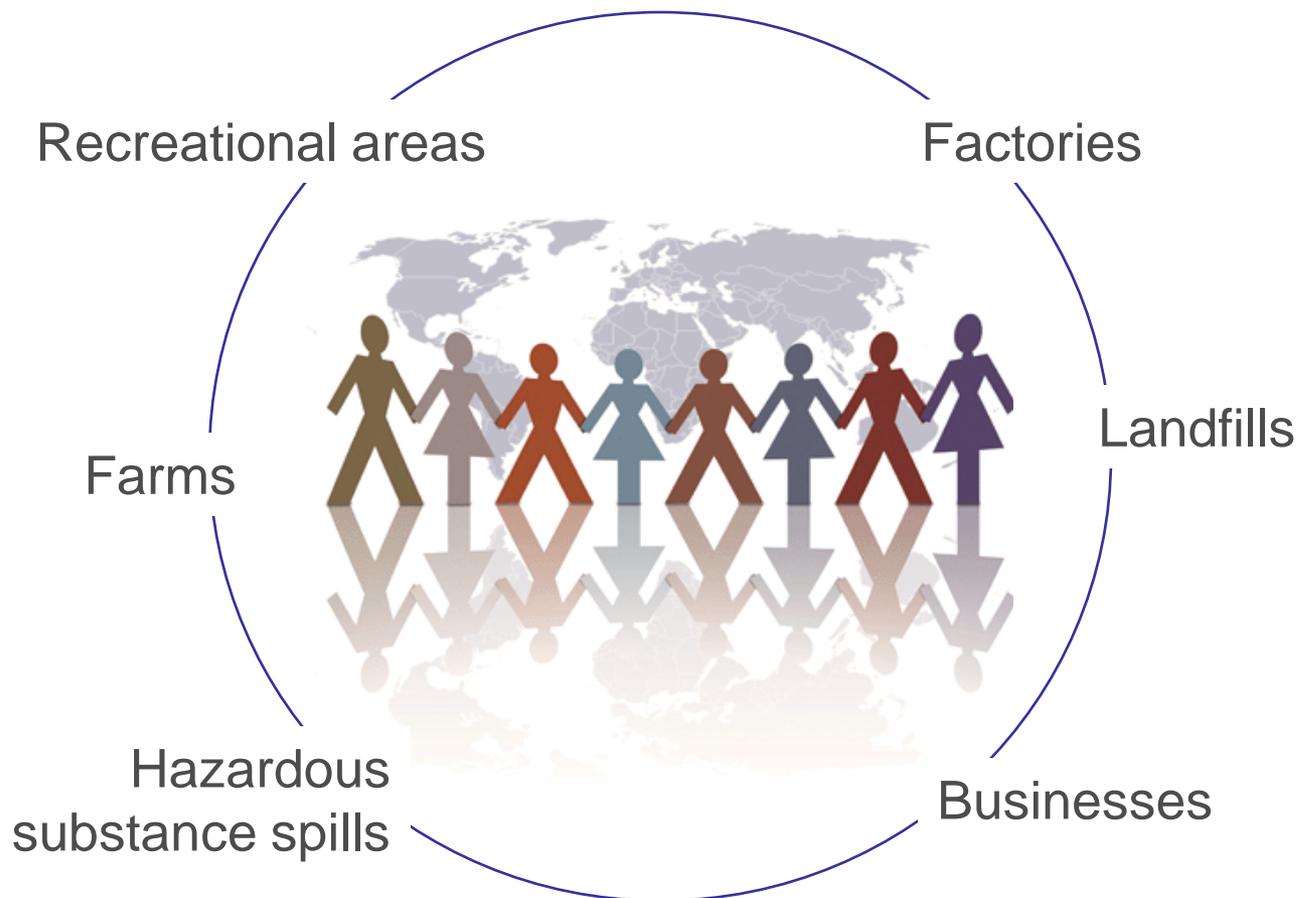
Personal



Socioeconomic

Adapted from Schettler T. 2009.

CH₂OPS: Community



Adapted from Schettler T. 2009; Expert Medical Advisory Committee on Environmental Impacts on Reproductive Health. 2009.

