ATTACHMENT 1: Indoor Air Pollutants

Toronto Public Health (TPH) reviewed the Health Canada Guidance for Indoor Air Quality Professionals that summarizes key pollutants and their associated sources and health impacts. The list of pollutants included in this attachment are intended to be illustrative and not an exhaustive list of all pollutants with potential health impacts. The pollutants are grouped into two categories: pollutants with strong health evidence and pollutants with emerging evidence of health impacts.

Strong evidence: Pollutants for which the relationship between indoor exposure and adverse health outcomes is well established in the epidemiological and toxicological literature, supported by multiple systematic reviews, and reflected in Health Canada Residential Indoor Air Quality Guidelines (RIAQGs), Health Canada risk communication/guidance documents or equivalent national or international authoritative guidance. Health-based guidance and remediation thresholds are available for many pollutants in this category, and well-characterized indoor sources are amenable to reduction through ventilation, filtration, source control, or remediation.

Emerging evidence: Pollutants or exposures for which indoor concentrations and biological plausibility of health effects are documented, but for which the quantitative relationship between indoor exposure and specific health outcomes is still being characterized, and for which numeric Canadian residential exposure limits do not yet exist or are tentative.

Table A1.1 Pollutants with Strong Evidence of Health Effects (in alphabetical order). Each pollutant contains a link to the relevant Health Canada guidance focused on sources and health impacts.

Pollutant	Principal Indoor Sources	Health Impacts
Asbestos	Insulation, ceiling tiles, vinyl floor tiles, pipe wrap, cement products, and other materials in buildings constructed before approximately 1990. Released when materials are disturbed, deteriorated, or improperly removed.	Lung cancer, mesothelioma and asbestosis from inhalation of asbestos fibres, particularly when asbestos-containing materials are disturbed during renovation, demolition or deterioration
Carbon monoxide (CO)	Malfunctioning furnaces, water heaters, gas ranges, fireplaces, attached garages, generators, charcoal grills, tobacco smoke.	Acute poisoning; reduces the blood's ability to carry oxygen and can cause headache, dizziness, nausea, confusion, loss of consciousness and death at high levels

Pollutant	Principal Indoor Sources	Health Impacts
Carbon dioxide (CO2)	Exhaled air from occupants, unvented or poorly vented fuel-burning appliances (gas stoves, space heaters, water heaters or furnaces) and cigarette smoke.	Indicator of ventilation adequacy and occupant-generated air; elevated levels may be associated with stuffiness, discomfort and reduced perceived air quality, but CO_2 is primarily used as a ventilation proxy rather than as a direct health-risk metric at typical indoor levels.
Formaldehyde	Pressed-wood products (particleboard, MDF, plywood), urea-formaldehyde insulation, paints and finishes, cleaning products, environmental tobacco smoke, secondary chemistry from indoor ozone and VOCs.	Eye, nose and throat irritation; respiratory symptoms and asthma-related concerns; long-term exposure is also relevant because formaldehyde is a recognized indoor air contaminant with health-based exposure limits.
Lead	Lead-based paint in pre-1990 buildings (especially pre-1960); leaded plumbing and brass fixtures; legacy contaminated soil and dust; some imported consumer products.	Neurodevelopmental effects in infants and children, including lowered IQ and attention-related effects; chronic exposure is also associated with nervous system, cardiovascular, kidney and reproductive effects.
Mould and dampness	Building leaks (roofs, plumbing, foundations); flooding; condensation on cold surfaces; inadequate bathroom and kitchen ventilation; humidifier overuse.	Eye, nose and throat irritation; coughing, wheezing, shortness of breath and worsening asthma symptoms; dampness and mould may also contribute to asthma development, bronchitis and other respiratory infections.
Nitrogen dioxide (NO2)	Gas stoves and ovens (especially without effective range hood), unvented gas space heaters, attached garages, infiltration from outdoor traffic.	Respiratory irritation and asthma-related effects, particularly for children and people with asthma or other respiratory conditions; indoor peaks can occur from combustion sources such as gas cooking.

