HEALTH & ENVIRONMENTAL FUNDERS NETWORK

ISSUE BRIEF

Catalyzing Change

A Funder Guide on Protecting People and the Environment from Toxic Chemicals

In just over a century, thousands of chemicals have been released into the environment and into human bodies. Most are untested for safety, and regulation is weak.

Chemicals have improved many aspects of life, yet the rapid spread of synthetic chemicals and materials throughout society also has triggered serious concerns. Decades of research have demonstrated that both naturally occurring and human-made chemicals can have devastating impacts on health and healthy development.

To help protect people and the environment, philanthropy is catalyzing many efforts to reduce toxic threats and shift society towards safer alternatives.

Introduction: Rising Concern about Chemicals

Many substances found in nature are known to be toxic, such as heavy metals like lead or poisonous gases like radon. Naturally-occurring toxins are released into the environment, for instance when companies use them in products that end up as waste or when fossil fuels are burned.

In recent decades, chemists also have developed a staggering number of synthetic (human made) chemicals – more than 50 million in the last 50 years. It took 33 years to get the first 10 million chemicals registered with the American Chemical Society, but just nine months for the last 10 million.[1]

Today more than 85,000 chemicals are registered in the U.S. for use in commerce, with about 2,000 new chemicals introduced each year. Synthetic chemicals have found their way into food, water, air, and almost all consumer products. Many also are now being found in human bodies, even in the bodies of newborn infants.

Scientists have conclusively demonstrated that many naturally occurring and synthetic chemicals can be toxic. With the dramatic uptick in everyday chemical exposures – and public concerns about it – philanthropy is learning from research about what this means for health. Understanding today's common exposures and their health impacts is a critical first step towards reducing harm and preventing disease.

Research Results: Linking Chemicals and Health

Extensive research has expanded knowledge about how people are exposed, health impacts of exposure, and which groups are most vulnerable to exposure. This section outlines basic research takeaways that may be relevant to grantmakers considering potential investments.

How People Are Exposed

People are exposed on a daily basis to a range of chemicals. What they are exposed to depends upon the conditions where they live, learn, work, and play. Routes of exposure may include:

- ***Ingestion*** of chemicals in food or water;
- ***Inhalation*** of chemicals in the air, either indoors or outside;
- ***Absorption*** of chemicals through the skin or eyes; and
- ***In utero*** and ***transgenerational*** transmissions of chemicals from parent to child.[2]

The National Centers for Disease Control and Prevention has found hundreds of chemicals in Americans' blood and urine.[3] While some chemicals pass through the system quickly, others bio-accumulate, staying in body tissues and building up over time.[4]

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Common Chemical Exposures

Air toxins are hazardous pollutants in the air. Most are from mobile sources (like cars, trucks, or buses) or stationary sources (like power plants, factories, or refineries). They may be breathed in, or ingested after falling from the air into water, food, or soil. Air toxics have links to cancer, reproductive, respiratory, cardiovascular, and other health problems.[5]

Bisphenol A (BPA) is used to line some consumer products, plastics like water bottles, and cash register receipts. It has been linked to heart disease, brain dysfunction, reproductive development, and hormone disruption.[6]

Brominated flame retardants may be found in household furniture, baby clothes, or electronics. These persistent, bioaccumulative chemicals have been linked to cancer, reduced fertility, thyroid disruption, and lower IQ.[7, 8, 9]

Formaldehyde may be used in furniture, wood products, cigarettes, dishwashing liquids, or fabric softeners. Formaldehyde may cause nasopharyngeal cancer and leukemia.[10]

Heavy metals found in nature are often used in products and may be toxic. Lead, a neurotoxin, has been added to gasoline, plumbing, and paint. Mercury, arsenic, and cadmium can affect the nervous system. Mercury pollution is produced by fossil fuel combustion and factory emissions; mercury may be in light bulbs, electronics, dental fillings, or skin lightening creams. Arsenic has been used in pressure treated wood; cadmium may be in batteries or solder in jewelry.[11]

Pesticides *and* ***herbicides*** are widely used in agriculture and in lawn and garden products, causing exposures through air, water, and food. Exposures have been linked to nausea, headaches, fatal poisonings, cancers, as well as to nervous, reproductive, and immune system disorders. Agricultural chemicals may be highly toxic to wildlife including fish and bees.[12]

