POLYCHLORINATED BIPHENYLS

FACT SHEET ON A DRINKING WATER CHEMICAL CONTAMINANT

GENERAL INFORMATION

Synonyms:
- PCBs; Chlorinated Biphenyls
- Trade Names: Kanechlor; Clophen; Arochlor; Dykanol; Noflanol; Chlorentol; Inerteen; Therminol

Chemical Description:
- Mixture of aromatic chlorinated organic compounds with 209 possible isomers
- Produced by direct chlorination of biphenyls, and the degree of chlorination determines the chemical properties of the mixture

Properties:
- Individual PCBs vary in their physical properties because the degree of chlorination determines the chemical properties of the compound, but all have the following:
  - very low water solubility
  - low vapor pressure
    - volatility increases with decreasing chlorination
  - low flammability
  - low electrical conductivity
  - high degree of thermal and chemical stability
  - heavier than water
- May exist in the form of a practically odorless, colorless oily liquid or viscous liquid or sticky resin

Production and Use:
- Used primarily in the electrical industry in capacitors and transformers prior to 1979, when the EPA banned most manufacturing, processing, distribution, and use of PCBs

ENVIRONMENTAL PROFILE

Occurrence:
- Not expected to be a common contaminant of drinking water supplies
- Exist in the atmosphere in the vapor phase due to volatilization and transport as an aerosol

Releases:
- Currently, the only environmental releases are from spills or from improper disposal of existing electrical equipment

Environmental Fate:
- **Persistent in the environment:**
  - extremely stable under normal environmental conditions; only undergo chemical oxidation, reduction, hydrolysis, or isomerization under extreme conditions
  - will volatilize to the atmosphere from soil surface and most surface waters
  - the more volatile PCBs will accumulate in the atmosphere, and are subject to washout
  - low mobility in soil (readily adsorbed onto soils, especially soil with high clay or organic content), with low potential for migration to ground water
  - the highly chlorinated compounds are not leached from soils, and lesser chlorinated compounds are leached with difficulty
  - readily adsorbed onto suspended solids, especially those with high carbon content, in surface waters
    - adsorbtion to sediment in natural waters is the major process for immobilizing PCBs, but may be rereleased to water if the sediment is resuspended
- High potential for bioaccumulation and bioconcentration, especially in fish and other aquatic organisms

HEALTH EFFECTS

Humans:
- Case studies of acute poisonings by ingestion of PCBs show effects ranging from acne-like skin eruptions and pigmentation of the skin to numbness of the limbs, hearing and vision problems, and spasms
  - toxic effects of PCBs may be influenced by the presence of the very highly toxic polychlorinated dibenzofurans (PCDFs), which are present in many commercial PCB mixtures and are products of photochemical and thermal decomposition of PCBs
- Case studies of chronic toxicity (usually the result of occupational inhalation and dermal exposures) show effects similar to acute poisonings, as well as irritation of the nose, throat, and gastrointestinal tract, and changes in liver functions

Experimental Animals:

- Causes liver and kidney damage, severe weight loss, eye discharges, and interference with some metabolic processes; may also have immunosuppressive effects
- Has teratogenic effects (causes growth retardations during pregnancy, and reproductive failure)
- High carcinogenic potential

REGULATORY PROFILE

Existing Standards:

- **Clean Air Act (CAA):** Not regulated
- **Clean Water Act (CWA):**
  Criteria established
- **Resource Conservation and Recovery Act (RCRA):**
  Not regulated
- **Superfund (CERCLA):**
  - Hazardous substance
  - **SARA:** Toxic chemical
- **Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA):**
  Registered
- **Toxic Substances Control Act (TSCA):**
  Regulated

HEALTH INFORMATION

Maximum Contaminant Level Goals (MCLG):

- Non-enforceable levels based solely on an evaluation of possible health risks and exposure, and taking into consideration a margin for public safety
- Set at zero mg/L to protect against cancer

MCLG for PCBs = Zero mg/L
(effective July 1992)

Maximum Contaminant Levels (MCL):

- Legally enforceable levels for contaminants in public drinking water supplies
- Based on health risks associated with the contaminants, analytical methods for their assay, and water treatment feasibility and practicality aspects
- Exceedance of the MCL in drinking water may result in adverse effects which will depend upon the contaminant concentration in water, amount of water/contaminant ingested, length of exposure, and other biological parameters

MCL for PCBs = 0.0005 mg/L
(effective July 1992)

EPA Health Advisories (HA):

- **Short-term HAs:** Provide acceptable concentrations of contaminants in water for up to 10 day exposures, primarily to evaluate the public health risk resulting from an accidental spill or an emergency contamination situation
- **Longer-term HAs:** Provide guidance for persistent water contamination situations to cover a period of up to 7 years
- **Lifetime HAs:** Derived in the same way as an MCLG

Health Advisories:

(EPA is currently evaluating health studies in order to issue HAs for PCBs)

ANALYTICAL METHODS

- Microextraction and Gas Chromatography
  EPA Method 505
- Gas Chromatography with an Electron Capture Detector
  EPA Method 508 (screen)
- Perchlorination and Gas Chromatography
  EPA Method 508A (quantitate)

WATER TREATMENT

Permanent Treatment:

- **Best Available Technology (BAT):**
  - Granular Activated Carbon

SHORT-TERM HAZARD ELIMINATION

- If the drinking water standards are exceeded, install BAT or use an alternative drinking water supply such as bottled water

ADDITIONAL HELP

- State or county health officials can indicate a certified laboratory for testing
- Experts in the state Department of Environmental Protection or Natural Resources may also be of help
- The EPA has toll-free numbers for further information on drinking water quality, treatment technologies, for obtaining Health Advisories, and for other regulatory information
- EPA Hotlines are available Monday through Friday
  - **Safe Drinking Water:** **800-426-4791**
  - **National Pesticides:** **800-858-7378**
  - **Superfund/RCRA:** **800-424-9346**
- For information on the Clean Water Act, call (202) 260-7301
- For information on the Toxic Substances Control Act, call (202) 554-1404
- For information on the Clean Air Act, call (919) 541-2777