The Technical Review Workgroup for Metals and Asbestos (TRW)
Bioavailability Committee Annual Report:
Accomplishments and Activities for Calendar Year 2014

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TRW Bioavailability Committee Accomplishments of Calendar Year 2014

Reports and Guidance on the Bioavailability of Metals in Soil

1. **Continued Development of an Arsenic *In Vitro* Bioavailability Assay (IVBA) Consensus Approach and Publication**
   Continued data review and analysis of arsenic Relative Bioavailability Assay and IVBA data to develop a consensus approach and regression analysis to predict arsenic RBA from an IVBA assay.

2. **Formed the Dioxin/PAH Subcommittee of the Bioavailability Committee**
   Regions requested assistance from the TRW regarding the application of the results from a site-specific Relative Bioavailability dioxin in soil study to other Superfund sites with dioxin-contaminated soil. In addition, the TRW was requested to review a pilot study designed to study the oral and dermal bioavailability of PAHs in soil. As a result of these requests, a subcommittee of TRW Bioavailability Committee members and outside experts was formed to promote the best science and consistency in assessments of bioavailability of dioxins and PAH in soils for applications to human health risk assessment.

3. **Continued Development of a New Soil Reference Material for Pb and As**
   In collaboration with U.S. Geological Survey (USGS), the TRW Bioavailability Committee continued development of a new soil Reference Material (RM) for Pb and As, using material collected from a Region 8 Superfund. The new RM is intended to replace the depleted NIST Soil Reference Materials (SRMs), and to be used as Quality Control standards in analyses of arsenic and lead levels in soil and *in vitro* bioaccessibility assays.

   Continued Manuscript Development: "Development and Analysis of a New Soil Reference Material for Pb and Arsenic"
   Continued development of a manuscript on the development and analysis of the new Soil Reference Material, reporting on the development process, consensus values for standard analyses, and results of additional *in vitro* and *in vivo* testing. Source for the soil is the Iron Mountain/Flat Creek (Montana) Superfund site in Region 8.

   Final Draft of Report on the Round Robin Validation of New Soil Reference Material for Pb and As
   Developed final draft report on a multi-laboratory round robin analysis of the new soil Reference Material to establish consensus values for Pb IVBA and for Pb and As concentrations analyzed using EPA Method 3051A (microwave extraction). To be posted on the TRW Bioavailability website.

4. **Final Draft Report on the Swine Bioassay on New Soil Reference Material**
   Developed final draft report on the relative bioavailability of As for the new soil Reference Material assay in swine to assess. To be posted on the TRW Bioavailability website.

5. **Final Draft the Fact Sheet and Technical Memorandum on "Effects of Phosphate Amendments on Bioavailability of Pb in Soils"**
   Developed final drafts of Fact Sheet and Technical Memorandum on the "Effects of Phosphate Amendments on Bioavailability of Pb in Soils". The document is currently in OSRTI management review. The final document will be posted on the TRW Bioavailability website.

Final Draft Bioaccessibility Sampling Guidance
Final guidance for collection and handling of soil to be used for site-specific Pb bioaccessibility assessments. To be posted on the TRW Bioavailability website.

6. **Publication of SW-846 Method 1340 In vitro bioaccessibility assay for lead in soil in validation SW-846 test methods** (November 2013)
   (http://www.epa.gov/osw/hazard/testmethods/sw846/new_meth.htm)

Communication, Training, and Outreach

1. ***Hotline.*** The Bioavailability Committee responds to questions from inquiries made either by telephone to the Bioavailability Committee hotline (toll-free 1-866-282-8622) or via bahelp@epa.gov. The Bioavailability Committee responded to six requests for assistance in 2014. Of these calls, one was from a Federal agency, one was from an international university, two were from consulting firms and two were from private citizens.

2. ***Presentations /Training:***
   a. Fundamentals of Soil Chemistry: Soil Chemistry of Hazardous Materials. K.G. Scheckel. 19th Annual Contaminated and Hazardous Waste Site Management Course, Toronto, Canada, 2014.
   b. Delineating Arsenic Landfill Leachate Discharge to a Freshwater Pond and Sediment Partitioning. K.G. Scheckel, R.G. Ford, S. Acree, B. Lien, T.P. Luxton, R. Ross, A. Williams, and P. Clark. Goldschmidt 2014, Sacramento, CA, 2014.
   c. Metal(loid)s Bioavailability: Analyses of Swine Tissue for Bioavailability Study. Bradley W. Miller, Jon Beihoffer, Cyndy Lemmon, Theresa Morris, John Reschl, James Stamey. National Enforcement Investigations Laboratory. 23-May-2014. Denver, CO.
   d. Evaluation of Bioaccessibility Methods to Predict Relative Bioavailability of Arsenic in Contaminated Soils. B. Stevens, N. Basta, S. Whitacre, S. Naber, K.G. Scheckel, S. Casteel, K. Bradham, and D. Thomas. Goldschmidt 2014, Sacramento, CA, 2014.
   e. Assessment of arsenic bioavailability, bioaccessibility, and speciation in contaminated soils. Karen Bradham, Albert Juhasz, Clay Nelson, Kirk Scheckel, and David Thomas. Oral presentation at the Society of Environmental Geochemistry and Health conference, Newcastle, UK, July 2014.
   f. Development and application of site-specific arsenic bioavailability for contaminated residential soils. Karen Bradham, Kirk Scheckel, Clay Nelson, Nick

Basta, David Thomas. SETAC International Meeting, Vancouver, Canada, November 2014.

