Emerging Contaminants
- The New Frontier -

Paul Yaroschak
Deputy Director, Chemical & Material Risk Management
Office of the Secretary of Defense
Part 1 – EC Background & DoD Program Basics
What is an Emerging Contaminant?

• Chemicals & materials that have pathways to enter the environment and present potential unacceptable human health or environmental risks…

and either

• do not have regulatory peer-reviewed human health standards

or

• the regulatory standards are evolving due to new science, detection capabilities, or pathways.
EC Examples – Past & Present

- **Ozone Depleting Substances** – Refrigerants, fire suppressants, solvents...phased out of production
- **Perchlorate** – Munitions/propellant oxidizer...highly water soluble...affects thyroid function...intense Congressional interest regarding DoD releases
- **Hexavalent Chromium** – Heavy metal used in weapons systems/platforms...recent, revised 10-fold reduction in Permissible Exposure Level (PEL)
- **PFOA** – Used to make fire retardant/high performance materials...bio-persistent....95% phase-out by 2010...100% by 2015
- **Naphthalene** – Component of JP-8/fuels used throughout DoD. Proposed “carcinogenicity” listing by EPA. New toxicity levels could have major impacts
- **Sulfur Hexafluoride** – Global warming gas used in essential applications
U.S. & International Interest

- **USGS Survey of 139 streams in 30 states**
  - ECs found in 80% of streams

- **U.S. Executive Order 13423 (January 24, 2007)**
  - Requires Chemical Management Plans
    - Life Cycle Chemical Management

- **European Union – REACH**
  - Registration, Evaluation, Authorization & Restriction of Chemicals

- **EPA ChAMP**
  - Chemical Assessment & Management Program

- **TSCA Reforms?**
National Trends

• **Use of Precautionary Principle**
  • Must understand health & environmental effects before using chemicals

• **Chemical Management and Green Chemistry**
  • E.U. REACH*, E.O. 13423, U.S. ChAMP¹, possible Toxic Substances Control Act reforms

• **Biomonitoring – What’s showing up in humans?**
  • Center for Disease Control’s national biomonitoring & Calif. voluntary program

• **Evolving Risk Assessment Process**
  • Increasing transparency…showing uncertainty range
  • Shift from animal dose/response → toxicogenomics with human cells
  • Use of computational sciences
  • Application of Age-Dependent Adjustment Factor (ADAF)
  • National Academy of Sciences report released 3 Dec!

¹ Chemical Assessment & Management Program
Our Vision

Imagine if the largest industrial complex in the nation could...

- **Predict** which chemicals we use, or might use, have evolving science that may change the regulatory status and pose health or environmental risks.

- **Develop** a consensus evaluation of types & magnitudes of the risks in using/releasing such chemicals.

- **Develop** risk management options and invest in high-payback actions.

- **Achieve** and **measure** risk reduction.
EC “Scan-Watch-Action” Process

Over-the-horizon

Scan

Possible DoD impacts

Watch

Phase I Assessment

Probable high DoD impacts

Action

Phase II Assessment

Risk Management

RM Options to Governance Council

Review literature, periodicals, regulatory communications, etc.

Monitor events; Conduct Phase I qualitative impact assessment

Conduct Phase II quantitative impact assessment with risk management options
### Phase I Impact Assessment Process

**Acquisition, Technology and Logistics**

1. Likelihood of Toxicity
   - Value/Regulatory Change

2. Scoping and Data Collection

3. Impact on DoD Functional Areas

<table>
<thead>
<tr>
<th>ES&amp;H</th>
<th>Training &amp; Readiness</th>
<th>Acquisition/ RDT&amp;E</th>
<th>POMD of DoD Assets</th>
<th>Cleanup</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>H</td>
<td>H</td>
<td>H</td>
<td>H</td>
</tr>
<tr>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>L</td>
<td>L</td>
<td>L</td>
<td>L</td>
<td>L</td>
</tr>
</tbody>
</table>

**Results:**
- Recommendation – Move to Action List?
- Initial Risk Management Options
Plot Risk & Develop Risk Management Options

RM Options
- Fill tox science gaps
- RDT&E
- Material substitution
- Process/spec changes
- Regulatory engagement
- Stockpile material
- Exposure assessment & monitoring
- Personal Protective Equipment (PPE)
- Alert acquisition managers
- Benchmark with industry
- Risk communication
- Training
1,4-Dioxane: Volatile, colorless liquid used primarily as a stabilizer for chlorinated solvents such as 1,1,1-trichloroethane (TCA). Also used in paints, resins, varnishes, waxes, paint strippers and fumigants. Undergoing IRIS assessment.

