

Regulatory Developments and Toxicology Update

Bob Krieger, Ph. D.

Personal Chemical Exposure Program

Department of Entomology

University of California, Riverside

bob.krieger@ucr.edu

Why do we keep *updating pesticide toxicology* if our regulations are based on “no effect” levels of exposure?

Personal Chemical Exposure Program

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

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).

Pesticides

Very special chemicals!

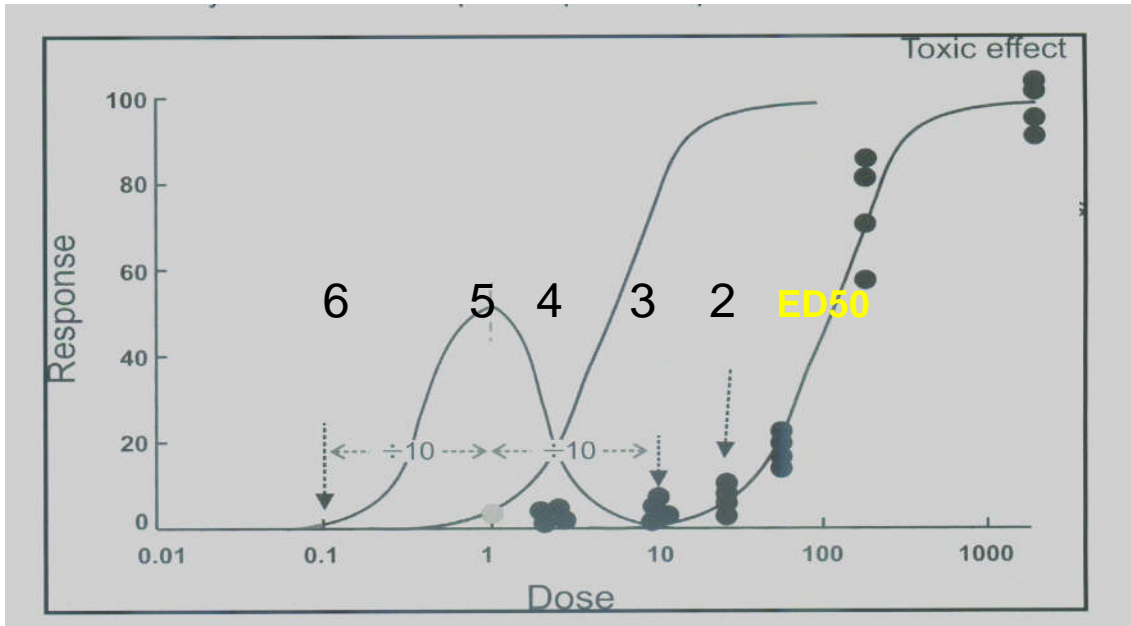
Preserve safe uses!

You make a difference—
know your stuff!

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!*



Dose is the *amount* of exposure in a specified *time*.

Response is *toxicity* or the *adverse effect*.

Effective Dose for 50% of the test population (ED50)

