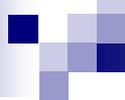




Embracing Risk: One IH's Perspective

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What is Risk*

Risk (*noun*)

exposure to the chance of injury or loss; a hazard or dangerous chance

*Source – Dictionary.com

Putting yourself 'at risk'

Participating voluntarily or involuntarily in an activity or event that could lead to injury, damage, or loss.

Voluntary Risk

- Exposure to hazards we knowingly accept
- Examples of voluntary risk:
 - skydiving
 - driving a car
 - smoking cigarettes
 - living in a floodplain
 - investing in the stock market



Involuntary Risk

- **Exposure to hazards that occur without our prior consent**
- **Examples of involuntary risk:**
 - tornado
 - terrorist attack
 - lightning strike
 - cosmic radiation
 - contamination in drinking water



Relative Risk

- Percentage increase in risk associated with one activity over another
- Typically it compares the 'risk of doing something' to the 'risk of doing nothing'
- Most common type of risk quoted by the media
- By itself, relative risk is meaningless
 - A 100% increase in relative risk must have context
 - Is a change from 1 in a million to 2 in a million significant?

“USING PAIN PILLS INCREASES RISK OF HEART ATTACK BY 24%”

- Increased risk of heart attack was observed *‘in men over the age of 50 using ibuprofen-like medication at ‘intensive’ doses’*
- Let’s say the risk of heart attack for all individuals over a lifetime is 10 in 1000, or 1%
- A *relative* increase of 24% would be 1.24%
- In terms of real increase: ~ 12-13 heart attacks per 1000 people, or an increase of 2 - 3 per 1000
- But...the study only applies to *intensive* users of the drug
- Out of 1000 people taking intensive doses of pills, expect 2 – 3 deaths in addition to the ten that would likely happen anyway
- The relative risk for a 30-something using ‘pain pills’ in moderation may be negligible

Activities w/ Equivalent Relative Risk

(each listed activity increases risk of premature death by 1 in a million)*

Smoke 1.4 cigarettes (total in a lifetime)

Live 2 months with a smoker (cancer - secondhand smoke)

Travel 10 miles by bicycle (accident)

Travel 300 miles by car (accident)

Travel 1000 miles by jet airplane (accident)

Travel 6000 miles by jet airplane (cancer from cosmic rays)

Live 5 miles from nuclear plant for 50 years (nuclear accident)

Live 2 months in Denver (cancer - radiation)

Live 2 months in stone/brick building (cancer - radiation)

Live 5 years - boundary of a nuclear power plant (cancer - radiation)

Exposure to 1 chest x-ray (cancer - radiation)

Eat 40 tablespoons of peanut butter (cancer)

Eat 100 charcoal-broiled steaks (cancer)

Drink 30 cans of diet soda made w/ saccharine (cancer)

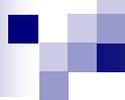
***Bernard Cohen, University of Pittsburgh (1995)**

Risk in Perspective

- **“Life” is a series of activities that affect our well-being**
- **We encounter risk every day**
- **All decisions are, to some degree, our attempt to manage risk**
- **Which risks do / should we...**
 - **...fret over?**
 - **...avoid?**
 - **...accept?**

What are the consequences of...

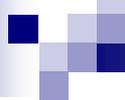
- ...Ignoring risk completely?
- ...Being totally risk averse?



If we viewed risk through a different lens, we might find ourselves embracing it!

Acknowledging risk could be the best management strategy...

...so why don't we do it?



WHAT ARE WE AFRAID OF?

People tend to:

- Overestimate the danger associated with rare events
- Underestimate dangers of common events
- Worry more about dramatic but infrequent events
- Assume if a situation can be ‘controlled’ it is safer
- Have different perspectives on voluntary & involuntary risk

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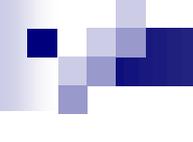
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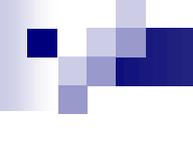
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The traditional IH perspective...

