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## **Air and water pollution, source, causes and strategies for control**

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### **Abstract**

Environmental pollution has many facets, and the resultant health risks include diseases in almost all organ systems. Each pollutant has its own health risk and it is difficult to summarize all relevant information into a short chapter difficult. However, it is the prime responsibility of public health practitioners and decision makers to be aware of the potential health risks caused by air and water pollution.

**Keywords:** pollution, causes, strategies, environmental

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### **Introduction**

If we see the problems caused by air and water pollution at the community, country, and global levels, it can be estimated that the proportion of the global burden of disease associated with environmental pollution hazards ranges from 23-30 %. The above mention estimates include infectious diseases related to:

1. Drinking water, sanitation, and food hygiene
2. Respiratory diseases related to severe indoor air pollution from biomass burning
3. Vectorborne diseases, such as malaria.

These three above mention types of diseases each contribute approximately 6.0 % to the estimate of the global disease. The World Health Organization (WHO) points out that the outdoor air pollution contributes as much as 0.7 to 1.5 % of the disease in developing regions, and other pollution, such as lead in water, air, and soil, may contribute 0.9 %.

#### **a. Air Pollution**

Air pollutants are generally classified into three categories:

1. Suspended particulate matter (PM) (dusts, fumes, mists, and smokes)
2. Gaseous pollutants (gases and vapors)
3. Odors

#### **1. Suspended PM**

Suspended PM can be categorized according to total suspended particles: the finer fraction, PM<sub>10</sub> (particles diameters of less than 10.0 microns) which can reach the alveoli, and the most hazardous, PM<sub>2.5</sub> (particles diameters of 2.5 microns, respectively). More PM<sub>2.5</sub> particle consists of secondary pollutants created by the condensation of gaseous pollutants viz sulfur dioxide (SO<sub>2</sub>) and nitrogen dioxide (NO<sub>2</sub>). Types of suspended PM include diesel exhaust particles; coal fly ash; wood smoke; mineral dusts, such as coal, asbestos, limestone, and cement; metal dusts and fumes; acid mists, viz sulfuric acid and pesticide mists.

#### **2. Gaseous pollutants**

Gaseous pollutants include sulfur compounds like SO<sub>2</sub> and sulfur trioxide; carbon monoxide; nitrogen compounds such as nitric oxide, NO<sub>2</sub>, and ammonia; organic compounds such as hydrocarbons; volatile organic compounds; polycyclic aromatic hydrocarbons and halogen derivatives such as aldehydes; and odorous substances. Volatile organic compounds are released from burning fuel (gasoline, oil, coal, wood, charcoal, natural gas, and so on); solvents; paints; glues; and other products commonly used at work or at home. Volatile organic compounds include such chemicals as benzene, toluene, methylene chloride, and methyl chloroform. Emissions of nitrogen oxides and hydrocarbons react with sunlight to eventually form another secondary pollutant, ozone, at ground level. Ozone at this level creates health concerns, unlike ozone in the upper atmosphere, which occurs naturally and protects life by filtering out ultraviolet radiation from the sun. Sources of Outdoor Air Pollution. Outdoor air pollution is caused mainly by the combustion of petroleum products or coal by motor vehicles, industry, and power stations. In some countries, the combustion of wood or agricultural waste is another major source. Pollution can also originate from industrial processes that involve dust formation (for example, from cement factories and metal smelters) or gas releases (for instance, from chemicals production). Indoor sources also contribute to outdoor air pollution, and in heavily populated areas, the contribution from indoor sources can create extremely high levels of outdoor air pollution. Motor vehicles emit PM, nitric oxide and NO<sub>2</sub> (together referred to as NO<sub>x</sub>), carbon monoxide, organic compounds, and lead. Lead is a gasoline additive that has been phased out in industrial countries, but some developing countries still use leaded gasoline. Mandating the use of lead-free gasoline is an important intervention in relation to health. It eliminates vehicle-related lead pollution and permits the use of catalytic converters, which reduce emissions of other pollutants. Workplace air is another important source of air pollution exposure. Resource extraction

And processing industries, which are common in developing countries, emit dust or hazardous fumes at the worksite. Such industries include coalmining, mineral mining, quarrying, and cement production. Developed countries have shifted much of their hazardous production to developing countries.

### **Impacts on Health**

Epidemiological analysis is needed to quantify the health impact in an exposed population. The major pollutants emitted by combustion have all been associated with increased respiratory and cardiovascular morbidity and mortality. This burden of disease occurs primarily in developing countries, with China and India contributing the most to the global burden. Eastern Europe also has major air pollution problems, and in some countries, air pollution accounts for 0.6-1.4 % of the total disability-adjusted life years from mortality. The global burden of disease caused by lead exposure includes subtle changes in learning ability and behavior and other signs of central nervous system damage.

### **A. Water Pollution**

Chemical pollution of surface water can create health risks, because such waterways are often used directly as drinking water sources or connected with shallow wells used for drinking water. In addition, waterways have important roles for washing and cleaning, for fishing and fish farming, and for recreation. Another major source of drinking water is groundwater that contains low concentrations of pathogens because of the filtration during its transit through underground layers of sand, clay, or rocks. However, toxic metals and chemicals such as arsenic and fluoride, respectively can be dissolved from soil and or rock layers into groundwater. Direct contamination can also occur from badly designed hazardous waste sites or from industrial sites. Coastal pollution of seawater may give rise to health hazards because of local contamination of fish or shellfish for instance, the mercury contamination of fish in the infamous. Seawater pollution with persistent chemicals, such as polychlorinated biphenyls (PCBs) and dioxins, can also be a significant health hazard even at extremely low concentrations.

