ENVH 111 Readings for Week October 25-29, 2010

Questions to think about:

1. The recent environmental disaster in Hungary had immediate effects on the health of the population in nearby towns. 9 people died and over 150 people required medical attention, what was likely the cause of these deaths and injuries? Is this a toxicological consideration?

2. It is known that the sludge contains low levels of heavy metals such as lead, arsenic, cadmium, and mercury. With 200 million gallons of sludge spilled into the environment, these metals may mount to be a considerable toxicological concern. What routes of exposures to these metals are most likely to the public? If you were the WHO, what would you like to monitor for metal exposures?

3. The WHO performed an assessment of risk due to the spill and a brief summary of the assessment is included in your readings. Do you agree with the WHO assessment? Is there anything you would like to add to it?

4. Lead (Pb) exposure to adults and children will likely increase in the region due to the spill. What would be some routes of human exposure to lead in this contaminated region? The exposure to lead may be at a low level, who would be most at risk of an effect due to the low exposure? And what types of effects would you expect?

5. What would you think if this happened in your back yard? What would you be most worried about? And what kind of long lasting effects would you worry about?

Reading 1

http://www.nytimes.com/2010/10/06/world/europe/06hungary.html?ref=hungarian_sludge_spill

Caustic Sludge Floods Several Hungarian Towns

Bernadett Szabo/Reuters

Workers cleaned up toxic sludge in the flooded village of Devecser, Hungary, on Tuesday.

By DAN BILEFSKY and JUDY DEMPSEY

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PRAGUE — The Hungarian government declared a state of emergency in several towns on Tuesday, a day after a reservoir at an alumina refining plant in Ajka burst its banks, unleashing a flood of caustic red sludge that killed at least four people and injured more than 120, government officials said.

The flood, estimated at 700,000 cubic meters, or 185 million gallons, swept cars off roads, damaged bridges and houses, and forced the evacuation of hundreds of residents. People who came in contact with the substance were burned through their clothes.

“People here speak of a mini-tsunami,” said Gyorgy Bakos, spokesman for the National Directorate General for Disaster Management, who was close to the scene of the accident.

Hungarian environmental experts said that the spill could have devastating environmental consequences and that it threatened to pollute the Danube River, causing long-term damage to ecosystems and killing fish and vegetation. The agricultural soil that is now under the sludge will have to be replaced at a potentially high cost, the experts said.

The authorities and emergency services evacuated residents from Kolontar, Devecser and Somlovasarhely, in southwestern Hungary, and set up makeshift camps in schools and local community centers.

In addition to the dead, who appeared to have drowned, five people were missing, and a total of 7,000 residents were affected by the spill. About 60 people were hospitalized, according to the National Directorate General for Disaster Management.

Zoltan Illes, state secretary at the Environment Ministry, who was also in Devecser, called the spill an “environmental disaster.”

The sludge leaked and flooded the towns through the Torna River. About 270 homes were quickly engulfed. The sludge spread over 16 square miles, according to the Environmental Ministry.

Gabor Figeczky, deputy country officer of WWF-Hungary, an environmental group, said that the main threat from sludge was that it is very alkaline, with a pH as high as 13, making it a caustic detergent that could burn, which had led to the injuries.

Mr. Figeczky said the environmental risk was created by the highly alkaline substance flowing into rivers and killing all life there. He said it was the first large spill of such sludge, and it remained unclear whether rainfall and upstream water could help dilute the caustic mud in the river and avert more damage in the larger rivers downstream.

"There hasn't been such a spill of this red sludge before anywhere," he said.

The Hungarian Environment Ministry immediately ordered the owner of the Ajka alumina plant, MAL Zrt, the Hungarian Aluminum Production and Trade Company, to suspend all operations.

Viktor Orban, the prime minister, appealed for calm. "There are grounds for panic, and this is understandable," he told reporters. He said the government had set up a special team of experts to analyze the accident, which he said might have been caused by human error and showed no signs of having been the result of natural causes. He stressed that there was no threat of radiation in the area affected by sludge.

Red sludge, also known as red mud, is a byproduct of the refining of bauxite into alumina, the basic material for manufacturing aluminum, according to the Aluminum Association, an industry trade group based in Arlington, Va. The sludge, a waste product, contains heavy metals and is toxic if ingested, scientists say.

