TOXICOLOGY RESOURCES FOR INDUSTRIAL HYGIENISTS IN EMERGENCY RESPONSE

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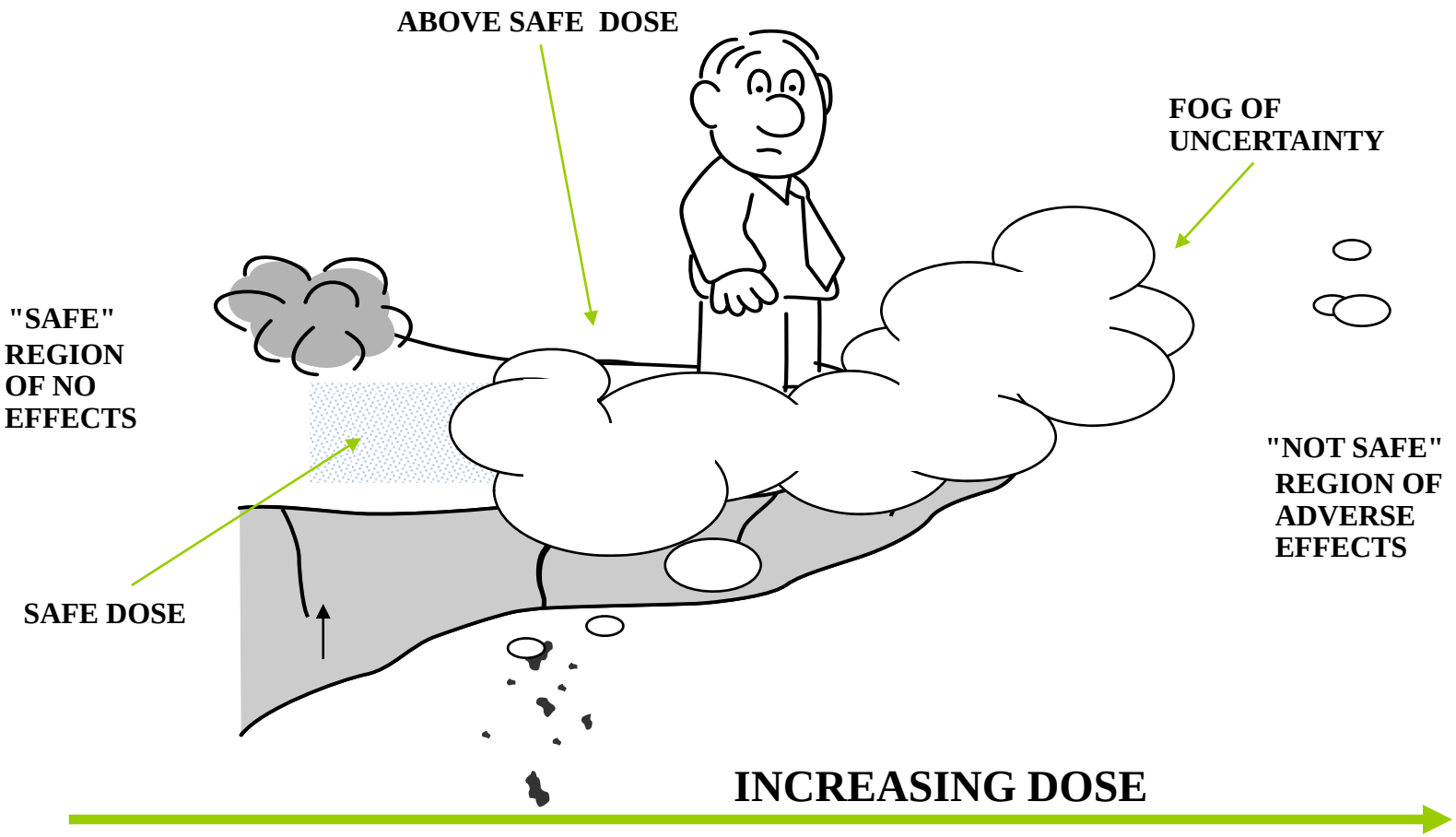
Objectives of Talk

- Roles of the IH in chemical emergency response
- Resource identification and selection - hazard and toxicity information
- Resource identification and selection - exposure limits alternatives

Role of the Industrial Hygienist

- Common Role:
  - Advisor to Onsite Incident Commander
    - Health effects of Concern and Relevant Exposure Limits
      - Exposure assessment strategy
      - Entry and control procedures
- Toxicology information supports decision making!
- Needs and resources differ based on response phase:
  - Planning
  - Initial Incident Response
  - Ongoing Response
  - Recovery and Clean-up

