From: Kari Fulton
Environmental Justice Organizer
Empower DC
Nov. 28, 2016November 28, 2016

DC Zoning Commission
Subject: Letter in Objection of DC United Stadium PUD

Re: DC-ZC Case 16-02 DC United Stadium

Dear DC Zoning Commission :
441 4th St. NW
Washington, DC 20001

Empower DC is a citywide, multi-issue, membership-based community organizing project. **Empower DC** builds campaigns to address key issues that directly-impact our membership. The organization is led by its membership, Board of Directors and staff.

In 2015 members of Empower DC who reside in the Near Buzzard Point community reached out for advocacy support in regards to the planned development in Buzzard Point including the remediation of several brownfield sites for the construction of the new DC United Soccer Stadium. Plans for the remediation, construction and traffic flow for the stadium raise many concerns and issues for our members. Empower DC is requesting that approval for the DC United Planned Unit Development be denied until the concerns of the community have been adequately addressed. Furthermore the Human Health Risk Assessment developed by Haley and Aldrich, Environmental Engineers for the project, has not been released to the public or added to the exhibits for case 16-02. This makes it difficult, to near impossible, for community members to properly weigh in on the impact of the remediation and construction of the project on the fenceline community.

The New Jersey Institute of Technology offered a review of the Voluntary Clean-Up Action Plan submitted by Haley and Aldrich. The review provides a set of recommendations to protect community health during the remediation process. Some of those safeguards include developing an air monitoring and dust control plan. Empower DC community members have requested that residents in the community closest to the construction site receive High Efficiency Particulate Air (HEPA) purifiers, HEPA

vacuums and dust mats to reduce exposure to toxins from potential exposure to contaminated fugitive dust from the site. We are also asking for air monitors to be placed in the adjacent neighborhood, not just on the site of the construction. We are requesting that community safeguards be put in place prior to remediation of the site.

The DC United Stadium plan in conjunction with the Buzzard Point Framework and Implementation Plan offer a real threat of displacement for the local community. Results from the Community Health and Safety Study showcase that in the census tract 0064 that is closest to the planned unit development, there is a significant economic gap between the residents of census tract 0064 and the surrounding community. The Soccer stadium will more than likely lead to an increase in rental cost and property taxes that may lead to displacement of some current residents of the area. This shift in demographic will make it difficult to monitor potential long-term adversary health impacts of the remediation on the community. We are requesting that all necessary health safeguards be put in place before remediation, including a strategy for short and long-term monitoring of health concerns for the community.

Empower DC stands in solidarity with ANC 6d Resolution in Opposition of the DC United Stadium Planned Unit Development. This document has already been placed as exhibit 92 in case 16-02.

We have also included the New Jersey Institute of Technology Review of the Voluntary Clean-up Action Plan as a supplement to this testimony.

Sincerely,

From: Kari Fulton
Environmental Justice Organizer
Empower DC

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Washington, DC 20009

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202-234-9119

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May 27, 2016

Ms. Rhonda Hamilton
Advisory Neighborhood Commission – 6D
44 O Street, SW
Washington, DC 20024
missrhonda@yahoo.com

RE: Technical Review of Cleanup Plan for
Proposed DC United Soccer Stadium at Buzzard Point
Washington, DC

Dear Ms. Hamilton:

The 6D Advisory Neighborhood Commission (ANC) requested assistance from the New Jersey Institute of Technology (NJIT) Technical Assistance to Brownfields Communities (TAB) program for the proposed DC United Soccer Stadium, in Washington DC.

The NJIT TAB program is a technical assistance program, funded through a grant provided by the United States Environmental Protection Agency (USEPA), which is intended to serve as an independent resource to communities and nonprofits attempting to cleanup and reclaim brownfields.

Specifically the ANC requested that NJIT TAB interpret the environmental reports for the site. ANC requested that NJIT TAB provide recommendations to minimize exposure to the community.

This correspondence provides:

- NJIT TAB's interpretation the environmental reports provided by ANC
- NJIT TAB's recommendations to minimize exposure to the community (in particular the students at the nearby schools), and

In general, as detailed in this correspondence, NJIT TAB recommends that D.C. United more proactively engage the community. Specifically, D.C. United should establish a public website with real-time air monitoring data, and a more thorough plan for addressing contaminated air during construction (dust control). In addition, a vapor intrusion investigation should be completed, and the environmental impact to the Anacostia River (and sediments) should be thoroughly investigated.
NJIT TAB reviewed the following documents:

- "Revised Cleanup Action Plan VCP Buzzard Point DC United Soccer Stadium Development", Haley & Aldrich, September 2015
- "Cleanup Action Plan VCP Buzzard Point DC United Soccer Stadium Ancillary Development", Haley & Aldrich, August 2015
- "Phase II Soil Investigation Report...Buzzard Point, Square 0605 Lot 0007", Haley & Aldrich, July 2015
- "Executive Summary Revised Cleanup Action Plan VCP Buzzard Point DC United Soccer Stadium Development", Haley & Aldrich, October 2015
- "Draft Scope for the Buzzard Point Community Health and Safety Study", January 15, 2016.

BACKGROUND

The site is approximately 13 acres and is located in a floodplain along the Anacostia River, and only 0.3 miles from the Potomac River. The site has been enrolled in the District of Columbia Department of Energy & Environment's Voluntary Cleanup Program.

The site has been used for numerous businesses, which have had the potential to cause environmental contamination:

- Ein Parcel (Parcel 3) – had a vehicle maintenance shop for the local telephone in company in 1972
- Super Salvage (Parcel 4) was a salvage yard for metal objects
- PEPCO (Parcels 5, 6, and 7) were used for electrical power management- including an electrical substation. The site also historically contained two large above ground storage tanks used to feed the substation.
- Akridge (Parcel 8) - PEPCO historically used the site as a gasoline filling station for vehicles. PEPCO currently stores old vehicles at the site.

In general, contamination at the site appears to be the result the former fuel storage and distribution activities, substation-related equipment and maintenance, and waste collection areas. In addition, the soil also contains contaminants that may be attributed to fill material brought to the site.

The proposed cleanup plan for the site is to remove up to the top 10 feet of soil (to accommodate the construction of the new stadium), and cap the remaining soil contamination.

SOIL

Soil will be excavated as part of the construction plan for the foundation of the new stadium. This will include much of the existing contaminated soil. However, there is currently no plan to excavate soil deeper than 10 feet below the ground surface and/or outside the footprint of the new stadium. Contaminated soil will be disposed of at an appropriate facility. After the soil is excavated, the environmental consultant will collect soil samples from the edges of the excavation to determine if contaminated soil remains at the site (or if all of the contaminated soil has been excavated).

The environmental consultant will then use the soil sampling results to conduct a human health risk assessment and leaching potential evaluation, to determine if any remaining contamination poses an unacceptable risk to human health or the environment.

