

Environmental Pollution, Public Health and Environmental Medicine-Oil Spills

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Abstract

How pollution interacts with public health, environmental medicine and the environment has undergone dramatic change. Recent oil spills in the Yellowstone River, Alaska tundra and Enbridge (Wisconsin) demonstrate how pollution can directly and indirectly impact man's health. Events of this kind bring back memory of the Gulf of Mexico spill. These disasters are not only impacting environmental factors associated with nature, but human factors as well; including many that are not well recognized. There has been an increased awareness of how pollution is observed regarding its health impact and attitudes toward public health and environmental medicine. Damage from oil spills will not only influence public health but overall disease rates for years to come. As environmental pollution increases so will the importance of environmental medicine in managing its consequences.

Keywords: Water pollution; Environmental health; Occupational medicine; Public health; Oil spills

Introduction

Environmental oil pollution events have become a major issue through-out the world. This is illustrated by the oil spills in the Yellowstone River, Alaska tundra, Gulf of Mexico event and Enbridge (Wisconsin). In general, concerns related to these spills are focused on environmental issues, but more recently there have also been discussions around the general population and worker health [1-3]. Historically, exposures from oil spills were mainly associated with water and soil events, but recently these concerns have been extended to air pollution hazards [4]. Exposure from these types of events can be categorized as either acute or chronic [5,6], with the real conundrum associated with long-term effects. Health consequences from these types of events are not well known. At least for the Gulf of Mexico spill however, epidemiological studies have been initiated for the elucidation of diseases and trends [7]. The problem is information from these studies will not be available for years to decades and thus is of little current value. The Gulf spill however has provided basic information on acute effects; nonetheless, each spill has different parameters and characteristics [1].

Commentary/Discussion

Pollution events have become a common occurrence on a global, regional and local scale [8]. Historically, environmental pollution was not a medical/public health issue nor was it discussed in clinical settings. Since the 1950's, environmental medicine has been discussed more frequently through a greater awareness in public health and preventive medicine; although today, there is now a focus on occupational medicine. Environmental and occupational medicine are however more commonly viewed as an integrated subject, with emphasis given to industrial issues. Certainly, pollution problems have been recognized in the distant past [9] but were more easily mitigated by nature due to the limited complexity of the pollutant, its degradability (e.g. biodegradable organics) and lower industrialization. Health-related effects from environmental pollution have been well known, but were not fully realized until highly notable events like the Donora (Pennsylvania) smog occurrence in 1948 [6] resulting in later public health programs including in their training a discussion of environmental medicine

or what could be called pollution medicine. For the most part these issues are given a cursory presentation in environmental/occupational medicine classes and vaguely relate to actual medical outcomes. Interactions of pollution and health are often noted with little detailed discussion of the acute and chronic health effects that can occur. Few realize that during the Donora Smog event more than 20 people died and possibly thousands suffered acute or chronic health effects, mostly pulmonary problems [10]. In the London occurrence this number was even greater with over 100,000 people becoming permanently injured by the pollution along with 4,000 deaths occurring during the actual fog (smog) event. In London, there were an additional 8,000 deaths in the next 10 weeks following this smog episode [11]. The question that can be asked is: Why should this change? From a practical perspective there are actually few real environmental medical "diseases" and those that do exist are probably more related to toxicology and environmental health as they relate to public health practice (e.g. Red Tide). Although these events have become well known they are often quickly forgotten.

Public health, environmental and occupational medicine and related fields are slowly evolving to encompass some of the most recent environmental events. Disease events from prior environmental pollution occurrences were mostly ignored. Today recent events such as the oil spill and the explosion in the Gulf of Mexico have changed most people's perspective. This disastrous event has impacted five states (Alabama, Louisiana, Florida, Mississippi and Texas) and was finally "stopped" on July 15, 2010; with plugging of the well on September 20, 2010. Most recently, the Yellowstone River on July 1, 2011, the Alaska tundra on July 17, 2011 and then the Enbridge Wisconsin on July 27,

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2012 spills have further reinforced both environmental and public health concerns. These types of events can no longer be ignored by public health practitioners.