Pollutant	Principal Indoor Sources	Health Impacts
Ozone (O3)	Outdoor ozone infiltration; ozone-generating air purifiers, ionizers, and "corona-discharge" devices; some printers and copiers.	Respiratory irritation and worsening respiratory symptoms; relevant indoors because outdoor ozone can infiltrate and some air-cleaning devices can generate ozone
Fine particulate matter (PM2.5)	Cooking (frying, gas combustion, smoke from charring), candles and incense, wood stoves and fireplaces, tobacco and cannabis smoke, infiltration from outdoor traffic and wildfire smoke.	Respiratory and cardiovascular morbidity and mortality; no apparent threshold for health effects, so indoor levels should be kept as low as possible, especially for children, older adults and people with heart or lung conditions.
Radon	Soil gas entering through foundation cracks, sumps, and crawl spaces; concrete; well water (minor pathway).	Lung cancer from long-term exposure; Health Canada identifies radon as the leading cause of lung cancer among non-smokers
Volatile organic compounds (VOCs) Selected (toluene, benzene, naphthalene, xylene)	Paints, varnishes, adhesives, new furniture, scented and personal care products, dry cleaning, attached garages, infiltration from outdoor traffic, environmental tobacco smoke.	Health effects vary by compound; may include eye, nose and throat irritation, headaches, neurological effects and, for some VOCs such as benzene or naphthalene, cancer-related concerns.

Table A1.2 Pollutants with Emerging Evidence of Health Effects (in alphabetical order). Health Canada does not currently publish Residential Indoor Air Quality Guidelines specific to these pollutants; however, some are addressed in Health Canada chemical assessments/fact sheets and related federal reports. These pollutants are not included in the Health Canada Guidance for Indoor Air Quality Professionals but are subject to active scientific research and monitoring by Health Canada.

Pollutant	**Principal Indoor Sources**	**Health Impacts**
Airborne microplastics*	Synthetic textiles, carpets, upholstery, plastic flooring degradation, packaging, dust resuspension, outdoor infiltration.	Emerging concern; potential respiratory exposure to particles and associated additives or adsorbed contaminants, but the relationship between indoor airborne microplastic exposure and specific health outcomes remains uncertain
Per- and polyfluoroalkyl substances (PFAS)	Stain- and water-resistant textiles, carpets, upholstery, food packaging, non-stick cookware coatings, some cosmetics, building materials, dust resuspension.	Potential effects on the liver, immune system, thyroid, development, reproduction, metabolism and some cancers; evidence and risk management approaches are evolving.
Polybrominated diphenyl ethers (PBDEs) and other flame retardants	Upholstered furniture, mattresses, electronics housings, building insulation; dust resuspension.	Emerging and legacy concern; potential neurodevelopmental, thyroid and liver effects, with indoor dust and air identified as important exposure pathways for some flame retardants.
Semi-volatile organic compounds (SVOCs), including phthalates	Plasticizers in vinyl flooring, wall coverings, shower curtains, electronic devices, personal care products, fragrances, cleaning products. SVOCs may also be influenced by secondary indoor chemistry (e.g., reactions involving ozone and VOCs) that can generate additional by-products.	Potential endocrine, reproductive and developmental effects for some compounds; some phthalates in indoor dust have also been studied in relation to childhood respiratory outcomes, including asthma.

Pollutant	Principal Indoor Sources	Health Impacts
Ultrafine particles (UFPs, <100 nm)*	Cooking (frying, broiling, toasting, natural gas combustion), candles and incense, vacuum cleaning, 3D printers, laser printers, infiltration from outdoor sources like vehicle traffic and aircraft emissions, ozone-VOC indoor chemistry.	Potential respiratory, cardiovascular and inflammatory effects; evidence on independent long-term health effects is growing but remains less certain than for PM2.5

*No Health Canada pollutant specific Residential Indoor Air Quality Guidelines or guidance document has been identified by Toronto Public Health.