NJIT TAB Comments:

NJIT TAB generally prefers "permanent" remedies (such as removing all of the contaminated soil – including soil deeper than 10 feet), as opposed to remedies which will require ongoing monitoring and maintenance, when practical.

Provided, that the cap is properly installed and is protective of human health and the environment, NJIT TAB finds this to be an acceptable remedy to address residual contamination, with the following conditions:

- *A visible contamination boundary marker should be installed beneath the cap.*
- *In vegetated areas - the cap should include a minimum thickness of two feet of soil overlying the geotextile membrane.*
- *The cap should be properly monitored (at least annually)*
  - *Evaluate vegetated areas for erosion,*
  - *Identify stressed vegetation, etc.*
- *A regular schedule for mowing and maintaining vegetative growth (including reseeding/replanting on an as needed basis) should be developed.*

NJIT TAB further recommends testing of any imported soil to be used for the soil cap to verify that the imported soil is clean.
In addition, a sediment and soil erosion control plan should be developed and implemented. The plan should include a truck wash station to minimize tracking of the contaminated dirt off the site.

Haley and Aldrich included a truck-route plan in their report. ANC should review this plan to ensure that it minimizes the disturbance to residents in the neighborhood.

GROUNDWATER / SURFACE WATER

Haley and Aldrich is planning to conduct a "Human Health Risk Assessment and Chemical Leaching Potential" evaluation. However, this has not yet been conducted. There is no specific plan in place for remediating groundwater, surface water, or sediments.

NJIT TAB Comments:

This assessment needs to be conducted to determine if additional groundwater remediation is necessary. In addition, this assessment should take into account the impacts of contamination on wildlife and plants – including those present in the adjacent Anacostia River.

VAPOR INTRUSION INVESTIGATION

Some of the chemicals (volatile compounds) identified at the site have the potential to travel through the soil as vapors. These vapors may then move up through the soil into nearby buildings, contaminating indoor air.

The reports indicate that "a soil gas survey may be conducted at the Site by the Site developer after the remediation activities to evaluate the potential for vapor intrusion into indoor air from VOCs in soil or groundwater. If a potential human health risk from possible vapor intrusion is identified, mitigation measures such as a vapor barrier or mitigation system shall be considered during the design of the stadium and installed during construction."

NJIT TAB Comments:
It is not clear what contaminants (and concentrations) will trigger the need for a vapor intrusion investigation (such as groundwater concentrations of benzene greater than 20 parts per billion (ppb), dibromochloromethane greater than 6 ppb, trichloroethene greater than 2 ppb, and vinyl chloride above 1 ppb). This should be clarified.

NJIT TAB recommends incorporating a vapor barrier and a passive vapor mitigation system into the design of all of the buildings at the site, prior to initiating construction. It is much easier and cost-effective to incorporate a vapor barrier and vapor mitigation system into the construction of a building, before the foundation is completed. After the completion of the remediation and construction, the conditions can then be assessed to determine if additional controls (such as adding a blower/fan to) are needed.

In addition, the potential for vapor intrusion in any off-site / neighboring building should also be assessed. NJIT TAB recommends conducting a vapor intrusion investigation for any structures within 100 feet of contaminated soil and/or groundwater, even if these buildings are not part of the planned construction project.

AIR MONITORING / PUBLIC OUTREACH / WEBSITE

The proposed remediation of the soil and concrete in contaminated areas may result in the generation of contaminated dust. Contaminants in dust may be transported to nearby neighbors where exposures can occur. Monitoring and control of this dust is a key concern of the public.

NJIT TAB recommends that DC United develop an air monitoring and dust control plan along with the action levels. NJIT TAB recommends the following action levels for the real time perimeter air monitoring stations:

Level 1 – Identify the cause and implement additional controls / modify work
- 0.1 parts per million (ppm) total VOCs

Level 2 – Halt Work
- 0.5 ppm total VOCs or 0.5 ppm benzene (real time monitoring / dragger tubes)

NJIT TAB recommends that DC United establish a website with the property perimeter real-time air monitoring to allow free public access to the data. The goal of the program is to gather accurate, timely data on the air quality and communicate that information to the public in ways that can reduce exposures. NJIT TAB also recommends that a 24-hour hotline phone number should be provided to the public so they can call with questions or complaints.

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NJIT TAB further recommends that DC United host community meetings where DC United can provide information on the monitoring program, and the website. The meetings should also provide the public with an opportunity to voice their concerns. DC United should develop a fact sheet and distribute it to the community regarding the project.

ODOR CONTROL

Even when the air quality is at a (health-based) safe level for volatile organic compounds and particulates, strong odors can still exist. In fact, there is a large window between safe and odor free. This gap can cause anxiety for the neighboring community, when they smell odors from the site and perceive that they are at an increased health risk from airborne contaminants. Therefore, NJIT TAB recommends extending the air quality program to include odor thresholds. At a minimum, the goal of the program should allow the occupants of the neighboring buildings to be free from the odors when they are inside their buildings with their doors and windows are shut.

Odor control methods (such as odor suppressing foam and/or perimeter air misters) should be implemented. NJIT TAB also evaluated an alternative of utilizing a remediation enclosure (tent) to capture airborne contaminants; however, if the above alternatives are effective, then a remediation enclosure may not be necessary.

FINANCIAL ASSURANCE

NJIT TAB has concerns regarding the long-term maintenance and monitoring which is required by the selected remedial action. Therefore, NJIT TAB recommends that DC United establish financial assurance in the form of a trust fund or surety bond, for the remediation activities as well as the on-going maintenance and monitoring over a 50-year time span, which will allow the DC Department of Energy & Environment to complete the activities if DC United fails to meet their remedial obligations.

CLOSING

Thank you for requesting the NJIT TAB Program's assistance. We truly appreciate the opportunity to work with you on this project. Please let us know if we can assist you further.

Sincerely,

Elizabeth R Limbrick

Elizabeth Limbrick
Project Manager
Policy and Planning Innovation for Civil Infrastructure and Environment
New Jersey Institute of Technology

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ATTACHMENTS

CHEMICALS AND HEALTH HAZARDS ASSOCIATED WITH CONTAMINANTS AT THE PROPOSED DC UNITED SOCCER STADIUM AT BUZZARD POINT SITE

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CHEMICALS AND HEALTH HAZARDS ASSOCIATED WITH CONTAMINANTS AT THE PROPOSED DC UNITED SOCCER STADIUM AT BUZZARD POINT SITE

NJIT TAB has evaluated the contaminants at the Buzzard Point site, the pathways for exposure to the contaminants, and the health effects of exposure to the contaminants. Generally, the pathways for exposure to contaminants at a site are:

- Soil:
  - Oral
    - (toddlers commonly eat soil)
    - (dust emissions that enter the mouth)
  - Skin Contact
- Water: Groundwater / Surface Water
  - Oral (drinking water)
    - At this site and in the nearby community, groundwater is not used for drinking water.
  - Skin Contact
- Air:
  - Breathing
    - Emissions (dust)
    - Vapors can migrate from under a building into a building.

