Multiple Chemical Exposure Evaluation

The potential for the toxic effects from the chemical mixture interactions of lead and arsenic were evaluated. The health impact of exposure to chemical mixtures and the potential for combined action of chemicals may be of concern at hazardous waste sites. This evaluation included the calculation of a Hazard Index (HI) for the lead and arsenic mixture. The HI is defined as the sum of the quotients of the estimated dose of a chemical divided by its MRL or comparable value: HI = Lead Dose/MRL + Arsenic Dose/MRL. If the HI is less than 1.0, it is highly unlikely that significant additive or toxic interactions would occur. If the HI is greater than 1.0, then further evaluation is necessary [ATSDR 2005]. Since no oral MRL or RFD has been established for lead, the use of media-specific slope factors and site-specific environmental monitoring data is recommended by ATSDR to predict media-specific contributions to blood lead [ATSDR 1999]. The hazard quotient for lead is estimated by dividing the predicted blood lead level by 10 μg/dL, CDC's level of concern. The Hazard Index for the lead and arsenic mixture at this site is 0.5. Since the HI is less than 1.0, it is unlikely that significant additive interactions would occur at this site. Hazard Index calculations are presented in Appendix B.

CHILD HEALTH CONSIDERATIONS

ATSDR recognizes that the unique vulnerabilities of infants and children require special emphasis in communities faced with contamination of their water, soil, air, or food. Children are at greater risk than adults from some environmental hazards. Children are more likely to be exposed to contaminants because they play outdoors, often bring food into contaminated areas, and are more likely to come into contact with dust and soil. Also, because children's bodies are still developing, children can sustain permanent damage if toxic exposures to some contaminants occur during critical growth stages.

The likelihood that children under the age of six can gain access to the Bauer site and its vicinity is low. A child's estimated exposure dose for on-site exposure has not been evaluated. However, children do live in downwind communities and could be exposed to contaminated soil and air. Fetuses can be affected indirectly through the placenta of an exposed mother. For those reasons, toxicological information about the effects of arsenic and lead on children is provided. Soil and air sampling data from downwind communities are needed to evaluate those possible exposures.

Arsenic and Children's Health

Children who are exposed to arsenic exhibit the same effects as adults; thus, all health effects due to arsenic are of potential concern in children. In particular, development of cancer has been observed in adults who were exposed to arsenic as children or young adults. Studies in animals indicate that arsenic affects development, including neural tube defects and disruption of kidney development [ATSDR 2000]. Animal studies have also shown that arsenic can cross the placental barrier and accumulate in the developing embryo. In addition, arsenic is known to be present in breast milk at low concentrations [ATSDR 2000]. A pregnant woman's infrequent exposure to arsenic at the site would not likely increase the cancer risk for her or her child, but the levels that might be present in downwind residential yards where children play have not been determined.

Lead and Children's Health

Many children are repeatedly exposed to lead during their childhood. A mother with lead in her body can expose the fetus to lead through the placenta. After birth, the mother could continue to expose her baby to lead through breast-feeding. Children can be exposed to lead if they eat food or drink water that contains lead. Children can swallow and breathe lead in dirt, dust, or sand while they play on the floor or on the ground. The dirt or dust on a child's hands, toys, and other objects with which the child comes into contact may have lead particles on them. In some cases, children swallow non-food items such as paint chips, which may contain large amounts of lead, particularly in older homes with lead-based paint. Also, compared to adults, a larger proportion of the amount of lead swallowed will enter the blood in children. Lead is stored in bones and can be released into the bloodstream when the body is stressed or when nutrition is poor, as when children refuse to eat healthy foods rich in iron and calcium [ATSDR 1999].

Children are more sensitive to the effects of lead than adults. Fetuses exposed to lead in the womb (due to the mother's high blood lead levels) may be born prematurely and have lower weights at birth. Exposure in the womb, in infancy, or in early childhood may also slow mental development and lower intelligence later in childhood. Evidence has been found that some effects may persist beyond childhood [ATSDR 1999]. Because it is not known what level of exposure to lead found in the environment might result in elevated blood lead levels, EEP and ATSDR recommend that any exposure to lead be avoided whenever possible.