Community: Guidance for Patients

Learn about/inform patients about community organizations & resources, such as:

- Dry cleaners that avoid toxic solvents
- Salons products without toluene, phthalates, other toxic chemicals
- Grocery stores that carry organic products

Resource Tip:

- Download the [What We Can Do: Community Efforts to Protect Our Health](#) Tool Kit from the [Women's Health and the Environment](#) Web site

CH₂OPS: Home/Hobbies

- Pesticides
- Adhesives
- Furniture products
- Cleaners
- Detergents
- Gardening products
(e.g., pesticides, plant food)



more...

CH₂OOPS: Home/Hobbies (continued)

Exposure to:

- Carbon monoxide
- Metals
- Solvents

Fishing:

- Be aware of fish advisories for mercury



more...

Home: Guidance for Patients

- Check for lead paint and pipes; manage dust
- Avoid vinyl products, such as shower curtain liners
- Avoid certain types of plastics for food:
 - **No. 3:** Polyvinyl chloride (PVC)
 - **No. 6:** Styrene (Styrofoam)
 - **No. 7:** Polycarbonate (bisphenol A [BPA])
- Where possible, avoid food stored in plastic containers or plastic wrap *more...*

Home: Guidance for Patients (continued)

- Use glass, ceramic, or food-safe metal containers
- Avoid using pesticides in homes, lawns, gardens, or on pets
- Wash fruits & vegetables; buy organic

Resource Tips:

Extensive resources are available to eliminate the use of pesticides or to use less toxic products. Some examples include:

- Visit www.beyondpesticides.org
- Visit the Pesticide Action Network (PAN): www.pesticideinfo.org
- Download the [Shopper's Guide to Pesticides](#) wallet card from the Environmental Working Group

more...

Adapted from Schettler T. 2009; Expert Medical Advisory Committee on Environmental Impacts on Reproductive Health. 2009.

Home: Guidance for Patients (continued)

- Read labels on cleaning products
- Avoid using ammonia or chlorine,
- Use inexpensive, nontoxic products such as vinegar and baking soda



Resource Tip:

- Find [non-toxic cleaning recipes](#) on the Women's Voices for the Earth Web site or www.care2.com

Adapted from Schettler T. 2009; Expert Medical Advisory Committee on Environmental Impacts on Reproductive Health. 2009.

Home: Guidance for Patients (continued)

Limit fish with high levels of mercury

Albacore tuna

King mackerel

Shark

Tilefish

Swordfish

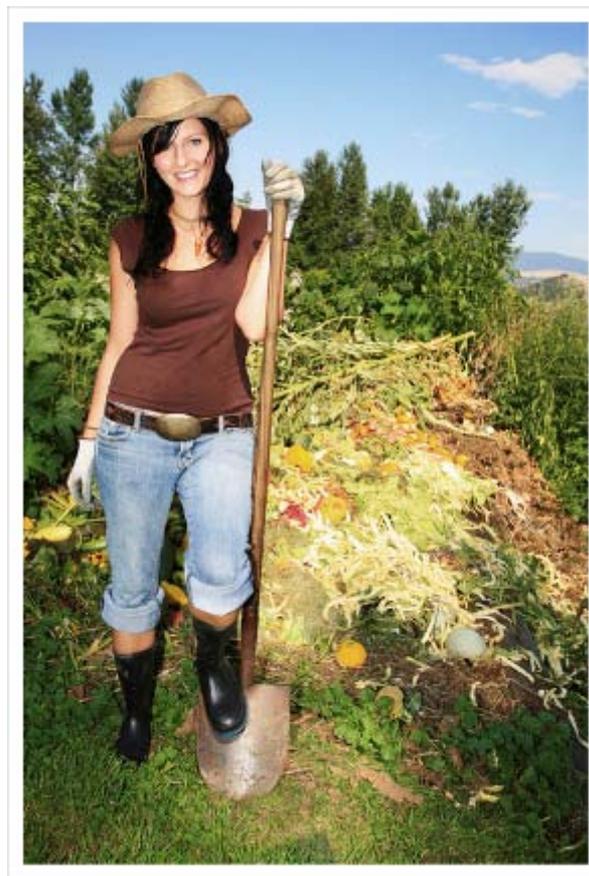


Resource Tips:

- Learn about [on-local fish advisories](#) from the EPA
- Download a [regional fish seafood-watch pocket guide](#) from Seafood WATCH

Hobbies: Guidance for Patients

- Understand mercury present in recreationally caught fish
- Use glue and solvents in well-ventilated spaces
- Garden with organic products



Adapted from Schettler T. 2009; Expert Medical Advisory Committee on Environmental Impacts on Reproductive Health. 2009.