The following is a list of the "predominant" contaminants that have been identified at the site. On the following pages, NJIT TAB provides an overview of each contaminant and its effects.

- Naphthalene
- Petroleum
- Ethylbenzene
- Polyaromatic hydrocarbons (PAHs)
  - Benzo(a)pyrene
  - Benzo(b)fluoranthene
  - Benzo(a)anthracene
- Arsenic
- Lead
- PCBs

The effects listed are generally associated with much higher concentrations than would be expected from the exposures to visitors at the Buzzard Point site.

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Naphthalene

Naphthalene is a white solid that evaporates easily. Fuels such as petroleum and coal contain naphthalene. It is also called white tar, and tar camphor, and has been used in mothballs and moth flakes. Burning tobacco or wood produces naphthalene. It has a strong, but not unpleasant smell. The major commercial use of naphthalene is in the manufacture of polyvinyl chloride (PVC) plastics. Its major consumer use is in moth repellents and toilet deodorant blocks.

Exposure to Naphthalene

- Breathing low levels in outdoor air
- Breathing air contaminated from industrial discharges or smoke from burning wood, tobacco, or fossil fuels
- Using or making moth repellents, coal tar products, dyes or inks could expose you to these chemicals in the air
- Drinking water from contaminated wells
- Touching fabrics that are treated with moth repellents containing naphthalene
- Exposure to naphthalene, 1-methylnaphthalene and 2-methylnaphthalene from eating foods or drinking beverages is unlikely

Effects on Health

Exposure to large amounts of naphthalene may damage or destroy some of your red blood cells. This could cause you to have too few red blood cells until your body replaces the destroyed cells. This condition is called hemolytic anemia. Some symptoms of hemolytic anemia are fatigue, lack of appetite, restlessness, and pale skin. Exposure to large amounts of naphthalene may also cause nausea, vomiting, diarrhea, blood in the urine, and a yellow color to the skin. Animals sometimes develop cloudiness in their eyes after swallowing high amounts of naphthalene. It is not clear whether this also develops in people. Rats and mice that breathed naphthalene vapors daily for a lifetime developed irritation and inflammation of their nose and lungs. It is unclear if naphthalene causes reproductive effects in animals; most evidence says it does not. Naphthalene is considered a chemical which is "reasonably anticipated to be human carcinogen." The US Environmental Protection Agency has determined that naphthalene is a possible human carcinogen.

Effects on Children

Hospitals have reported many cases of hemolytic anemia in children, including newborns and infants, who either ate naphthalene mothballs or deodorants cakes or who were in close contact with clothing or blankets stored in naphthalene mothballs. Naphthalene can move from a pregnant woman's blood to the unborn baby's blood. Naphthalene has been detected in some samples of breast milk from the general U.S. population, but not at levels that are expected to be of concern. There is no information on whether naphthalene has affected development in humans. No developmental abnormalities were observed in the offspring from rats, mice, and rabbits fed naphthalene during pregnancy. We do not have any information on possible health effects of 1-methylnaphthalene or 2-methylnaphthalene on children.

Recommendations

The EPA recommends that children not drink water with over 0.5 parts per million (0.5 ppm) naphthalene for more than 10 days or over 0.4 ppm for any longer than 7 years. Adults should not drink water with more than 1 ppm for more than 7 years. For water consumed over a lifetime (70 years), the EPA suggests that it contain no more than 0.1 ppm naphthalene.

Source: Agency for Toxic Substances and Disease Registry (ATSDR). 2005

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Total Petroleum Hydrocarbons (TPH)

"Total petroleum hydrocarbons" (TPH) is a term used to describe a large family of several hundred chemical compounds that originally come from crude oil. Crude oil is used to make petroleum products, which can contaminate the environment. Because there are so many different chemicals in crude oil and in other petroleum products, it is not practical to measure each one separately. However, it is useful to measure the total amount of TPH at a site. TPH is a mixture of chemicals, but they are all made mainly from hydrogen and carbon, called hydrocarbons. Scientists divide TPH into groups of petroleum hydrocarbons that act alike in soil or water. These groups are called petroleum hydrocarbon fractions. Each fraction contains many individual chemicals. Some chemicals that may be found in TPH are hexane, jet fuels, mineral oils, benzene, toluene, xylenes, naphthalene, and fluorene, as well as other petroleum products and gasoline components. However, it is likely that samples of TPH will contain only some, or a mixture, of these chemicals.

Exposure to TPH

- Everyone is exposed to TPH from many sources.
- Breathing air at gasoline stations, using chemicals at home or work, or using certain pesticides
- Drinking water contaminated with TPH.
- Working in occupations that use petroleum products.
- Living in an area near a spill or leak of petroleum products.
- Touching soil contaminated with TPH.

Effects on Health

Some of the TPH compounds can affect your central nervous system. One compound can cause headaches and dizziness at high levels in the air. Another compound can cause a nerve disorder called "peripheral neuropathy," consisting of numbness in the feet and legs. Other TPH compounds can cause effects on the blood, immune system, lungs, skin, and eyes.

Animal studies have shown effects on the lungs, central nervous system, liver, and kidney from exposure to TPH compounds. Some TPH compounds have also been shown to affect reproduction and the developing fetus in animals. Benzene, which is one of the many chemicals that comprise TPH, is considered to be a carcinogen to humans. There is no medical test that shows if you have been exposed to TPH. However, there are methods to determine if you have been exposed to some TPH compounds. Exposure to kerosene can be determined by its smell on the breath or clothing. Benzene can be measured in exhaled air and a breakdown product of benzene can be measured in urine. Other TPH compounds can be measured in blood, urine, breath, and some body tissues.

Effects on Children

Harmful effects from exposure to hexane have mainly occurred in adults. This is because most known cases have occurred in workers. However, it is probable that if children were exposed to hexane at levels that cause harmful effects in adults, similar effects would occur. Children may be exposed by playing in soil contaminated with TPH. Case reports of accidental poisoning through ingestion indicate that children 5 years old or younger often mistakenly drank kerosene because it was accessible. The applicability of this scenario to hazardous waste sites is questionable.

Recommendations

There are no regulations or advisories specific to TPH. The following are recommendations for some of the TPH fractions and compounds: The EPA requires that spills or accidental releases into the environment of 10 pounds or more of benzene be reported to the EPA.
The Occupational Safety and Health Administration has set an exposure limit of 500 parts of petroleum distillates per million parts of air.

Source: Agency for Toxic Substances and Disease Registry (ATSDR). 1999

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Fuel Oil

Fuel oils are a variety of yellowish to light brown liquid mixtures that come from crude petroleum. Some chemicals found in fuel oils may evaporate easily, while others may more easily dissolve in water.

Fuel oils are produced by different petroleum refining processes, depending on their intended uses. Fuel oils may be used as fuel for engines, lamps, heaters, furnaces, and stoves, or as solvents.

