

# Tools for Prioritizing Food Safety Concerns: An Industry Perspective

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# Chasing Zeroes

- Zero is a small number
- How we chase zero
- Problems this presents
- TTC as a prioritization tool



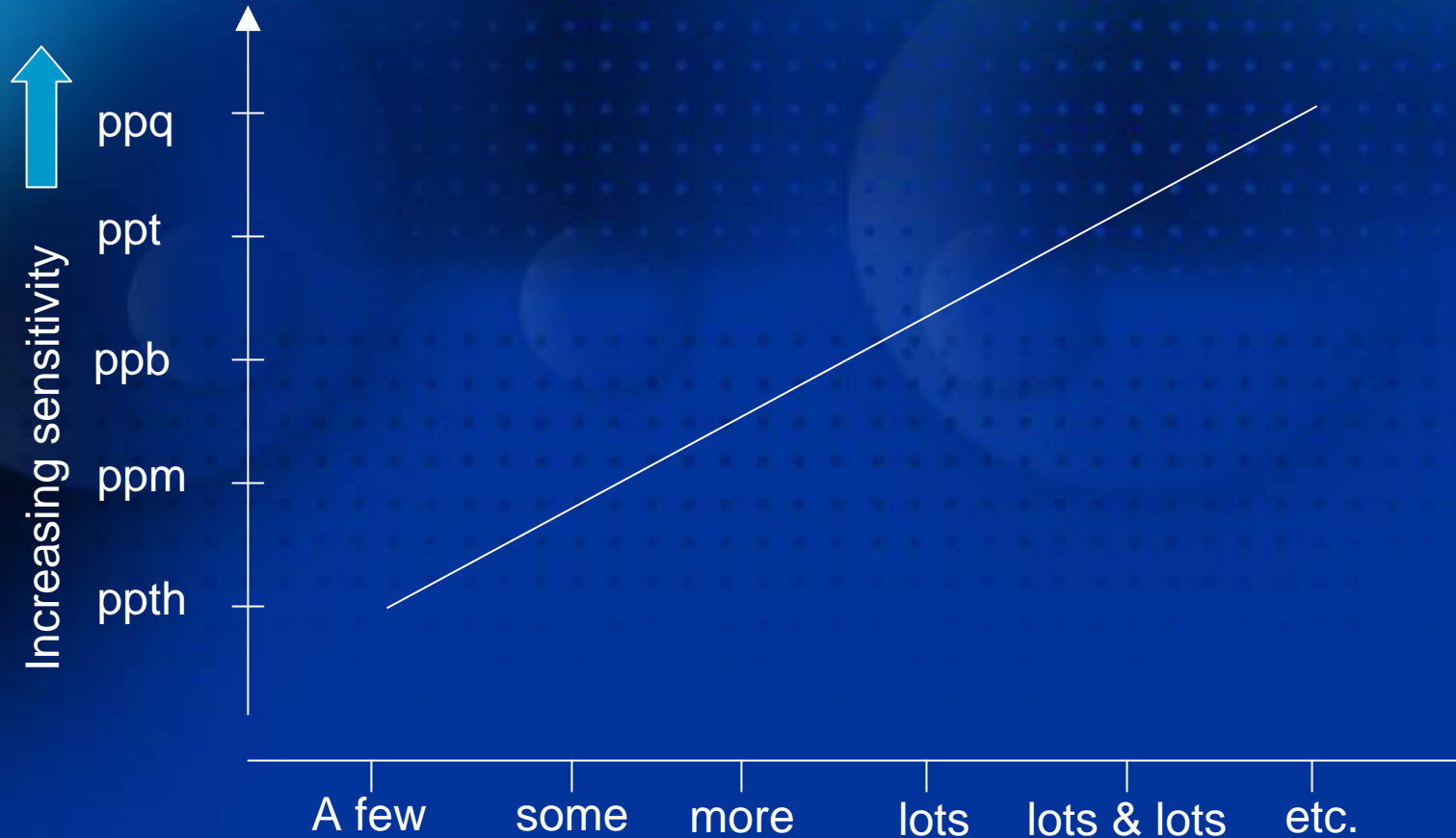
# Zero is a Small Number

- 1950s & 1960s – parts per thousand, ppm
- 1970s & 1980s – ppm, ppb
- 1990's & 2000s – ppt, ppq

Analytical technology has advanced quickly –  
but tools (or their application) for interpreting  
findings have not kept pace