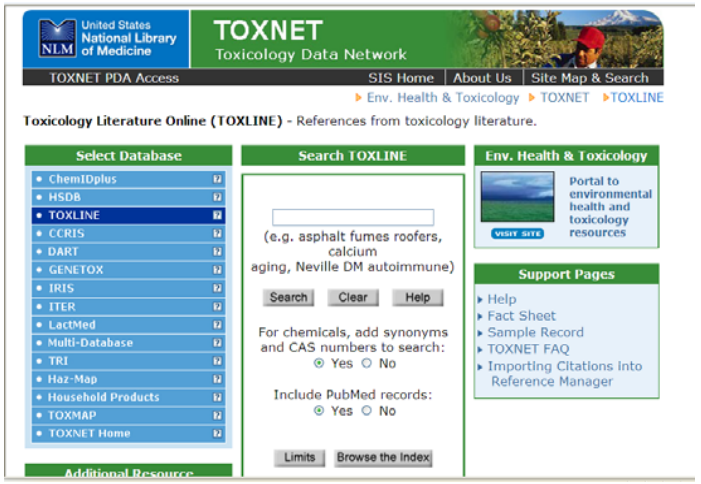
The Risk Value Process



This process incorporates the fundamental concepts of toxicology – that for non-cancer effects, there is an exposure threshold below which exposure is safe and the onset of toxicity is a function of the exposure concentration.

Hazard and Toxicity Information

- Hazard and Toxicology Information Sources
  - Rapid response phase:
    - CHEMTREC®; MSDS; etc.
  - Planning or ongoing management phase:
    - TOXNET; Agency Toxicity reviews; EPA and EU chemical registration databases; etc.
  - Other integrated resources
    - CHEMM; HSDB, etc.



Using Toxicology Information

- Things to know:
  - Rapid sources of key target organs and effects
  - The difference between potential hazard and degree of potency; and the indicators of potency embedded in current information resources
  - Current hazard and labeling classifications
    - DOT placards and NFPA codes
    - European Union Risk-phrases
    - Globally Harmonized Systems (GHS)
    - H-phrases and symbols

  - The many sources of detailed toxicology summaries and their relevance and reliability (peer reviewed?)

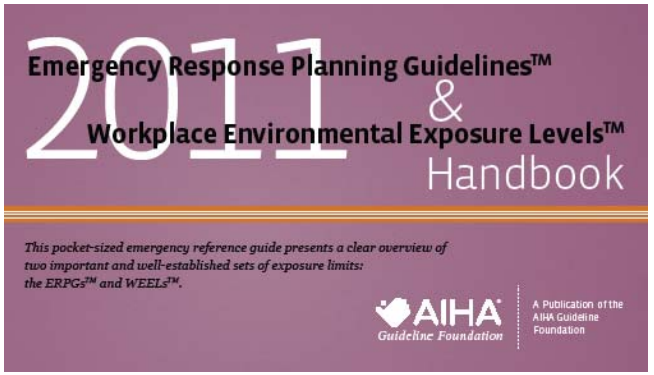
Types of Exposure Guidance

- There are many sources and types of exposure limit information that can apply at different phases of an emergency response scenario:
  - Exposure duration
    - Acute versus chronic?
  - Exposure population
    - Responders, workers, general population?
  - Exposure frequency
    - Routine or infrequent?
- How do you find these and select one for your scenario?

