

Clark/Bakersfield #1

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Residential Pesticide Exposures In Context

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- **We are your one-stop shop for home and garden pest solutions!**
- **We are here whenever you need us!**
- **We care about your family's health and safety and the environment!**

Pesticide Exposures In Context

Part ①

- Chemical perceptions
- Dose-response
- Measurement and “Zero”
- Exposure and Drugs

Part ②

- Safety evaluation
- Tox Signal Words
- Residues and Exposure
- *“To show you care....”*

*...health, safety and the environment
are issues strongly related to public perception of
chemicals role in pest management*

Exposure is contact with potential absorption

- Chemical use results in environmental residues and human exposures at some level
- Exposures are invariably unavoidable, unintentional, or accidental
- Acknowledge exposure, but recognize that exposure is not a disease



© 1995

We live in a chemical world!

More than 52,000,000 known

- Origin

Natural and Synthetic

- Class

Organic and Inorganic

- Sustainable Use (*Green*)

Process •• ***Commercial Products*** •• Pollutants

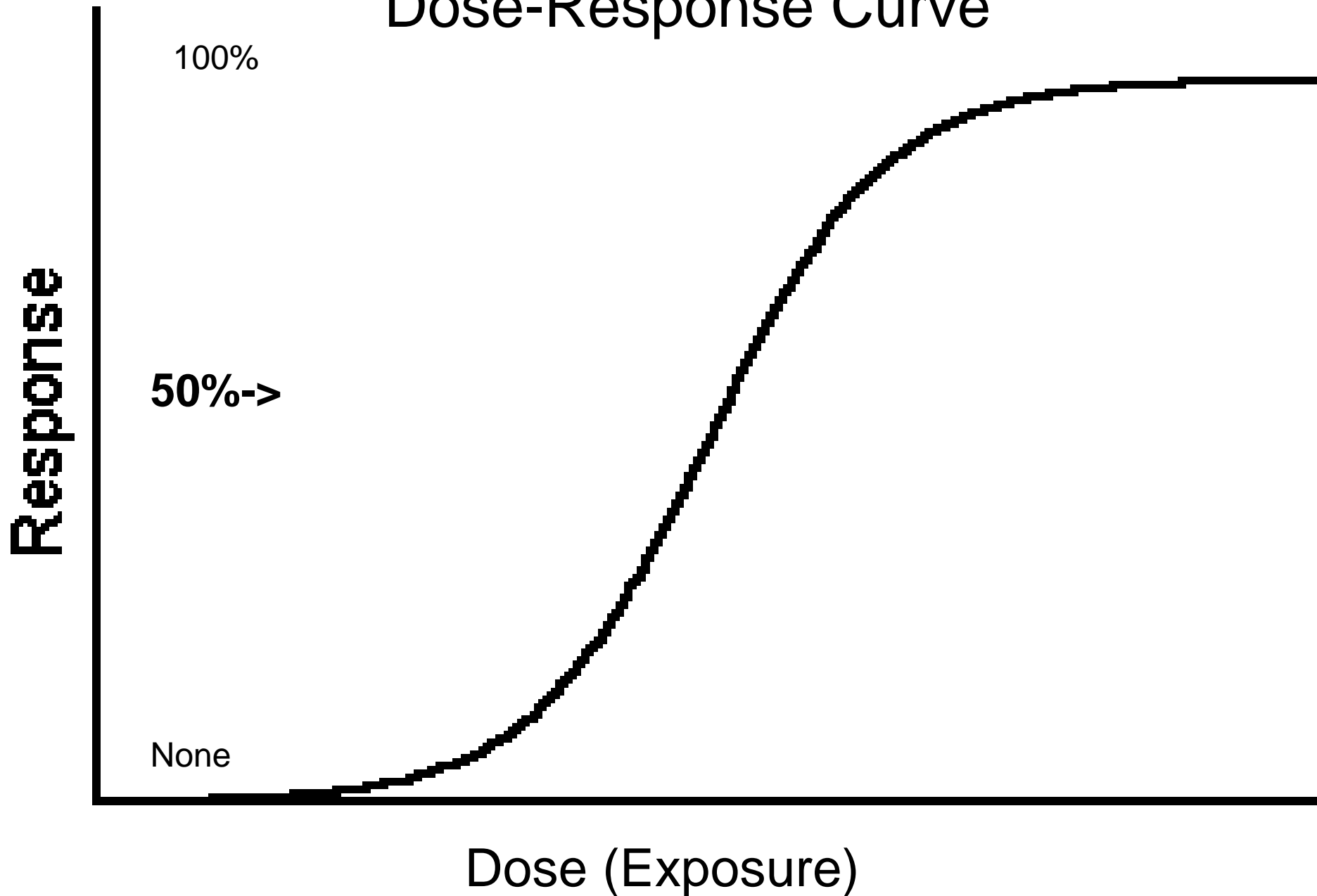
Foods • Drugs • Cosmetics • Pesticides

Chemical Risk Characterization Process

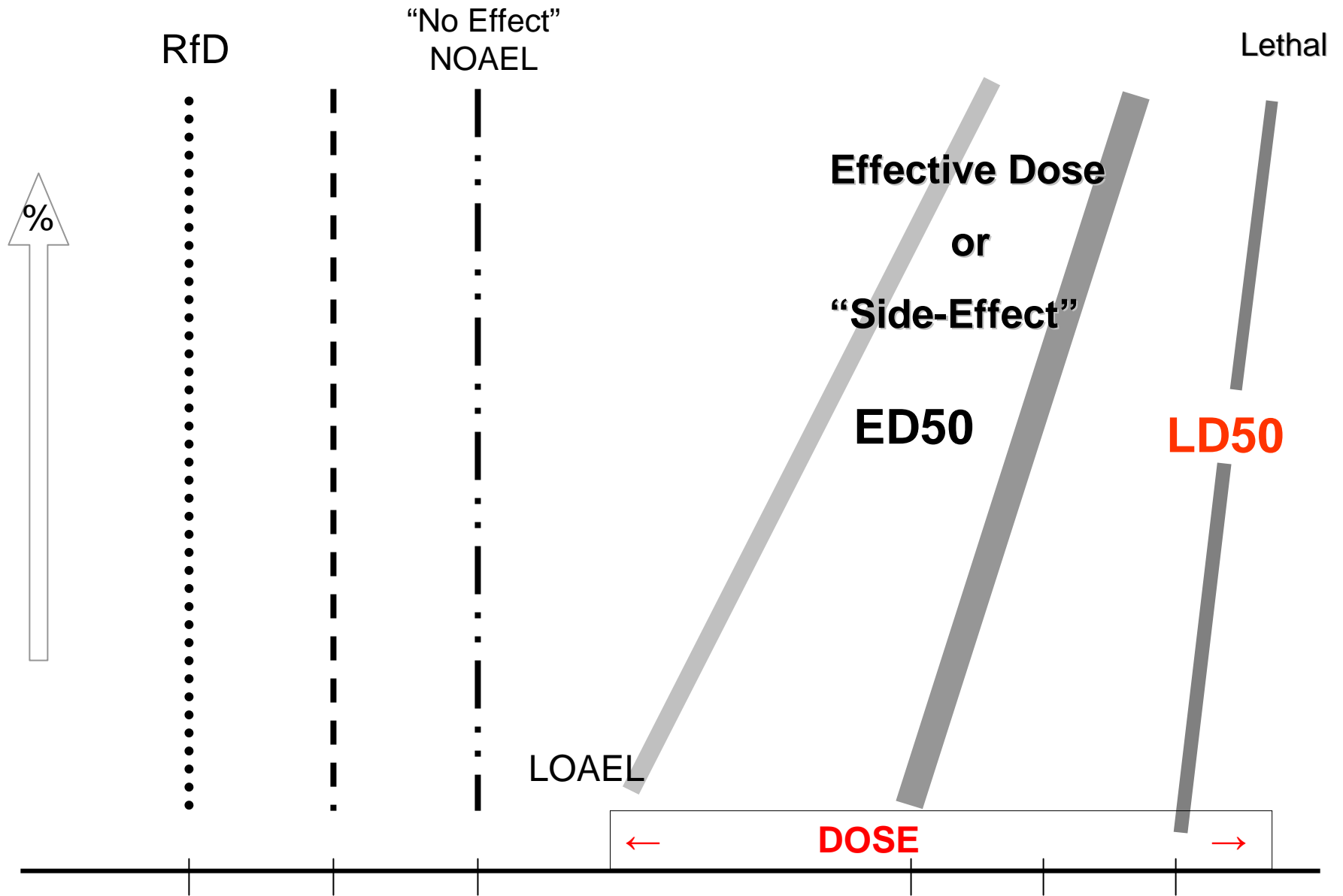
- Hazard Identification (flammable, explosive, corrosive, allergenic, toxic)
- Dose-response Relationships
- Exposure Assessment
- Risk Assessment

NRC/NAS 1983

“Dose-Response Curve”



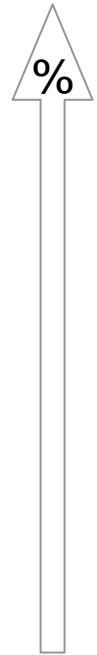
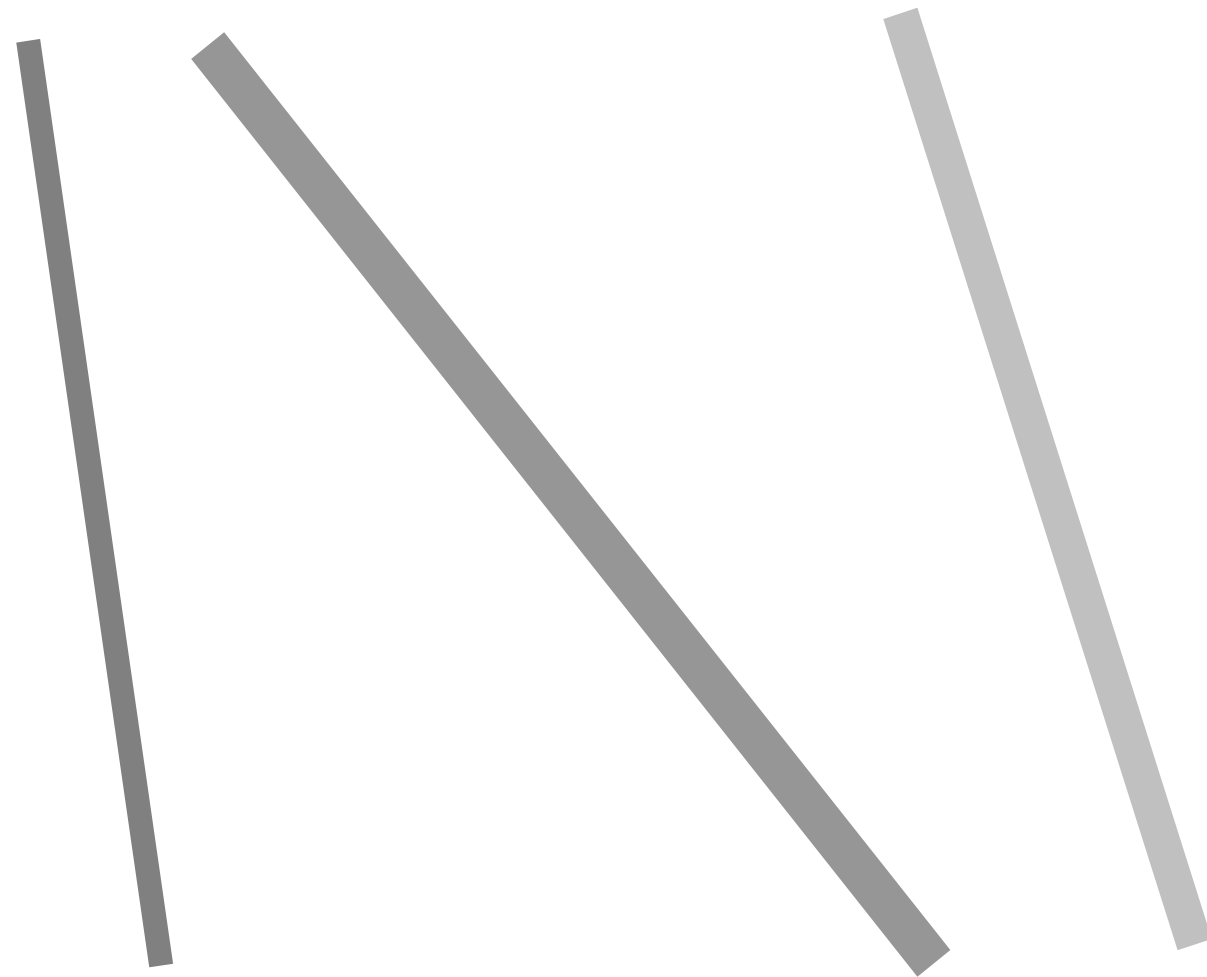
Safety Evaluation: Exposure-Response Relationships



What about everyday exposures?