**...collect a sample & compare
the result to a standard...**

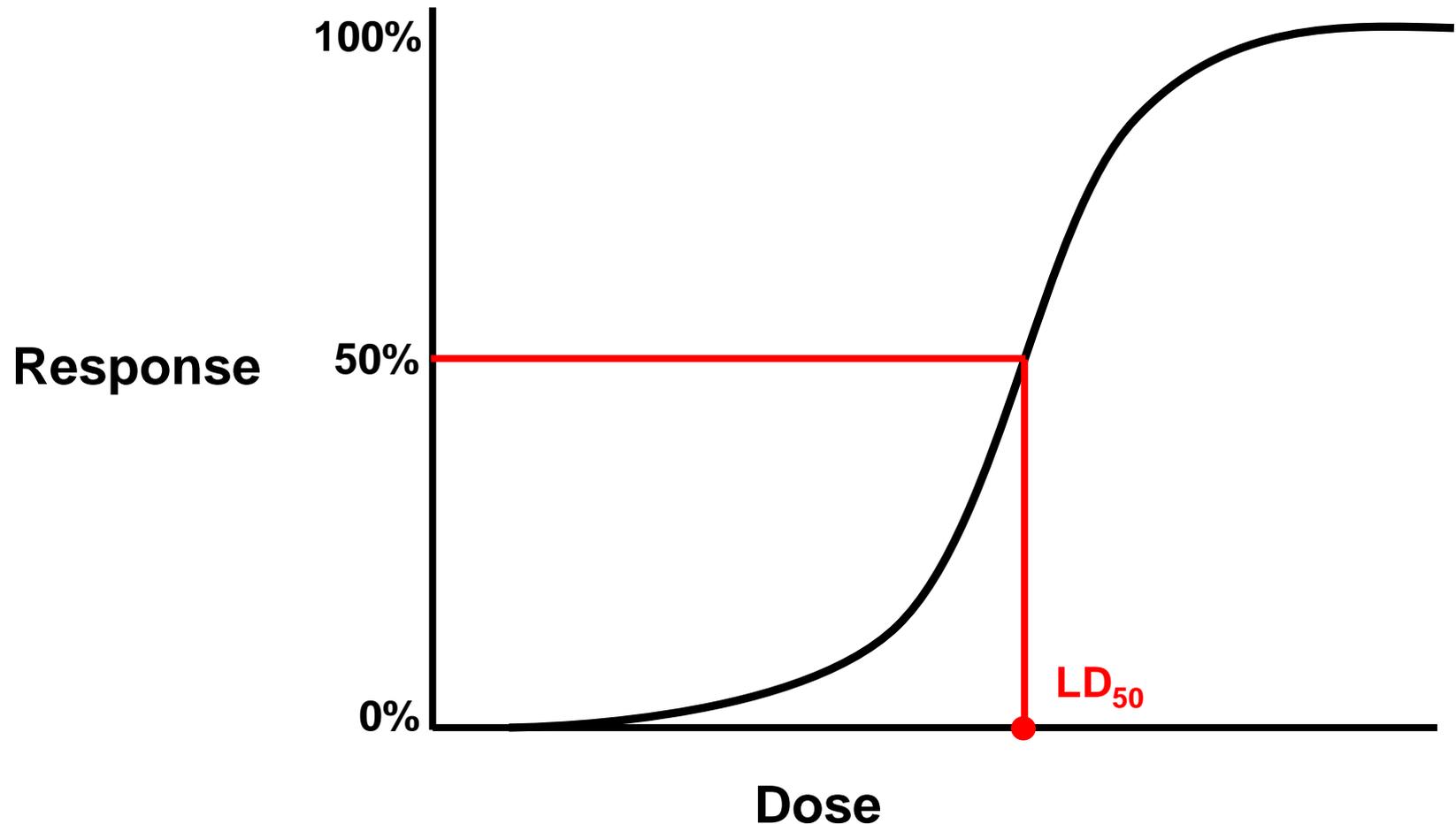
...health risk assessment.



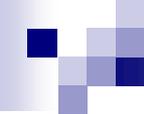
**What exposure
(and associated risk) is the IH
trying to assess & manage?**

The dose makes the poison...

Dose-Response Curve



Cancer is the typical 'response of interest'