Some commonly found fuel oils include kerosene, diesel fuel, jet fuel, range oil, and home heating oil. These fuel oils differ from one another by their hydrocarbon compositions, boiling point ranges, chemical additives, and uses.

Exposure to Fuel Oils

- Using a home kerosene heater or stove, or using fuel oils at work.
- Breathing air in home or building basements that has been contaminated with fuel oil vapors entering from the soil.
- Drinking or swimming in water that has been contaminated with fuel oils from a spill or a leaking underground storage tank.
- Touching soil contaminated with fuel oils.
- Using fuel oils to wash paint or grease from skin or equipment.

Effects on Health

Little information is available about the health effects that may be caused by fuel oils. People who use kerosene stoves for cooking do not seem to have any health problems related to their exposure.

Breathing some fuel oils for short periods may cause nausea, eye irritation, increased blood pressure, headache, light-headedness, loss of appetite, poor coordination, and difficulty concentrating. Breathing diesel fuel vapors for long periods may cause kidney damage and lower your blood's ability to clot.

Drinking small amounts of kerosene may cause vomiting, diarrhea, coughing, stomach swelling and cramps, drowsiness, restlessness, painful breathing, irritability, and death unconsciousness. Drinking large amounts of kerosene may cause convulsions, coma, or. Skin contact with kerosene for short periods may cause itchy, red, sore, or peeling skin. The International Agency for Research on Cancer (IARC) has determined that some fuel oils (heavy) may possibly cause cancer in humans, but for other fuel oils (light) there is not enough information to make a determination.

Effects on Children

Children are more likely to be exposed to kerosene accidentally than adults. In particular, children that are 5 years old or younger often mistakenly drank kerosene because it was accessible to them.

Numerous case studies have described death following the accidental ingestion of kerosene by children (usually under the age of 5 but as old 15 years). The deaths are usually attributed to lipoidal pneumonia that was probably induced by the aspiration of the kerosene. Specific respiratory effects associated with death from kerosene ingestion include pneumothorax, emphysema and pneumonitis. Even if the kerosene is initially ingested (accidental ingestion of fuel oils is most often noted in children under 5 years of age), the

respiratory toxicity is usually attributable to the aspiration of kerosene into the lungs during vomiting. There are epidemiological data that found no evidence of respiratory toxicity in children from exposure to kerosene vapor and combustion products from kerosene stoves used for cooking; however, the importance of such exposures to individuals living near hazardous waste sites or in the workplace is uncertain.

Recommendations

The Occupational Safety and Health Administration (OSHA) and the Air Force Office of Safety and Health (AFOSH) have set a permissible exposure level (PEL) of 400 parts of petroleum distillates per million parts of air (400 ppm) for an 8-hour workday, 40-hour workweek.

The National Institute for Occupational Safety and Health (NIOSH) recommends that average workplace air levels not exceed 350 milligrams of petroleum distillates per cubic meter of air (350 mg/m^3) for a 40-hour workweek.

The Department of Transportation (DOT) lists fuel oils as hazardous materials and, therefore, regulates their transportation.

Source: Agency for Toxic Substances and Disease Registry (ATSDR). 1995.
http://www.atsdr.cdc.gov/toxprofiles/tp75-c2.pdf

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Fuel Oil # 2

Diesel fuels, and typical home heating oil and high aromatic content home heating oil, are forms of no. 2 fuel oil. Specifications for both middle distillate heating fuels and transportation fuels are similar. The final products may be treated as required for their particular use, but they are otherwise virtually indistinguishable on the basis of their gross physical or chemical properties. Diesel oil 2 is similar in chemical composition to No. 2 Fuel Oil, with the exception of additives. Along with diesel oil, typical heating fuel oil is a type of No. 2 Fuel oil. Fuel oils are comprised of mixtures of petroleum distillate hydrocarbons. The various kinds of fuel oils are obtained by distilling crude oil, and removing the different fractions. According to the U.S. Coast Guard Emergency Response Notification System (ERNS), No. 2 Fuel Oil is one of the most commonly spilled petroleum products in the U.S.

Effects on Health

Short-term hazards of the some of the lighter, more volatile and water soluble compounds (such as toluene, ethylbenzene, and xylenes) in No. 2 Fuel Oil include potential acute toxicity to aquatic life in the water column (especially in relatively confined areas) as well as potential inhalation hazards. Long-term potential hazards of some of the lighter, more volatile and water soluble compounds (such as toluene and xylenes) in No. 2 Fuel Oil include contamination of groundwater. Long-term water uses threatened by spills include potable (ground) water supply. Chronic effects of some of the constituents in No. 2 Fuel Oil (toluene, xylene, naphthalenes, alkyl benzenes, and various alkyl PAHs) include changes in the liver and harmful effects on the kidneys, heart, lungs, and nervous system. Increased rates of cancer, immunological, reproductive, fetotoxic, genotoxic effects have also been associated with some of the compounds found in No. 2 Fuel Oil (see entries on individual compounds for more details).

Source: http://www.nature.nps.gov/hazardssafety/toxic/fueloi2h.pdf

Fuel Oil # 4

No. 4 Fuel Oil is a heavier distillate No. 2 Fuel Oil, yet lighter than No. 5. Fuel Oil. No. 4 Fuel Oil is usually a 'light' residual, but sometimes is, or contains, a heavy distillate. No. 4 Fuel Oil can be prepared by combining 40 percent No. 2 Fuel Oil with 60 percent No. 6 Fuel Oil. Fuel oil numbers 4, 5, and 6 are commonly known as "residual oils" since they are manufactured in whole or in part from distillation residues from refinery processing. No. 4 Fuel Oil is intended for use in atomizing type burners that atomize oils of higher viscosity than domestic burners can handle.

Effects on Health

Chronic effects of some of the constituents in No. 4 Fuel Oil (such as naphthalenes) include changes in the liver and kidney. Due to their relative persistence and potential for various chronic effects (like carcinogenicity) PAHs (and particularly the alkyl PAHs) can contribute to long-term (chronic) hazards of No. 4 Fuel Oil in contaminated soils, sediments, and groundwater. No. 4 Fuel Oil can be directly toxic to some forms of aquatic life, can coat birds. Certain components of No. 4 Fuel Oil, such as PAHs, may be carcinogenic to animals and humans. There is sufficient evidence for the carcinogenicity in experimental animals of residual (heavy) fuel oils and cracked residue derived from the oil refining of crude oil. Residual (heavy) fuel oils are possibly carcinogenic to humans.

Source: http://www.nature.nps.gov/hazardssafety/toxic/fueloil4.pdf

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Fuel Oil # 6

No. 6 Fuel Oil is a dense, viscous oil produced by blending heavy residual oils with a lighter oil (often No. 2 fuel oil) to meet specifications for viscosity and pour point. These oils can occasionally form an emulsion, but usually only slowly and after a period of days. Because of its high viscosity, beached oil tends to remain on the surface rather than penetrate sediments. Light accumulations usually form a "bathtub ring" at the high-tide line; heavy accumulations can pool on the beach.