Normal

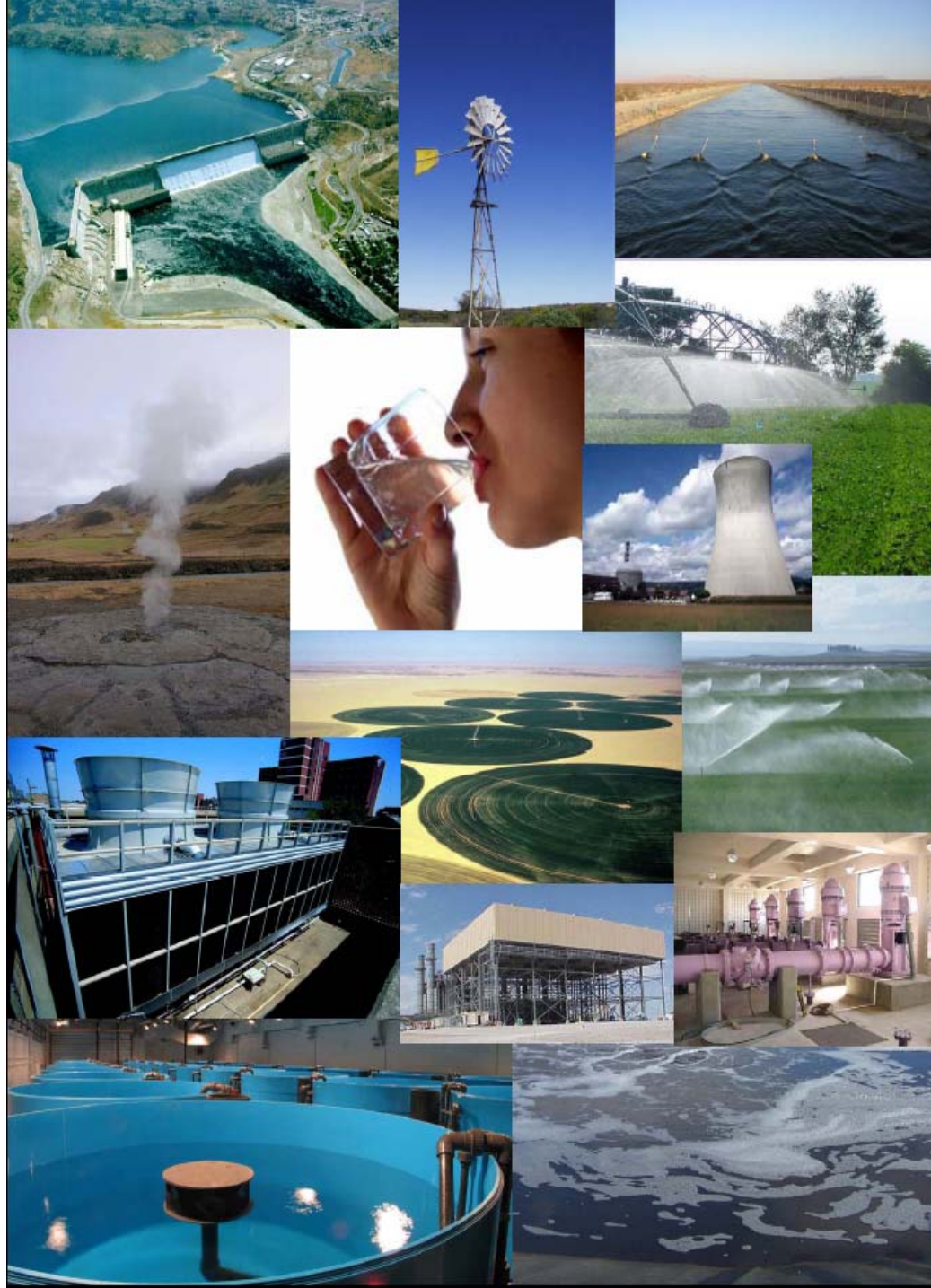
Occupational



← DOSE →

Modern Chemical Analysis

Confirms the
*Laws of
Conservation
of Matter*



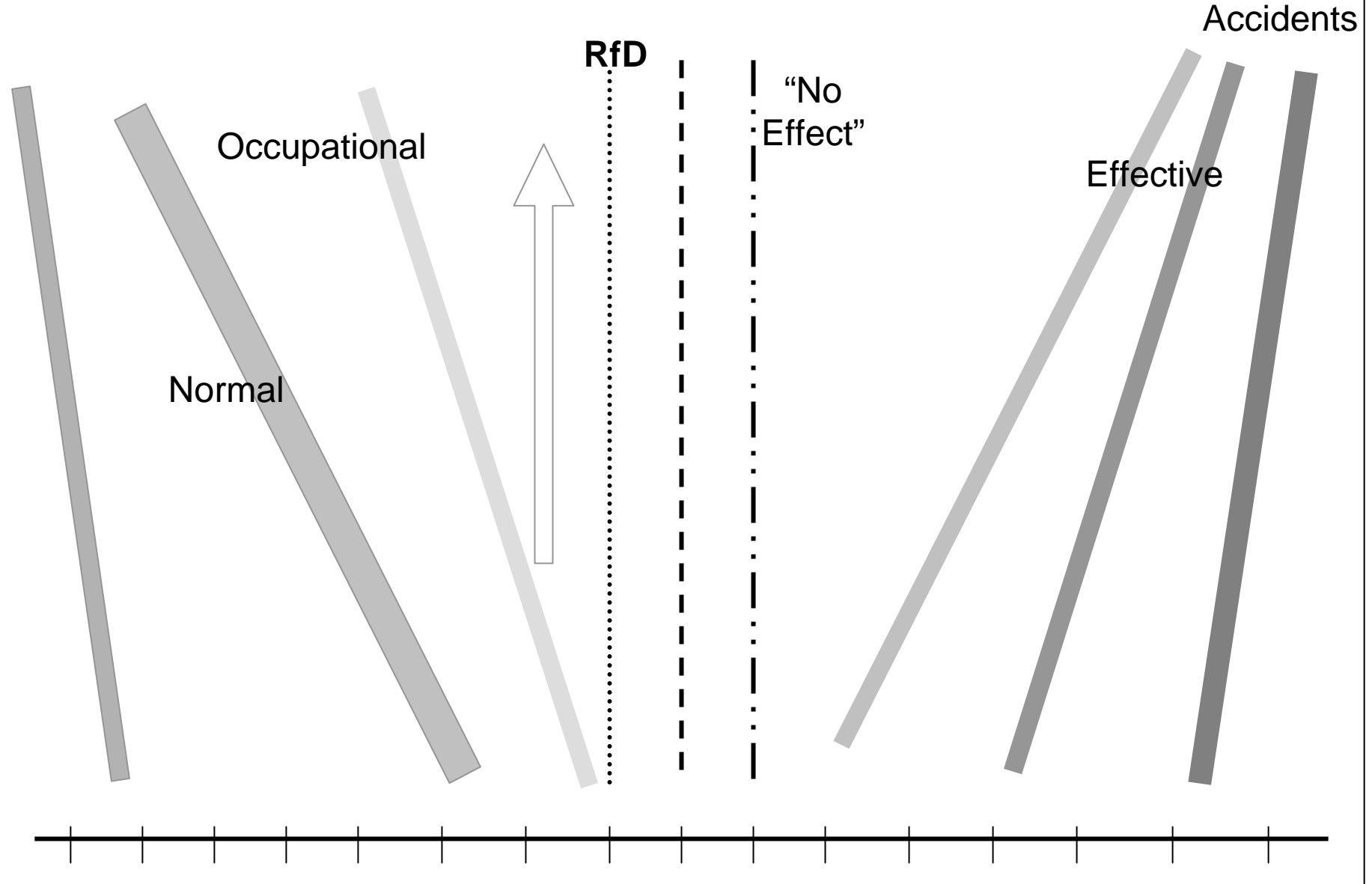
*Everything
goes
somewhere*

that only
chemical
analysts
can find!

