How Do Compounds Become Identified as Emerging Contaminants, and Its Implications to Regulatory Agencies and Industries

"International workshop on Emerging policy challenges on New SOil contaminants (ENSOr)"

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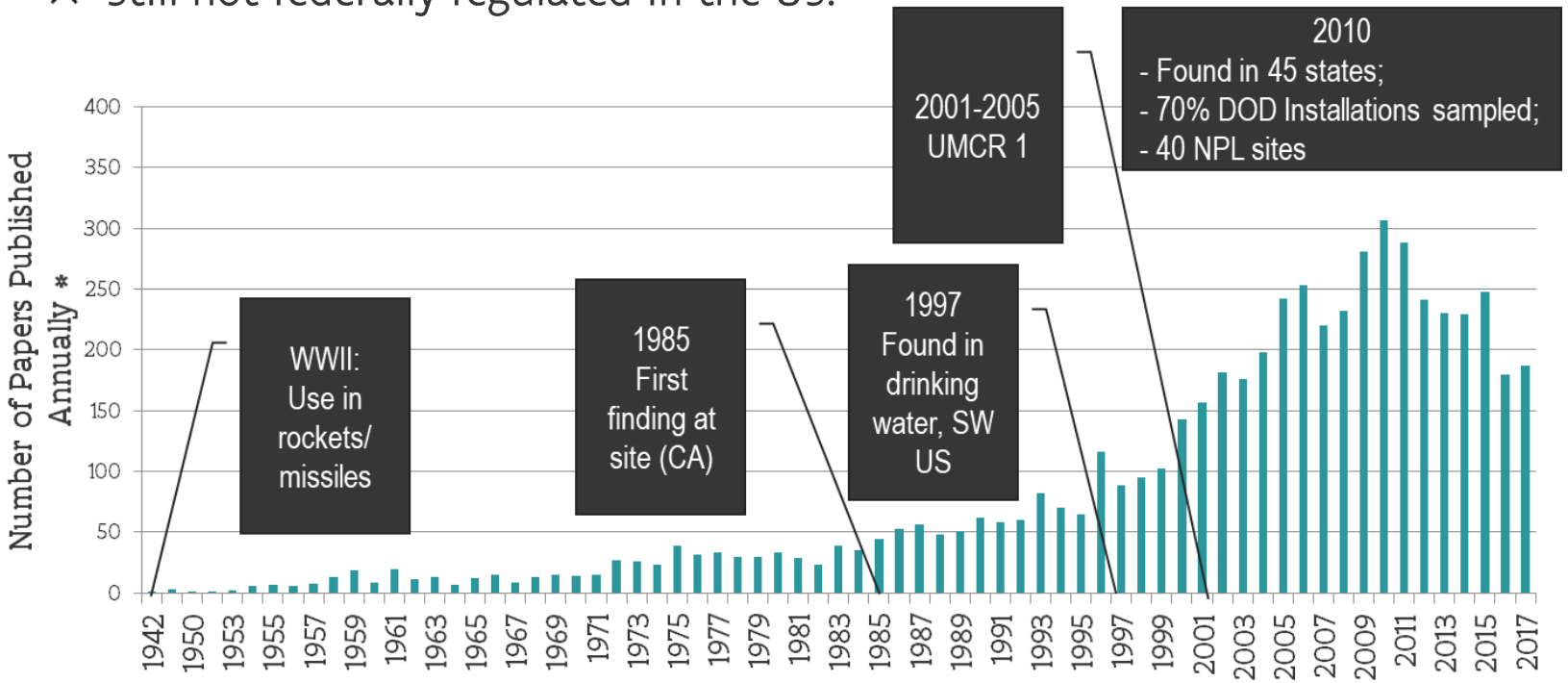
What is an emerging contaminant?

- **Chemicals or other materials that have a pathway to enter the environment and present real or potential unacceptable human health and/or environmental risks**
  - → Noticed by industry, regulators, public, or other parties as a potential problem
  - → Potentially toxic, especially if persistent in environment
  - → May not have peer-reviewed standards to asses potential impact to humans and/or the environment
  - → Not yet, or not sufficiently regulated, or have regulatory standards evolving due to new science, detection capabilities, etc.

