



**Responding to the chemical part of  
pesticide risks in modern agriculture**

Bob Krieger, Ph. D.  
Personal Chemical Exposure Program  
Department of Entomology  
University of California, Riverside

[Bob.krieger@ucr.edu](mailto:Bob.krieger@ucr.edu)



© 1998

# Commercial Chemicals

- *Natural products*

- *Synthetics*



Drugs

*Ceremonial*

*Medicinal*

*Recreational*

**Pesticides**

*Storage*

*Crop protection*

*Residences*

Food

Industrial

*Process*

*Product*

*Pollutant*

# Pesticide Product

- Active Ingredient
- Inert or ***Other*** Ingredients
  - Water
  - Formulating agents
  - Surfactants
- Mixture

# Perceptions

## *Origins of Concern*

- Food Taboos and Medicines
- German Beer Purity Law of 1516
- England-food adulteration (1800s)
- USA-food purity (1900s)
  - Production conditions
  - Adulteration
  - Contamination
  - Pesticide residues
- Conventional and Organic Produce

# Food Taboos

Food is often the subject of taboo or disgust because it is internalized. *Any revulsion we have for the food is magnified by the thought it will become part of us.*

Carole M. Counihan, 1999  
Ethnographer  
Millersville University, PA

# Taboo Food and Drinks

- Religion
  - Forbidden consumption of meats
  - Observe vegetarianism
- Culture
  - Species standing (pets, “non-foods”)
- Health
  - Undercooked pork
  - Seafood (seasonal poisoning)
  - Scavengers and carnivores

# Medicinal Foods

Eating foods with medicinal effects to meet our health conditions is the most effective way in promoting good health. They are less expensive than drugs, have no adverse side effects, are easy to make, and are extremely nutritious and tasty.

Chinese Food Therapy, 2006



# “THE SUPERIOR HERBS”

Herbal remedies cannot be pre-packaged or standardized because they are only prescribed according to an individual patient's needs. This is what makes herbal medicine so difficult for modern science to follow.

# Consumer Benefits

## Organ transfers...

- animal penises give healthy sex lives
- rooster testicles help women stay young
- monkey brains cure neurological ailments

" If we eat wrongly,  
No doctor can cure us;  
if we eat rightly,  
No doctor is needed."

*- Victor G. Rocine circa 1930*

# Food Remains the First Concern

(today the Food Quality Protection  
Act of 1996)

# German Beer Purity Law, 1516

Specified ingredients

***Water***

***Malt***

***Hops***

***Yeast***

# **Botulism Associated with Commercial Carrot Juice in Georgia and Florida, September 2006**

"Bolthouse Farms 100% Carrot Juice"

"Earthbound Farm Organic Carrot Juice"

"President's Choice Organics 100% Pure Carrot Juice"

Cranial nerve palsies

Progressive descending flaccid paralysis  
resulting in respiratory failure in 4 persons

Voluntary recall from all 50 states  
by Bolthouse Farms, Bakersfield, CA

(Unlikely to effect BoTox sales!)



# Pesticides are EU citizens' top food-related health concern

**63%**

September, 2005

Low No 18007  
C. E. Holton





# Cranberry Scare, 1959

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

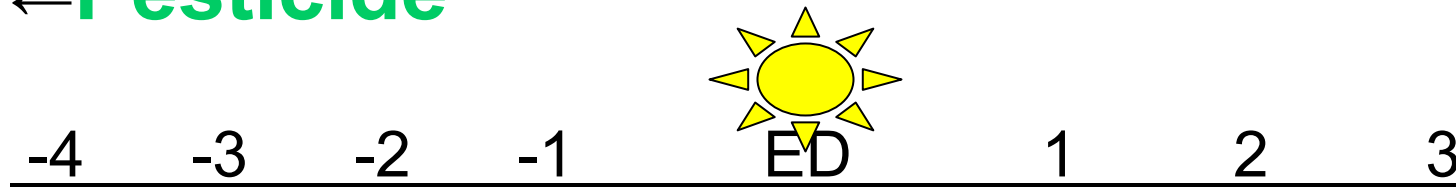
Arthur Fleming, Secy. HEW



# Testing for Safety: Scientific Studies

## Pest Responses: Adverse Effects (ED50)

← **Pesticide**



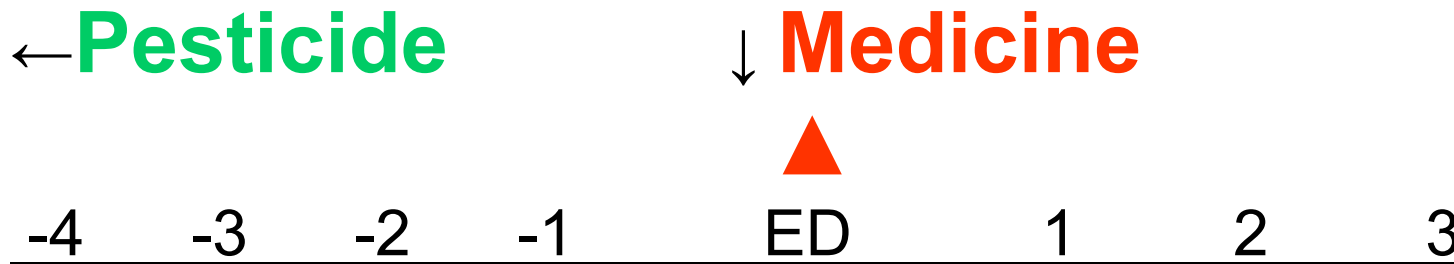
▲  
a. Chemical Exposure Levels

b. Time

$$(ED = a \times b)$$

# Testing for Safety: Scientific Studies

## Responses: Adverse Effects (ED50)



- ◀
- a. Chemical Exposure Levels
  - b. Time
- (ED = a x b)

