# Water Pollution in America: Lead Poisoning

## Abstract

Issues concerning water quality are a primary challenge facing the human race in contemporary society. American water systems are constructed using lead and iron pipes. Regardless of the health improvement caused by these water systems, here, we review lead and copper, their adverse effects on human health, and various approaches to mitigate pollution of freshwater sources. This paper emphasizes chemical pollution, predominantly inorganic toxic metals.1 Aspect of diseases, measures to combat these diseases, and the urgent need for improved sanitation in the United States are also discussed. The review addresses current advances in science to cope with the great diversity of chemical pollutants. The paper is organized along with the various chronological scales of global water pollution.

## Introduction

Lead is a very insidious environmental pollutant. Across the nation, environmental specialists have documented lead effects on both adults and children. The total amount of lead consumed increased significantly over the last few years. The sources where lead can be ingested include drinking water, soil, and food. The concentration of lead has very adverse effects on human health. The duration of lead in the body is a major factor in determining the level of poisoning it inflicts. Due to the duration factor, the sources of lead should be controlled to prevent the accumulation of lead in children.2 Dating back to the 1960s and 70s, the concentration of lead in tap water, dust, and the air began to decline, leading to low lead levels in the blood cells throughout the United States. However, US citizens still face exposure to lead. This is prevalent because most people in the US live in houses where drinking water service lines are made of lead. The leaching of lead into the drinking water from pipes can be controlled using adequate control measures. Currently, the majority of public water services are compliant with the safe drinking water Act of 1991. The continuous contamination of water has prompted the EPA to review the LCR rules. Consequently, EPA has expected to gear further changes on the rule to enhance the protection of the citizens. One of the prevention measures for lead contamination entails informing the public of the degree of risk.10 Water is considered the main source of lead contamination by the LCR, even though other sources exist. This paper reviews a selection of peer-reviewed publications on lead poisoning and its sources in both adults and children in America. The paper focuses on tap water as the primary source of lead poisoning. The provides a very comprehensive review of current literature on lead contamination

## Background Information

 Lead, as a metal has been used in the US for over 4000 years. Over these years, the production of lead in the US has increased from 10 to 1million tons in a year. The average BLL has increased by more than 100 times the background level of BLL. These percentages indicate that there are substantial sources of lead contaminating the environment. Further changes in the federal legislation aimed at reducing the emissions and use of lead in water pipes have helped in reversing the increase in contamination.2 The regulation of lead entails eliminating lead from foods, water pipes, food packaging, drinking cans, and house paints.

In the past, the Environmental Protection Agency decided to implement a water purification policy. EPA based this policy on the purification of water in a treatment plant. This was the final stage in the purification process; however, after leaving the plant, the amount of lead that enters the water is not identified. The assumption that the distribution channels from the treatment plant are safe was a major miscalculation. Much of the lead contamination occurs during the period of distribution and with no monitoring done; it was difficult to identify how common the exposure to lead contaminants occurred. Therefore, the strategy did not serve its purpose because, after purification, lead poisoning still occurred. To solve this problem, it was further suggested that cleaning home faucet aerators once a very week would serve the purpose of reducing lead contamination. Additionally, there need to let the water tap run for approximately three minutes before collecting water for home use would help in washing away the poisoned water that had accumulated when the water was still in the pipes.8

Due to negligence, it is emerging that lead levels are continuously rising in the domestic water systems. Following the research done by the CDC, it has emerged that contamination with lead is more likely among black children compared to White-American children. The CDC study explains the situation in flint where there is a larger population of black people living under low income.4 The recent cases at Flint reveal a lack of sufficient testing of the levels of lead. Apparently, in recent times, CDC in conjunction with the EPA continues to conduct tests on human exposure to lead as a main contaminant of water in the USA. Insufficient methods of measuring lead water pollution have led to further speculation about elevated levels of lead contamination. Further studies to determine the reasons behind more lead poisoning among the blacks population are underway.3 The future studies are expected to explain this phenomenon in an attempt to reduce the contamination of lead in the USA. Older water pipes that were considered safe from lead contamination have shown signs of corrosion due to the rising levels of lead in these areas. Therefore, future researchers should concentrate on determining the possible solution to the prevalent corrosion of the older water pipes. Corrosion of these pipes put the US population at a very high risk of lead contamination. Additionally, the disparity of lead levels in the blood of the black population and the whites need detailed research.