# Zero is a Small Number



Findings of trace amounts of chemicals in food



# How Small?

<u>Unit</u>	<u>1 ppm</u>	<u>1 ppb</u>	<u>1 ppt</u>
Length	1 in/16 mi	1 in/16,000 mi	1 in/16 million mi (6" trip toward the sun)
Time	1 min/ 2 yrs	1 sec/ 32 yrs	1 sec/ 320 centuries
Money	1ct/\$10,000	1ct/\$10 million	1ct/\$10 billion
Area	1 ft <sup>2</sup> /23 acres	1ft <sup>2</sup> /36 mi <sup>2</sup>	1in <sup>2</sup> / 250 mi <sup>2</sup>
Volume	1 drop v'mouth in 80 L gin	1 drop/500 barrels gin	1 drop/pool of gin covering football field 43 feet deep <u>or</u> 1 drop in 520 30,000 gal tanker cars



# How We Chase Zero

- Something new is found in food
- Zero = the current limit of detection (LOD)
- A new instrument or method drops the LOD
- The component is found again & new ones may appear for the first time
- Detection is often seen by the public as *undenied* risk, which is translated as “inevitable harm.”
- Human nature has caused society to chase the receding “zero”



# An Example of Chasing Zero

- Chloramphenicol
  - Antibiotic used by China in bee colonies 5 or so years ago – now deemed carcinogenic
  - Traces found in honey around the world
  - “Can’t set an acceptable level” acc. to regulators
  - Each lot tested down to LOD of 0.5 ppb
  - Canada improved LOD down to 0.05 ppb (50 ppt)
  - Business shut down for weeks, loss of >\$1,000,000
  - Chasing zero causes lots of problems



# Problems Presented by Chasing Zeroes

- Consumer confidence in food is eroded
- Scarce resources do not always go to the most critical risks
- Disruption of business, international trade
- No end in sight...zero rushes ahead, just out of reach, with improvements in analytical sensitivity
- Not just advances in methods, but also global sourcing, sensitivity around food defense, decreasing scientific literacy, others...will make this issue more acute in future





# Problems Presented by Chasing Zeroes

- Key point: do we have the resources to pursue all detections as major issues?
- Can society afford to continue to operate using the toxicology model of the mid-20<sup>th</sup> century? (Foreign chemicals are rare in pure food; when found, we chase to zero.)
- Can't toxicology guide us to agree on some threshold of concern?



# Threshold of Toxicological Concern

- The TTC concept was actually described in the early 1500s

Paracelsus: “All things [substances] are poison and nothing is without poison. Solely the dose determines that a thing is not a poison.”



# How to Change

- Over the past 50 years, TTC has been developed and applied to:
  - Food packaging
  - Flavors
  - Pharmaceuticals
  - Cosmetics

Proposition: TTC can be applied now to nearly any trace finding in foods, whether naturally occurring, formed during cooking, or via addition from the environment



# Problem is Larger than Just Chasing Zero

- Non-zero guidance needed on some compounds esp on newly discovered, when tox is incomplete
- For many, where guidance is set, there is continuing downward pressure
- Others have guidance levels that were developed through great expenditure of resources. Some might have benefited from application of TTC.



# Some Examples of Low Level Findings in Food

- Acrylamide
  - Carcinogenic in animal tests at ppm levels
  - Found in 2002 - formed in heating sugars, carbohydrate, and amino acids – ppb levels
  - Major international meetings
  - Extensive product/process testing
  - Regulatory agencies looking at interventions
  - Toxicity tests still underway to determine relevance in humans
- Other heat formed toxicants:
  - Furan
  - Semicarbazide
  - PhIP
  - European Heat-Tox project – 7 million Euros looking for more



# Some Examples of Low Level Findings in Food

- Packaging residues – BPA, ITX, butadiene, phthalates, etc.
- Processing residues – chloropropanols from acid-hydrolyzed vegetable proteins
- Heavy metals in foods – Hg in fish; Cd in vegetables; Pb in chocolate, water
- Mold toxins – AFB1, FMB, OTA, DON, in cereal grains, nuts, oil seeds
- Perchlorate in water – military sites or naturally formed?
- Allergens? Starlink®?



# Use of TTC

- Benefits

- Puts resources where the biggest risks are
- Gives science-based guidance in place of unattainable zero level and zero risk
- Avoids “crying wolf”—public can take warnings seriously when they are saved for significant risks
- Maintains confidence in safety of foods
- Gives predictability to business, trade, regulation
- An honest approach based on science, not emotion