The Gulf spill for example lasted for longer than four months with some estimates that more than 19,000 barrels of oil were released a day into the Gulf of Mexico. It is unknown where most of the oil has gone, although it has been suggested that it sank and is on the ocean floor. This spill became an international event in that oil and its residue eventually impacted other nations (e.g. Caribbean nations) in the Gulf, augmented by disturbances like hurricanes and currents. Some have characterized this calamity as the largest oil spill release in the northern hemisphere, even surpassing the Exxon Valdez event. There certainly have been other major oil spill events in the Gulf of Mexico area (i.e. Ixtoc I oil well - 1979-1980, Atlantic Empress - 1979). Oil from the Gulf spill continued to impact the coastline and damage sensitive environmental areas as has been seen related to food harvested from this region; thus, resulting in possible continual health effects for the coastal population. Such effects may not be readily predictable and will emerge over time [12]. The potential health impact is exemplified by actions undertaken to protect beaches from oil residue; although most of this action is/was for environmental protection, it complements actions to protect public health, mostly from volatile organics.

Spills on the Yellowstone River, Alaska tundra and Enbridge (Wisconsin) were much smaller than the Gulf, but occurred in sensitive environmental/commercial areas. Although these areas are generally remote, it appears, especially for the Yellowstone River, those members of the general population experienced exposure to the oil, including air pollution. Studies from the Gulf spill have suggested a wide range of exposures and potential harm from oil, including organic hydrocarbons [1]. Recently, it has been suggested that those engaged/participating in spill "activities" can also suffer from various symptoms/signs/illnesses, including neurological, long after the event [3,13]. These low level organics could have a major impact on the local coastal community health including nausea, vomiting, dizziness, skin rashes, headaches, triggering of asthma and other types of pulmonary irritations [12,14].

Extended impacts on health that would generally not be considered a related event to the oil pollution must also be considered, such as increased infection rates [15]. The long-term impact from these types of events is difficult to quantify [16].

These incidents are not new, but as time goes on they are becoming more magnified. Yet, what is of even greater concern is that such disasters might become enhanced with increased global warming! A burden of heat-related mortality during heat waves is already being observed in many areas [17]. Future susceptibility is expected to increase with populations in western countries and fast urbanization in many developing ones [18,19]. As the earth warms, the wet-bulb temperature will also increase making it more difficult for humans to function. As little as a 3°C increase in core body temperature can threaten life [20], whereas a recent report suggests an increase as small as 4 degrees will make about half of the earth uninhabitable for man. A small increase of a few degrees could thus make events like Yellowstone River, Alaska tundra, Enbridge, and Gulf of Mexico a bigger catastrophe. Even though such inclusive factors and interactions are only rarely mentioned in public health and environmental science, many could consider this the time such an introduction be provided. Although global and regional environmental changes will have an influence on environmental medicine, these phenomena will be difficult to observe and study.

Scenarios such as this make environmental medicine a potentially

major subject of interest in the near future. As global events change so will the direction of medicine. In the latter part of the 18th and the early part of the 19th century, infections and their prevention was a major focus of medicine. This can be observed from reports on historical medicine where many of the scientists worked on treatment and prevention of infectious diseases [21].