Exposure to Heavy Fuel Oils

Heavy fuel oils are stored and handled in closed systems and involve the use of insulated storage tanks and lagged and trace-heated transfer lines. Exposure to fuel oil is therefore limited, except on tank filling and during maintenance operations.

Effects on Health

In the aquatic environment, the main concern is the aromatics in No. 6 Fuel Oil. Benzene Toluene, Ethyl Benzene, and Toluene (BTEX) compounds, although they do not make up a large percentage of this product, are present and could represent an acute toxicity risk. Due to their relative persistence and potential for various chronic effects (like carcinogenicity), the heavier aromatic PAHs, (and particularly the alkyl PAHs) in No. 6 Fuel Oil can pose long term hazards in contaminated soils, sediments, and groundwater. No. 6 Fuel Oil would be expected to be a skin, eye and respiratory irritant and a CNS depressant from inhalation of large amounts of the vapor or mist. Exposure to hydrogen sulphide at concentrations above the recommended occupational exposure standard may cause headache, dizziness, irritation of the eyes, upper respiratory tract, mouth and digestive tract, convulsions, respiratory paralysis, unconsciousness and even death. Prolonged or repeated contact with the skin may produce a defatting dermatitis with dryness and cracking. This product may contain substances which have caused kidney damage in laboratory animals.

Recommendations

Storage tanks in land based applications should be surrounded by oil tight bund walls to prevent escape of heavy fuel oil into the environment in the event of a major spillage or tank failure. A marine spillage should be reported to the nearest coastal state and additional guidance sought from the owner of the vessel, or the charterer. The cleaning of combustion deposits from boilers and furnaces is a specialist operation; suitable breathing apparatus must be used to prevent the inhalation of dust and ash.

When it is required to dispose of fuel oil, for example, following a spillage or tank cleaning operations, this should be done through a recognized waste contractor. In marine applications, all waste fuel oil should be collected and disposed of on land in accordance with local regulations

Source: http://www.dec.state.ak.us/spar/perp/response/sum_fy05/041207201/fact/noaa_971_no_6.pdf
http://www.nature.nps.gov/hazardssafety/toxic/fueloil6.pdf
http://www.accede.org/prestige/documentos/Tox_fuel_pesado.pdf

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Ethylbenzene

Ethylbenzene is a colorless, flammable liquid that smells like gasoline.
It is naturally found in coal tar and petroleum and is also found in manufactured products such as inks, pesticides, and paints. Ethylbenzene is used primarily to make another chemical, styrene. Other uses include as a solvent, in fuels, and to make other chemicals.

Exposure to Ethylbenzene

- Ethylbenzene moves easily into the air from water and soil.
- It takes about 3 days for ethylbenzene to be broken down in air into other chemicals.
- In surface water, ethylbenzene breaks down by reacting with other chemicals found naturally in water.
- Ethylbenzene can move through soil into groundwater .
- In soil, it is broken down by bacteria.
- If you live in a city or near many factories or heavily traveled highways, you may be exposed to ethylbenzene in air.
- Releases of ethylbenzene into the air occur from burning oil, gas, and coal and from industries using ethylbenzene.
- Ethylbenzene is not often found in drinking water; however, high levels may be found in residential drinking water wells near landfills, waste sites, or leaking underground fuel storage tanks.
- Exposure can occur if you work in an industry where ethylbenzene is used or made.
- Exposure can occur if you use products containing it, such as gasoline, carpet glues, varnishes, and paints.

Effects on Health

Exposure to high levels of ethylbenzene in air for short periods can cause eye and throat irritation. Exposure to higher levels can result in dizziness. Irreversible damage to the inner ear and hearing has been observed in animals exposed to relatively low concentrations of ethylbenzene for several days to weeks. Exposure to relatively low concentrations of ethylbenzene in air for several months to years causes kidney damage in animals. Ethylbenzene is found in the blood, urine, breath, and some body tissues of exposed people. The most common way to test for ethylbenzene is in the urine. Ethylbenzene is listed as a possible human carcinogen.

Effects on Children

There are no studies evaluating the effects of ethylbenzene exposure on children or immature animals. It is likely that children would have the same health effects as adults. We do not know whether children would be more sensitive than adults to the effects of ethylbenzene. We do not know if ethylbenzene will cause birth defects in humans. Minor birth defects and low birth weight have occurred in newborn animals whose mothers were exposed to ethylbenzene in air during pregnancy.

Recommendations

The EPA has determined that exposure to ethylbenzene in drinking water at concentrations of 30 mg/L for 1 day or 3 mg/L for 10 days is not expected to cause any adverse effects in a child.

The EPA has determined that lifetime exposure to 0.7 mg/L ethylbenzene is not expected to cause any adverse effects. The Occupational Health and Safety Administration (OSHA) has limited workers' exposure to an average of 100 ppm for an 8-hour workday, 40-hour workweek.

Source: Agency for Toxic Substances and Disease Registry (ATSDR). 2010.

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Polycyclic Aromatic Hydrocarbons (PAHs)

Polycyclic aromatic hydrocarbons (PAHs) are a group of over 100 different chemicals that are formed during the incomplete burning of coal, oil and gas, garbage, or other organic substances like tobacco or charbroiled meat. PAHs are usually found as a mixture containing two or more of these compounds, such as soot.

Some PAHs are manufactured. These pure PAHs usually exist as colorless, white, or pale yellow-green solids. PAHs are found in coal tar, crude oil, creosote, and roofing tar, but a few are used in medicines or to make dyes, plastics, and pesticides.

Exposure to PAHs

- Breathing air containing PAHs in the workplace of coking, coal-tar, and asphalt production plants; smokehouses; and municipal trash incineration facilities.
- Breathing air containing PAHs from cigarette smoke, wood smoke, vehicle exhausts, asphalt roads, or agricultural burn smoke.
- Coming in contact with air, water, or soil near hazardous waste sites.
- Eating grilled or charred meats;
    - PAHs can be formed when fat and juices from meat grilled drip directly over a flame or hot coals. Heavy charring of meat also produces PAHs.
- Eating contaminated cereals, flour, bread, vegetables, fruits, meats; and processed or pickled foods.
- Drinking contaminated water or cow's milk.
- Nursing infants of mothers living near hazardous waste sites may be exposed to PAHs through their mother's milk.

Effects on Health

Mice that were fed high levels of one PAH during pregnancy had difficulty reproducing and so did their offspring. These offspring also had higher rates of birth defects and lower body weights. It is not known whether these effects occur in people.