3. ***Publications***
   a. Remediation of a Lead-smelter Contaminated Calcareous Soil with Different Amendments and Their Effects on Metal Availability and Soil Properties. W. Xing, L. Li, K.G. Scheckel, A.R. Betts, G. Xiang, H. Lan, and L. Li. 2014. Acta Scientiae Circumstantiae. 34: 1534-1540.
   b. Iron Amendments to Reduce Bioaccessible Arsenic. W.G. Cutler, A. El-Kadi, N. Hue, K.G. Scheckel, and C. Ray. 2014. J. Hazard. Mater. 279: 554-561.
   c. In situ Formation of Pyromorphite is not Required for the Reduction of in vivo Pb Relative Bioavailability in Contaminated Soils A.L. Juhasz, D. Gancarz, C. Herde, S. McClure, K.G. Scheckel and E. Smith. 2014. Environ. Sci. Technol. 48: 7002-7009.
   d. Speciation Mapping of Environmental Samples using XANES Imaging. B. Etschmann, E. Donner, J. Brugger, D. Howard, M. de Jonge, D. Paterson, R. Naidu, K.G. Scheckel, C.G. Ryan and E. Lombi. 2014. Environ. Chem. 11: 341-350.
   e. Localization and Speciation of Arsenic in *Glomus intraradices* by Synchrotron Radiation Spectroscopic Analysis. M.C. González-Chávez, B.W. Miller, I.E. Maldonado-Mendoza, K.G. Scheckel, and R. Carrillo-González. 2014. Fung. Biol. 118: 444-452.
   f. μ-XRF, μ-XAS and μ-XRD Investigation of Pb Speciation after the Addition of Different P Amendments to a Smelter-Contaminated Soil. L.R. Baker, G.M. Pierzynski, G.M. Hettiarachchi, K.G. Scheckel, and M. Newville. 2014. J. Environ. Qual. 43: 488-497.
   g. Immobilization of Pb in Soil Influenced by Soluble Phosphate and Calcium: Pb Speciation Evidence. L. Li, K.G. Scheckel, L. Zheng, G. Liu, W. Xing, and X. Guoqiang. 2014. J. Environ. Qual. 43: 468-474.
   h. Influence of in vitro Assay pH and Chyme Composition on As Bioaccessibility in Contaminated Soils. E. Smith, K.G. Scheckel, B.W. Miller, J. Weber and A.L. Juhasz. 2014. Sci. Total Environ. 473: 171-177.
   i. Remediation of Heavy Metal(loid)s Contaminated Soils - To Mobilize or to Immobilize? N. Bolan, A. Kunhikrishnan, J. Kumpiene, J. Park, T. Makino, M.B. Kirkham, and K. Scheckel. 2014. J. Haz. Mater. 266: 141-166.
   j. Variability Associated with As in Vivo-in Vitro Correlations When using Different Bioaccessibility Methodologies. Juhasz AL, Smith E, Nelson C, Thomas D, Bradham K. (2014) Environ Sci Technol 48: 11646-11653.
   k. Assessing the Bioavailability and Risk from Metal Contaminated Soils and Dusts. Karen D. Bradham, Brian Laird, Pat Rasmussen, Sophia Serda, Steven Siciliano, and Michael F. Hughes. 2014. Human and Ecological Risk Assessment, 20: 272-286.
   l. Evaluation of Methods for Analysis of Lead in Air Particulates: An Intra-Laboratory and Inter-Laboratory Comparison. James M. Harrington, Clay M.

Nelson, Frank X. Weber, Karen D. Bradham, Keith E. Levine, Joann Rice. 2014. Environ. Sci.: Processes Impact., 16, 256-261

4. ***Website:*** TRW Bioavailability Committee website was updated as necessary.

5. ***Bioavailability Committee Annual Meeting.*** Held October 27-30, 2014, Gulf Breeze, FL. Members of the Bioavailability Committee met to work on projects and plan activities for 2015.

Coordination/Support with Regions, EPA Program Offices, and Other Federal Agencies

1. **USGS:** Continued development and analysis of a new Pb and As soil Reference Material, in collaboration with USGS.

2. **EPA Region 5:**
   a. Reviewed proposed site-specific dioxin bioavailability studies at the Tittabawassee River, Saginaw River & Bay Superfund site, Michigan (B5KF).
   b. Reviewed and commented on the investigation plan for a PAH bioavailability pilot study at the former Laredo Air Force Base Shotgun Range.

3. **EPA Region 6:**
   a. Reviewed and commented on "Selection of the Relative Bioavailability Adjustment Factor for the Baseline Human Health Risk Assessment San Jacinto River Waste Pits Remedial Investigation/Feasibility Study CERCLA Docket No. 06-03-10" for dioxin.
   b. Assisted in review of a pilot study for the Former Foster Air Force Base Skeet Range, Victoria, Victoria County, Texas for dioxin.

4. **EPA Region 8:** In collaboration with Region 8, continued development of a consensus approach and regression analysis to predict arsenic As RBA from an IVBA assay.

5. **EPA Region 9:** Reviewed and commented on the Work Plan for As Bioavailability Study at IR Site 22 – Former Naval Weapons Station Seal Beach Detachment Concord (Concord, California).

6. **OECA:** Digestion of swine material for confirmation of lead content for the swine RBA assay for the new OSRTI/USGS reference material.

7. **Arizona Department of Health**: Assisted the development of a protocol for evaluating bioavailability of As in soil.

8. **State of Texas:** Reviewed and commented on the "Investigation Plan for Former Laredo Air Force Base Shotgun Range PAH Bioavailability Pilot Study."