**New Cohorts for Environmental Exposures and Cancer Risk (CEECR)**

**Glossary of Terms**

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Funded by the National Cancer Institute (NCI), and the National Institute of Environmental Health Sciences (NIEHS), NIH, DHHS

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**Background**

The New Cohorts for Environmental Exposures and Cancer Risk (CEECR) is a collaborative effort co-funded by the National Institute of Environmental Health Sciences (NIEHS) and the National Cancer Institute (NCI). CEECR aims to support innovative scientific research in new prospective cohorts that address knowledge gaps in cancer etiology and carcinogenesis processes with a focus on environmental exposures.

The purpose of this glossary is to provide definitions of key terms used by CEECR researchers,

clinicians, and lay persons to communicate and collaborate. Online access to this glossary and

other CEECR materials can be found on the CEECR website

Recommendations for new terms or changes can be sent to ceecrcc@uwcarbone.wisc.edu

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**Acrylamide:** Acrylamide is a chemical widely used during the manufacturing of paper, dye, and other industrial products. It can also be formed when certain foods are cooked at high temperatures. (11)

**Aflatoxins:** Aflatoxins are a family of toxins produced by certain fungi that are found on agricultural crops such as maize (corn), peanuts, cottonseed, and tree nuts. The main fungi that produce aflatoxins are Aspergillus flavus and Aspergillus parasiticus, which are abundant in warm and humid regions of the world. Aflatoxin-producing fungi can contaminate crops in the field, at harvest, and during storage. People can be exposed to aflatoxins by eating contaminated plant products (such as peanuts) or by consuming meat or dairy products from animals that ate contaminated feed. Farmers and other agricultural workers may be exposed by inhaling dust generated during the handling and processing of contaminated crops and feeds. (12)

**Arsenic:** Arsenic is a naturally occurring element that is widely distributed in the Earth’s crust. It is found in water, air, food, and soil. Exposure to arsenic affects human health. (11)

**Asbestos:** Asbestos is the name given to a group of naturally occurring fibrous minerals that are resistant to heat and corrosion. Because of these properties, asbestos has been used in commercial products such as insulation and fireproofing materials, automotive brakes, and wallboard materials. If products containing asbestos are disturbed, tiny asbestos fibers are released into the air. When asbestos fibers are breathed in, they may get trapped in the lungs and remain there for a long time. Over time, accumulated asbestos fibers can cause tissue inflammation and scarring, which can affect breathing and lead to serious health problems. (12)

**Benzene:** Benzene is a colorless or light-yellow liquid chemical at room temperature. It is used primarily as a solvent in the chemical and pharmaceutical industries, as a starting material and an intermediate in the synthesis of numerous chemicals, and in gasoline. Benzene is produced by both natural and man-made processes. It is a natural component of crude oil, which is the main source of benzene produced today. Other natural sources include gas emissions from volcanoes and forest fires. (12)

**Benzidine:** Benzidine is a manufactured chemical that does not occur in nature. In the past, large amounts of benzidine were used to produce dyes for cloth, paper, and leather. It was also used in clinical laboratories for detecting blood, as a rubber-compounding agent, and in the manufacture of plastic films. However, benzidine has not been sold in the United States since the mid-1970s, and it is no longer used in medical laboratories or in the rubber and plastics industries. (12)

**Beryllium:** Beryllium is a metal that is found in nature, especially in beryl and bertrandite rock. It is extremely lightweight and hard, is a good conductor of electricity and heat, and is non-magnetic. Because of these properties, beryllium is used in high-technology consumer and commercial products, including aerospace components, transistors, nuclear reactors, and golf clubs. Most exposures to beryllium that cause disease are related to beryllium processing. The major route of human exposure is through airborne particles of beryllium metal, alloys, oxides, and ceramics. Beryllium particles are inhaled into the lungs and upper respiratory tract. Hand-to-mouth exposures and skin contact with ultrafine particles can also occur. (12)

**1,3 – Butadiene:** 1,3-Butadiene is a colorless gas at room temperature with a gasoline-like odor. It is used to produce synthetic rubber products, such as tires, resins, and plastics, and other chemicals. (12)

**Biospecimen:** A sample of material, such as urine, blood, tissue, cells, DNA, RNA, or protein, from humans, animals, or plants. Biospecimens may be used for a laboratory test or stored in a biorepository to be used for research. (2)

**Bisphenol A (BPA)**: Bisphenol A (BPA) is a chemical produced in large quantities for use primarily in the production of polycarbonate plastics and epoxy resins. NIEHS and NTP support research to better understand potential health effects of exposure to BPA. (11)