Phthalates are plasticizers often used in cosmetics, perfumes, air fresheners, toys, vinyl coverings, and medical devices. They have been linked to reduced sperm counts, reproductive problems, and birth defects.[13]

Triclosan, often used to prevent bacterial contamination, may be in soaps, toothpastes, and other personal care products. Recent studies have linked it to heart disease, reduced muscle function, and hormone disruption.[14, 15]

Health Impacts of Exposure

A substantial part of today's health burdens are linked to chemical exposures. Just how much disease is attributable to chemical exposures is uncertain, but the estimates are increasing as additional research is done. A World Health Organization review estimated that over eight percent of all global disease is linked to chemicals; U.S. researchers have linked 30 percent of childhood asthma diagnoses to chemicals.[16, 17]

Chemical exposures have been linked to several categories of illness affecting millions of Americans, including:

- Certain types of cancer;
- Learning and developmental disabilities;
- Alzheimer's and Parkinson's diseases;
- Reproductive health and fertility problems; and
- Asthma.[18]

Rising rates of these conditions are increasing concerns about associated health care costs, as well as interests in preventing disease and gaining cost savings by reducing exposures.[19]

New research has expanded understanding about the ways in which chemical exposures may affect health and development.[20] Scientists now challenge the conventional assumption about chemical exposures, that "the dose makes the poison." Among the new lessons from science:

- Chemicals may have adverse health impacts at low levels of exposure, particularly during critical windows of development.

- People are exposed not to just one chemical but to many. Chemicals may interact, amplify, or conflict

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with each other, an effect already widely recognized in relation to pharmaceuticals.

- Chemicals may have synergistic effects with other factors like diet or stress, often amplifying impacts or rendering the system more vulnerable to subsequent exposures.

- Chemicals may interact with genetics. Some have the potential to change the "expression" of genes and/or to alter genes in ways that may be passed to subsequent generations.

Environmental health and ecological research also has heightened concerns about particular classes of chemicals because of their qualities and effects. These worrisome classes of chemicals include:

- **Persistent Bioaccumulative Toxics (PBTs**) and **Persistent Organic Pollutants (POPs).** As the names suggest, these types of chemicals last a long time, can build up in the body, and have harmful impacts on people and wildlife. Mercury, a naturally occurring PBT, may be released into air or water by burning coal or from consumer product waste. Other PBTs, including some pesticides and flame retardants, are human-made.

  PBTs first released as toxic air pollutants may be transported thousands of miles, deposit in water, and move up the food chain through fish, fish-eating animals, and people. Chemicals policy in Europe and elsewhere increasingly aims to reduce or ban PBTs and POPs.[21]

- **Endocrine Disrupting Chemicals (EDCs).** EDCs affect the endocrine system, mimicking or interfering with hormonal signals for development; they are linked to developmental, reproductive, neurological, and immune problems.[22] Some EDCs occur naturally, like arsenic. Others are human-made.

  EDCs are common in agricultural chemicals; phthalates and Bisphenol A (BPA) are ubiquitous in consumer products, including toys, food packaging, and cash registry receipts. A statement from the Endocrine Society, a global scientific and medical association, has concluded it cannot be assumed there is any safe level of exposure to EDCs.[23]

People and Populations Most Impacted

Several populations of concern to grantmakers are at particular risk from chemical exposures.

Children are a particularly vulnerable population. Their bodies, tissues, and organs are still developing. This means children are more susceptible to chemical exposure and their healthy development more at risk. Children proportionally eat, drink, and breathe in more than adults do; this means they receive proportionally larger doses of toxicants. Infants and younger children often put things in their mouths and spend more time on the ground, increasing their potential exposures.[24]

Low-income communities, communities of color, and low-wage workers are more likely to live in neighborhoods that are disproportionally located near multiple sources of pollution, such as industrial facilities, power plants, waste facilities, and major transportation corridors. These groups are also more likely to live in substandard housing, which means greater exposures to indoor hazards; and they are more likely to face other health stressors, like poverty or poor access to health care or lack of access to healthy foods.[25]

