

# **Pesticides**

***Very special chemicals!***

Preserve safe uses!

You make a difference—  
know your stuff!

# Pesticide

Pesticide. Any substance which alone, in chemical combination, or in any formulation with one or more substances is defined as a pesticide in section 2(u) of the Federal Insecticide, Fungicide, and Rodenticide Act (7 U.S.C. 136(u) et seq).

# Toxicology

Scientific study of adverse effects of chemicals

- **Effects** are determined by dose
- Principle codified by a physician, alchemist, philosopher: Paracelsus, 1450
- *If dose determines a poison, there must be a safe level of everything!*

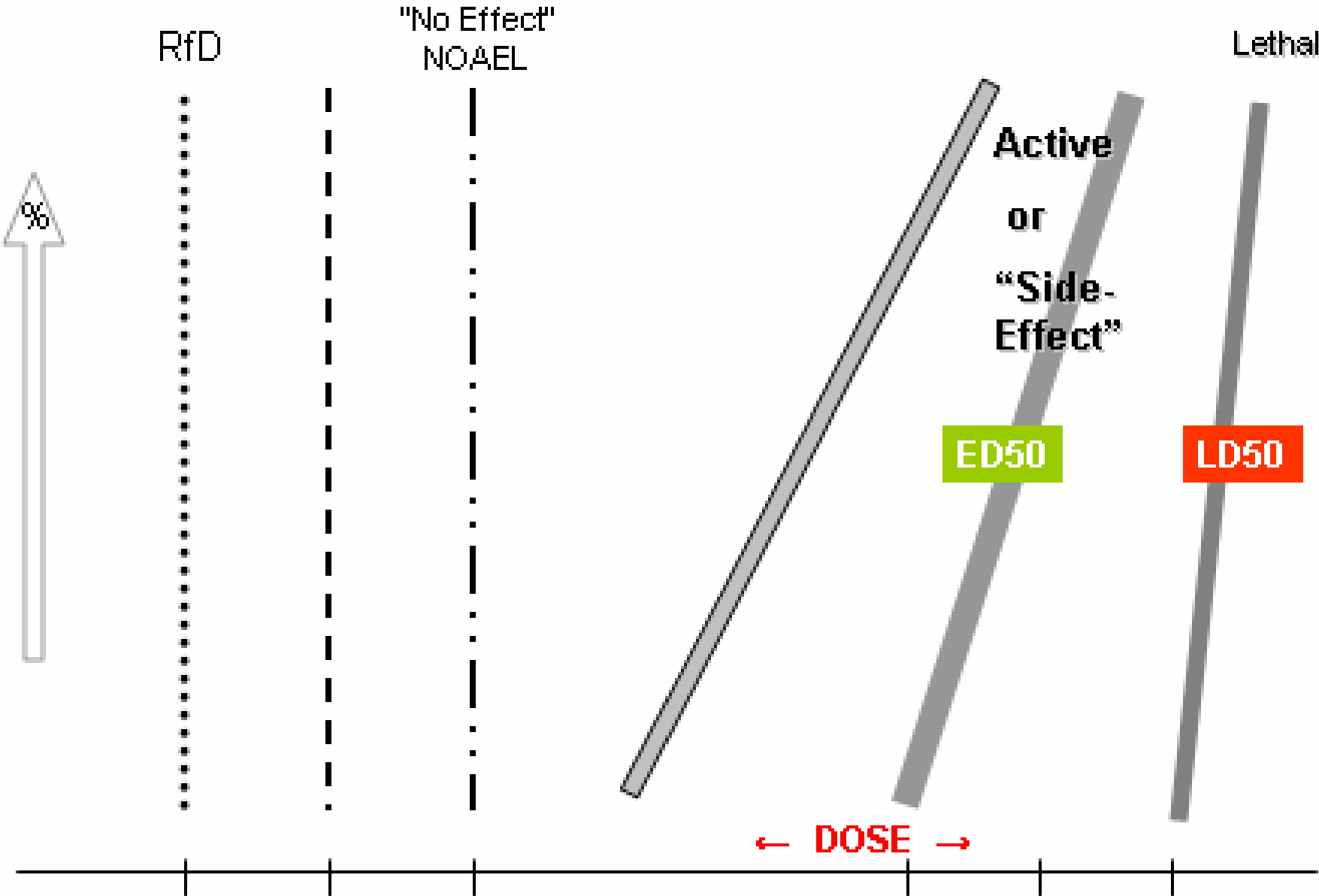
When *exposure* makes something happen....

