DRAFT

Health Fact Sheet – PCBs

HOW ARE WE EXPOSED TO PCB's IN THE ENVIRONMENT?

PCB's are fairly ubiquitous in the environment and can be found in almost all media: outdoor and indoor air, soil, sediments, surface water, and animals. PCBs in the atmosphere, in either their vapor or particle form, enter the food chain primarily through deposition on the food source. PCBs bioaccumulate in the food chain because they are persistent in the environment, lipophilic, stable, and are stored in fatty tissues. The vast majority of human exposure to PCBs occurs via the food chain with inhalation as a secondary source. Between 1978 and 1991, it has been estimated that food chain exposures have decreased by over an order of magnitude due to the production ban on PCBs. Currently, sport fish, particularly those from the Great Lakes-St. Lawrence River basins, are the largest contributors to PCB exposure.

Although PCBs were banned in 1977, exposure may still occur as residual levels remain in the environment and/or because PCB containing materials are still in use. PCBs may still be found in materials such as dielectric fluids (e.g. older electrical instruments and fluorescent lights that contain PCB-filled capacitors), caulking materials, elastic sealants, or heat insulation. If PCBs are released in the workplace or other occupied structures, exposure may occur through inhalation of particulates or by touching substances that contain PCBs. However, as described above, ingestion of foods that contain PCBs is the most significant route of exposure relative to other potential pathways.

WHAT ARE THE MAIN HEALTH EFFECTS FROM EXPOSURE TO PCBs?

Many studies have looked at how PCBs can affect human health. Occupational studies, have documented health effects when exposure levels are several orders of magnitude greater than the general population such as with workers manufacturing capacitors that contain oils with PCBs. People exposed to such high levels of PCBs have been shown to develop skin conditions, such as chloracne and rashes. Extrapolating effects documented in human studies of PCB ingestion incidents are complicated because the mixture nature of PCB exposure and possible interactions between the congeneric components and other chemicals is not documented clearly, thus it cannot be determined which congeners are associated with the effects.

Numerous animal studies have been conducted to address the shortcomings of the human exposure studies. These studies typically exposed animals via food to large PCB doses over a relatively short period of time and indicated that these animals developed symptoms such as anemia, acne-like skin conditions, and liver, stomach, and thyroid effects. There are a limited number of studies designed to document health effects via inhalation or dermal contact. In these studies, very high exposure levels were necessary to produce any effects. Documented effects from direct application of PCBs to the skin included liver, kidney, and skin damage. Inhalation effects included liver and kidney effects.

Studies have also been conducted to determine the carcinogenicity of PCBs. Workers highly exposed in the occupational setting developed liver and biliary tract cancers and animals fed PCB mixtures over their lifetime developed liver cancer. Based on the evidence for cancer in animals, the Department of Health and Human Services (DHHS) has stated that PCBs may reasonably be anticipated to be carcinogens. Both EPA and the International Agency for Research on Cancer (IARC) have determined that PCBs are probably carcinogenic to humans.

IS THERE RISK FROM PCB EXPOSURE INSIDE THE LEDERLE GRADUATE RESEARCH BUILDINGS?

The exposure dose, or the amount of PCBs taken into the body, is a function of the frequency and intensity of exposures as well as the PCB concentration. The frequency of direct contact with PCB dusts or materials, and subsequent hand to mouth activity, typically decreases significantly following the toddler years. A similar decrease in the amount of dust/particulates ingested or contacted relative to body weight also occurs with an increase in age.

At the Lederle Graduate Center buildings, direct contact with subsequent ingestion and inhalation of particulate dust from the window glazing material are the primary potential exposure routes. These exposures are expected to be minimal as concentrations measured on interior surfaces and in the indoor air are very low. Also, the frequency of direct contact with impacted surfaces and the subsequent incidental ingestion of dusts is not anticipated to be excessive for typical work activities/workers in this setting.

The results from surface wipe samples from interior locations following the building exterior abatement work (collected in July 2008) and recent wipe tests collected in 2009 indicate that all samples from surfaces (window ledges, desks, tables, bookcases, etc.) were less than EPA's high occupancy criteria (e.g., acceptable for residential use). Test results from surface wipe samples from the actual window glazing and frames indicated slightly higher concentrations of PCBs (above this residential or high occupancy criteria).

Low concentrations of PCBs have been detected in indoor air samples throughout the buildings. Concentrations of PCBs detected in indoor air samples during the latest two rounds of sampling (July 2008 and May 2009) were well below published exposure limits (occupation limits range from 1 to 500 µg/m^3). The latest LGRC test data indicated PCB concentrations ranging from 0.033 to 0.16 µg/m^3. As a general comparison, the analytical results were also below the post-abatement re-occupancy criteria developed as part of the exterior abatement project (0.29 µg/m^3).

To put these values in context, it is useful to compare LGRC measured concentrations to other similar locations. ATSDR Toxicity Profile for Polychlorinated Biphenyls (2000) summarizes many such studies. In the following examples there were no documented sources of PCBs. One study of an industrial research building, showed indoor air concentrations ranging up to 0.20 µg/m^3. Another study of several municipal office buildings located in Bloomington, Indiana, a setting analogous to the research center, were monitored with the maximum concentration of 0.31 µg/m^3. The studies showed that older buildings have higher concentrations than newer buildings.

Based on this exposure information, health risks are expected to be minimal as exposure to PCBs in the LGRC buildings is not likely to be significantly different from other buildings without known PCB sources (based on published ATSDR studies). Furthermore, the potential for exposure is relatively low compared to other potential routes of exposure, such as dietary ingestion of PCBs. This source of exposure can be further minimized by not directly touching the window glazing and frames and by a thorough washing of hands if contact does occur.

As indicated in previous communications, UMass is developing interim measures to potentially include cleaning of all windows and ledges, interim sealing of the PCB-containing glazing, and monitoring of potential indoor exposure pathways.