**How are exposure limits
established?**

**Occupational Exposure Limit:
Formaldehyde**

Formaldehyde

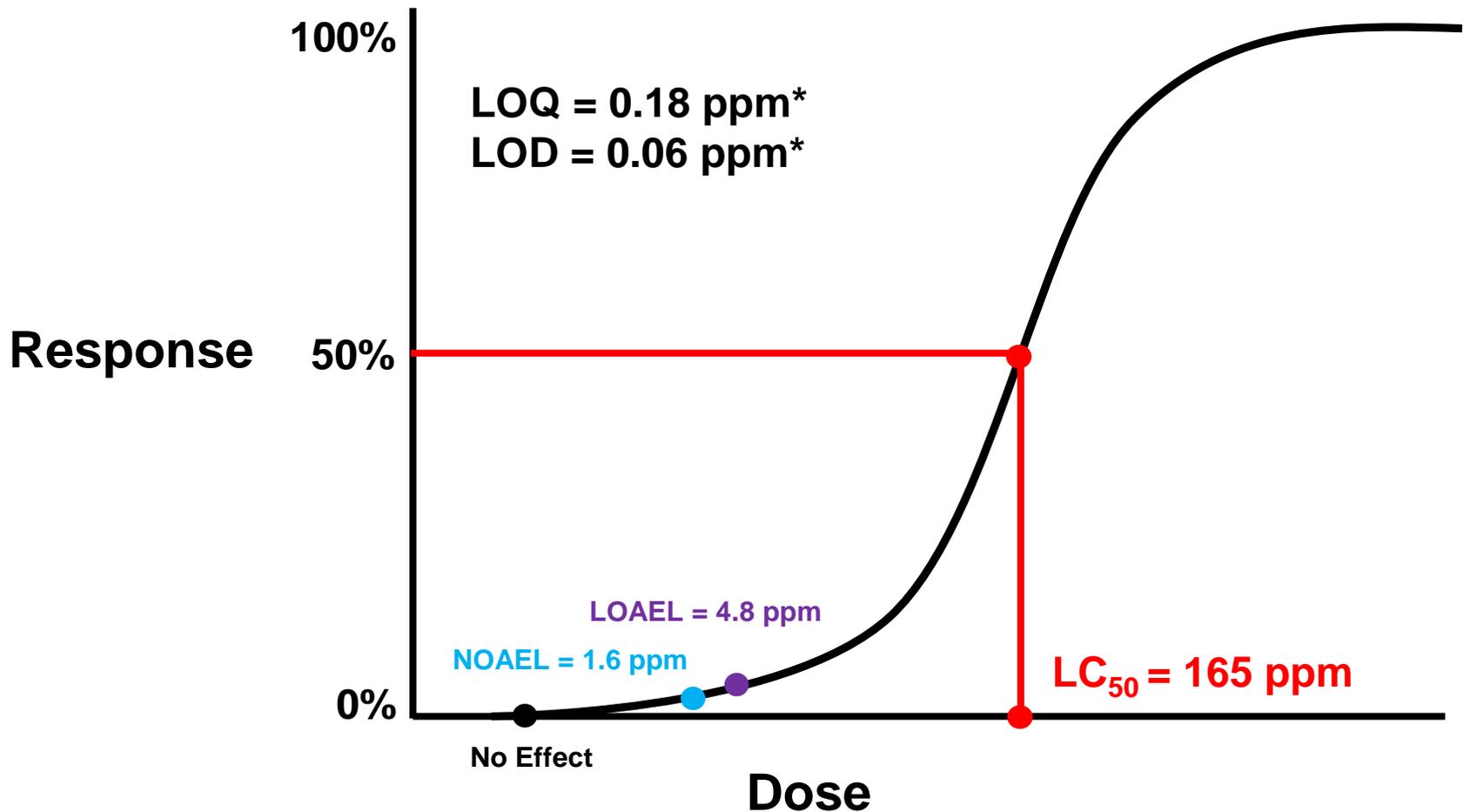
- **Classified as a Suspected Human Carcinogen – rat nasal carcinoma**
- **Rats are obligate nose breathers**
- **Current Standards:**
 - **OSHA – 0.75 ppm 8-TWA; 2 ppm STEL**
 - **ACGIH – Ceiling 0.3 ppm**

Formaldehyde

Points to Consider:

- **LC₅₀ – Lethal Concentration 50%**
- **LOAEL – Lowest Observable Adverse Effect Level**
- **NOAEL – No Observable Adverse Effect Level**
- **Limit of Quantification – LOQ**
- **Limit of Detection – LOD**
- **Applying exposure data collected on rats to humans?**
- **What to consider in setting an exposure limit?**

Notional Dose-Response Curve Formaldehyde



*NIOSH Method 2016 using minimum sampling volume

Formaldehyde

■ In Summary:

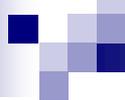
- **LC₅₀ – 165 ppm**
- **LOAEL – 4.8 ppm**
- **NOAEL – 1.6 ppm**
- **LOQ – 0.18 ppm**
- **LOD – 0.06 ppm**

■ Current Standards:

- **OSHA – 0.75 ppm 8-TWA; 2 ppm STEL**
- **ACGIH – Ceiling 0.3 ppm**

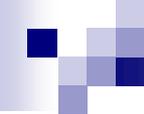
Considerations

- **What is a reasonable exposure limit based on the data being considered?**
- **What is an appropriate margin of safety – 10x, 100x, 1000x?**
- **What if the difference between controlling exposure at the NOAEL versus the LOQ is \$1 million in real cost?**



Points to Consider

- **Do lawmakers rigorously consider the science on which standards are based?**
- **Do regulatory agencies consider all types of risk & associated cost w/ proposed standards?**
- **Who can be ‘most’ objective in establishing a risk-based standard?**



Health Risk is one consideration in performing a comprehensive risk assessment...

- Operational risk
- Financial risk
- Non-compliance risk
- Political risk

Final Thoughts

- Understand the processes being employed to make decisions in your organization
- Recognize health risk is weighted differently in different situations
- EHS professionals may lose credibility by focusing solely on health risk
- Understand and be engaged in the EHS regulatory standard setting process
- Use ‘teachable moments’ to educate on risk