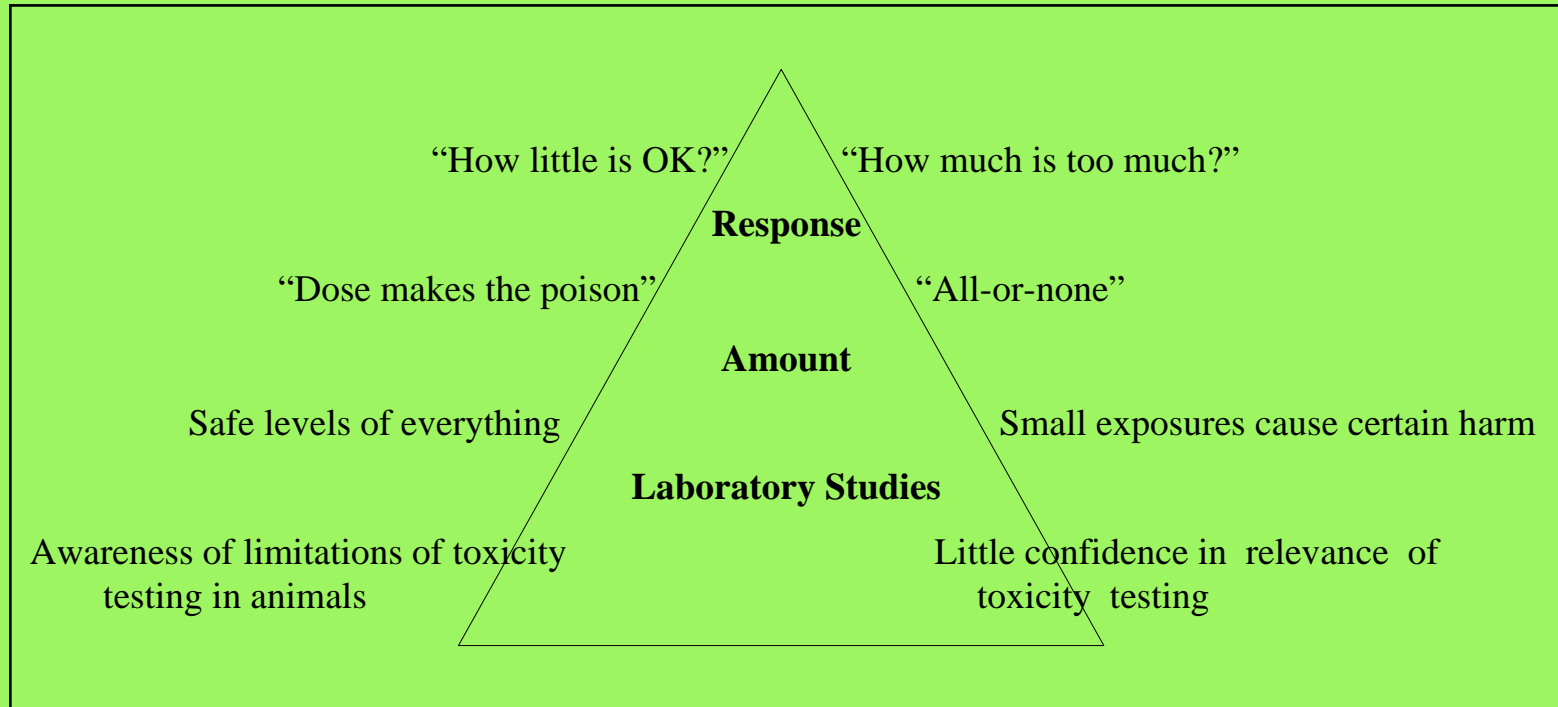
2 “threshold”; 3 LOAEL; 4 NOAEL; 5 estimated NOAEL; 6 Reference Dose ($3/10 \times 10$)

Exposed to a pesticide!

What?



What?



Personal Views of Pesticide Exposure

Regulatory Risk Characterization

- Hazard identification
- Dose-response studies
- Exposure assessment
- Risk assessment

Hazard and Risk

Hazards do not become *risks* unless a vulnerable population is exposed producing an adverse effect.

Chemicals are mostly to blame in loss of frogs

Federal researchers are blaming them for drastic reductions

U.S. Geological Survey....pesticides deserve part of the blame

If confirmed as the culprit, pesticides...

...one piece of a predatory puzzle that includes introduced fish, viruses, and limb defects

"I think one thing everyone can agree on is that there is no single cause for amphibian decline."

"It is not just frogs that are at risk if these results are borne out."