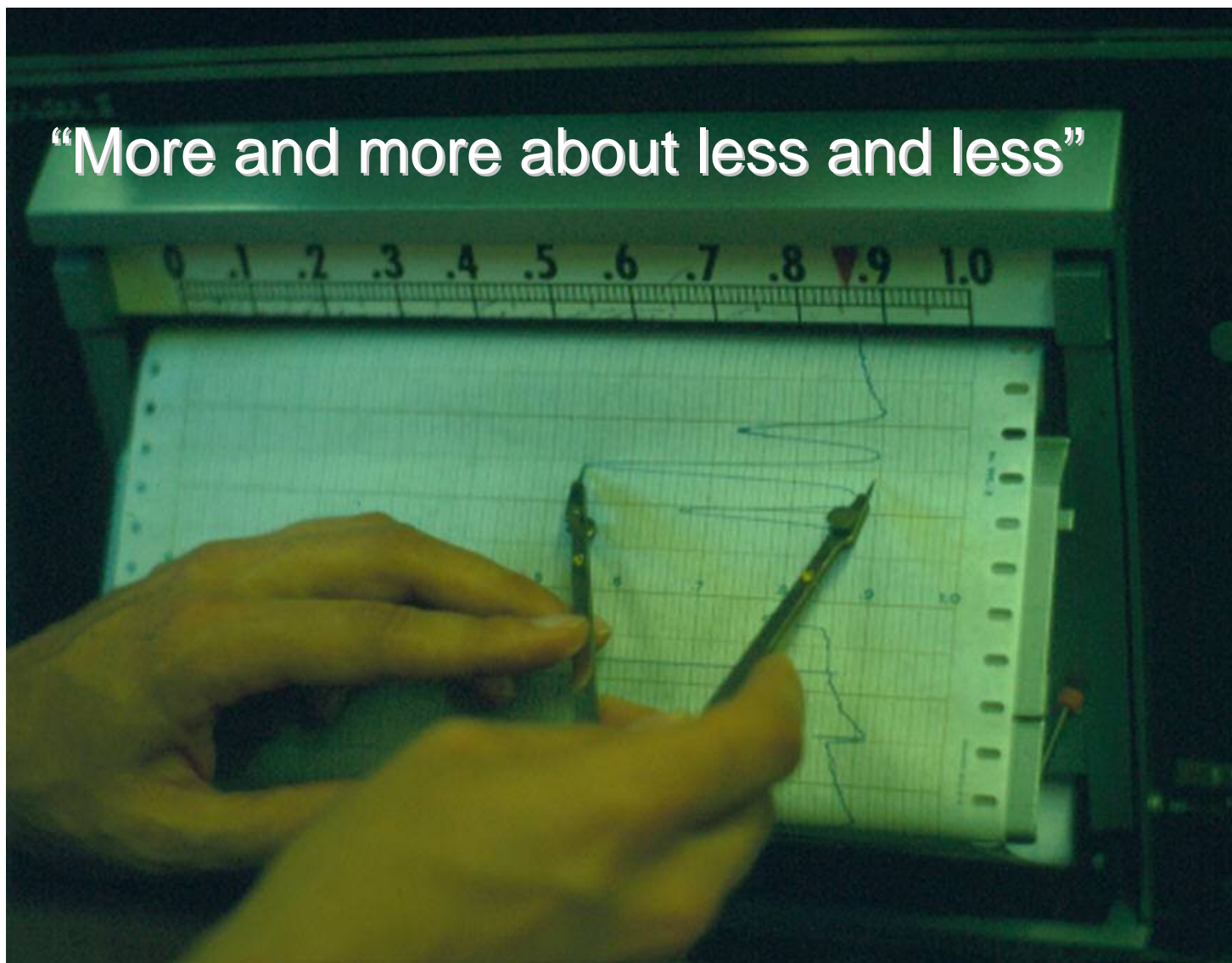
*Even **Zero** isn't none; but it is not very much!*

- 0.1 ppm is a glass in 30+ milk tankers!
- *or*
- 1 grain of table salt in 20 pounds
- Measurable levels are invariably below harmful amounts! ***Exposure isn't an effect!*** Residues are about marketing, Good Ag Practices, and trade!

Yes, Exposure goes with use!



“More and more about less and less”



How much is too much? How much is OK?

Chemical	Usual Dose	Toxic Dose	Source	Selected Responses	Lethal Dose
Alcohol <small>Ethanol Blood Level</small>	0.05%	0.1%	Beverage	Blurred vision, staggering, nausea	0.5%
Carbon Monoxide <small>% Carboxy Hemoglobin</small>	<10%	20-30%	Combustion	headache, nausea, fatigue	>60%
Secobarbital <small>(sleep aid) Blood Levels</small>	0.1 mg/dL	0.7 mg/dL	Prescription drug	staggering, slurred speech, drowsiness	>1 mg/dL
Aspirin	0.65 gm <small>2 tablets</small>	9.75 gm <small>30 tablets</small>	OTC drug	stomach pain, heartburn, gastric bleeding	34 gm <small>105 tablets</small>
Acetaminophen <small>Tylenol (over 200 products)</small>	500 mg <small>tablet</small>	7000 mg <small>14 tablets</small>	OTC drug	nausea, vomiting, liver toxicity	>25,000 mg <small>50 tablets</small>