Types of Acute Limits

Occupational Exposures

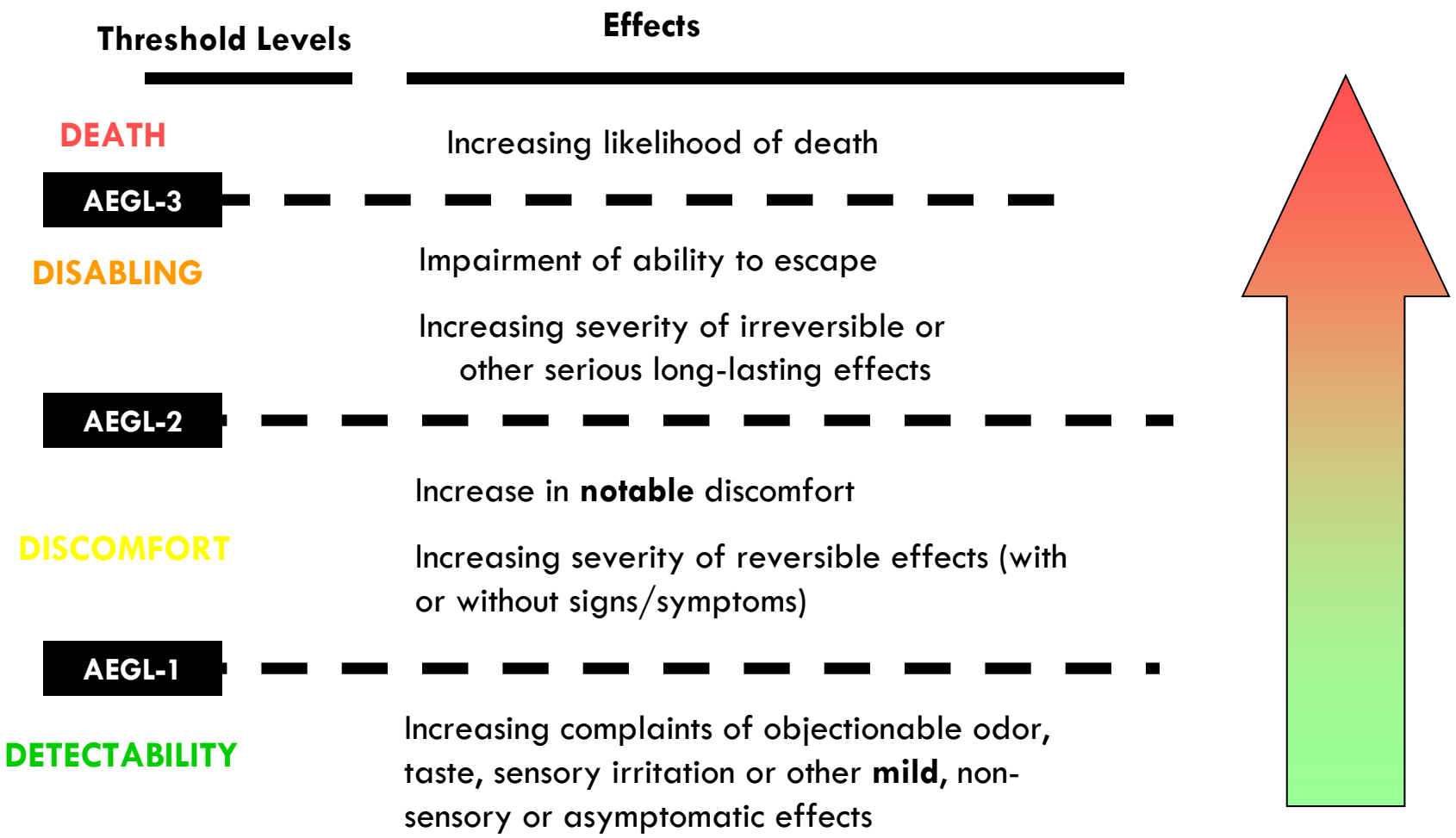
- Routine operations
  - ACGIH Threshold Limit Value (TLV®)
    - TWA, STEL or Ceiling Limits
  - AIHA Workplace Environmental Exposure Level (WEEL™)
    - TWA, STEL or Ceiling Limits
- Special occupational populations or scenarios
  - NIOSH Immediately Dangerous to Life or Health Values (IDLH)
  - U.S. EPA – pesticide limits for agricultural workers and new chemical registration
  - U.S. DoD – war fighter limits; submarine air quality, etc.



Types of Acute Limits

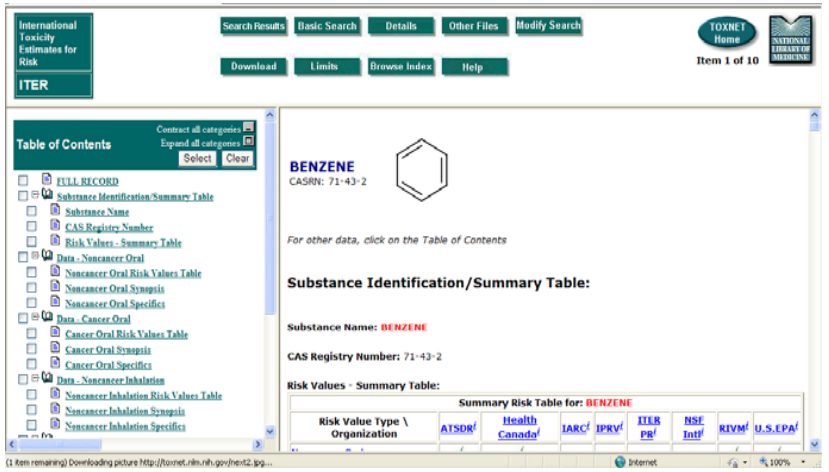
- General Population Exposures
  - Routine Conditions
    - U.S. EPA Acute Reference Values (ARE)
    - U.S. state values (often for facility permitting) such as California acute reference exposure limits (REL); Texas environmental screening levels (ESL)
  - Non-routine operations
    - NAS/NRC Acute Emergency Guideline Levels (AEGL)
    - AIHA Emergency Response Planning Guidelines (ERPG™)
    - DOE Temporary Emergency Exposure Levels (TEEL)