CDC has determined that blood lead levels greater than 10 μg/dL in children are elevated, and some studies suggest that intelligence might be affected when levels are as low as 7 μg/dL. Blood lead levels as low as 10 μg/dL can adversely affect the behavior and development of children. Learning disabilities have been observed in children with blood levels exceeding 40 μg/dL [CDC 1991, 1997].

COMMUNITY HEALTH CONCERNS

Residents living in Grantsville have expressed concern about possible adverse health effects resulting from exposure to contaminants that are or may be present in dust emanating from the Bauer site [EEP 1999a]. Those residents have expressed concerns about increased cancer, neurological disease, and birth defect rates in their community. The EEP conducted a statistical review in 1999 of the cancers diagnosed in the Grantsville community and found that cervical cancer was significantly elevated as compared to other communities [EEP 1999c]. Exposure to heavy metals could lead to the development of respiratory and genito-urinary system cancer, but cervical cancer is not associated with heavy metal exposure. Although other types of cancer were identified, none were found to be significantly elevated.

Heavy metal exposure is associated with peripheral and central nervous system disorders. Lead, in particular, has been associated with poor child development. No air or soil samples have been collected from neighboring communities to determine whether windblown contaminants from the site have settled in communities at levels that could cause adverse health effects upon exposure.

People in those communities have not reported any specific health effects they suspect as site-related to the Tooele County Health Department [personal communication, Slade 2000].

Workers in the area have expressed concern about possible drug trafficking at the site, as well as stray bullets, and a "red dust" that covers their vehicles after a windstorm.

Public Comment Release of Public Health Assessment

On March 16, 2006, the EEP released the draft of this public health assessment for public comment. The public availability of the document was announced as a legal notice in local newspapers. The report also was available at two local repositories. Copies of the public health assessment were available for review at the Tooele County Health Department, the Tooele City Library, and through the Utah Department of Health Environmental Epidemiology Program. The public comment period for the draft PHA ended on April 8, 2006. No comments were received during the public comment period.

CONCLUSIONS

The Bauer site is currently classified as a public health hazard due to concentrations of lead in the soil and physical hazards on the site. Adult and young adult trespassers who use the site for recreation are at risk for exposure to contaminated soils and tailings, contaminated surface water, and various physical hazards that include old oxygen canisters and old, unstable buildings. Contamination from the site could also pose a health hazard for people, especially children, who live downwind of the site. Air monitoring and/or soil sampling data from downwind communities are needed to evaluate possible exposure. In addition, the cylinders on the Bauer site may ignite if tampered with.

The nearest community that could be potentially affected by off-site migration of contaminants is the Tooele Army Depot, which is approximately 2.5 miles downwind from the site. Air monitoring near the Tooele Army Depot would be useful in evaluating the potential for exposure to site-related contaminants. Windblown contaminants are not likely a concern in the town of Stockton, which is within one mile north of the site. Off-site migration of contaminants is unlikely to occur at levels sufficient to cause adverse health effects in the community of Grantsville, located approximately 10 miles from the Bauer site. Windblown contamination from the site would disperse and be diluted substantially as it traveled toward that community. A 1999 analysis of cancers in the Grantsville area concluded that although one type of cancer was found to be significantly elevated, it was a type not associated with heavy metal exposure [EEP 1999c].

The LMMD and OCD areas of the site may pose a health hazard. These dumps have not been characterized and may contain contaminants at levels that could cause adverse health effects upon exposure or might contain physical hazards that could injure people. Other physical hazards identified at the site include old, unstable buildings.

RECOMMENDATIONS

Exposure Reduction Recommendations

1. Establish erosion control measures to prevent off-site migration of contaminants.
2. Restrict site access by installing perimeter fencing and locked gates.
3. Erect signs around the perimeter of the site warning of the health hazard.
4. Inform ranchers of contaminants detected in soil and surface water.