Response

log[Dose]



# Safety Evaluation: Exposure-Response Relationships



# Regulation: How much is too much? How little is OK?

- LD50

- ED50

- Threshold or Low Observed Adverse Effect Level

- No Observed Adverse Effect Level

- » No Observed Effect Level

- Uncertainty factors

- Species 1/10

- Intraspecies 1/10

- Special (children) 1/10

- o Reference Dose (mg/kg-day)

# Risk Assessment

Finding the amounts of exposure that do nothing to health (and environmental quality)!

1. Hazard Identification (what?)
2. Dose-response (time/amount)
3. Exposure assessment (animal→human)
4. Risk characterization → Regulation

# **Food Purity**

A BASIC HUMAN CONCERN

Food as Food

Properties

Ingredients

Chemicals





# **Pesticides are top food-related health concern**

**≈65%**

Trace chemical residues became a public concern in the 1960s

A white mouse with red eyes is looking at a large red strawberry. The background is filled with many other strawberries.

***“...to be on the safe side,  
she doesn’t buy.”***

**1959**

**“Pesticide residues are a condition of production...”**

**Harvey Wiley, founder FDA 1906**



**Lead arsenate residues, ca. 1900**



## Causes of Foodborne Illness

[Amnesic Shellfish Poisoning and Domoic Acid](#)

[Campylobacter jejuni](#)

[Ciguatera Poisoning](#)

[Clostridium botulinum](#)

[Clostridium perfringens](#)

[Cyclospora cayetanensis](#)

[Hemolytic Uremic Syndrome \(E. coli 0157:H7\)](#)

[Listeria monocytogenes](#)

[Paralytic Shellfish Poisoning](#)

[Red Tide, PSP and Safe Shellfish Harvesting](#)

[Salmonella](#)

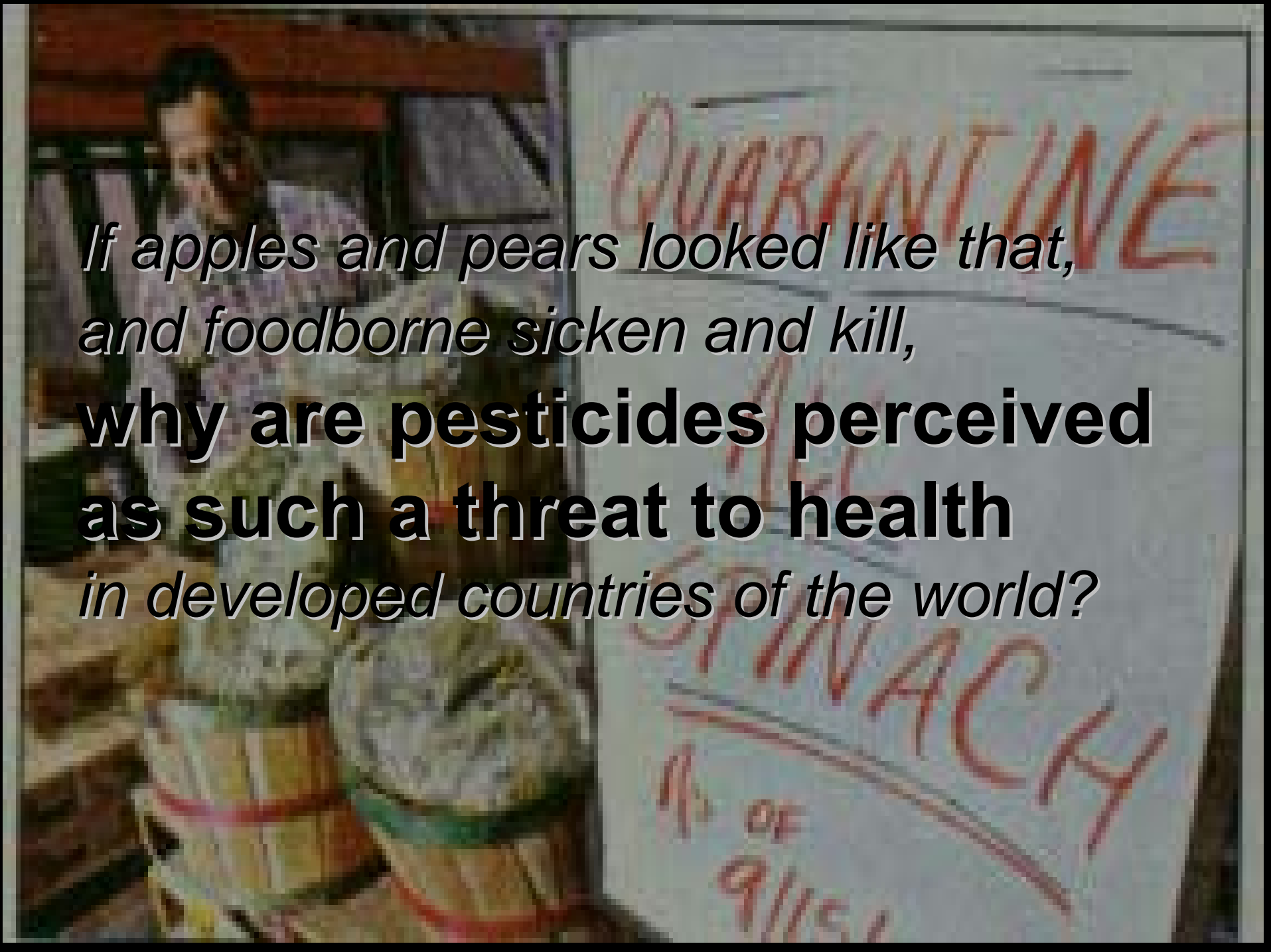
[Scombroid Poisoning](#)