The plant's owner issued a statement Tuesday afternoon saying that "the red sludge waste is not considered hazardous waste" according to European Union standards.

The company added that it had conformed to all safety standards.

Joseph Hennon, European Commission spokesman for the environment, said the sludge was regulated under European Union law but was not necessarily considered a hazardous waste; that depends on what exactly it contains. He said the commission was waiting for the Hungarian government to provide an analysis of the sludge. The factory received a permit for handling the sludge from the Hungarian government in 2006.

"It presumably had procedures for handling and safety," he said.

According to the Aluminum Association, the alumina refining process removes impurities from the bauxite-containing soil, leaving a residue that is highly alkaline and caustic. Generally, the residue is washed several times to reduce the alkalinity and remove potentially hazardous materials, and then dried, according to the association.

The final material contains trace amounts of nearly every element found in the earth's crust, but the United States Environmental Protection Agency does not consider red mud a toxic or carcinogenic substance, an association official said.

Residents in Kolontar, not far from where the accident occurred, tried to rush from their homes as a wave of sludge six feet high pushed its way through narrow streets and homes.

"My dad, who is 82 years old, managed to lift up my mother to the level of the window, holding her tight," Robert Lemann, a local resident, told Hungarian public television. "Then we rushed my father to the hospital because the alkaline burned the skin on his legs."

Others complained that they had lost their livelihoods as farms, family corner shops and local businesses were overcome by the onslaught of the red sludge.

Mr. Bakos said any residents who came in contact with the sludge experienced unpleasant sensations to the legs, arms or ears. Officials said it was hard to confirm the numbers, but 80 to 120 people were taken to the hospital for treatment.

“It is chaotic here in the sense that people do not know how to react,” he added. But some people, fearing for their property and possessions, were eager to return. “They are concerned about their valuables, their assets,” he said.

Dan Bilefsky reported from Prague, and Judy Dempsey from Berlin. Elisabeth Rosenthal contributed reporting from Rome, and John M. Broder from Washington.

Reading 2

http://www.euro.who.int/en/what-we-do/health-topics/environmental-health/sections/news/2010/10/whoeurope-to-assess-health-impact-of-sludge-spill-in-hungary

Environmental health

WHO/Europe to assess health impact of sludge spill in Hungary

12-10-2010

A team of WHO experts is travelling to Hungary today to provide additional expertise to the Government-led assessment of potential short- and long-term health impact of a sludge spill that affected the country’s western territories on 4 October 2010.

The acute public health impact of the event has been serious but localized, with 8 people killed and over 120 injured. The immediate health effects of the spill included drowning and chemical burns due to the elevated pH (>12) of the red sludge. Assessment is needed of the health effects of possible exposure to dust, water and locally produced food that may contain increased amounts of heavy metals. The Hungarian authorities are continuously monitoring the situation, and have taken the public health actions required at this stage.

The sludge entered the river Danube at the end of last week, and it may spread in attenuated form to countries downstream; this possibility and related health effects will be evaluated. While serious short-term health effects are considered unlikely, potential medium- and long-term effects through contamination from heavy metals (for example, entering the food chain) can only be assessed as more information becomes available. The risk of contaminated dust’s spreading from the spill site to neighbouring countries is considered negligible.

The WHO mission will make an expert assessment of the short-, medium- and long-term effects of the spill on public health in the affected area; the Hungarian authorities will use the results to develop appropriate preventive action. The team includes international experts in evaluating and managing health risks from the environment, particularly from contaminated water and chemicals.

WHO/Europe is ready to provide technical assistance to the governments of countries through which the Danube runs, downstream of Hungary, if requested.

Reading 3

http://www.euro.who.int/en/where-we-work/member-states/hungary/sections/news/2010/10/whoeurope-concludes-mission-on-health-impact-of-sludge-spill-in-hungary

Hungary

WHO/Europe concludes mission on health impact of sludge spill in Hungary

20-10-2010

A four-day WHO expert field mission to Hungary concluded on 16 October by making recommendations to minimize the short- and long-term health impact of a sludge spill at an alumina plant of Magyar Alumínium Zrt. (MAL Zrt.), Ajkai Timfoldgyar in the town of Ajka, and to prevent similar events with potential transboundary effects.