Animal studies have also shown that PAHs can cause harmful effects on the skin, body fluids, and ability to fight disease after both short- and long-term exposure. But these effects have not been seen in people. In the body, PAHs are changed into chemicals that can attach to substances within the body. There are special tests that can detect PAHs attached to these substances in body tissues or blood. However, these tests cannot tell whether any health effects will occur or find out the extent or source of your exposure to the PAHs. The tests aren't usually available in your doctor's office because special equipment is needed to conduct them.

PAHs are listed as compounds that "may reasonably be expected to be carcinogens."

Effects on Children

The effects of short-term exposure to children are the same as for adults. However children, who have lower bodyweights than adults, do not require as great an exposure to experience the same health effects as adults. Young children are also prone to behaviors that may increase their potential for exposure, e.g. crawling on bare dirt surfaces, eating soil, and more hand-to-mouth activities.

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Recommendations

The Occupational Safety and Health Administration (OSHA) has set a limit of 0.2 milligrams of PAHs per cubic meter of air (0.2 mg/m^3). The OSHA Permissible Exposure Limit (PEL) for mineral oil mist that contains PAHs is 5 mg/m^3 averaged over an 8-hour exposure period.
The National Institute for Occupational Safety and Health (NIOSH) recommends that the average workplace air levels for coal tar products not exceed 0.1 mg/m^3 for a 10-hour workday, within a 40-hour workweek. There are other limits for workplace exposure for things that contain PAHs, such as coal, coal tar, and mineral oil.

The safe distance from a site will be dictated by onsite activities that may result in release of contaminated dust or vapors. Appropriate management of a contaminated site includes ensuring that off-site releases are minimized and do not result in significant exposure to surrounding residents.

Source: Agency for Toxic Substances and Disease Registry (ATSDR). 1995.
http://www.health.sa.gov.au/pehs/PDF-files/ph-factsheet-PAHs-health.pdf

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Benzo(a)pyrene

Pure Benzo(a)pyrene (BaP) is usually found as pale yellow crystals. It does not dissolve in water, but will dissolve in organic (carbon-containing) solvents. BaP is one of a group of compounds known as the Polycyclic Aromatic Compounds (PAHs). Only relatively small amounts of BaP are intentionally manufactured to be used in dyes.

Exposure to Benzo(a)pyrene

- The vast majority of BaP is released to the environment when combustion is incomplete (usually because there is insufficient oxygen). Thus, most BaP is released from vehicle exhausts and domestic wood and coal fires.
- Trace amounts are found in cigarette smoke.
- BaP is also released naturally from volcanoes and forest fires, but the amounts are very small compared to those released from man-made combustion sources.
- BaP has very low solubility in water, but can be found in drinking water when groundwater or surface water sources are contaminated with BaP. BaP binds to particulate matter in water, which is often removed by filtration before reaching the tap.
- BaP partitions strongly to sediment, but will break down when exposed to UV in sunlight.

Effects on Health

Benzo(a)pyrene can enter the body either by inhalation of air containing benzo(a)pyrene, ingestion of water or food containing benzo(a)pyrene, or by dermal contact with benzo(a)pyrene, contaminated soil or products containing benzo(a)pyrene. Inhalation of benzo(a)pyrene may cause respiratory tract irritation. Exposure to benzo(a)pyrene may damage the reproductive system and cause cancer. Ingestion of benzo(a)pyrene may cause gastrointestinal irritation. Dermal contact with benzo(a)pyrene may lead to skin irritation. In the natural environment benzo(a)pyrene occurs as part of a mixture of Polycyclic Aromatic Hydrocarbons (PAHs). The full effects of benzo(a)pyrene on human health are unknown, however studies have shown that inhalation of PAHs or dermal contact with PAHs for long periods of time can cause cancer. However, exposure to benzo(a)pyrene at normal background levels is unlikely to have any adverse effect on human health. Lung cancer has been shown to be induced in humans by various mixtures of polycyclic aromatic hydrocarbons known to contain BAP including cigarette smoke, roofing tar and coke oven emissions. It is not possible, however, to conclude from this information that BAP is the responsible agent.

Effects on Children

Based on what is known about effects of BaP exposure, health concerns associated with BaP exposure for children are: formation of BaP-DNA adducts which may lead to errors in DNA replication and increased risk of cancer; also increased risk of cancer associated with BaP metabolite formation; persistent effects on the development and function of the immune system; and reduced fertility in offspring during adulthood following BaP exposure during pregnancy.

Concerns for BaP exposure of pregnant women and children are: ambient air contamination from mobile sources (e.g., cars) and industrial sources (e.g., coke ovens, metal processing plants); fetal exposure from maternal cigarette smoking; fetal and childhood exposure from second-hand cigarette smoke; and exposure from diet, including grilled and broiled food . Children may also have greater exposure than adults to contaminated soil in areas where BaP-contaminated soil from industrial contamination may be present, because of behavior patterns, particularly hand-to-mouth activity.

Recommendations

In view of the U.S. EPA Maximum Contaminant Level Goal (MCLG) of 0 for BaP (see Toxicity Summary and Reference Values in this Chemical Summary), caregivers may consider an alternate water supply where BaP contamination is impacting drinking water.
BaP is number 9 on the 2005 Priority List of Hazardous Substances for the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) section 104(i), as amended by the Superfund Amendments and Reauthorization Act (SARA).

Source: http://apps.sepa.org.uk/spripa/Pages/SubstanceInformation.aspx?pid=22
http://www.epa.gov/iris/subst/0136.htm
http://www.epa.gov/teach/chem_summ/BaP_summary.pdf

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Benzo[b]fluoranthene

Benzo[b]fluoranthene is a crystalline solid which is found in fossil fuels and occurs ubiquitously in products of incomplete combustion. It has been detected in mainstream cigarette smoke, urban air, gasoline engine exhaust, emissions from burning of coal and from oil-fired heating, broiled and smoked food, and oils and margarine and in soils, groundwater, and surface waters at hazardous waste sites. Of all estimated environmental releases of benzo(b)fluoranthene, 97% are to air. Of the remaining 3%, approximately equal amounts of benzo(b)fluoranthene are released to water and land. Because it is formed when gasoline, garbage, or any animal or plant material burns, it is usually found in smoke and soot. This chemical combines with dust particles in the air and is carried into water and soil and onto crops.

Exposure to Benzo[b]fluoranthene

- Benzo[b]fluoranthene is not manufactured, but is sometimes used as a research chemical
- The incomplete burning of fossil fuels, garbage, or other organic matter
- Wood preserving involving creosote, and paving, roofing, and insulation work involving asphalt or bitumens
- Occupational exposure may be through inhalation and dermal contact with this compound at workplaces where coal and petroleum derived substances are produced or used or where combustion processes are extensive.
- Benzo(b)fluoranthene was detected at 0.2 ng/mg skin lipid (median concentration) in samples taken from roofing workers exposed to polycyclic aromatic hydrocarbons (PAH) as a component of coal tar pitch & the asphalt roofing material. The presence in skin oil provides evidence of continued body burden after leaving the workplace.

