Mayor's Spring Valley Scientific Advisory Panel's
Review of the Department of Health's
Draft Comments on the
U.S. Army Corps of Engineers' Report

We have reviewed the D.C. Government's draft comments of the Corps of Engineers' Final Report of Analytical Results, dated May 8, 2002 – 3819 48th Street; 4710 Quebec Street; 4625 Rockwood Parkway and 4633 Rockwood Parkway. Our comments will address each section of the report.

Sequence of Events

This appears to be a subjective analysis of what the Corps of Engineers did or did not do. It speaks to procedural/administrative issues. The Department of Health may wish to explain the relevance of these issues to the health and safety concerns of Spring Valley residents. If there are problems in sampling and/or analytical methods, the District Government should explain how these might affect efforts to assess the risk of exposure to the contaminants identified. For instance, what impact does the procedural problems have on dose to which the resident may be exposed. Issues of soil sample management should be evaluated by a laboratory specialist, with educational and experiential background in laboratory science. This is a highly specialized subspecialty of science.

Generic Comments

This section of the Draft Comments speaks to other administrative issues, which may not be directly related to the health and safety of Spring Valley residents. However, this section lacks clarity. The fourth full paragraph is confusing to readers who are not familiar with work plans, etc. (second unnumbered page).

Comments on Risk

This would appear to be the principal focus of the comments. It addresses a fundamental question: What are the potential or real health risks of exposure to the list of contaminants identified? First, the term "risk-based concentration" should be explained. The more scientifically appropriate term is one of the following: permissible exposure limit; maximum allowable concentrations; maximum contaminant level (MCL), as in drinking water standards.

The following comment in the draft is not clear. "Since many of these are volatile compounds, and many are found in surface soils a presumptive pathway to human exposure exist." What is a presumptive pathway? Do we mean route of exposure? In this regard, it should be clear that human exposures to volatile organic compounds (VOC) are widespread. Nearly everyone is exposed to solvents in the conduct of their normal daily

activities. Solvents, as a chemical class, are volatile. The majority of the more volatile organic compounds volatilize when products containing them (aerosol propellants, paint thinners cleaners, soil fumigants) are used as intended. Solvent loss into the atmosphere also occurs during production processing, storage and transport activities. Wind dilutes and disperses solvent (VOC) vapors across the world.

Atmospheric concentrations of most VOCs are usually extremely low (i.e., nondetectable to nanograms or a few micrograms per cubic millimeter of air). High concentrations of VOCs are sometimes found in the efficient use of facilities of rubber producers, chemical companies, petrochemicals and paper mills. Concentrations diminish rapidly after VOCs enter bodies of water, due primarily to dilution and evaporation.

Nearly everyone is exposed to solvents or VOCs. Examples include:

- Cigarette Smokers (benzene, styrene)
- Persons who fill their automobile gas tank at a self-serving station (benzene, toluene, 1, 3 butadiene)
- Persons who have their clothes dry cleaned (tetrachloroethylene)

Most solvent exposures are mixtures of chemicals, rather than a single compound. Our knowledge of the toxicity of solvent mixtures is rudimentary relevant to the toxicology of individual solvents.

While the assumption is frequently made that the toxic effect of multiple solvents are additives, solvents may also interact synergistically or antagonistically. For example, ethanol intake near the time of exposure to VOCs may inhibit their metabolism and be protective.

Another well-characterized example of solvent antagonism is the interaction between benzene and toluene. Co-exposure to these chemicals result in diminished benzene metabolism. It is now recognized that there are significant data gaps in the area of mixtures toxicology, and these can preclude accurate risk assessment.

Toxic agents generally produce the greatest effect and most rapid response when given directly into the blood stream (intravenous route). An approximate descending order of effectiveness for other routes would be inhalation, intradermal, oral and dermal.

It is instructive to look at skin (dermal) as a barrier to toxic agents. A large and highly accessible human organ, the skin protects the body against external insults. Rather than merely repelling noxious agents, the skin may react to them with a variety of defense mechanisms that serve to prevent internal or widespread skin damage.