The team was led by staff of WHO/Europe's WHO European Centre for Environment and Health, Rome, and included experts from the WHO collaborating centre for chemical incidents in the United Kingdom and ICARO, the Italian consulting company on environment and health risk assessment. The team added international know-how to the efforts and expertise of the national authorities and the WHO Country Office, Hungary; it focused on the public health aspects of the event, complementing the work of a European Union mission.

Acute health risk diminished

The spill caused 9 deaths and over 150 injuries, mostly due to drowning and chemical burns from the corrosive effect of the red mud. It destroyed or severely damaged over 300 houses in the villages of Kolontár, Devecser and Somlóvásárhely in western Hungary.

At the affected sites, measures were promptly taken to neutralize the corrosive mud and reduce the immediate danger of exposure. As the sludge has receded and its pH decreased, the risk of direct health damage from contact has been substantially reduced.

Focus on resident population and rescue workers

As the recovery and rehabilitation phase is under way, particular attention now needs to be paid to preventing potential health risks to the population of the affected areas, and the nearly 4000 rescue workers and volunteers involved in the clean-up.

Exposure to the mud by contact, inhalation or ingestion should be minimized. This requires completing the removal of the sludge from the affected areas (particularly houses), monitoring the concentration of outdoor and indoor air pollutants, and providing the population and first-line workers with clear advice on protecting themselves.

As the psychological effects of the disaster are recognized, a specialized team of Hungarian psychologists is providing support on site to people who have been evacuated, suffered injuries and/or deaths in their families, and/or sustained losses of and damage to property. This need will persist for both the short and medium terms.

No danger to health from drinking-water

Importantly, the quality of drinking-water supplied to the affected areas has remained adequate and poses no health risk to the community.

Continued monitoring of outdoor and indoor air, drinking-water and the quality of soil and food production will remain essential to assess the risk of exposure, particularly to heavy metals, in the medium and long terms and to take action as required.

No risk from international spread

Great effort has been dedicated to preventing the further spread of the spill to the river Danube, as this could result in environmental damage to neighbouring countries. The information available indicates that the quality of Danube water has remained substantially unaffected.

Nevertheless, with some 150 waste reservoirs located along the river, the spill highlights the need for comprehensive mapping and assessment of these installations, their resilience to extreme weather events and to any risk of contamination of soil and ground water from poorly isolated reservoirs.

Risk from currently used and heritage industrial sites is common to many countries in the lower Danube. Existing policy instruments, such as the Protocol on Water and Health, can support action to identify and remediate particularly contaminated sites with a potential to harm health through water contamination. The upcoming second meeting of the Parties to the Protocol, taking place on 22–25 November 2010 in Bucharest, Romania, offers a unique opportunity to discuss possible options on this important topic.

Reading 4

http://www.epa.gov/superfund/health/contaminants/lead/health.htm

Brief overview of lead in the environment

Lead is a naturally-occurring element that can be harmful to humans when ingested or inhaled, particularly to children under the age of six. Lead poisoning can cause a number of adverse human health effects, but is particularly detrimental to the neurological development of children. To learn more about the effects of lead poisoning and EPA's role in reducing the presence of lead in the environment, visit the EPA's Lead Web page.

For hundreds of years, lead has been mined, smelted, refined, and used in products (e.g., as an additive in paint, gasoline, leaded pipes, solder, crystal, and ceramics). Natural levels of lead in soil are usually below 50 parts per million (ppm), but mining, smelting, and refining activities have resulted in substantial increases in lead levels in the environment, especially near mining and smelting sites, near some types of industrial and municipal facilities, and adjacent to highways (Chaney et al., 1984). Soil lead concentrations of more than 11,000 ppm have been reported (National Research Council, 1980).

Lead particles in the environment can attach to dust and be carried long distances in the air. Such lead-containing dust can be removed from the air by rain and deposited on surface soil, where it may remain for many years. In addition, heavy rains may cause lead in surface soil to migrate into ground water and eventually into water systems.

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How might I be exposed to lead?

Everyone is exposed to "background" levels of lead, given its widespread distribution. Possible routes of lead exposure include:

- ingestion of lead-contaminated water, soil, paint chips, or dust;
- inhalation of lead-containing particles of soil or dust in air; and
- ingestion of foods that contain lead from soil or water.

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What health concerns are associated with lead contamination?

