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Thank you, Doctor Suk. I'm delighted to be a part of the Superfund Basic Research Program conference this year. I am here to applaud two decades of partnership between NIEHS and EPA and to let you know how important your research is.

The overview for this conference on the NIEHS website says that "since 1987 the SBRP has provided funding to researchers to conduct multidisciplinary studies to address the *intractable* issues plaguing the national Superfund program." Webster's dictionary says "intractable" means *difficult to manage or govern.* It is true that the Superfund program does face many intractable issues. But, Superfund is a remedial program. Even though we have difficult issues, we have to take action and make decisions based on best available science. By providing that best available science, the Superfund Basic Research Program helps us improve the quality of our decisions. Although this program funds "basic" research, what you do often *translates* directly into practical applications in the field.

Let me discuss just a few critical areas where the SBRP has conducted important research:

- **<u>Phosphate treatment for lead contaminated soil</u>**,
    - The SBRP has sponsored research to pilot the use of phosphate treatment to "fix" lead in soil – so it is not bioavailable. This treatment technology is directly applicable to many Superfund sites. For example – in Omaha, Nebraska, EPA has removed lead contaminated soil from over 3000 residential yards, but the total number of yards needing cleanup may be as high as 16,000. If phosphate treatment is successful those additional yards can be cleaned up more quickly and cost-effectively. We face

significant lead contamination at other sites as well. In fact, in September we proposed to list three new sites in the Washington County Missouri Lead District -- together, these three sites encompass 105 square miles in eastern Missouri. Lead also is a principal contaminant at many hardrock mining sites – and we have 84 sites related to hard rock mining on the Superfund NPL, including the largest NPL site – the Coeur d'Alene basin in eastern Washington and northern Idaho, which is 1500 square miles.

- **<u>Fate and Transport of PCBs in Sediments</u>**
    - PCB research conducted under SBRP grants also contributed to the remedy decision for the Upper Hudson River. This is a 40 mile stretch of river with extensive PCB contamination in sediments. The Hudson is a very dynamic environment, so it is critical to understand the fate and transport of the PCB contaminated sediments in the River to refine the remedial approaches. And, of course, the Hudson is not the only river with PCB contaminated sediments. The Fox River in WI, the Kalamazoo River in MI, the Housatonic River in MA, the Passaic River in NJ – all have PCB contamination.

- **<u>Phyto remediation</u>**
    - The SBRP also has funded phyto remediation research. Phyto remediation has been used at 21 Superfund projects. It has application for TCE, which impacts about one third (about 570) of all Superfund sites. It has application for PCBs in soil and it has application for metals – which is particularly important at the 84 NPL sites related to hardrock mining that I just mentioned.

- **<u>In situ Bioremediation</u>**
    - In situ bioremediation has been used at over 70 Superfund projects, including 40 groundwater cleanup projects, and is planned for an

additional 29 groundwater projects. The reason I am emphasizing the use of bioremediation for groundwater is because our traditional groundwater remedy – pump and treat – has not been very successful. At many sites we are going back to reexamine the groundwater remedy to optimize it. Groundwater is an incredibly valuable resource, so any new technologies that will help achieve restoration would be tremendously important.

As you can tell from this discussion, when we talk about the kind of problems that need the help of the Superfund Basic Research Program, we are often focusing on contaminated sediments, contaminated soil and groundwater from historic mining practices, and other contaminated groundwater aquifers. I encourage you to focus your research on these "intractable" areas.