**Cadmium**: Cadmium is a natural element found in tiny amounts in air, water, soil, and food. All soils and rocks, including coal and mineral fertilizers, contain some cadmium. Most cadmium used in the United States is extracted during the production of other metals such as zinc, lead, and copper. Cadmium does not corrode easily and has been used to manufacture batteries, pigments, metal coatings, and plastics. (12)

**Cancer:** A term for diseases in which abnormal cells divide without control and can invade nearby tissues. Cancer cells can also spread to other parts of the body through the blood and lymph systems. There are several main types of cancer. Carcinoma is a cancer that begins in the skin or in tissues that line or cover internal organs. Sarcoma is a cancer that begins in bone, cartilage, fat, muscle, blood vessels, or other connective or supportive tissue. Leukemia is a cancer that begins in blood-forming tissue, such as the bone marrow, and causes too many abnormal blood cells to be made. Lymphoma and multiple myeloma are cancers that begin in the cells of the immune system. Central nervous system cancers are cancers that begin in the tissues of the brain and spinal cord. Also called malignancy. (2)

**Cellular Aging:** In 1961, cellular aging was first described by Hayflick and Moorhead. They showed that human cells in culture do not divide indefinitely but reach a limit (called the Hayflick limit) of replication and stop all further division. Cells approach this limit by slowing their divisions and entering cellular senescence, a dormant period. Recently, for damaged cells, this pathway of cellular progression has been considered an alternative to apoptosis (cell suicide). Both DNA damage and insufficient telomere replication are common signals leading to these events. When the cell does not trigger either of these pathways, it can become cancerous. (17)

**Clonal Hematopoiesis of Indeterminant Potential (CHIP):** Clonal hematopoiesis of indeterminate potential (CHIP) is a new entity in which somatic mutations are found in cells of the blood or bone marrow, but no other criteria for hematologic neoplasia are met. Hematologic neoplasms comprise multiple malignant diseases derived from cells of myeloid or lymphocytic hematopoietic lineages. Its prevalence rises with age and is roughly 10% among persons aged 70 to 80. (14, 15)

**Coal Tar and Coal-Tar Pitch:** Coal tar is derived from coal. It is a byproduct of the production of coke, a solid fuel that contains mostly carbon, and coal gas. Coal tar is used primarily for the production of refined chemicals and coal-tar products, such as creosote and coal-tar pitch. Certain preparations of coal tar have long been used to treat various skin conditions, such as eczema, psoriasis, and dandruff. (12)

**Cohort:** A group of individuals who share a common trait, such as birth year. In medicine, a cohort is a group that is part of a clinical trial or study and is observed over a period of time. (2)

**Consortium:** An agreement, combination, or group (as of companies) formed to undertake an enterprise beyond the resources of any one member. (9)

**Crystalline Silica:** An abundant natural material, crystalline silica is found in stone, soil, and sand. It is also found in concrete, brick, mortar, and other construction materials. Crystalline silica comes in several forms, with quartz being the most common. Quartz dust is respirable crystalline silica, which means it can be taken in by breathing. (12)

**Dioxins:** Dioxins are mainly byproducts of industrial practices. They are produced through a variety of incineration processes, including improper municipal waste incineration, and burning of trash, and can be released into the air during natural processes, such as forest fires and volcanoes. Almost every living creature has been exposed to dioxins or dioxin-like compounds (DLCs). (11)

**Environmental Exposures:** Refers to physical, chemical, and biological factors external to a person, and related behavioral factors. (1)

**Epigenomics:** Epigenomics is a field in which researchers chart the locations and understand the functions of all the chemical tags that mark the genome. The epigenome is a multitude of chemical compounds that can tell the genome what to do. The human genome is the complete assembly of DNA (deoxyribonucleic acid)-about 3 billion base pairs - that makes each individual unique. DNA holds the instructions for building the proteins that carry out a variety of functions in a cell. The epigenome is made up of chemical compounds and proteins that can attach to DNA and direct such actions as turning genes on or off, controlling the production of proteins in particular cells.When epigenomic compounds attach to DNA and modify its function, they are said to have "marked" the genome. These marks do not change the sequence of the DNA. Rather, they change the way cells use the DNA's instructions. The marks are sometimes passed on from cell to cell as cells divide. They also can be passed down from one generation to the next. (13)

**Ethylene Oxide:** At room temperature, ethylene oxide is a flammable colorless gas with a sweet odor. It is used primarily to produce other chemicals, including antifreeze. In smaller amounts, ethylene oxide is used as a pesticide and a sterilizing agent. The ability of ethylene oxide to damage DNA makes it an effective sterilizing agent but also accounts for its cancer-causing activity. (12)