What is an emerging contaminant?

- **Emerging Contaminant ≠ New Compound**
  - → Lead, PCB, PFAS, …
  - → Case Study Perchlorate in the United States:
    - × Used during WWII, but did not emerge as a COC until 2000s
    - × Still not federally regulated in the US!



How are emerging contaminants identified?

1. **Exposure** - There needs to be a risk for exposure either to the public or the environment (ecological risk)

2. **Toxicity** – The compound must be harmful to either human health or the environment

3. **Public Outrage** – There has to be a reason to drive change

How are emerging contaminants identified?

- **In the European Union and the United States various ways have been developed for screening compounds and prioritizing its potential hazards:**

Country/ Region	Name of List/Regulation	Purpose	Nr of Compounds
US	Safe Drinking Water Act	List the contaminants that are currently not subject to any proposed or promulgated national primary drinking water regulations, but are known or anticipated to occur in public water systems	109
US	Toxic Substances Control Act	Evaluate the risk from exposure to new chemicals and regulate if necessary to limit risk	>63.000
EU	NORMAN network	Network to enhance the exchange of information on emerging substances starting at identification of the currently most frequently discussed emerging substances down to confirmation of its status as a future regulated priority pollutant	1036
NL	Substances of High Concern list	To guide Dutch policies focused on prevention or minimizing emissions of such substances to the environment	>1400
Germany	PMT substances list	Identification of substances that are persistent in the environment, mobile in the aquatic environment and toxic may be critical for the quality of raw waters	134

How are emerging contaminants identified?

- **How do we determine which compounds to focus on?**
  - → Method 1 - Risk:
    - × Evaluate the risk from exposure to (new) chemicals, but this requires data about the prevalence of the compound in the environment and about its toxicity
  - → Method 2 - Exposure:
    - × Focus on contaminants that are the most prevalent in the environment and for which there is the highest risk of exposure; however, exposure does not mean that there is a risk
  - → Method 3 – PBT Approach:
    - × Focus on the most persistent compounds that bioaccumulate and are toxic (PBT); however, data may not be available, and/or conflicting
  - → Method 4 – Volume:
    - × What compounds are manufactured in the largest quantities and focus on those, but these may not be the most toxic or persistent compounds

How are emerging contaminants identified?

- **Which Method is the Best?**
  - → Undetermined, but probably a combination, which requires collection and analysis of a lot of data
  - → Who should be responsible for data collection (i.e. where does the money come from)?

In a workshop on "Managing Contaminants of Emerging Concern" in California (2009), participant suggested that, owing to the scarcity of data and lack of robust methodologies for measuring most CECs, a flexible, multi-element prioritization framework was recommended to identify those compounds of highest concern. Priority CEC lists could be further optimized by incorporating indicator compounds and/or surrogate parameters, which serve to enhance the effectiveness of monitoring approaches while reducing the cost and complexity of monitoring.

Challenges for identifying and regulating emerging contaminants

- **Collecting (Sufficient) Data**
  - → To understand the risk associated with a compound requires data related to toxicology and potential exposure that may not be readily available
- **How to balance the benefit of a compound versus the environmental/human impact?**
  - → Many of these compounds were developed to serve a purpose and designed to benefit humanity (eg. pharmaceuticals, PFAS, ..)
- **Technical issues**
  - → Need for consistent sampling & lab methodologies to ensure meaningful results for decision makers
  - → New methods needed for assessing risks of exposure to mixtures
  - → New treatment techniques may be needed
- **Regulatory**
  - → How to keep lists up to date and relevant
  - → How to balance public reaction

Potential implications

Industry

- Current data gaps & unknowns associated with emerging contaminants, make it very difficult to quantify and manage these potential liabilities
- Without guidance and a regulatory framework to be followed, it can be difficult to plan towards an endpoint
- Managing stakeholders can be a massive challenge
  - Reputational risk!