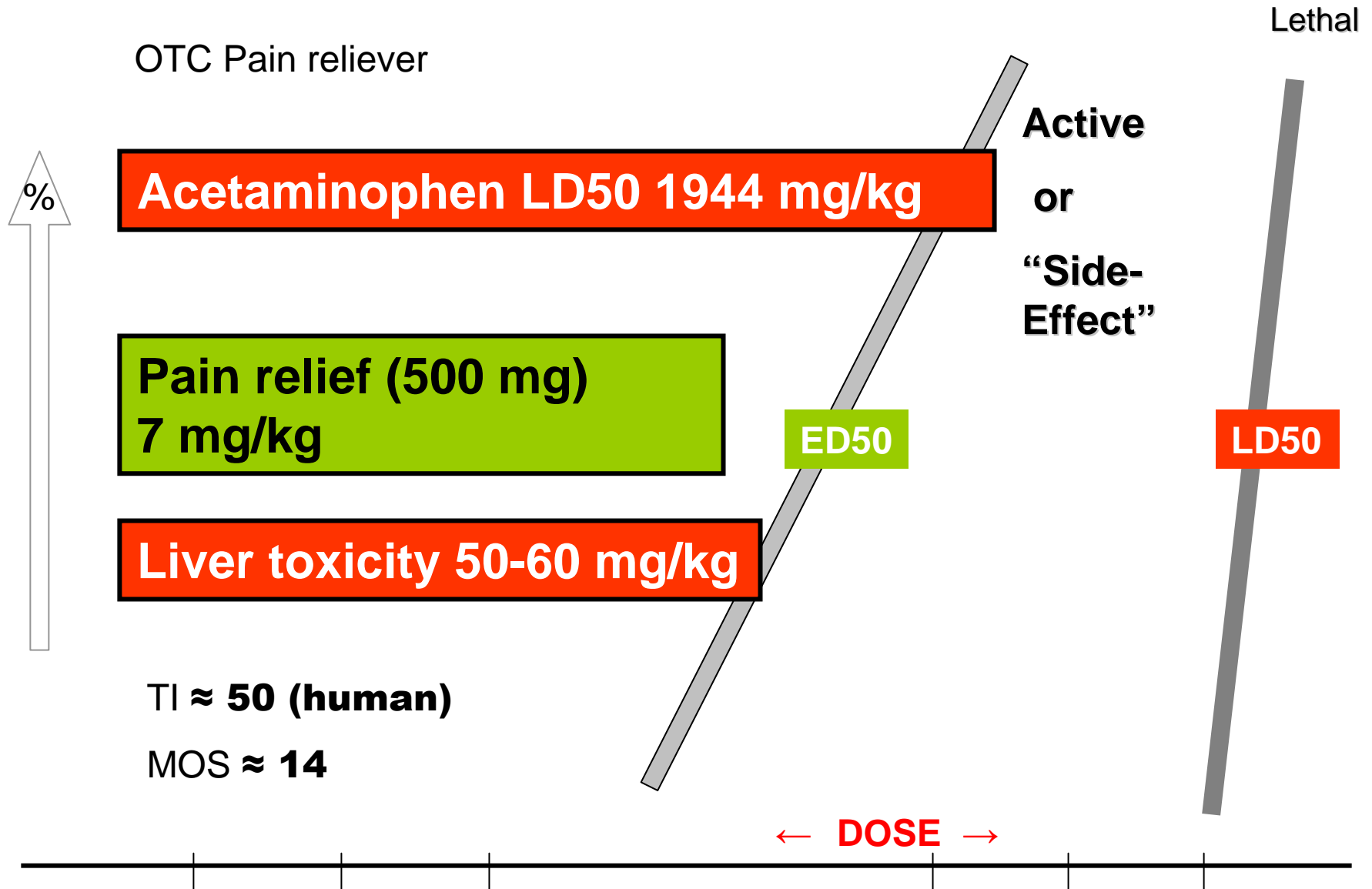
Chemical	Usual Dose	Toxic Dose	<u>Toxic</u> Usual	Margin of Safety	Lethal Dose
Alcohol <small>Ethanol Blood Level</small>	0.05%	0.1%		2	0.5%
Carbon Monoxide <small>% Carboxy Hemoglobin</small>	<10%	20-30%		>2	>60%
Secobarbital <small>(sleep aid) Blood Levels</small>	0.1 mg/dL	0.7 mg/dL		7	>1 mg/dL
Aspirin	0.65 gm <small>2 tablets</small>	9.75 gm <small>30 tablets</small>		15	34 gm <small>105 tablets</small>
Acetaminophen <small>Tylenol (over 200 products)</small>	500 mg <small>tablet</small>	7000 mg <small>14 tablets</small>		14	>25,000 mg <small>50 tablets</small>

After Gossel and Bricker, Principles of Clinical Toxicology

Chemical	Usual Dose	Toxic Dose	Lethal Dose	Margin of Safety	Therapeutic Index
Alcohol <small>Ethanol Blood Level</small>	0.05%	0.1%	0.5%	2	10
Carbon Monoxide <small>% Carboxy Hemoglobin</small>	<10%	20-30%	>60%	>2	>6
Secobarbital <small>(sleep aid) Blood Levels</small>	0.1 mg/dL	0.7 mg/dL	>1 mg/dL	7	>10
Aspirin	650 mg 2 tablets	9.75 gm <small>30 tablets</small>	34,000 mg 105 tablets	15	53
Acetaminophen <small>Tylenol (over 200 products)</small>	500 mg tablet	7000 mg <small>14 tablets</small>	>25,000 mg 50 tablets	14	50