**Likelihood of Toxicity Value/Regulatory Change**

1. Probability the USEPA will establish a revised set of IRIS toxicity benchmarks for 1,4-dioxane

   *In the absence of federal guidelines, individual states and USEPA Regional Offices are establishing guidance levels for 1,4-dioxane (e.g., Colorado, California, USEPA Regions 3, 6, and 9)*
SF6 Phase I Impact Assessment
Completed January 2008

Sulfur Hexafluoride (SF6) is used in radar systems (e.g., AWACS aircraft); helicopter rotor-blade leak tests; discharge testing in fire suppression systems; electrical switch gear; and propulsion systems for specific weapons in service (e.g., MK-50 torpedo) and under design.

Likelihood of Toxicity Value/
Regulatory Change

1. Probability that Greenhouse Gas emission initiatives will restrict use/availability of SF6
   - Probability
   - Timeframe: 2-3 yrs
   - Status: Completed

2. Probability the OSHA will revise the permissible exposure limit (PEL) for SF6
   - Probability
   - Timeframe: 5-10 yrs
   - Status: Under Design

ES&H
PO&MD of Assets
Training & Readiness
Cleanup
Acquisition/RDT&E
EC Watch List

✓ Tungsten alloys
  • Sodium Tungstate
✓ Tetrachloroethylene (PCE)
✓ Dioxin
✓ 1,4-dioxane*
  • Nanomaterials
✓ Perfluorooctyl sulfonate (PFOS)
✓ Di-nitrotoluenes (DNT)*
✓ Lead
✓ Nickel

✓ Cadmium
  • Manganese
  • Cerium
  • Cobalt
✓ Perfluorooctanoic acid (PFOA)…moved from action list

Dropped After Assessment:
  • Polybrominated biphenyl ethers (PBDEs)
  • 1,2,3-trichloropropane (TCP)
  • N-nitrosodimethylamine (NDMA)
  • Dichlorobenzenes

✓ Phase I Impact Assessment completed

* To be re-assessed
EC Action List

✓ Perchlorate
  • Royal Demolition eXplosive (RDX)
    • Cyclotrimethylenetrinitramine
✓ Trichloroethylene (TCE)
✓ Hexavalent Chromium (Cr6+)
  • Naphthalene
  • Beryllium (Be)
  • Sulfur Hexafluoride (SF6)

✓ Phase II Impact Assessment completed. All others initiated.

Note: Some risk management actions underway on all ECs including research on toxicity, substitutes, & treatment.
Part 2 – EC Program Update

Accomplishments & New Initiatives
EC Program Accomplishments – FY08

- Benchmarked gov’t & industry chemical ranking systems
- Multi-Attribute Analysis process for Risk Management Options (RMOs) ranking
- Completed 6 Phase I Impact Assessments
  - Sulfur hexafluoride, cadmium, lead, tungsten alloys, hexavalent chromium, naphthalene
- Completed 3 Phase II Impacts Assessments & RMOs
  - Hexavalent chromium, TCE, & perchlorate
- Completed state survey + 3 policy papers with EPA & the Environmental Council of States
  - Minimizes field disputes at DoD installations
ECOS-DoD-EPA Work Group Products

✔ Completed – ECOS Resolution Passed

• **Issue:** How do states define ECs? What are ECs of concern?
  - Product: State EC Survey ✔

• **How can states & federal agencies send a consistent risk message to the public?**
  - Product: Risk communication paper ✔

• **What values should be used if no IRIS value?**
  - Product: Provisional toxicity values paper ✔

• **What conditions, requirements, authorities influence the decision to expend funds on EC response when threat to human health is not clear?**
  - Product: EC action triggers paper ✔
Questions & Discussion