# Prescription Drugs and Over-the-Counter Medicines

- allergic reaction
- chest pain or irregular heartbeat
- chest, jaw, or neck pain
- severe stomach pain
- weakness or numbness
- nausea



# Signal Word: Acute Toxicities

	Highly toxic	Moderately toxic	Slightly toxic	Very low toxicity
<b>Oral LD50 mg/kg</b>	0-50	50-500	500-5000	>5000
<b>Inhalation LC50 (mg/L)</b>	<0.2	0.2-2	2-20	>20
<b>Dermal LD50 mg/kg</b>	<200	200-2000	2000-5000	>5000
<b>Eye effects</b>	corrosive	irritation persists 7 d	irritation reversible 7d	no irritation
<b>Skin effects</b>	corrosive	severe irritation @72 h	moderate irritation @ 72 h	mild irritation @ 72 h

# Product Signal Words

Signal word	Acute Oral LD50 (mg/kg bw)
<b>CAUTION</b> <i>slightly toxic</i>	<b>500-5000</b>
<b>WARNING</b> <i>moderately toxic</i>	<b>50-500</b>
<b>DANGER</b> <i>highly toxic</i>	<b>0-50</b>

# Environmental Chemicals- Contact, Then What

- Absorption
- Distribution
- Metabolism
- Excretion

Urine

 */after work*

Feces



*“Any revulsion we have for the food is magnified by the thought it will become part of us.”*

# Risk

*Chemicals* are not associated with *risk* unless a vulnerable group of people are *exposed* and *produce a harmful* effect.

- 1. Chemical**
- 2. Risk**
- 3. Toxicity**

A red starburst shape with a black outline, centered on a white background. The text "Look at the Record" is written in white, bold, sans-serif font inside the starburst.

**Look at the  
Record**

## Unintentional Injuries On-the-Job

Injury Division	Workers x 10 <sup>3</sup>	Deaths 2003	Deaths per 10 <sup>5</sup> Workers
Agriculture	3,340	710	20.9
Mining	539	120	22.3
Construction	9,268	1,060	11.4
Manufacturing	17,708	490	2.8
All industries	138,988	4,500	3.2

US National Safety Council, 2004

## Causes of Death, 2004

Cause	Number	Deaths per 10 <sup>5</sup> Deaths
All unintentional injuries	101,537	35.6
Motor-vehicle	43,788	15.4
Falls	15,019	5.3
Poisoning	14,078	4.9
Pesticide	7	0.0025
Choking	4,185	1.5
Drowning	3,281	1.2
All other	21,186	7.4

National Safety Council, 2004

# California Illness and Injury Data Classified by Definite, Probable, and Possible Exposures<sup>1</sup>

Year	Total cases	Relationship of Illness or Injury to Pesticide Exposure					
		Definitely or Probably			Possible		
		Cases	Hospitalized	Lost work time	Cases	Hospitalized	Lost work time
1999	1,629	830	32	126	371	2	51
2000	1,144	637	33	144	256	3	51
2001	979	430	27	78	186	2	25
2002	1,859	924	19	106	291	6	42
2003	1,232	614	8	70	188	1	42

**<sup>1</sup>Definite: Signs and symptoms would be expected from exposure described. Probable: Close correspondence. Possible: Some correspondence.**

# Substances Most Frequently Involved Children Under 6

Substance	Number x 10 <sup>5</sup>	Per Cent
Cosmetics & personal products	1.7	13.4
Cleaning substances	1.2	9.7
Analgesics	1.0	7.8
Foreign bodies	0.92	7.4
Topicals	0.92	7.4
Cough and cold preparations	0.68	5.5
Plants	0.58	4.6
Pesticides	0.51	4.1
Vitamins	0.45	3.6
Antimicrobials	0.35	2.8
All other	1.5	11.2
Total	12.5	--

# Shaping Pesticide Perception

Environmental Justice  
Or  
Advocate Blackmail?