**Exposome:** The exposome can be defined as the measure of all the exposures of an individual in a lifetime and how those exposures relate to health. An individual’s exposure begins before birth and includes insults from environmental and occupational sources. Understanding how exposures from our environment, diet, lifestyle, etc. interact with our own unique characteristics such as genetics, physiology, and epigenetics impact our health is how the exposome will be articulated. (19)

**Exposomics:** The study of the exposome and relies on the application of internal and external exposure assessment methods. Internal exposure relies on fields of study such as genomics, metabonomics, lipidomics, transcriptomics and proteomics. Commonalities of these fields include 1) use of biomarkers to determine exposure, effect of exposure, disease progression, and susceptibility factors, 2) use of technologies that result in large amounts of data and 3) use of data mining techniques to find statistical associations between exposures, effect of exposures, and other factors such as genetics with disease. External exposure assessment relies on measuring environmental stressors. Common approaches include using direct reading instruments, laboratory-based analysis, and survey instruments. The extent to which internal and external exposure assessment will contribute to our understanding of the exposome is being debated as each approach has certain merits. (19)

**Flame Retardants:** Flame retardants are chemicals that are applied to materials to prevent the start or slow the growth of fire. Some of these chemicals are associated with adverse health effects in animals and humans. (11)

**Formaldehyde:** Formaldehyde is a colorless, flammable, strong-smelling chemical widely used to make home building products. Most formaldehyde produced in the United States is for the manufacture of resins, such as urea-formaldehyde, used to make the adhesives for pressed wood products, such as particleboard, furniture, paneling, cabinets, and other products. (11)

**Genetics:** Genetics is the scientific study of genes and heredity—of how certain qualities or traits are passed from parents to offspring as a result of changes in DNA sequence. A gene is a segment of DNA that contains instructions for building one or more molecules that help the body work. (6)

**Glyphosphate:** Glyphosate is a widely used herbicide that can kill certain weeds and grasses. Glyphosate works by blocking an enzyme essential for plant growth. The product is used primarily in agriculture, but also in forestry and lawn and garden care. (7)

**Hazardous Material/Waste:** Hazardous wastes are discarded materials with properties that make them potentially harmful to human health or the environment. (11)

**Hexavalent Chromium Compounds:** Chromium is an odorless and tasteless metallic element that is found in the earth’s crust. It is also found in air, water, soil, and food. Hexavalent chromium compounds are a group of chemicals that have useful properties, such as corrosion resistance, durability, and hardness. These compounds have been used widely as corrosion inhibitors and in the manufacture of pigments, metal finishing and chrome plating, stainless steel production, leather tanning, and wood preservatives. They have also been used in textile-dyeing processes, printing inks, drilling muds, fireworks, water treatment, and chemical synthesis. (12)

**Inflammation:** If a cut on your skin swells up, turns red, and hurts, those symptoms are signs of acute, or short-lived, inflammation. Feeling hot or losing function may be signs of inflammation from other harm to your body. Some inflammation that occurs in your body’s cells or tissues may not have outward symptoms. Inflammation is a normal part of the body’s defense to injury or infection, and, in this way, it is beneficial. But inflammation is damaging when it occurs in healthy tissues or lasts too long. Known as chronic inflammation, it may persist for months or years. Inflammation may result from many factors, such as: environmental chemicals; injuries like scrapes, insect stings, or a splinter in your finger; pathogens (germs) like bacteria, viruses, or fungi; radiation. (16)

**Lead:** Lead, a metal found throughout the earth, has been used in a variety of products including gasoline, paint, plumbing pipes, ceramics, solders, batteries, and even cosmetics. It remains a significant public health concern for some children because of persistent lead hazards in the environment. (11)

**Malignancy:** The term "malignancy" refers to the presence of cancerous cells that have the ability to spread to other sites in the body (metastasize) or to invade nearby (locally) and destroy tissues. Malignant cells tend to have fast, uncontrolled growth and do not die normally due to changes in their genetic makeup. Malignant cells that are resistant to treatment may return after all detectable traces of them have been removed or destroyed. (3)

**Mineral Oils:** The name mineral oil has been used to describe many colorless, odorless liquids. Most often, the term refers to a liquid by-product of the distillation of petroleum to produce gasoline and other petroleum-based products from crude oil. These oils, including lubricant base oils and products derived from them, are used in manufacturing, mining, construction, and other industries. (12)

**Mercury:** Mercury is a metal that is toxic to living organisms. It exists in several forms, some of which occur naturally in the environment. Metallic or elemental mercury — an odorless, shiny, silver-white liquid — is commonly used in thermometers, barometers and fluorescent light bulbs. Metallic mercury is extremely dangerous with a few drops generating enough fumes to contaminate the air in a room. Furthermore, skin contact with the metal results in the absorption of mercury into the blood stream and potential health problems. (11)

