Examples of chemicals most often studied in biomonitoring

Chemicals that have been tested for in past biomonitoring studies fall under the following groups, listed below. They are considered some of the most harmful chemicals to human health as they may cause cancer, disrupt hormones, or cause reproductive/developmental/respiratory problems.

The following chemicals can be characterized in one or all three of the following type of toxin: carcinogen, mutagen, and teratogen. All three of these toxins have adverse health effects. Carcinogens may cause cancer; some examples include asbestos and benzene. Mutagens can cause mutations or changes in a person or animal’s body that may lead to disease or abnormalities in future generations. Mutagens may cause abnormalities in reproductive cells (eggs and sperm) and/or cells not part of the reproductive system (skin or lung cells). Examples of mutagens include chloroform, benzene, and lead. Finally, a teratogen toxin may cause birth defects, abnormalities, developmental delays, or death in children in the absence of significant harmful effect on the mother.¹

- **Phthalates**: used in a range of consumer products, including cosmetic and personal care products, synthetic fragrances, PVC (“vinyl”) consumer products, and construction materials. Disrupt hormones and can cause birth defects of male reproductive organs.

- **PCBs (polychlorinated biphenyls)**: banned in Canada since 1977, but continue to be released into the environment from PCB-containing industrial equipment still in use, and from sources in other countries. Cause cancer; damage the nervous, immune and cardiovascular systems; and lead to birth defects, brain damage, and decreased immune function.

- **PFCs (perfluorinated compounds)**: used in a range of consumer products, such as stain repellents on clothing and other fabrics, food packaging, and Teflon® products (e.g., non-stick cookware). Can cause cancer and disrupt hormones. Common PFCs include perfluorohexansulfonate (PFHS), perfluorooctane sulfonate (PFOS), and perfluorooctane acid (PFOA).

- **OCPs (organochlorine pesticides)**: many of their uses have been restricted because they persist in the environment (e.g., DDT). Can enter environment from direct application and runoff, emissions from waste incinerators, releases from manufacturing plants, and disposal of contaminated waste in landfill.

Recognized carcinogens and reproductive/developmental toxins, suspected hormone disruptors and respiratory toxins.

- **BPA (bisphenol-A):** used to make polycarbonate plastic (recycling # 7) food and beverage containers and linings of metal cans for foods. Known hormone disruptor that can cause reproductive damage and birth defects, which may lead to prostate and breast cancer in adulthood.

- **PBDEs (polybrominated diphenyl ethers):** used as flame retardants in upholstered furniture, mattresses, curtains, carpets, clothing, and electronics. Suspected hormone disruptors and can cause cancer, reproductive and developmental disorders. Has damaging effects on the thyroid, and may cause neurodevelopmental disorders such as learning disabilities and behaviour problems.

- **Heavy metals:** most common source of exposure is food. Some are known to cause cancer, reproductive and developmental disorders, and may be respiratory toxins.
  - **Cadmium:** exposures come from dyes and bakeware, electronic equipment, car parts, batteries, phosphate fertilizer, sludge applications in agriculture, cigarettes and contaminated food. Known to cause lung and prostate cancer, and is toxic to the gastrointestinal tract, kidneys, respiratory, cardiovascular, and hormonal systems.
  - **Lead:** exposures come from lead paint as well as emissions from industrial facilities like metal smelters. Lead shot, spent bullets and fishing sinkers used in hunting and fishing are common sources of lead. Found in crystal tableware, porcelain enamel and contaminated food. Suspected carcinogen, a known hormone disruptor, and can damage almost every organ and system in the human body, particularly the nervous system. Cause of decreased mental ability, developmental delays, behavioural disorders, and reproductive defects.
  - **Mercury:** sources include coal-fired power plant emissions and emissions from mining and manufacturing processes, and mercury-containing products, such as thermometers, batteries, and fluorescent light tubes. Eating contaminated fish and seafood is the most common pathway of mercury contamination. Recognized developmental toxin, and is a suspected hormone disruptor, neurotoxin, reproductive toxin and respiratory toxin.

- **VOCs (volatile and semivolatile organic compounds):** include xylene, benzene, and toluene. Found in many household products, including paints, varnishes, paint stripping products, and adhesives. Contribute to poor air quality and are one of the building blocks of smog. Can cause cancer and is toxic to the nervous system, and damage reproductive, neurological and respiratory systems. May also contribute to birth defects and impaired kidney and liver function.

To learn more about the AFN biomonitoring study or how to get involved, visit [http://www.afn.ca/](http://www.afn.ca/)