Consultants

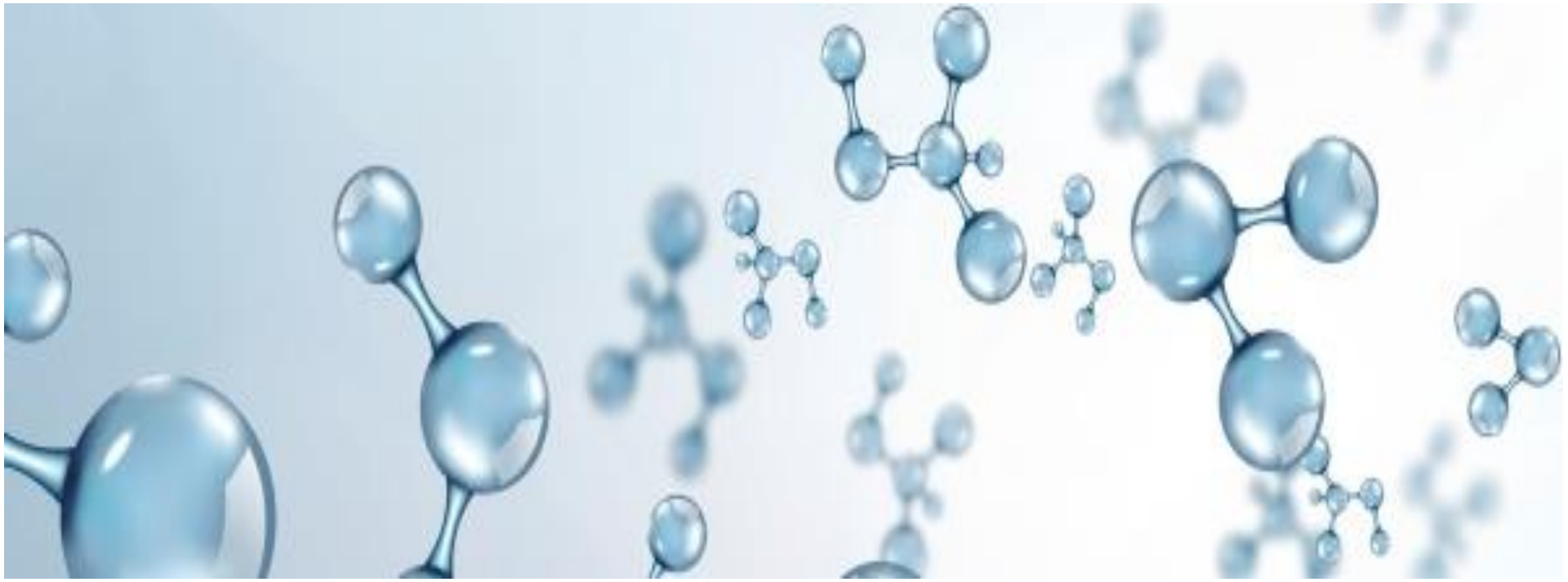
- Conflicting or inconclusive data can make it difficult to have project strategies well defined
- Lack of regulatory framework to guide investigation & treatment can become a roadblock
- Ongoing (or closed) remedial strategies may need to be adjusted (re-opened) to address new concerns related to emerging contaminants

Regulatory Community

- Enough data available to establish clear regulatory frameworks?
- How to respond to the urgent need to provide guidance on what to prioritize, how to sample and analyze, applicable thresholds…
- Public opinions still being formed, governmental collaboration is key

Lessons learned

- Current chemical-specific risk assessment approach seems neither feasible nor cost-effective for prioritizing and managing the vast majority of emerging contaminants
- Need for policy & treatment technology for source control/removal and product stewardship to avoid or minimize emerging contaminants with known or suspected risk
- Science on emerging contaminants is constantly evolving; The regulatory framework must follow the pace
- Managing proactively communication with stakeholders is key to avoid that sentiment, rather than science, is driving decisions



Thank you

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