**Everyone *knows* how  
bad *they* are!**

Rachel Carson (1962) and media like EDF,  
NRDC, PAN, Landrigan, Seymour, Sheen,  
*Press Enterprise, CBS, NBC, ABC, CNN,*  
*etc.*

**Institute Analysts have just  
announced—mg, ug, ng, pg, fg, at**

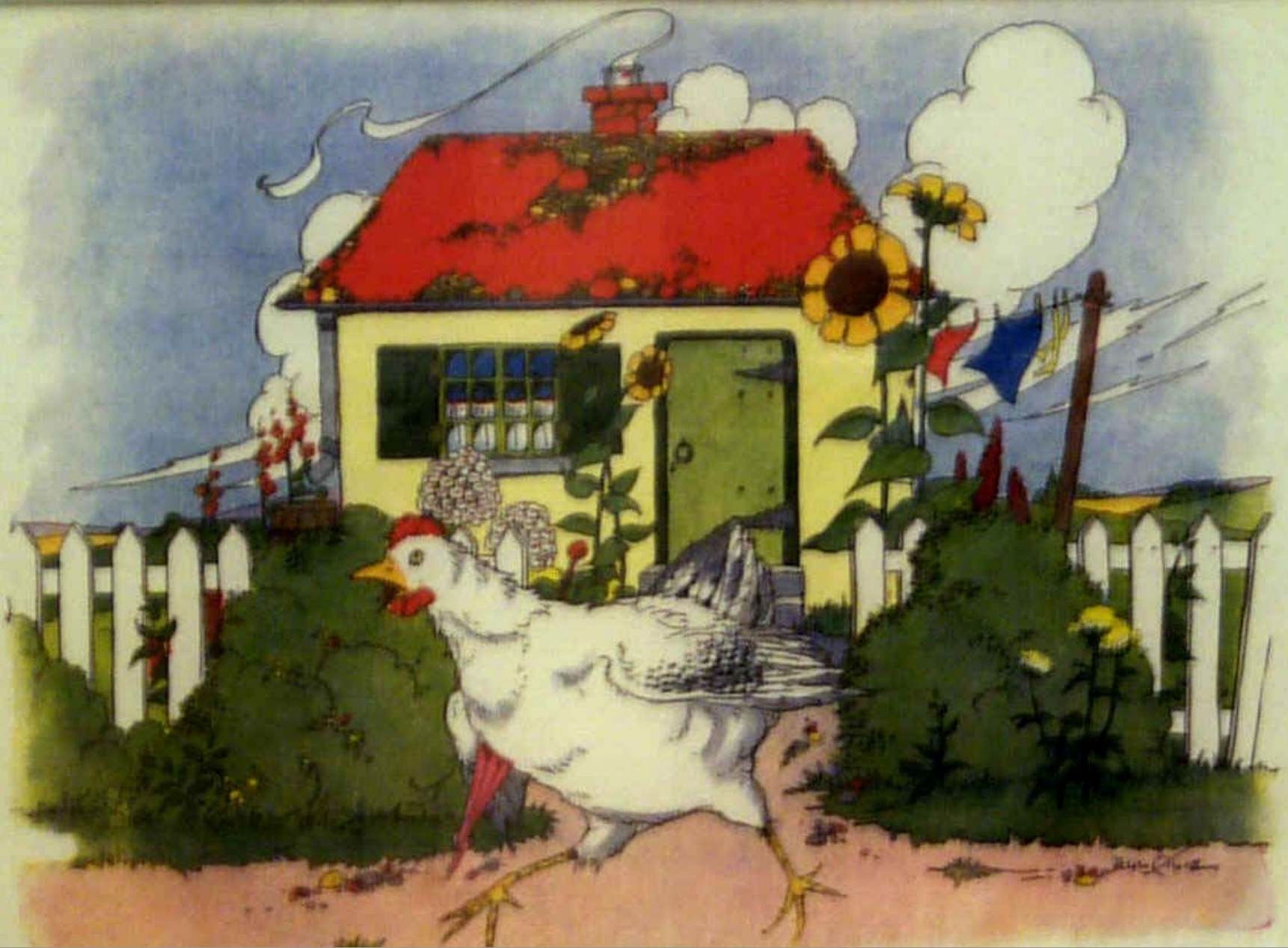
**“We can now find *a flea* in a line of  
100 full-grown, circus elephants!”**

*1 Flea      ≈ millimeter*

*Elephant ≈ 10 meters*

# Regulate!

- An alarmed, chemically naïve public
- Extremely low contact
- NOAELs become illness thresholds!



Chicken Little



*Safe pesticide use?*

**Yes, I think so!**

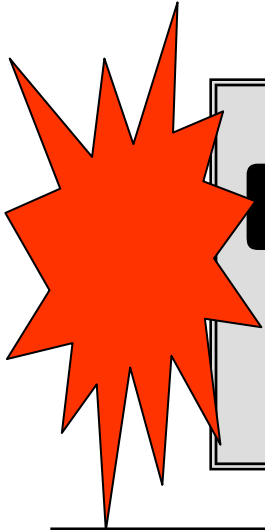
*But there is a long way to go!*

# Getting there...

- Exposure at some level is inevitable.
- Everything goes somewhere.
- Even zero isn't none!
- Exposure is not an effect.
- *How little is OK?* Usual amounts.
- What is *usual*? Heed the label.

# Including the fine print...

- Dose is the chemical part of risk.
- Risk reduction must be an ongoing educational process—a lot more can be done.



**Demonstrate by doing:  
Strive For Safe Use!**

Know and Heed Labels

Recognize Reality of Exposure

Use Good Judgment!