Dose-Response: AEGLS



Types of Chronic Limits

- US EPA: Reference Dose (RfD); Reference Concentration (RfC)
  - Concentration of a chemical thought to be safe with continuous lifetime of exposure
- WHO or US FDA: Acceptable Daily Intake (ADI)
- ATSDR: Minimal Risk Level (MRL)
- Health Canada: Tolerable Daily Intake (TDI)
- IPCS: Tolerable Intake (TI)



Why Do You Need to Know?

- Increased duties outside of routine operations
  - In well controlled operations – periodic or task operations often greatest exposure concern
  - Increased role in evaluating off-site community exposures or releases for emergency response
  - Greater roles in events that affect the general population
- Preferred value may not be available
- Understanding basis of other values – allows for better judgments in:
  - Interpreting results for an existing value
    - Current value seems reasonable compared to array of existing values?
  - Filling gaps when an existing value is not available or may be out-dated

Selecting Among Resources

- How to decide which value among many
  - Mandated regulatory hierarchy
  - Other considerations to weigh in decision
    - Relevance of the guide value to the scenario of interest
    - The degree to which the exposure guidance includes current literature and methods (development and *full* review date)
    - Confidence in the value
      - Screening vs. full assessment
      - Robustness of limit setting process (e.g., authoritative agency, peer review, etc.)

Approaches to Identify Guidance

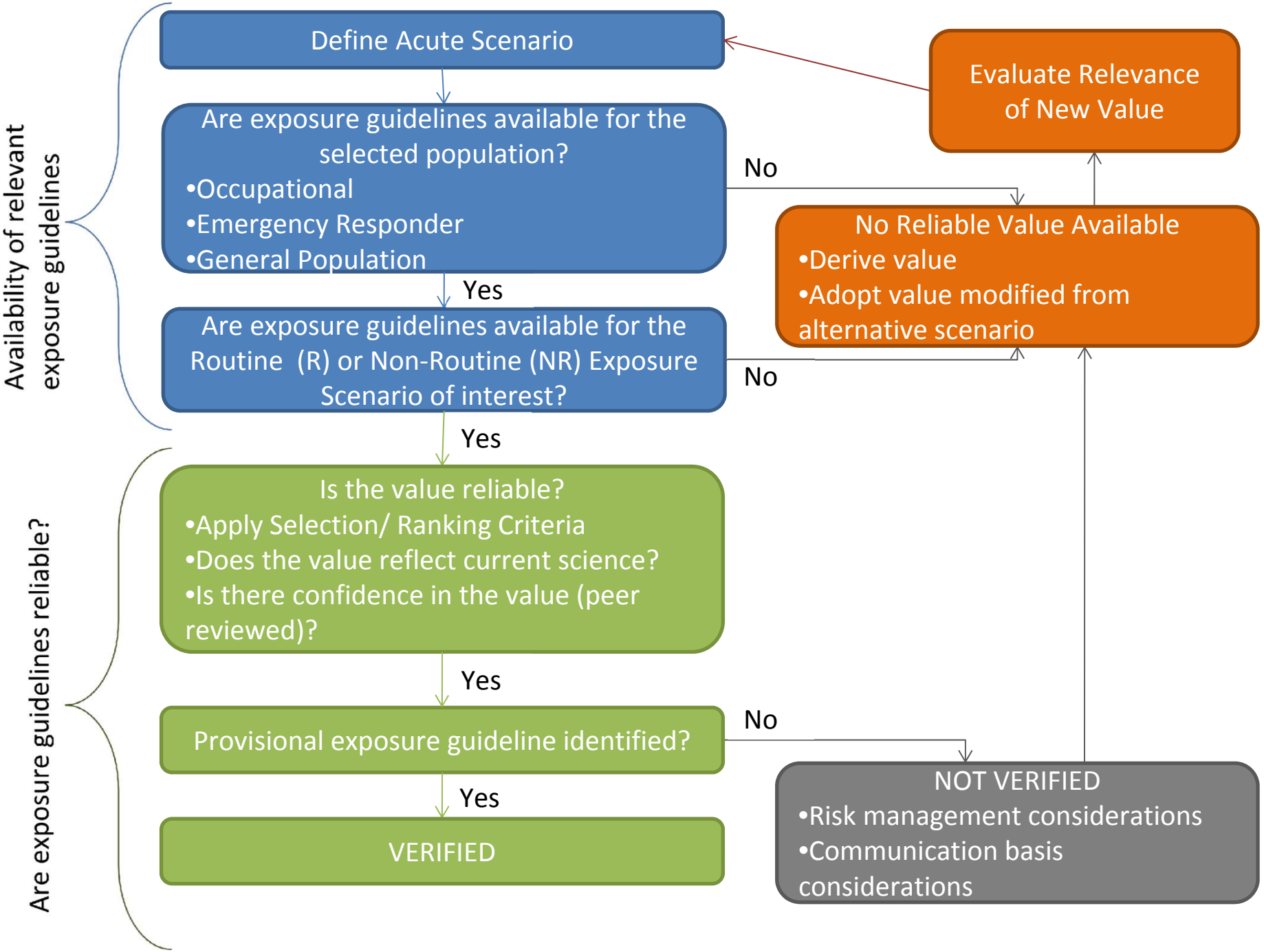
- Emergency Response
  - Contact emergency response resource – e.g., CHEMTREC® or the manufacturer MSDS contact number
- Planning
  - Search databases or contact organizations for specific reference value of interest
  - Compile array of relevant limits as a surrogate for the desired scenario limit
  - Seek to develop limits for values of interest
    - Nomination through ERPG™ Committee, etc.
    - Develop value with internal or consulting resources using current risk assessment methods with peer review