Today it can be asked - what is the future direction of environmental/occupational medicine? All we know currently is this is not about the next short-term hot topic, but rather the overall concern for years to come. As noted for decades, concern revolved around identifying, treating and preventing infectious disease outbreaks. More specifically, a reduction of waterborne diseases was a major preventative determinant on overall lower mortality. It is likely that one of these new hot subject areas will be related to the environment. This topic and its associated impacts on man are becoming greater by the day. Occurrence of pollution events that are related to disease have become easier to observe, primarily as a result of better investigative techniques into disease causation, basic research into biochemistry and physiology and a decrease of occupational exposures [13]. With these advances and increases in global pollution and rising temperatures, earlier poorly identifiable problems will become magnified. Only today are some of the disease states caused by environmental pollution being recognized [16]. It has even been suggested that exposure from the Great Fog of London in 1952 resulted in an increase in gastrointestinal viral infections due to swallowing of particles containing adenoviruses and rotaviruses [15]. It is argued that these agents in association with particulate pollution have resulted in an increased rate of intussusceptions. Although such information is not well known in medicine, these accidents may be more common than suspected, albeit difficult to relate to an environmental pollution event, especially those associated with common chronic conditions (e.g. heart disease, cancer or respiratory disease). In a population exposed to dioxin as a result of the 1976 accident in the Seveso (Italy) production plant, all-cancer mortality 15-20 years after exposure increased among those living in the highest contaminated area. No excess was observed however in the most recent follow-up corresponding data on cancer incidence, with the number of expected events still too small to allow conclusions for specific cancer sites [5].

Chronic diseases are however the principal cause of morbidity and mortality worldwide nowadays, and ambient air pollution has been implicated in increasing the incidence and mortality from lung cancer and from cardio-pulmonary diseases [22-25]. Such associations are being hypothesized with at least atmospheric pollution (e.g. heart disease, diabetes) [9]. Urban pollution has been suggested to result in almost 60% of the chronic health problems [16].

Changing environmental events are becoming of greater concern with the impact on man clearly not known or even understood. For health effects, those from a natural disaster like Hurricane Katrina will likely receive greater attention. In this event about 1,300 died as a result of the hurricane and this occurred over a period of a few days [26]. Such reports are similar for the Donora and London inversions, and if the total number of deaths is examined, especially for pollution-related events, the long-term mortality is likely 20 to 50 times higher than initially reported. In Donora it has been estimated that 5,000 to 7,000 people became ill with 400 hospitalizations in a population of 14,000 [27]. If the same estimates are used for Donora and London Smog occurrences, the number of early deaths in each would be 400-1,000 and 80,000-200,000, respectively. The employment of a multiplier for the actual mortality is based on the fudge factor of 20 to 50. Urban pollution has been suggested to result in almost 60% of the chronic health problems

[16]. With an increase in airborne organics from the oil spill this rate could increase. When this is combined with loss of employment due to reduced commercial activity in the coastal areas and magnification from global warming, these rates will be much higher, although not easily predicted. This suggests that a potential interaction between the environment and an event such as an oil spill should be taken into account when establishing the rates of environmental disease.

These occurrences and concepts provide a glimpse of at least one type of issue that those working in environmental medicine may face in the future. As medicine improves in disease detection, many of these scenarios, especially those characterized by major pollution, will have a greater impact on patient health. Health effects from environmental pollution are often misdiagnosed as the cause and an ailment such as heart disease is listed as the clinical outcome. Heart disease as mentioned above however, may actually be a result of environmental pollution, and for some become magnified through global events. In this respect "It is at least as important to ask what man has the symptoms, as it is to ask what symptoms the man has" [28].

Even a small change will influence a large number of people. The first impact will occur during cleanup of spills, most likely affecting workers. Loss of a protective layer against sunlight and UV light may be the first health problem observed. The question here, as related directly to the spill, is whether organics will have a synergistic effect with UV light damage on those conducting cleanup activities. This may become even more pronounced with the aging population in many countries and those that have an epidemic of chronic diseases, such as AIDS. Awareness of issues associated with environmental/occupational medicine is needed, especially in events like the oil spill seen in the Gulf of Mexico [29-31]. Much of this area of medicine will fall upon the shoulders of primary care practitioners, many who are not well prepared in this subject area [32]. As seen through history other nations are not immune from these events. How will environmental/occupational medicine identify and treat these problems when the cause of action is only remotely related to the patient?

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