After Gossel and Bricker, Principles of Clinical Toxicology

Safety Evaluation: Exposure-Response Relationships and H



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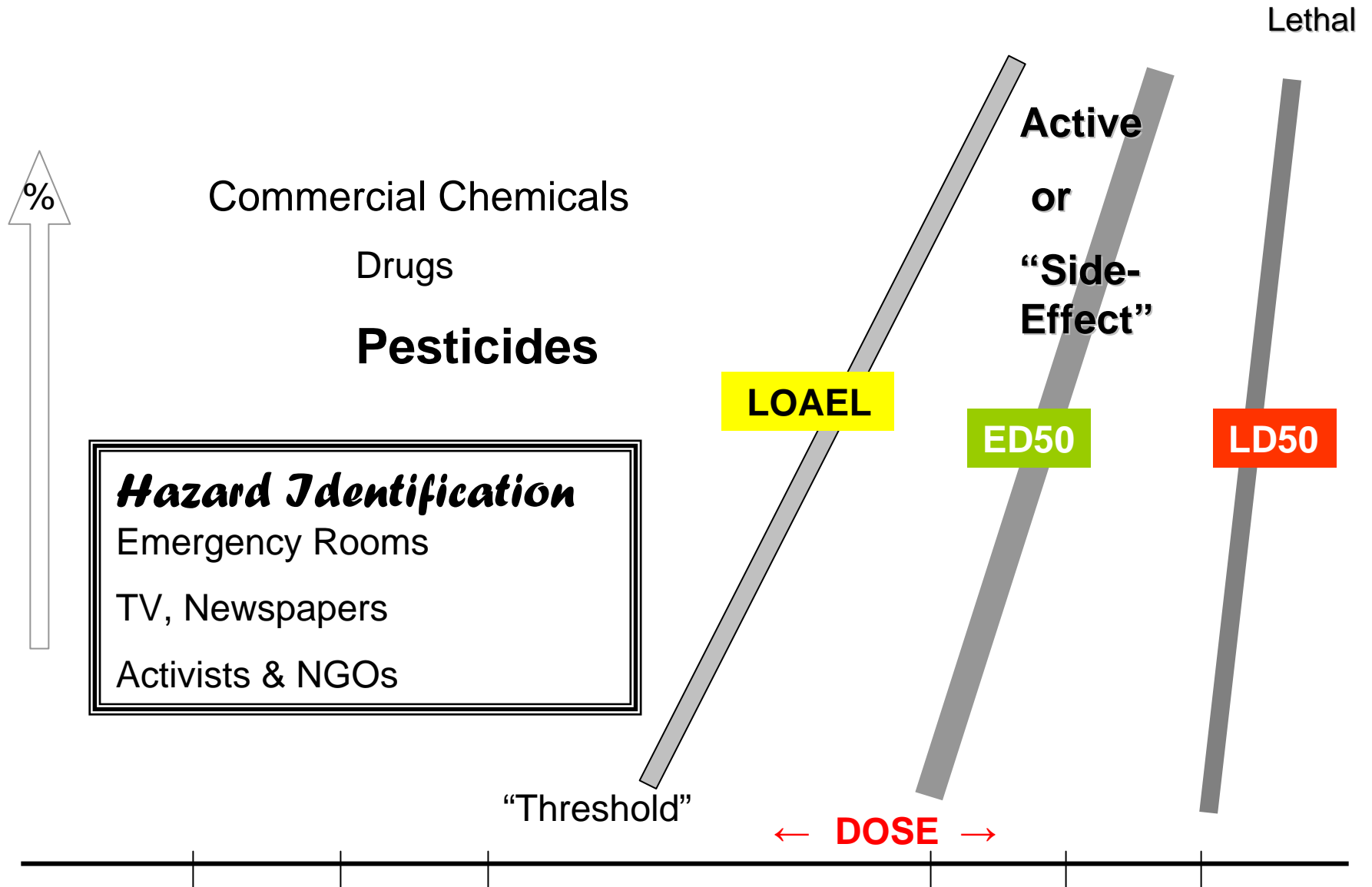
So what makes pesticides so special?

First and foremost,

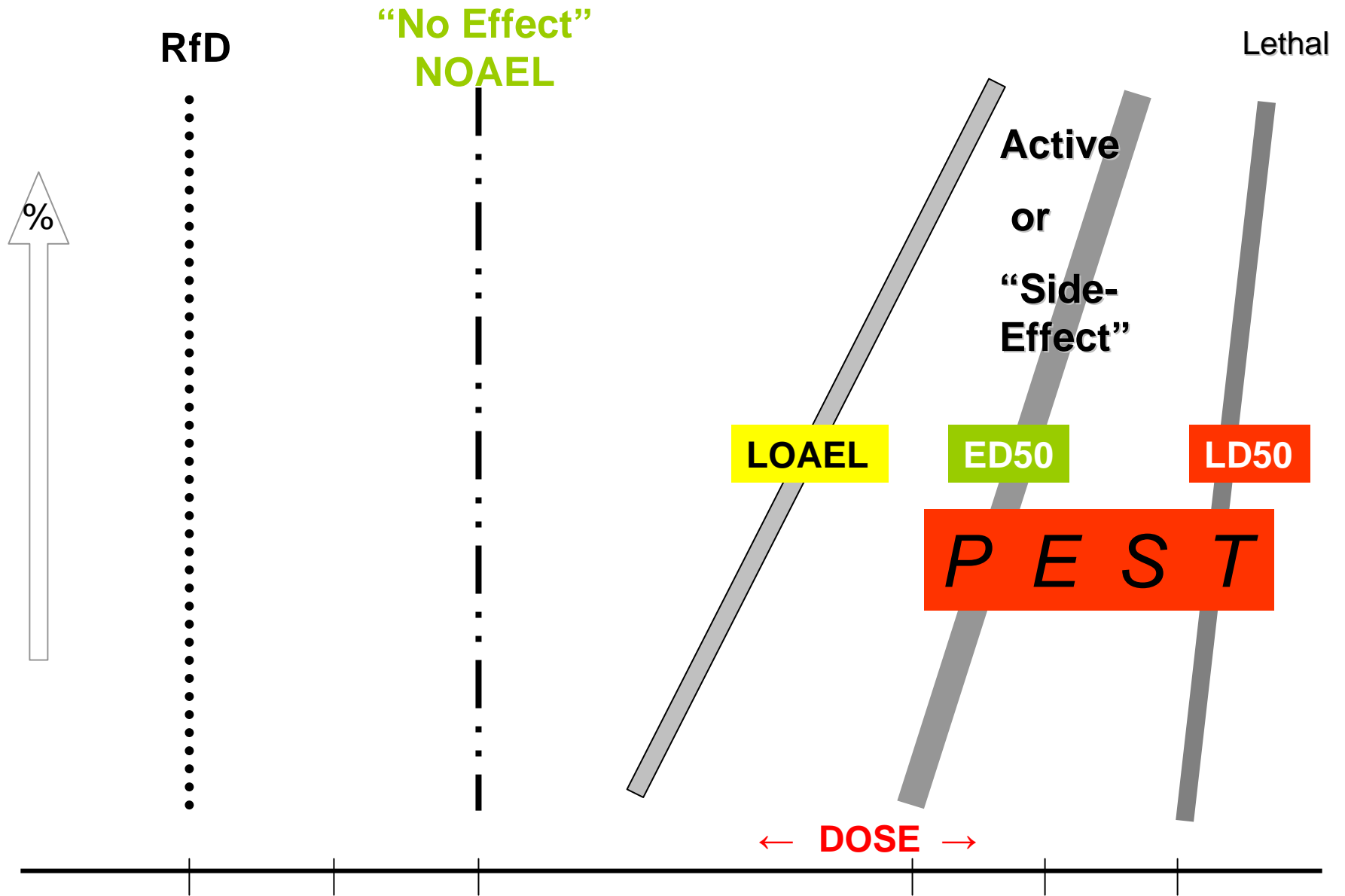
How they are used!

And that is up to you!

Pesticide Safety Evaluation



Safety Evaluation: Exposure-Response Relationships



Pesticide Toxicology

Label signal words and relative toxicities

Signal Word	Toxicity	Oral Lethal Dose (Human, 150 lbs.)
<i>Danger</i> ^a	Highly toxic	Few drops to 1 teaspoon ^b
<i>Warning</i>	Moderately toxic	1 teaspoon to 1 tablespoon
<i>Caution</i>	Low toxicity	1 ounce to more than a pint

^a Skull and cross bones + POISON for highly and extremely hazardous a.i.s

^b Lower doses for children.