Effects on Health

Benzo(b)fluoranthene is a probable carcinogen in humans. It has been shown to cause lung, liver and skin cancer in animals. Contact with Benzo(b)fluoranthene can cause skin and eye irritation. Benzo(b)fluoranthene has not been tested for other chronic (long-term) health effects.

Recommendations

There is no special test for this chemical. However, if illness occurs or over exposure is suspected, medical attention is recommended. Enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn. A regulated, marked area should be established where Benzo(b)fluoranthene is handled, used, or stored. Wear protective work clothing. Wash thoroughly immediately after exposure to Benzo(b)fluoranthene and at the end of the workshift.

Source: http://www.osha.gov/SLTC/healthguidelines/benzo-bfluoranthene/recognition.html
http://cira.ornl.gov/documents/Benzobfluoranthene.pdf
http://web.doh.state.nj.us/rtkhsfs/factsheets.aspx

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Benzo(a)anthracene

Benz(a)Anthracene is a colorless plate-like material which is recrystallized from glacial Acetic Acid or a light yellow to tan powder. It is not produced commercially but occurs as an intermediate during chemical manufacturing. It is also found in Coal Tar.

Exposure to Benzo(a)anthracene

People may be exposed to benzo(a)anthracene from environmental sources such as air, water, and soil and from cigarette smoke and cooked food. Typically, exposure for workers and the general population is not to benzo(a)anthracene alone, but to a mixture of similar chemicals

Effects on Health

Harmful if inhaled, swallowed, or absorbed through the skin. It is irritating on contact with skin, eyes or mucous membranes. It may cause damage to kidney, ureter, and bladder. Chronic exposure may cause alteration of genetic material. Although there are no human data that specifically link exposure to benzo(a)anthracene to human cancers, benzo(a)anthracene is a component of mixtures that have been associated with human cancer. Benzo(a)Anthracene may be a carcinogen in humans since it has been shown to cause bladder and skin cancer in animals.

Source: http://web.ncifcrf.gov/rtp/LASP/intra/forms/msds/msds-benzanathracene.pdf
http://www.nature.nps.gov/hazardssafety/toxic/benzoant.pdf
http://web.doh.state.nj.us/rtkhsfs/factsheets.aspx

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Arsenic

Arsenic is a naturally occurring element widely distributed in the earth's crust. In the environment, arsenic is combined with oxygen, chlorine, and sulfur to form inorganic arsenic compounds. Arsenic in animals and plants combines with carbon and hydrogen to form organic arsenic compounds, which generally considered to be less harmful to humans.

Inorganic arsenic compounds are mainly used to preserve wood. Copper chromated arsenate (CCA) is used to make "pressure-treated" lumber. CCA is no longer used in the U.S. for residential uses; it is still used in industrial applications. Organic arsenic compounds are used as pesticides, primarily on cotton fields and orchards.

Exposure to Arsenic

- Ingesting small amounts present in your food and water or breathing air containing arsenic.
    - The predominant dietary source of arsenic is seafood, followed by rice / rice cereal, mushrooms, and poultry.
- Breathing sawdust or burning smoke from wood treated with arsenic.
- Living in areas with unusually high natural levels of arsenic in rock.
- Working in a job that involves arsenic production or use, such as copper or lead smelting, wood treating, or pesticide application.

Effects on Health

Breathing high levels of inorganic arsenic can give you a sore throat or irritated lungs. Ingesting very high levels of arsenic can result in death. Exposure to lower levels can cause nausea and vomiting, decreased production of red and white blood cells, abnormal heart rhythm, damage to blood vessels, and a sensation of "pins and needles" in hands and feet.
Ingesting or breathing low levels of inorganic arsenic for a long time can cause a darkening of the skin and the appearance of small "corns" or "warts" on the palms, soles, and torso.
Skin contact with inorganic arsenic may cause redness and swelling.

Arsenic is also a known carcinogen, and has been reported to increase the risk of cancer in the skin, liver, bladder and lungs.

Almost nothing is known regarding health effects of organic arsenic compounds in humans. Studies in animals show that some simple organic arsenic compounds are less toxic than inorganic forms. Ingestion of methyl and dimethyl compounds can cause diarrhea and damage to the kidneys.

Effects on Children

There is some evidence that long-term exposure to arsenic in children may result in lower IQ scores. There is also some evidence that exposure to arsenic in the womb and early childhood may increase mortality in young adults.

There is some evidence that inhaled or ingested arsenic can injure pregnant women or their unborn babies, although the studies are not definitive. Studies in animals show that large doses of arsenic that cause illness in pregnant females, can also cause low birth weight, fetal malformations, and even fetal death. Arsenic can cross the placenta and has been found in fetal tissues. Arsenic is found at low levels in breast milk.

Recommendations

The EPA has set limits on the amount of arsenic that industrial sources can release to the environment and has restricted or cancelled many of the uses of arsenic in pesticides. EPA has set a limit of 0.01 parts per million (ppm) for arsenic in drinking water.
The Occupational Safety and Health Administration (OSHA) has set a permissible exposure limit (PEL) of 10 micrograms of arsenic per cubic meter of workplace air (10 $\mu g/m^3$) for 8 hour shifts and 40 hour work weeks.

Source: Agency for Toxic Substances and Disease Registry (ATSDR). 2007

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Lead

Lead is a naturally occurring bluish-gray metal found in small amounts in the earth's crust. Lead can be found in all parts of our environment. Much of it comes from human activities including burning fossil fuels, mining, and manufacturing.

Lead has many different uses. It is used in the production of batteries, ammunition, metal products (solder and pipes), and devices to shield X-rays. Because of health concerns, lead from paints and ceramic products, caulking, and pipe solder has been dramatically reduced in recent years. The use of lead as an additive to gasoline was banned in 1996 in the United States.

Exposure to Lead

- Lead itself does not break down, but lead compounds are changed by sunlight, air, and water. When lead is released to the air, it may travel long distances before settling to the ground. Once lead falls onto soil, it usually sticks to soil particles. Movement of lead from soil into groundwater will depend on the type of lead compound and the characteristics of the soil.
- Eating food or drinking water that contains lead. Water pipes in some older homes may contain lead solder. Lead can leach out into the water.
- Spending time in areas where lead-based paints have been used and are deteriorating. Deteriorating lead paint can contribute to lead dust.
- Working in a job where lead is used or engaging in certain hobbies in which lead is used, such as making stained glass.
- Using health-care products or folk remedies that contain lead.

Effects on Health

The effects of lead are the same whether it enters the body through breathing or swallowing. Lead can affect almost every organ and system in your body. The main target for lead toxicity is the nervous system, both in adults and children. Long-term exposure of adults can result in decreased performance in some tests that measure functions of the nervous system. It may also cause weakness in fingers, wrists, or ankles. Lead exposure also causes small increases in blood pressure, particularly in middle-aged and older people and can cause anemia. Exposure to high lead levels can severely damage the brain and kidneys in adults or children and ultimately cause death. In pregnant women, high levels of exposure to lead may cause miscarriage. High level exposure in men can damage the organs responsible for sperm production. The International Agency for Research on Cancer (IARC) has determined that inorganic lead is probably carcinogenic to humans and that there is insufficient information to determine whether organic lead compounds will cause cancer in humans.