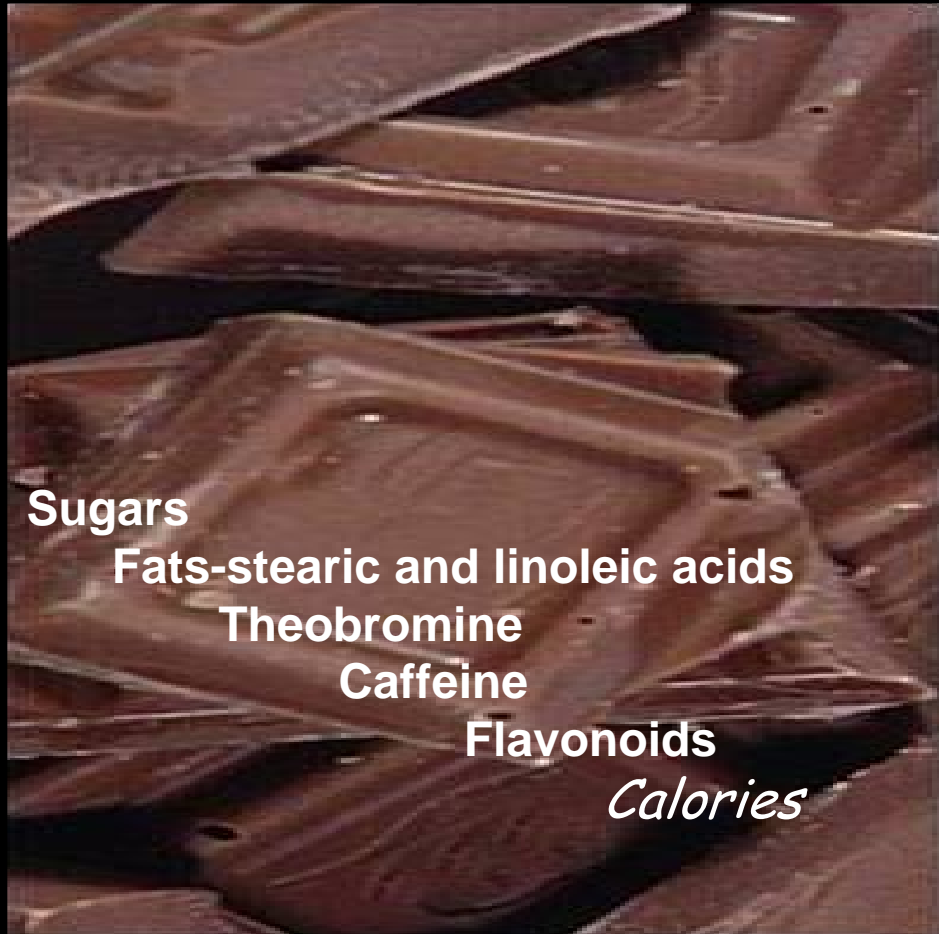
"It also puts human populations at risk."

Declining Amphibians Population Task Force



**The plural of
anecdotal is not
evidence!**

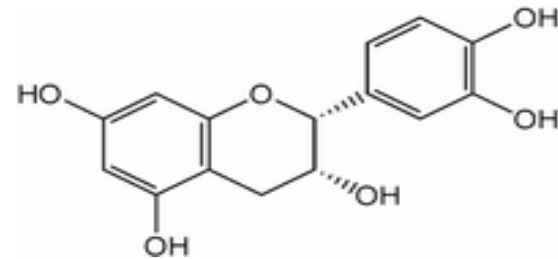
Chocolate



Sugars
Fats-stearic and linoleic acids
Theobromine
Caffeine
Flavonoids
Calories

Solid bars invented 1847

Over 380 chemicals are constituents of chocolate



Chocolate, wine and tea improve brain performance

Chocolate can contribute significant portions of dietary antioxidants...Waterhouse, UCD 1996

Slow plaque buildup due to oxidation of Low-Density Lipoproteins (LDL)

1.5 oz milk chocolate = 5 oz red wine

CN1C=NC2=C1C(=O)N(C)C(=O)N2C

450 mg/oz

40-60 mg/oz

CN1C=NC2=C1C(=O)NC(=O)N2C

Theobromine lethality in dogs: 250-500 mg/kg

Chocolate organics mimic cannabanoids at receptor (THC); *chocolate high!*

Est. dose 25# chocolate/130# adult!

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

Residue to Dose

- Residue level, ppm to ppb
- 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

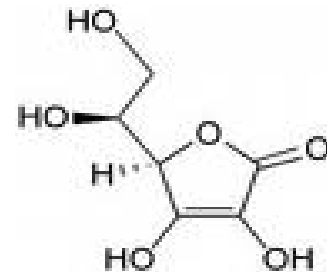
Pesticide residues are tiny!