Resource Links Not Exhaustive

- Hazard and Toxicology Databases
  - EPA IRIS www.epa.gov/iris
  - TOXNET – HSDB http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?HSDB
  - ITER http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?iter
  - European Commission – ESIS http://ecb.jrc.ec.europa.eu/esis/
  - Concise International Chemical Assessment Documents (CICAD) http://www.who.int/ipcs/publications/cicad/en/
- Exposure Limit Resources
  - ACGIH TLV®
  - AEGLs http://www.epa.gov/opptintr/aegl/
  - AIHA WEEL™ http://www.aiha.org/foundations/GuidelineDevelopment/weel/Documents/WEEL_Values2010.pdf
  - AIHA ERPG http://www.aiha.org/foundations/GuidelineDevelopment/ERPG/Documents/ERPG_Values2010.pdf
  - DOE TEELs www.eh.doe.gov/chem_safety/teel.html; www.orau.gov/emi/scapa/teels.htm
  - NIOSH IDLH http://www.cdc.gov/niosh/idlh/idlh-1.html
  - NIOSH RELS http://www.cdc.gov/niosh/npg/default.html
  - OSHA PELS http://www.osha.gov/SLTC/pel/
- Integrated Emergency Response Information
  - Radiation Emergency Medical Management (REMM) http://www.remm.nlm.gov/
  - Wireless Information System for Emergency Responders (WISER) http://wiser.nlm.nih.gov/
  - Chemical Hazards Emergency Medical Management (CHEMM) [near completion]

Integrative Resources Are Needed

- Increased need for "tool boxes" and decision support systems, ideally:
  - One-stop shopping
    - Rich source of toxicology data, and
    - Rich source of methodology information, and
    - User algorithms (or at least exports to user tools)
  - Tools to identify the most relevant content
    - Need access to everything, but want most relevant first: relevance sorting, quality filters, value of information tools, decision logics
  - Compatibility with mobile technology
    - Do we have an App for that?


Availability of relevant exposure guidelines
Define Acute Scenario
Are exposure guidelines available for the selected population?
•Occupational
•Emergency Responder
•General Population
No
Yes
Are exposure guidelines available for the Routine (R) or Non-Routine (NR) Exposure Scenario of interest?
No
Yes
Evaluate Relevance of New Value
No Reliable Value Available
•Derive value
•Adopt value modified from alternative scenario
Are exposure guidelines reliable?
Is the value reliable?
•Apply Selection/ Ranking Criteria
•Does the value reflect current science?
•Is there confidence in the value (peer reviewed)?
Yes
Provisional exposure guideline identified?
No
Yes
VERIFIED
NOT VERIFIED
•Risk management considerations
•Communication basis considerations

Take Home Points

- The number of resources available is vast!
- Part of effective planning process is knowing ahead of time where to get health hazard and exposure limit information
- A process is needed to prioritize and select among available resources
- The utility of the resources will vary by the
  - Phase of the response
  - The nature of the scenario
- New efforts to develop integrated data resources and decision tools to help – see next talk!