### **Sources of Chemical Water Pollution**

Chemicals can enter waterways from a point source and or a nonpoint source. Point source pollution may due to discharges from a single source, while the nonpoint-source pollution involves many small sources that combine to cause significant pollution. For example, the movement of rain or irrigation water over land picks up pollutants such as fertilizers, herbicides, and insecticides and carries them into rivers, lakes, reservoirs, coastal waters, or groundwater.

Paper and pulp mills consume large volumes of water and discharge liquid and solid waste products into the environment. The liquid waste is usually high in biological oxygen demand, suspended solids, and chlorinated organic compounds such as dioxins. The storage and transport of the resulting solid waste may also contaminate surface waters. Sugar mills are associated with effluent characterized by biological oxygen demand and suspended solids, and the effluent is high in ammonium content. Waste from petrochemical manufacturing plants contains suspended solids, oils and grease, phenols, and benzene. Solid waste generated by petrochemical processes contains spent caustic and other hazardous chemicals implicated in cancer.

Another major source of industrial water pollution is mining. The grinding of ores and the subsequent processing with water lead to discharges of fine silt with toxic metals into waterways unless proper precautions are taken, such as the use of sedimentation ponds. Lead and zinc ores usually contain the much more toxic cadmium as a minor component. If the cadmium is not retrieved, major water pollution can occur.

### **Intervention**

The variety of hazardous pollutants that can occur in air or water also leads to many different interventions. Interventions pertaining to environmental hazards are often more sustainable if they address the driving forces behind the pollution at the community level rather than attempt to deal with specific exposures at the individual level. In addition, effective methods to prevent exposure to chemical hazards in the air or water may not exist at the individual level, and the only feasible individual-level intervention may be treating cases of illness. Some would label interventions at the driving force level as policy instruments. These include legal restrictions on the use of a toxic substance, such as banning the use of lead in gasoline, or community-level policies, such as boosting public transportation and reducing individual use of motor vehicles. Interventions to reduce pressures on environmental quality include those that limit hazardous waste disposal by recycling hazardous substances at their site of use or replacing them with less hazardous materials. Interventions at the level of the state of the environment would include air quality monitoring linked to local actions to reduce pollution during especially polluted periods (for example, banning vehicle use when pollution levels reach predetermined thresholds). Finally, interventions at the effect level would include actions by health services to protect or restore the health of people already showing signs of an adverse effect.

### **Interventions to Reduce Air Pollution**

Reducing air pollution exposure is largely a technical issue. Technologies to reduce pollution at its source are plentiful, as are technologies that reduce pollution by filtering it away from the emission source. Getting these technologies applied in practice requires government or corporate policies that guide technical decision making in the right direction. Such policies could involve outright bans, guidance on desirable technologies or economic instruments that make using more polluting technologies more expensive than using less polluting technologies. For trucks, buses, and an increasing number of smaller vehicles that use diesel fuel, improving the quality of the diesel itself by lowering its sulfur content is another way to reduce air pollution at the source. More fuel-efficient vehicles, such as hybrid gas-electric vehicles, are another way forward. These vehicles can reduce gasoline consumption by about 50 % during city driving. Policies that reduce “unnecessary” driving, or traffic demand management, can also reduce air pollution in urban areas. Power plants and industrial plants that burn fossil fuels use a variety of filtering methods to reduce particles and scrubbing methods to reduce gases, although no effective method is currently available for the greenhouse gas carbon dioxide. High chimneys dilute pollutants, but the combined input of pollutants from a number of smokestacks can still lead to an overload of pollutants. An important example is acid rain, which is caused by SO<sub>2</sub> and NO<sub>x</sub> emissions that make water vapor in the atmosphere

acidic. Changing the pH of wastewater or adding chemicals that flocculate the toxic chemicals so that they settle in sedimentation ponds are common methods. The same principle can be used at the individual household level. One example is the use of iron chips to filter out arsenic from contaminated well water.

### Conclusion

Evidence shows that a number of chemicals that may be released into the air or water can cause adverse health effects. The associated problem of disease can be substantial, and investment in research on health effects and interventions in specific populations and exposure situations is important for the development of control strategies. Pollution control is therefore an important component of disease control, and health professionals and authorities need to develop partnerships with other sectors to identify and implement priority interventions. Developing countries face major water quantity and quality challenges, compounded by the effects of rapid industrialization. Concerted actions are needed to safely manage the use of toxic chemicals and to develop monitoring and regulatory guidelines. Recycling and the use of biodegradable products must be encouraged. Technologies to reduce air pollution at the source are well established and should be used in all new industrial development. Retrofitting of existing industries and power plants is also worthwhile. The growing number of private motor vehicles in developing countries brings certain benefits, but alternative means of transportation, particularly in rapidly growing urban areas, need to be considered at an early stage, as the negative health and economic impacts of high concentrations of motor vehicles are well established. The principles and practices of sustainable development, coupled with local research, will help contain or eliminate health risks resulting from chemical pollution. International collaboration involving both governmental and nongovernmental organizations can guide this highly interdisciplinary and intersectoral area of disease control.

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