For example, Superfund needs improved field and laboratory analytical methods for detection, speciation, and quantification of contaminants in all media, but particularly in *groundwater*. We need improved models for assessing the fate and transport of subsurface contamination. Again, we have a particular need for modeling extensive *groundwater* aquifers as well as *sediment* fate and transport. We need a better understanding of how metals and other contaminants bioaccumulate in sediments and organisms, for our *contaminated sediment* and *mining* sites. We need improved methods for evaluating exposures at different life stages and different durations of exposure, including better methods and data to estimate soil ingestion in children, which is particularly important where we have residential lead exposure from historic *mining* activities. Finally, new remediation technologies that do a better, and more cost effective job of cleaning up are of great interest to us. In particular, the Superfund program would benefit from research that generates alternatives to current *groundwater* pump-and-treat technology – because, as I mentioned, pump and treat has not been very successful at achieving groundwater restoration: which is a goal of the Superfund program.

For example, I was recently at one of the San Gabriel Basin area wide groundwater sites in California. This area is over four miles long and one and a half miles wide and is divided into 4 Superfund sites overlaying a groundwater basin which provides about 90 percent of the water supply for over a million people. The sites were listed because of chlorinated solvents. But, then we found perchlorate, and more recently we found 1,4 dioxane. With the current limits on technology, we are not cleaning up the groundwater in the aquifer. We are pumping it out, running it through a treatment train to remove the various contaminants, and sending the clean water into the local water distribution systems.

If we could actually clean the water in situ, we could restore the groundwater resource, which is our goal. One exciting new area of research that might help is the use of nanotechnology based tools to help bioremediation. I noted that the SBRP has a Funding Opportunity Announcement out right now for research in this area. Of course, we also have to be careful with using nanotechnology tools. This September, EPA and the SBRP held a seminar on Human Toxicology and Risk Assessment as it relates to Nanoparticles.

Other groundwater research needs are:

- Less expensive ways of detecting emerging contaminants such as perchlorate and 1,4-dioxane;
- Real-time and cost-effective screening tools and monitoring methods, particularly non-invasive methods;
- Tools for characterizing and evaluating vapor intrusion pathways from groundwater,
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Other sediment research needs include:

- Containment and treatment technologies;
- Validation of transport and food change models;
- Methods for accurately evaluating releases from upland sources;
- Methods for evaluating impacts on ecological and human health.

At mining sites, research on in situ treatment to increase the pH and reduce the metals content of mine drainage would be tremendously helpful. Currently at many mining sites we have constructed water treatment plants that will have to operate in perpetuity to prevent ecological devastation from the mine drainage.

Finally, I want to emphasize the research needs associated with one particular site: the Libby, Montana asbestos site. EPA has been working in Libby, Montana, since 1999, when an Emergency Response Team was sent to investigate local concerns about asbestos-contaminated vermiculite. Although available human data establish the toxicity of asbestos, and preliminary dose-response analyses for Libby amphibole have been developed, these estimates need to be refined. We also need to better understand the toxicity of Libby amphibole beyond its carcinogenicity, and the differential susceptibility of different groups of people, including children. EPA is funding a significant amount of research that will support the development of the baseline risk assessment for Libby amphibole, and will help us select an appropriate remedial objective. In fact, later today I will be going over to EPA's lab at RTP to hear about the progress being made. But, there are other research needs in Libby that are not related to EPA's cleanup mission. The research EPA is funding will tell us what levels of exposure to Libby amphibole will be protective in the future. But, at Libby, a lot of exposure has already taken place, and people are getting sick and dying. Understanding how the body reacts to asbestos exposure is a medical research issue, but I bring it up because there is a real need for research in this area.

Surprisingly, there are a lot of data available. In particular, in Libby, the local clinic runs a Center for Asbestos Related Disease and has collected lung x-ray films going back for many years. A study based on those films could help understand the biological causes, and may help with treatment, of asbestos related disease. So, if you have colleagues who conduct medical research please let them know about the need in Libby.

Getting back to research related to site cleanup -- if you or your colleagues want to understand more about how EPA's Superfund program uses innovative technologies I suggest you visit our "CLU In web site at www.clu-in.org. In addition, we publish an annual report called "Treatment Technologies for Site Cleanup: Annual Status Report." The 12th annual report was published in September 2007 and is available on the CLU In web site. Thank you.