CH₂OPS: Occupation/School

- Chemicals
- Radiation
- Biological agents
- Pesticides in schools



Adapted from Schettler T. 2009; Expert Medical Advisory Committee on Environmental Impacts on Reproductive Health. 2009.

Occupation: Guidance for Patients

- Use protective gear with toxic substances or radiation
- For chemicals, wash exposed skin; change work clothes; clean clothes separately.
- Understand chemicals used at work
- Take extra care if pregnant (planning pregnancy)

Resource Tip:

- Learn more from the CDC report, ["The Effects of Workplace Hazards on Female Reproductive Health"](#)

Occupation (Schools): Guidance for Patients

Advise patients:

- Practice non-pesticide insect management; inform parents if pesticides used
- Use fresh fruit & vegetables; avoid junk foods in cafeterias
- Avoid pressure-treated woods (arsenic) in playground equipment

Resource Tips:

- Visit the [Healthy Schools Network](#) Web site and EPA's [Healthy School Environments](#) Web site to learn more about creating a healthier school environment

CH₂OPS: Personal

- Dietary history
- Alcohol use
- Tobacco use
- Prescription & non-prescription medications
- Substance abuse
- Insect repellants
- Cosmetics; personal care products



Adapted from Schettler T. 2009; Expert Medical Advisory Committee on Environmental Impacts on Reproductive Health. 2009.

Personal: Guidance for Patients

Advise patients:

- Use fewer, simpler products
- Don't trust: "dermatologist-tested," "natural," "organic"
- Avoid tobacco use; exposure to 2nd-hand smoke
- Use alcohol in moderation
- Learn about skin products that are safe for children

Resource Tips:

- Check the safety of your personal care products at the [Skin Deep Cosmetic Safety Database](#) and the [Campaign for Safe Cosmetics](#)
- Download the [Safety Guide to Children's Personal Care Products](#) from the Environmental Working Group
- Visit www.HealthyToys.org to find toy rankings and a safer toy shopping list

Adapted from Schettler T. 2009; Expert Medical Advisory Committee on Environmental Impacts on Reproductive Health. 2009.

CH₂OPS: Socioeconomic

- Living in higher levels of air pollution
- Exposure to lead, asbestos
- Limited access to nutritious food
- Vulnerability to other factors



Socioeconomic: Guidance for Patients

Advice for patients:

- Know tenant & citizen rights
- Work with community organizations, government agencies to ensure risk awareness & knowledge

Resource Tip:

- Visit the [Alliance for Healthy Homes](#) Web site for tools and tips on reducing environmental hazards in homes and communities

An Important Take-Home Message

Identifying and reducing exposures to potentially harmful toxicants *now*, when couples plan (or not) a pregnancy, increase the likelihood of a successful outcome.

ARHP Resources

Learn more at the ARHP Web site:

- Click on Environmental and Reproductive Health topic area
 - www.arhp.org/topics/enviro-repro-health
 - Fact Sheet: *Environmental and Reproductive Health Resources for Health Care Providers*
 - Patient handout: *Health Matters: The Connection Between Your Health and the Environment*
-

Pesticide Resources

- Fact sheets from CDC's National Agricultural Safety Database (www.cdc.gov/nasd)
 - National Pesticide Information Center (npic.orst.edu)
 - EPA's Pesticides Information Web site (includes information for children) (www.epa.gov/pesticides)
 - Pesticide Action Network (PAN) database (www.pesticideinfo.org)
-

Resources for Clinicians

- Critical Windows of Development (www.endocrinedisruption.com): Online tool from The Endocrine Disruption Exchange (TEDX)
- ReproTox (www.reprotox.org): Summaries on the effects of >5,000 agents and exposures on pregnancy, reproduction, and development
- TOXNET (<http://toxnet.nlm.nih.gov/>): Databases on toxicology, hazardous chemicals, environmental health, and toxic releases

more...

Resources for Clinicians (continued)

- American College of Occupational and Environmental Medicine (www.acoem.org)
 - Collaborative on Health and Environment (CHE) database (<http://database.healthandenvironment.org/>)
 - EnviRN (www.envirn.umaryland.edu)
 - Local environmental health specialists
 - Occupational and environmental health departments in universities
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Summary

- Evidence is increasing of effects of pesticide exposure on reproductive health
 - Precautionary approach should emphasize prevention
 - Environmental health history and patient guidance should be incorporated into health care for all patients
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