Wildlife and pets are as vulnerable to chemical exposures as are humans. Rachel Carson's seminal 1963 book *Silent Spring* first drew attention to the impacts of chemicals, in this case pesticides, on bugs, birds, fish, and other living creatures.[26]

More recently, urgent concerns are rising about Colony Collapse, which refers to the drastic loss of European and North American honeybees linked to some uses of insecticides, fungicides, and herbicides. Honeybees are the planet's most prolific pollinators of agricultural crops and their loss would be devastating to agriculture and food industries.[27]

Ecosystems also are impacted by chemical exposures. Toxic impacts on some species of fish, wildlife, or vegetation may have ripple effects throughout an ecosystem.[28] For example, fossil fuel combustion produces carbon dioxide, sulfur dioxide, and nitrogen

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oxides. These air toxins mix with water in the atmosphere, fall as acid rain, and may destabilize entire ecosystems resulting in declining forest health or the loss of aquatic species in rivers, lakes, and oceans.[29]

Source: American College of Obstetricians and Gynecologists

Opportunities and Challenges: Grantmaking Strategies to Improve Health

A strong and vibrant movement is building from the grassroots to the global levels, pushing to reduce toxic threats to health and promoting safer alternatives. In many places, philanthropy is providing support to broaden, deepen, and accelerate these shifts towards healthier materials for healthier people.

This section provides an overview of grantmaker opportunities, challenges, strategies, and work in this field. Referenced strategies and examples are illustrative, not comprehensive, offered to outline areas of interest rather than as funding recommendations.

Reforming Policies and Improving Regulation

Most chemicals in U.S. commerce are legally on the market without safety testing. The European Union and several countries around the world are tightening regulation of chemicals. Within the U.S., chemicals regulation remains very weak, leaving testing, information, and health protection dependent largely on voluntary efforts by industry.

The 1976 Toxic Substances Control Act (TSCA) is the main U.S. law covering chemical safety. TSCA was fatally flawed from the beginning because it grandfathered in 62,000 chemicals already in use without requiring chemical manufacturers to prove that they were safe. It also created an unwieldy burden of proof on the government to show that a chemical causes actual harm and that an action to regulate or control a chemical would be "least burdensome" on industry.[30]

A 2010 President's Cancer Panel Report called TSCA "the most egregious example of ineffective regulation of chemical contaminants" and joined many other groups in urging Congress to reform the outdated law.[31]

To proactively protect people from chemical exposures, stronger regulation of all chemicals is needed. Areas of policy reform include TSCA as well as regulations of chemicals in cosmetics, agricultural products (pesticides and herbicides), food, and food packaging.

The European Union is now in an implementation phase of a more health-protective chemical policy; more than 160 countries have agreed to phase out one or more brominated flame retardants.[32] In the U.S., state legislatures have passed hundreds of chemicals policy bills with bipartisan support, and a few states are promoting research on safer alternatives to toxic chemicals.

There is now broad agreement about the need for TSCA reform, with heightened debate over various reform proposals.[33]

Philanthropy is helping support policy reforms from the local to global level. Examples of policy-focused funding include:

- Support of chemicals policy reform campaigns in and across key U.S. states, as well as of a national campaign for TSCA reform[34];
- Grants for the development of sustainable agriculture production standards that better protect farmworkers from agricultural chemical hazards;
- Funding for NGO advocacy to strengthen implementation of European Union policies on EDCs; and
- Support of international organizing helping lead to a new Minimata Convention on Mercury.[35]

Design Priorities and Green Chemistry

Modern society depends on a materials base shaped by chemistry. However, few universities require training in toxicology or environmental impact for their graduate students in chemistry. People designing a new molecule or chemical may be asked to prioritize certain performance qualities or cost-effectiveness; rarely are health impacts identified as a design priority or integrated into the design process.

Traditional efforts to reduce pollution and hazards have tended to focus on controlling uses of toxic materials or on cleaning up after the fact, rather than on designing hazard out of a chemical or process.