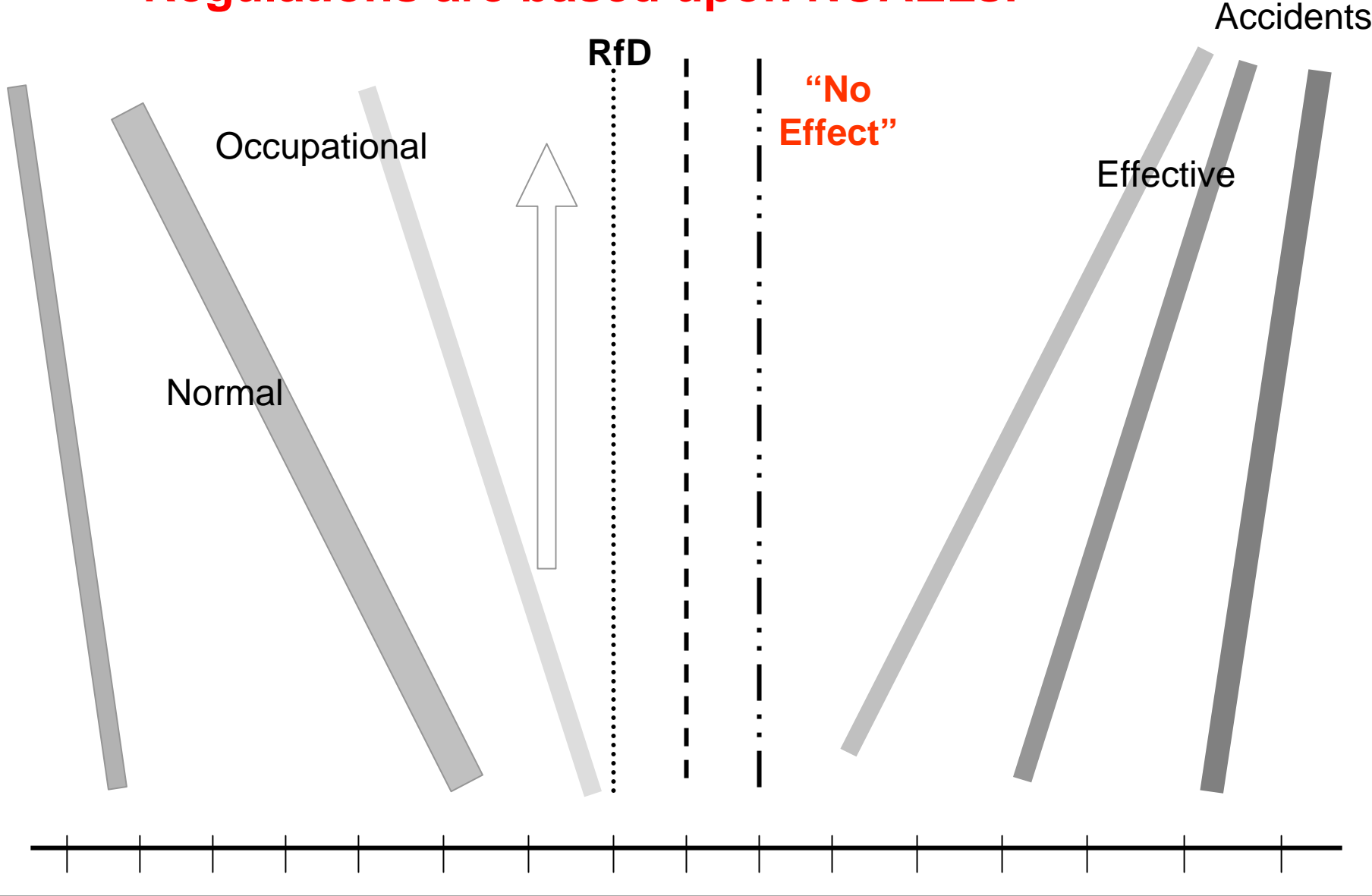
Pesticide Safety is about Pattern of Use!

Chemical	Usual Exposure	Non-Toxic Level mg/kg	Lowest Toxic Level mg/kg	Use	LD50 ^a mg/kg
cyfluthrin	micrograms/kg (mg/1000/bw)	2	7.5	Cy-Kick ^b	869-1271
fipronil		2.5	7.5	Termidor	97
imidacloprid		5.7 (males) 7.6 (females)	-	Premise/Imaxx	450
permethrin		5	-	Permethrin	430-4000
pyrethrin		10	-	Pyrethrins	200-2600

^a Table salt = 3000 mg/kg (human est lethal 1000 mg/kg)

^b Unlikely due to the product being pressurized and producing particles large enough not to be respirable.

Yes, Exposure goes with use!
Regulations are based upon NOAELs!



What about the pesticide residue exposure in food that the consumer wants to avoid...

Residue to Dose

- Residue level, *ppb to ppm*
- Amount eaten, *grams*
- 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 2 500 mg tablets acetaminophen

- 10,000 *ug/kg*

Pesticide residues are tiny!

Context for Concern

“Mounting scientific studies revealing new evidence of the buildup of some chemicals in ecosystems and people, and rising public concern about toxic chemicals in everyday products, have driven recent reform efforts in many states. The research found that debates about broad chemicals policy reform measures are taking place in at least eight states.”

The Lowell Center for Sustainable Production
University of Massachusetts, Lowell (2008)

Environmental Chemical Inventories

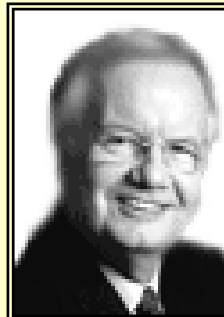
- CDC/March 2001 27 chemicals
- CDC/January 2003 116
- CDC/June 2005 148
- EWG/Mt.Sinai 167 (total, n = 9)

2005 CDC Third National Report

EPA survey of U.S. population-chemical inventory

Metals (Lead, mercury, cadmium) 13	Pyrethroid Pesticides 5	Phytoestrogens 6	Tobacco Smoke 1
Organochlorine Pesticides 16	Other Pesticides 5	PAHs 22	
OP Insecticides: DAP 6	Herbicides 6	Cl _x -dioxins & Furans 17	
OP: Specific Metabolites 5	Phthalates 12	PCBs 36	148

“the most comprehensive assessment of chemical contamination in individuals ever performed.”



Biomonitoring Impact

“The emotional dimension of chemical body burden data poses a major communications and stewardship challenge to industry.”

William K. Rawson, Lawyer
Washington, D. C.

*An estimated 90% of the people
who buy organic produce do so to
avoid pesticide residues....*

The Organic Center

Personal Chemical Exposure Program, UC Riverside

Manufacturers, regulators, universities,
users, and others who should know better,
have done a very poor job of
public education.

“...the possible public-health implications of pesticide residues in the diet.”