[Shigella](#)

[Toxoplasma gondii](#)

Public health experts estimate that there are 11 to 13 million cases of foodborne illness in Canada every year. Many more in the USA...

“How many are caused by pesticide residues?” **Silence**

A photograph of a person in a purple shirt standing in a room. In the background, there is a sign that says "QUARANTINE" and "STEWART". The person is looking towards the camera. The room appears to be a quarantine facility.

*If apples and pears looked like that,  
and foodborne sicken and kill,*

**why are pesticides perceived  
as such a threat to health**  
*in developed countries of the world?*

Organic food is produced without

**1 most conventional pesticides**

2 fertilizers from synthetic ingredients  
or sewage sludge

3 bioengineering

4 ionizing radiation.

USDA Consumer Brochure: *Organic Food Standards and Labels: The Facts*

“Organic agriculture practices *cannot ensure that products are completely free of residues*; however, methods are used to minimize pollution from air, soil and water.

USDA National Organic Standards Board (NOSB) definition, April 1995

*New perspective on pesticide residues in food...*

The public revulsion for pesticides is magnified by the thought they will become part of us.

B. Krieger, 2008



People choose to avoid pesticide exposure—  
is there a measurable benefit?

Pests live their lives for free on field crops!

Crops are grown to sell; not to give away!

Pesticides are purchased to protect crops  
for sale—*5-A-Day* is a healthy choice!

Consumers will have a residue exposure.

What about the pesticide exposure that the consumer wants to avoid...

## Residue to Dose

- Residue level, ppm
- Amount eaten, g
  
- 50 g strawberries
- 1 ppm insecticide
  
  
- $50 \text{ g} \times 1 \text{ ug/g} = 50 \text{ ug}$

- Dosage is amount per body weight
- 50 ug/100 kg or 0.5 ug/kg

*If 2 tablets acetaminophen*

- 6,500 ug/kg

*Pesticide residues are tiny!*

# But this is about residues!

- Residue, 1 ppm
- No Effect Level  
5 mg/kg

• *How much at one meal?*  
 $[5 \text{ mg/kg}] / [0.5 \text{ ug/kg}] =$   
*10,000 servings!*

- More than 100 full 8 pound trays to get to “No Effect” Level

*But don't worry....*

*Vitamin C diarrhea*

*Methanol blindness*

*Ethanol drunkenness*

*Will protect you from the  
NOAEL pesticide!*

# Do misconceptions about food safety hurt your business?

- Too small to matter
- Opposition is beyond reason—not really
- Green must be good!
- Fear drives emotional decision-making
- Appeasement politics quiets the masses (for the short term)

- Ignorance is the only excuse for poor decisions; it should be a very short-term condition
- Pervasive anxiety is an unhealthy state of mind
- Can obscure the public good, waste time and valuable resources
- Pragmatic decisions are no substitute for sound judgment and action

# Your Experience and Public and Regulatory Perceptions of Pesticide Safety and Risk, 2008

*Simply don't match!*

# Risk<sub>None/Big numbers!</sub>? Just a minute...

*Chemicals, including pesticides, are not associated with risk unless they cause a harmful response in a vulnerable group of exposed people.*

**1. Chemical**

**2. Exposure**

**3. *Harm***

Regain public confidence in pest  
control by responsibly reversing  
food safety fallacies!

Bob Krieger  
PCEP, UCR 2008