Lead poisoning is a particularly insidious public health threat because there may be no unique signs or symptoms. Early symptoms of lead exposure may include:

- persistent fatigue
- irritability
- loss of appetite
- stomach discomfort and/or constipation
- reduced attention span
- insomnia

Failure to treat lead poisoning in the early stages can cause long-term or permanent health damage, but because of the general nature of symptoms at early stages, lead poisoning is often not suspected.

In adults, lead poisoning can cause:

- poor muscle coordination
- nerve damage to the sense organs and nerves controlling the body
- increased blood pressure
- hearing and vision impairment
- reproductive problems (e.g., decreased sperm count)
- retarded fetal development even at relatively low exposure levels

In children, lead poisoning can cause:

- brain damage and/or mental retardation
- behavioral problems
- anemia
- liver and kidney damage
- hearing loss
- hyperactivity
- developmental delays
- in extreme cases, death

Although the effects of lead exposure are a potential concern for all humans, young children (less than seven years old) are most at risk (Reagan and Silbergeld, 1989). This increased vulnerability results from a combination of the following factors:

- Children typically have higher intake rates (per unit body weight) for environmental media (such as soil, dust, food, water, air, and paint) than adults, since they are more likely to play in dirt and put their hands and other objects in their mouths;
- Children tend to absorb a higher fraction of ingested lead from the gastrointestinal tract than adults;
- Children tend to be more susceptible than adults to the adverse neurological and developmental effects of lead; and
- Nutritional deficiencies of iron or calcium, which are common in children, may facilitate lead absorption and exacerbate the toxic effects of lead.

The current blood lead level of concern in children is 10 micrograms (μg) of lead per deciliter (dL) of blood (10 μg/dL); however, since adverse effects may occur at lower levels than previously thought, various federal agencies are considering whether this level should be lowered further.

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Is there a medical test to determine if I have been exposed to lead?

Yes. Your doctor can conduct blood tests to determine lead concentrations in your blood. Blood tests are inexpensive and sometimes free; however, please consult your insurance provider to determine coverage of such tests. Lead in bone and teeth can be measured using x-ray techniques, but this test is not used very often.

In communities where houses are old and deteriorating, residents are encouraged to take advantage of available screening programs offered by local health departments and to have children checked regularly for lead poisoning. Because the early symptoms of lead poisoning are similar to those of other illnesses, it is difficult to diagnose lead poisoning without medical testing.

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What recommendations has the Federal government made to protect human health?

The Centers for Disease Control and Prevention (CDC) EXIT Disclaimer recommends that screening for lead poisoning be included in health care programs for children under 72 months of age. This screening is especially critical for children under 36 months of age. Screening should start at six months of age if the child is at risk for lead exposure (e.g., if the child lives in a home built before 1960, with peeling or chipping paint). Decisions about further lead testing should be based on previous blood-lead test results, and the child's risk of lead exposure. In some states, more frequent lead screening is required by law.

To help protect small children who might swallow paint chips, the Consumer Product Safety Commission (CPSC) does not allow the amount of lead in most paints to exceed 0.06 percent. The Centers for Disease Control and Prevention (CDC) suggests testing paint on the inside and outside of residential buildings for lead.

The Consumer Product Safety Commission (CPSC), EPA, and states are required by the 1988 Lead Contamination Control Act to test drinking water in schools for lead, and to remove the lead if levels are too high. Drinking water coolers must be free of lead contamination and any water coolers that are tainted with lead have to be removed. EPA regulations limit lead in drinking water to 15 micrograms per liter (15 μg/L).

EPA has established standards designed to limit the amount of lead in air. Over a three-month period, the amount of air that the public inhales cannot contain more than 1.5 micrograms of lead per cubic meter of air (1.5 $\mu g/m^3$). The National Institute for Occupational Safety and Health (NIOSH) EXIT Disclaimer recommends that workers not be exposed to lead levels of greater than 100 $\mu g/m^3$ for up to ten hours. Because lead can be released into the air with automobile exhaust, EPA limits the amount of lead in unleaded gasoline to 0.05 grams of lead per gallon of gasoline (0.05 g/gal). Lead emissions from automobile exhaust now contribute only marginally to lead levels in the environment, but before leaded gasoline was banned in the United States, exhaust emissions were a significant problem. Lead emitted from past burning of leaded fuel is still present in the environment today.

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