“A consensus now exists, at least within the USA, that dietary residues are a significant public health concern, particularly for young children (NRC 1993). Nevertheless, the available evidence falls short of associating specific harm to individuals with routine exposure to dietary pesticide residues.”

Baker, Benbrook, Groth & Benbrook
Food Additives and Contaminants 19, 427-446 (2002)

...the average American is exposed to 10 to 13 pesticide residues each day from food, beverages, and drinking water.

“Some of these exposures pose clear risks, particularly when they occur during pregnancy, the first years of life, during other vulnerable periods.”

“This is important news as it comes at a time...

when there is growing recognition in the scientific and medical communities that pesticide exposure is a major risk factor in the development of neurological conditions from ADHD to Alzheimer’s disease.”

Alan Greene, MD
Board Chair, The Organic Center (2008)

So just what is the story?

Take a careful look!

“Strawberries are one of the British summer's most anticipated seasonal treats.”

"But these findings - that most non-organic strawberries are tainted with multiple pesticides - leave a sour taste."

- "There is compelling evidence emerging that the combined effect of pesticides, even at minuscule levels, is more significant than previously realised, especially as several of the pesticides found have been proven to have serious health implications.
- "Fortunately people can enjoy this traditional, British summer treat without worrying about unwanted pesticides by choosing organic strawberries."

Emma Hockridge, Soil Association (2008)

...the level of contamination was "extremely high."

- "Strawberries are one of the more frequently contaminated foods but we would expect traces of pesticides in 30 to 40 per cent of them, not 90 per cent."
- "That is excessive, and we still do not know the full facts about the effects these pesticides may have over a lifetime."

Ruth Beckmann, Pesticides Action Network (2008)

Wimbledon Strawberries

EU, June 2008

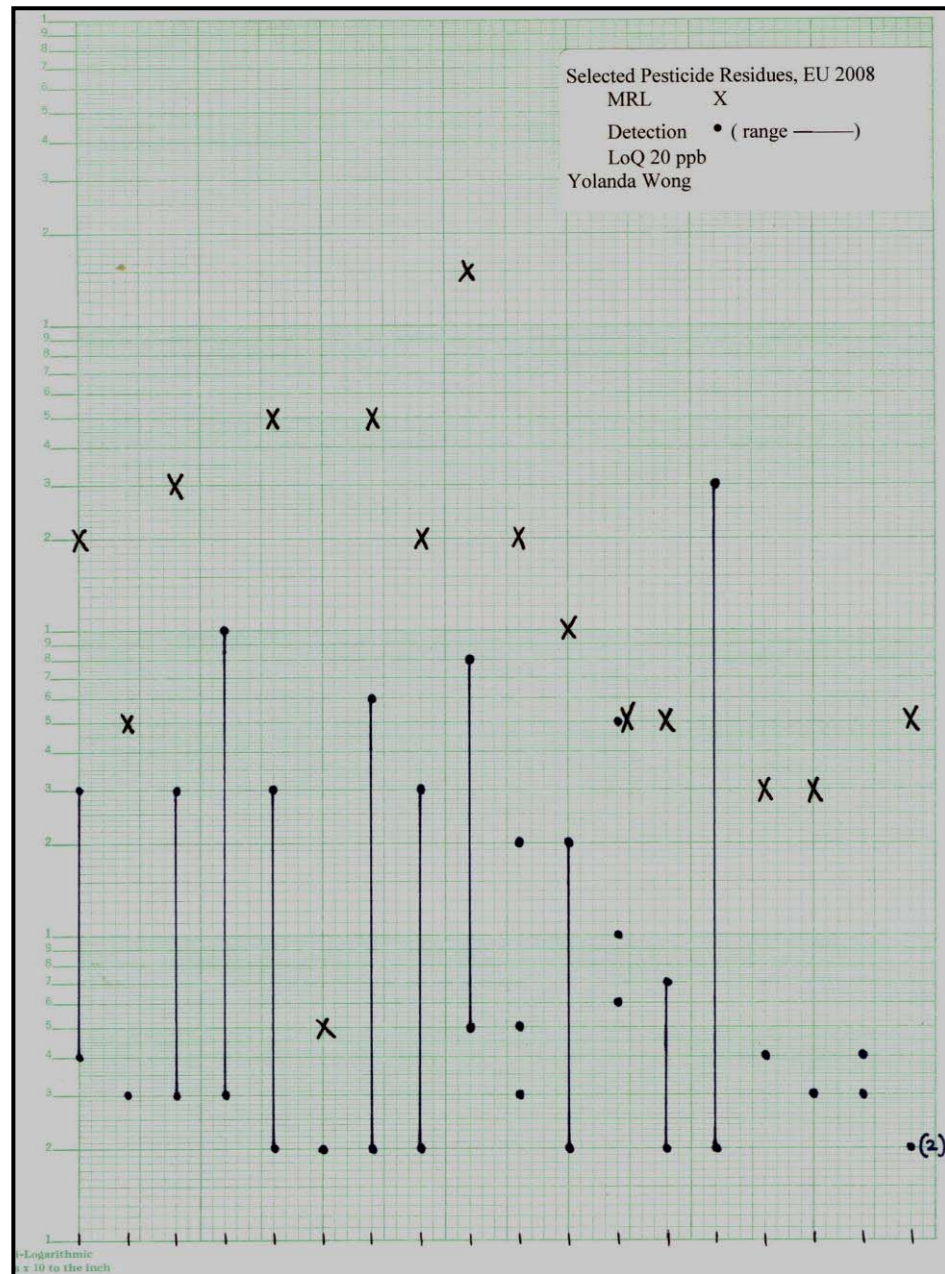
These represent the berries consumed at Wimbledon Tennis Club.
49 samples tested for 186 residues (UK and Netherlands)

Findings (all below MRL)

<u>Samples</u>	<u>Residues</u>
4(+1)	0
5	1
8	2
10	3
6	4
7	5
4	6
3	7
1	8

“... the level of contamination was ‘extremely high.’ ”

PAN 2008

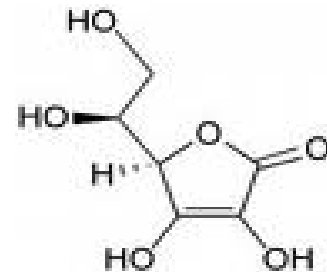




Insecticide and fungicide residues may be on produce in tiny amounts...parts per billion

For a child to get even a NO EFFECT dose, they would have to eat over 1000 average servings and their parents more than 3-times that much!

But it just can't happen, because the natural vitamin C in the berries would make both of them sick long before they could even get to the NO EFFECT dose!



To show that you care about health and safety and the environment!



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

Personal Chemical Exposure Program
Department of Entomology
UC Riverside

<http://faculty.ucr.edu/~krieger/members.htm>