The inhalation route is also an important consideration. The sites of deposition of gases in the respiratory tract define the pattern of toxicity of those gases. Water solubility is the critical factor in determining how deeply a given gas penetrates into the lungs. Highly soluble gases such as sulfur dioxide (SO_2) do not penetrate farther than the nose and are therefore relatively nontoxic. Relatively soluble gases such as ozone and nitrogen oxide

(NO_2) penetrate deeply into the lungs.

Another risk-factor consideration is particle size, which is the critical factor that determines the region of the respiratory tract in which particles (solid or droplets) will be deposited.

In capsule, there are numerous factors that must be considered in determining the health risk of exposure to environmental toxicant. This determination is a multidisciplinary approach requiring the input of toxicologists, epidemiologists, environmental and occupational health scientists and biostatisticians.

The D.C. Government notes that the compounds identified were in the parts per billion range. It is appropriate to suggest that this range may fall within the de minimis risk classification. It refers to levels that are so low, and risks that are so small that they usually can be ignored. The term de minimis is derived from the legal doctrine de minimis non curat lex (the law does not concern itself with trifles). Moreover, physiological and metabolic systems of humans can act on an environmental contaminant and potentially decrease the amount received by the human body. Thus, 1 billion parts per million in ambient exposures (e.g., soil, water, air) may result in far less (insignificant) of an absorbed dose, the amount of agent absorbed by the lungs (inhalation), the gastrointestinal tract (ingestion) and skin (dermal exposure).

Surveillance

We emphasize, again, the importance of environmental health surveillance, a system, which the D.C. Government has put in place with particular concern for the Spring Valley community. While the surveillance program is not perfect, it is an appropriate beginning to address the health and safety concerns of the Spring Valley residents. The D.C. Government should not allow anecdotes to trump facts. That is, surveillance – the ongoing, systematic collection, analysis, and interpretation of health data – should guide the District's planning, implementation and evaluation of public health intervention.

Environmental disease surveillance extends beyond risk assessment to address the question: Is the environmental exposure associated with an increased incidence of disease among residents in the vicinity of the exposure? Surveillance thus involves analysis of exposure and exposure routes, disease types and disease rates and collection of environmental monitoring data.

As we have indicated previously, clinicians play an important role of collecting health data including providing accurate diagnosis and complete vital statistic data; alerting health authorities about potential health hazards and clustering of disease; and educating patients about health surveillance and environmental hazards.

It is worth noting, for example, that environmental (air, water, soil) toxin exposures are significantly lower, even in worst-case scenarios, than occupational (workplace) toxin exposures. Occupational exposure are experienced at levels in parts per million.

Environmental exposures are usually experienced at levels in parts per billion. Therefore, the amount of disease expected is significantly less with environmental toxic exposure because most toxins follow a lose-response pattern. This means that as opposed to occupational toxin exposures, environmental toxin exposures are so low that a much larger group of people needs to be studied to define detectable increases of a specific toxin-induced disease. Furthermore, because many populations are extremely mobile in modern society defining exposed population can be very difficult.

Recommendations

Future reports should separate administrative issues from scientific concerns. In other words, issue of epidemiology, toxicological and risk assessment should be treated separately. These are highly specialized areas and should be dealt with by the Department of Health's scientists. The Department should not become bogged down in administrative/procedural questions that may blur the important health questions, which are to be addressed. They are:

- potential vs. real exposure;
- exposure, dose – biologically effective dose; and
- disease (clinically diagnosed) incidence.

Many of these issues have been addressed in earlier reports of the Spring Valley Scientific Advisory Panel. Those reports should be made available to the public and to the Department of Health's staff for their review.

We also recommend that the Department develop a continuing education program designed to ensure that staff members are knowledgeable about scientific advances in epidemiology, toxicology and related environmental health sciences.

Fortunately, the Washington Metropolitan region is well endowed with an array of experts in all of the environmental health sciences. The Department of Health should take maximum advantage of these resources to enhance its capacity to serve the residents of the District of Columbia.

FOR THE PANEL

Bailus Walker, Jr., PhD, MPH
Chair, Spring Valley Scientific Advisory Panel