Leaders in green chemistry have identified principles to design chemicals that are intrinsically safer. The field is developing alternatives to toxic chemicals and processes and promoting green chemistry training and innovation.[36]

Philanthropy is supporting green chemistry leaders and projects, for example through:

- Grant support for academic centers engaged in green chemistry research and education;
- Scoping investment opportunities to accelerate innovation of "benign by design" materials and safer chemical substitutes;[37] and
- Funding collaboration between environmental health scientists and chemists to develop TiPED (Tiered Protocol for Endocrine Disruption), a new tool to screen for EDCs in chemical design.[38]

Community Information and Organizing

Many local communities are working to understand sources and impacts of local toxic hazards. Philanthropy is helping equip local groups to assess and address toxic pollution concerns, for example through:

- Grants to community groups monitoring neighborhood air quality near industrial facilities;
- Support of community health surveys and mapping to identify emerging health concerns and toxic "hot spots" threatening vulnerable populations; and
- Rapid response funding to Gulf Coast communities following Hurricane Katrina, to enable testing for toxins in flooded areas;

Civil Society and Health Care Engagement

Hundreds of civil society groups have identified toxics as a concern. Foundation support is enabling health, labor, environmental, social justice, consumer, community, and parental organizations representing tens of millions of people to gain information, organize, and take action to protect health.

For example, philanthropy is:

- Helping many non-governmental groups get engaged and active on toxics issues;

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- Supporting collaboratives that connect researchers, health professionals, and groups sharing concern about environmental exposures and health; and

- Encouraging a movement within health care to reduce health care institutions' uses of hazardous chemicals and products.

Expanding Research

Environmental health science and the knowledge base it is creating continue to grow. Funders may support a research project, advocacy to increase funding for research, or translation of science for the public and for decision-making.

For example, foundations are:

- Providing support for research on links between childhood autism and environmental factors;

- Funding convenings of researchers and professional associations to review and evaluate scientific findings and their implications for policy; and

- Supporting news aggregation and reporting on environmental health science.

Marketplace Strategies and Litigation

With growing pressure from consumers and patchwork policy reforms, the marketplace is changing. Green businesses and cleaner technologies are fast growing industry sectors.

Grant support is helping to move dozens of large corporations to reduce and remove toxics from products, for example:

- Supporting consumer organizing and shareholder campaigns to improve disclosure and gain corporate commitments to phase out toxics in products and operations;

- Funding dialogues between environmental health advocates, researchers, and corporate executives to accelerate business transitions from toxic to safer products and processes; and

- Granting support for legal strategies like combining consumer product testing with litigation under state toxics labeling laws.

Philanthropic Engagement

Concern about toxic threats to people and wildlife was a major motivation for the founding of the Health and Environmental Funders Network (HEFN). HEFN and its funder community have invested years and hundreds of millions of dollars in work on toxics and environmental health. Funders interested in chemicals and health have worked through HEFN to learn and strategize, including through virtual communications, webinars, meetings, and many small-group collaborations.[39]

Collaboration between grantmakers has been, and will continue to be essential in developing:

- **Health Advocates:** Hundreds of health, labor, environmental, social justice, consumer, community, and parental organizations, representing tens of millions of people, are pushing for safer chemical policies and practices.

- **Green Chemistry**: This new field brings sustainability concepts to industry by reducing and eliminating waste and toxics in the initial product design.

- **Essential Research**: Providing critical information about chemicals' complex interactions with people and the environment.

- **Health-Protective Policies**: Governmental action at the state, federal, and international levels can expand research, regulate hazards, and incentivize safer alternatives.

- **Sustainable Businesses***:* Pressure and support for healthier products, green business, and cleaner technology practices are already yielding marketplace actions.

The chemical revolution of the 20th century completely reshaped the world. Philanthropy can play a key role in launching another revolution – a fundamental change in how chemical products are created and processes to reduce or eliminate their toxic hazards.

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About HEFN and This Issue Brief

HEFN is a network of funders investing at the intersections of health and the environment.

HEFN's mission is to maximize philanthropy's impact on environmental health and environmental justice.

Catalyzing Change was co-authored by HEFN Director Karla Fortunato, HEFN Director Kathryn Sessions, and consultant Michael Passoff. HEFN Communications Associate Lauren Linville provided editorial support.

For more information, please visit www.HEFN.org.

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