Effects on Children

Small children can be exposed by eating lead-based paint chips, chewing on objects painted with lead-based paint or swallowing house dust or soil that contains lead.

Children are more vulnerable to lead poisoning than adults. A child who swallows large amounts of lead may develop blood anemia, severe stomachache, muscle weakness, and brain damage. If a child swallows smaller amounts of lead, much less severe effects on blood and brain function may occur. Even at much lower levels of exposure, lead can affect a child's mental and physical growth.

Exposure to lead is more dangerous for young and unborn children. Unborn children can be exposed to lead through their mothers. Harmful effects include premature births, smaller babies, and decreased mental ability in the infant, learning difficulties, and reduced growth in young children. These effects are more common if the mother or baby was exposed to high levels of lead. Some of these effects may persist beyond childhood.

Recommendations

It is recommended not to let children to chew or mouth surfaces that may have been painted with lead-based paint. Also if the house has a water lead problem, it is advised to run or to flush water that has been standing overnight before drinking or cooking with it. A blood test is available to measure the amount of lead in your blood and to estimate the amount of your recent exposure to lead. The Centers for Disease Control and Prevention (CDC) recommends that states test children at ages 1 and 2 years. Children should be tested at ages 3–6 years if they have never been tested for lead, if they receive services from public assistance programs for the poor such as Medicaid or the Supplemental Food Program for Women, Infants, and Children, if they live in a building or frequently visit a house built before 1950; if they visit a home (house or apartment) built before 1978 that has been recently remodeled; and/or if they have a brother, sister, or playmate who has had lead poisoning. CDC considers a blood lead level of 10 μg/dL to be a level of concern for children.

Source: Agency for Toxic Substances and Disease Registry (ATSDR). 2007. Toxicological Profile for Lead (Update). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

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Polychlorinated Biphenyls (PCBs)

Polychlorinated biphenyls are mixtures of up to 209 individual chlorinated compounds (known as congeners). There are no known natural sources of PCBs. PCBs are either oily liquids or solids that are colorless to light yellow. Some PCBs can exist as a vapor in air. PCBs have no known smell or taste. Many commercial PCB mixtures are known in the U.S. by the trade name Aroclor.

PCBs have been used as coolants and lubricants in transformers, capacitors, and other electrical equipment because they don't burn easily and are good insulators. The manufacture of PCBs was stopped in the U.S. in 1977 because of evidence they build up in the environment and can cause harmful health effects. Products made before 1977 that may contain PCBs include old fluorescent lighting fixtures and electrical devices containing PCB capacitors, and old microscope and hydraulic oils. PCBs entered the air, water, and soil during their manufacture, use, and disposal; from accidental spills and leaks during their transport; and from leaks or fires in products containing PCBs. PCBs can still be released to the environment from hazardous waste sites; illegal or improper disposal of industrial wastes and consumer products; leaks from old electrical transformers containing PCBs; and burning of some wastes in incinerators.

Exposure to PCBs

- Using old fluorescent lighting fixtures and electrical devices and appliances, such as television sets and refrigerators that were made 30 or more years ago. These items may leak small amounts of PCBs into the air when they get hot during operation, and could be a source of skin exposure.
- Eating contaminated food. The main dietary sources of PCBs are fish (especially sportfish caught in contaminated lakes or rivers), meat, and dairy products.
- Breathing air near hazardous waste sites and drinking contaminated well water.
- In the workplace during repair and maintenance of PCB transformers; accidents, fires or spills involving transformers, fluorescent lights, and other old electrical devices; and disposal of PCB materials.

Effects on Health

The most commonly observed health effects in people exposed to large amounts of PCBs are skin conditions such as "Chloracne" and rashes. Studies in exposed workers have shown changes in blood and urine that may indicate liver damage. PCB exposures in the general population are not likely to result in skin and liver effects. Most of the studies of health effects of PCBs in the general population examined children of mothers who were exposed to PCBs.

Animals that ate food containing large amounts of PCBs for short periods of time had mild liver damage and some died. Animals that ate smaller amounts of PCBs in food over several weeks or months developed various kinds of health effects, including anemia; acne-like skin conditions; and liver, stomach, and thyroid gland injuries. Other effects of PCBs in animals include changes in the immune system, behavioral alterations, and impaired reproduction. PCBs are not known to cause birth defects. Few studies of workers indicate that PCBs were associated with certain kinds of cancer in humans, such as cancer of the liver and biliary tract.

PCBs are classified as a chemical which is "reasonably anticipated to be a human carcinogen."

Effects on Children

Women who were exposed to relatively high levels of PCBs in the workplace or ate large amounts of fish contaminated with PCBs had babies that weighed slightly less than babies from women who did not have these exposures. Babies born to women who ate PCB-contaminated fish also showed abnormal responses in tests of infant behavior. Some of these behaviors, such as problems with motor skills and a decrease in short-term memory, lasted for several years. Other studies suggest that the immune system was affected in children born to and nursed by mothers exposed to increased levels of PCBs. There are no reports of structural birth defects caused by exposure to PCBs or of health effects of PCBs in older children. The most likely way infants will be exposed to PCBs is from breast milk. Transplacental transfers of PCBs were also reported In most cases, the benefits of breast-feeding outweigh any risks from exposure to PCBs in mother's milk.

Recommendations

Tests exist to measure levels of PCBs in your blood, body fat, and breast milk, but these are not routinely conducted. The EPA has set a limit of 0.0005 milligrams of PCBs per liter of drinking water (0.0005 mg/L). Discharges, spills or accidental releases of 1 pound or more of PCBs into the environment must be reported to the EPA. The Food and Drug Administration (FDA) requires that infant foods, eggs, milk and other dairy products, fish and shellfish, poultry and red meat contain no more than 0.2-3 parts of PCBs per million parts (0.2-3 ppm) of food. Many states have established fish and wildlife consumption advisories for PCBs.

Source: Agency for Toxic Substances and Disease Registry (ATSDR). 2000.

Aroclors

Aroclor is a PCB mixture produced from approximately 1930 to 1979. It is one of the most commonly known trade names for PCB mixtures. There are many types of Aroclors and each has a distinguishing suffix number that indicates the degree of chlorination. The numbering standard for the different Aroclors is as follows: The first two digits generally refer to the number of carbon atoms in the phenyl rings (for PCBs this is 12), the second two numbers indicate the percentage of chlorine by mass in the mixture. For example, the name Aroclor 1254 means that the mixture contains approximately 54% chlorine by weight.

Source: http://www.epa.gov/osw/hazard/tsd/pcbs/pubs/aroclor.htm