## Approaches to Mitigate Lead Water Pollution: Its Pros and Cons

### Education and Creation of Public Awareness

In the U.S, public education and awareness creation on the adverse effects of water pollution by lead is a key approach to mitigate the problem. In the course of such activities, home-based certified laboratory analysis is encouraged. The public gets educated on how to conduct simple treatment systems across the country. For example, Deluxe Water, which is a simple analysis that removes the element with a point-of-use lead filter? It also uses a reverse osmosis system or a whole-house lead filter. However, this depends on the budget and the much a household would want to spend to minimize the levels of exposure.7

#### Pros

Public education helps citizens to understand health concerns, and the need to eliminate harmful impacts of toxic chemical concentrations in water so that they become cautious of the problem.1 When the public is informed of the dangers of drinking water polluted with lead, they acquire the necessary knowledge and means to control the intake of such water. Secondly, awareness serves to notify the public of various environmental problems affecting the locality. It gives the public a chance to provide recommendations and solutions on how to solve such problems, which affect their community.

#### Cons

High costs and time needed to conduct public education is a major setbacks to such initiatives. Government agencies and organizations may not have the full needed funds to carry out intensive campaigns. Some agencies resort to cheaper means of delivering information through social media that have otherwise proved ineffective. This discourages donors from public awareness programs.

### Legislation and Regulation

Clean Water Restoration Act establishes the structure for regulating the amount of discharge of pollutants into United States waters. The Act constitutes the U.S. Environmental Protection Agency, which is the authority that regulates emissions of pollutants from sources including lead pipes, utilities, and steel mills. EPA sets the National Primary Drinking Water Regulations (PSWDW) that maintain quality standards. The standards guide people on how they drink water.5 It has implemented control programs for pollution that include wastewater standards for factories to protect the resources that would guarantee them a safe supply of drinking water.

Frank R. Lautenberg Chemical Safety, signed into law in June 2016. It is essentially an amendment to the toxic substance control Act. It became the U.S primary chemical strategic management regulation. This marked a milestone for the control of the lead and other elements' exposure levels as it incorporated the evaluation of existing chemicals with enforceable deadlines.9 It also set new risk safety standards and increased public transparency for chemical information.

#### Pros

Legislation on water pollution is advantageous as the laws protect the health and safety of humans. Without such regulations, businesses and people would do whatever satisfies their selfish needs, at the expense of the society and environment. Another advantage is strict environmental laws, which increase environmental-friendly technologies.11 The benefit arises in cases where companies seek other alternative technologies that would comply with the set government regulations

#### Cons

Some companies may fail to comply with the laid laws. Non-compliance has been a major setback to the efforts of effective legislation. Some of these organizations may include parastatals that ought to set good examples together with non-governmental organizations. Some laws may also lack local support. Environmental laws tend to impose regulations before considering their impacts on society. Some people may perceive such laws as constituting human rights violations.

### Health studies and research

The United States sets health studies branch, which investigates and reports on the potential human impacts on exposure to environmental hazards resulting in chemical pollution or technological disasters that may lead to water pollution. The results obtained from such studies help in formulating, evaluating, and implementing strategies for preventing and reducing harmful levels of public chemical exposures.7

#### Pros

Research helps identify new and appropriate strategies for mitigating chemical pollution and improving environmental health. It facilitates statistical analysis that assesses the significance and improvements that are needed in mitigating and controlling water pollution. A second advantage is that it allows evaluation of theoretical and practical approaches to come up with findings for formulating recommendations.

#### Cons

The problem of time and funds constraints is a major disadvantage to research and health studies. Research activities need large budgets for experiments and field observations. The time required in analyzing findings to come up with conclusions and recommendations could be so long. The problem discourages stakeholders and donors of projects from conducting a comprehensive research.