**Metabolomics:** The scientific study of chemical processes involving metabolites, the small molecule substrates, intermediates, and products of cell metabolism. Specifically, metabolomics is the "systematic study of the unique chemical fingerprints that specific cellular processes leave behind", the study of their small-molecule metabolite profiles. (18)

**Mold:** A microorganism and type of fungus, molds are part of the natural environment and can be found everywhere, outside, and indoors. Health-related reactions in people depend on mold type, the amount and duration of exposure, and individual characteristics. (11)

**Nickel:** Nickel is a silvery-white metallic element found in the earth’s crust. It can be combined with other elements to form nickel compounds. Because of its unique properties, nickel has many industrial uses. Most nickel is used in metal alloys because it imparts useful properties, such as corrosion resistance, heat resistance, hardness, and strength. (12)

**Per- and Polyfluoroalkyl Substances (PFAS)**: PFAS are widely used, long lasting chemicals, components of which break down very slowly over time. Scientific studies have shown that exposure to some PFAS in the environment may be linked to harmful health effects in humans and animals (4)

**Pesticides**: A pesticide is any substance or mixture of substances intended for preventing, destroying, repelling or mitigating any pest; use as a plant regulator, defoliant, or desiccant; use as a nitrogen stabilizer. (10)

**Radon:** Radon is a naturally occurring radioactive gas that can cause lung cancer. You can’t see or smell radon. Testing is the only way to know your level of exposure. Radon can have a big impact on your Indoor Air Quality. (5)

**Recruitment:** Recruitment involves a number of activities, including identifying eligible participants, adequately explaining the study to the potential participants, recruiting an adequate sample based on study goals and design, obtaining informed consent and maintaining ethical standards, and retaining participants until study completion. (8)

**Risk factor:** Something that increases the chance of developing a disease. Some examples of risk factors for cancer are age, a family history of certain cancers, use of tobacco products, being exposed to radiation or certain chemicals, infection with certain viruses or bacteria, and certain genetic changes. (2)

**Soot**: Soot is a byproduct of the incomplete burning of organic (carbon-containing) materials, such as wood, fuel oil, plastics, and household refuse. The fine black or brown powder that makes up soot may contain a number of carcinogens, including arsenic, cadmium, and chromium. (12)

**Styrene:** Styrene is a colorless, flammable liquid, which has a sweet odor and is highly volatile. Styrene is widely used to make plastics and rubber, which are used to manufacture a variety of products, such as insulation, pipes, automobile parts, printing cartridges, food containers, and carpet backing. (11)

**Thorium:** Thorium is a naturally occurring radioactive metal that is found in soil, rock, and water. It is formed by the radioactive decay of uranium. Minerals such as monazite, thorite, and thorianite are rich in thorium and may be mined for the metal. Thorium has coloring properties that have made it useful in ceramic glazes. Thorium also has been widely used in lantern mantles for the brightness it imparts (though alternatives are replacing it), and in welding rods, which burn better with small amounts of added thorium. Until the 1950s, thorium dioxide was used as a contrast agent (called Thorotrast) in medical radiology. (12)

**Trichloroethylene (TCE):** Trichloroethylene (TCE) is a volatile, colorless liquid organic chemical. TCE does not occur naturally and is created by chemical synthesis. It is used primarily to make refrigerants and other hydrofluorocarbons and as a degreasing solvent for metal equipment. TCE is also used in some household products, such as cleaning wipes, aerosol cleaning products, tool cleaners, paint removers, spray adhesives, and carpet cleaners and spot removers. Commercial dry cleaners also use trichloroethylene as a spot remover. (12)

**Vinyl Chloride:** Vinyl chloride is a colorless gas that burns easily. It does not occur naturally and must be produced industrially for its commercial uses. Vinyl chloride is used primarily to make polyvinyl chloride (PVC); PVC is used to make a variety of plastic products, including pipes, wire and cable coatings, and packaging materials. Vinyl chloride is also produced as a combustion product in tobacco smoke. (12)

**Wood Dust:** Wood dust is created when machines or tools are used to cut or shape wood. High amounts of wood dust are produced in sawmills, and in the furniture-making, cabinet-making, and carpentry industries. Individuals who use machinery or tools to cut or shape wood are exposed to wood dust. When the dust is inhaled, it is deposited in the nose, throat, and other airways. Occupations with high exposure to wood dust include sander operators in the transportation equipment industry, press operators in the wood products industry, lathe operators in the furniture industry, and sander operators in the wood cabinet industry. (12)

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