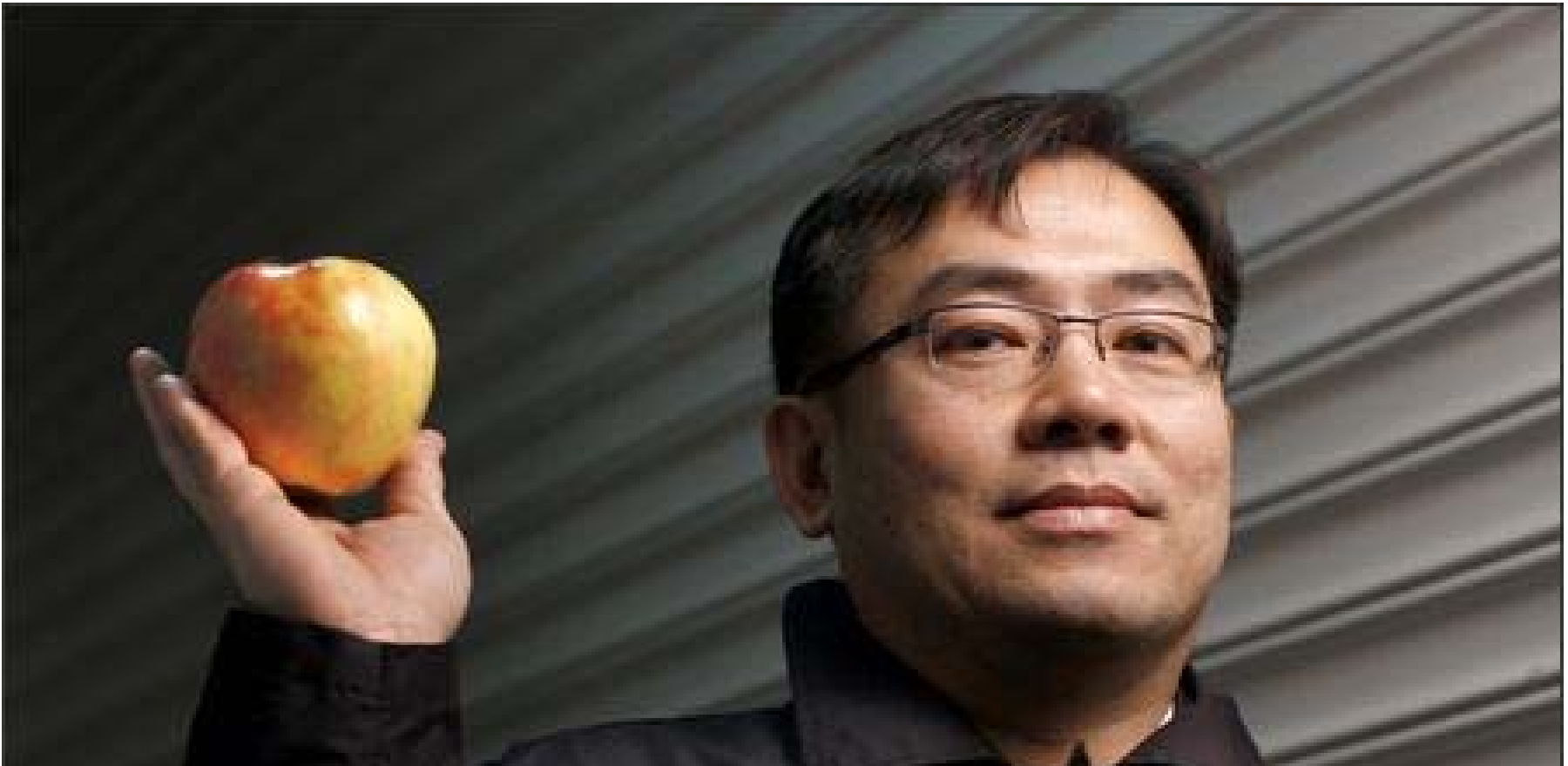


Insecticide and fungicide residues may be on produce in tiny amounts...parts per billion

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!





Chensheng Lu, holding a Washington apple, studied the pesticide levels in Mercer Island children. The children ate a variety of conventional produce from area groceries and then switched to organic.

Harmful pesticides found in everyday food products

Mercer Island children tested in yearlong study

*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.

Your experiences with pesticides
and
Public and Regulatory
Perceptions of Pesticide
Safety and Risk, 2009

Simply don't match!

**My personal recommendation:
Demonstrate safe pest management...**

- **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.**

Context of Concern

...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)

In the news: “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