### Analysis of the Problem

 The lead element does not break down into less toxic substances. The element is used in manufacturing metal water pipes, paints, glassware, and food containers. The substances contain varying quantities of lead elements. Even though the use of the element has been banned in manufacturing most of the products, some quantities of it are still found in drinking water. In rare cases, the element gets into the water due to pesticides used in the past and industrial activities, which contaminate soil and groundwater. Lead is likely to enter the water through household plumbing activities. The element dissolves in water from lead pipes in plumbing systems through a process called corrosion. In addition, it dissolves in water from metal faucets and fixtures manufactured by brass, which is an alloy of zinc and copper. The alloy contains lead impurities that intoxicate water in metal water lines.

### Evaluation of Statistical Measures

The problem majorly affects children below six years old. Children’s bodies are growing faster, which allows the elements to be absorbed easily and efficiently. The elements cause premature birth, reduce the weight of babies, brain damage, and lower Intelligent quotient among children. It also causes cancer, kidney-related diseases, stroke, hypertension, and memory problems among adults. Lead is tasteless, odorless, and colorless; which makes it hard to detect in water. Most infants receive exposure to drinking water in schools. The problem varies greatly among homes, schools, and other buildings such as churches and hospitals. The yearly costs of childhood lead exposure are probably $50 billion in U.S.12

Environmental Protection Agencies suggest that none U.S. States have reported safe levels of lead pollution in their water supply. The states include North Dakota, Alabama, Hawaii, Tennessee, Kentucky, Arkansas, South Dakota, Nevada, and Mississippi. Several schools in the U.S. have reported a high level of lead contamination in the last three years. The element mostly affects pipe water more than other kinds of water sources, since the material used to manufacture them contains lead.

### Advantages and Disadvantages of the Research on Water Pollution

#### Advantages

The research avails information to the people on ways of reducing lead pollution in water sources. The information gathered will be availed through publications so that the public and the lead manufacturing industry can participate fully in curbing this pollution. In this case, the research acts as a basis for developing programs for campaigning against the water pollution pandemic, especially by discouraging the use of lead piped water. Apart from understanding the danger that leads piped water poses to people, this research offers alternatives for piping water using plastic, which is safer than the former. Disseminating information about this challenge to the population helps future generations to formulate long-term strategies creatively that will be used to curb the problem of water pollution through lead.

#### Disadvantages

The initial cost of conducting research is very high. The government invests a lot of money in paying experts to research the effects of lead water Pollution. Lead pollution problem has affected many people since 1991. The U.S. government has tried various ways to solve the problem including researching to gather information on the cause of the problem. The research is conducted by various companies, which are expensive to hire. The companies conduct extensive research and deliver possible solutions to the problem. In addition, lead pollution reduces an individual's IQ, which lowers a country's economic production.14

### Recommendations

The U.S. citizens and the government should collaboratively enact a comprehensive safer chemicals policy at both state and federal levels. These laws and policy formulations should be inclusive of all stakeholders to incorporate all sectors in the decision-making process. It helps to restore public endorsement that facilitates a better implementation process.6

Exclusive research works need to be conducted to help close the broken gap in the chemical system and ensure chemical safety. Research is useful as it provides data and promotes innovative technology. It would help revitalize the U.S toxic-dependent economy through green chemistry. Consumers also need to take action towards protecting their families’ health. People need to take personal initiatives to reduce exposure to toxic chemicals. Ensuring and using safer products for homes should be a family initiative. Parents need to take the action to educate their children on how to protect themselves from exposure to lead.

## Conclusion

The government should promote training programs to enlighten people on the impact of lead water pollution on their health. In addition, it can conduct community programs to train society on ways of preventing pollution. The process of eradicating this problem should not be a political one. It should be based on scientific research.15 Experts should be employed to conduct scientific research on the primary cause of the problem, and then suggest a possible solution to the problem.13 The government can also implement stringent measures on companies that violate pollution laws to reduce the problem. Some lead substances intoxicate water sources through industrial activities by various companies. Implementing various policies on ways of reducing pollution by such companies including firms, which manufacture lead water pipes, will reduce the problem considerably.

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