Curriculum Units by Fellows of the Yale-New Haven Teachers Institute
1997 Volume VII: Environmental Quality in the 21st Century

Lead Contamination In Our Environment

Curriculum Unit 97.07.05
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Introduction

Lead is a health hazard for all humans. You can not see or smell lead, and often, you can not taste it. We are surrounded by lead in our environment, however, it does not mean that you will be poisoned. The purpose of this unit on “Lead Contamination: Practices, Policies, and Ethics” is to provide information, awareness, and activities to teachers and students in the middle grades, 5-8; to the seriousness of the problem of lead toxins in the environment.

The unit will provide a conceptual framework on how to deal with fundamental problems through sources of lead in the environment; how it may contaminate food and water; why children are especially vulnerable; what to do about it; technologies (batteries) that concentrate lead and disperse it (gas and paint); lead prevention; lead toxicity; human toxicity and exposure; lead regulations and policy and environmental justice.

Students will be exposed to subject content and lessons plans that enhance critical thinking and inquiry through hands-on approach to learning about lead toxins in the environment. Also, included in the unit is a student reading list, teacher reading list, speakers, resources, field trip information, and a bibliography.

Sources of Lead in Our Environment

Lead is one of the elements in nature. It is usually found in combination with other elements to form different minerals. The mineral called galena is most often mined in this country to produce lead metal as we recognize it.

There are so many sources of lead in our environment. An individual can get lead poisoning from a variety of sources. Major sources of lead exposure include lead in paint, gasoline, water distribution systems, food, and lead used in hobby activities. Lead exposure attributable to automobile air emissions was a major exposure source prior to 1796. Between 1976 and 1990, lead used in gasoline declined by 99.8% in the United States, but not in some other countries where lead is permitted in gasoline: National Association of Physicians for the Environment (NAPE, 1993). [1]

Lead poisoning is an environmental and public health hazard of global proportions. Children and adults in virtually every region of the world are being exposed to unsafe levels of lead in the environment. In fact, children are exposed to lead from different sources, such as paint, gasoline, and solder, and through different pathways such as air, food, water, dust and soil. It can be from a single high level exposure or the cumulative effect of repeated high or low level exposures. Once introduced into an environment, it can stay there in a dangerous form for a very long time. For example, a home that was contaminated with lead dust from a renovation may lead poison a child many years later.

On one hand, in the U.S., the major sources of lead exposure culpability have shifted from gasoline to paint and water distribution systems and fixtures. On the other hand, in Eastern Europe and many developing countries, the air pollution contribution of lead exposure remains high.

Although all U.S. children are exposed to some lead from food, air, dust, and soil, some children are exposed to high dose sources of lead, lead-based paint is the most widespread and dangerous high-dose source of lead exposure for preschool children.

Lead-based Paint

Throughout the 1940's and 1950's lead-based paint was in widespread use. It continued to be used in lower concentrations until the mid-1970's. [2] The manufacture of paint containing high concentrations of lead for interior and exterior residential surfaces, toys, and furniture was banned in 1978 by the Consumer Product Safety Commission. [3] Although lead-containing paint was banned for residential use in the United States in 1978, residential paint on older buildings is the most frequent source of lead exposure in young children. It has properties that make it deal as a base for glazes, paints, solder, bullets, sinks and plumbing fixtures. Lead has been used to make petroleum products, glass panels, crafts, batteries, jewelry pencils, colored newsprints, etc. [4] However, with high lead content is estimated to be in 74 percent of all housing built before 1980. [5] Those housing units containing deteriorating lead-based are the major concern. Of even greater concern is these homes that have young children as occupants.

Lead paint exposure accounts for as much as 90% of childhood lead poisoning. While generally considered an inner city problem, it is, in fact, not so. [6] Lead paint not only directly poisons individuals, but contaminates soils and other surfaces which can also be the cause of poisoning.

Millions of tons of lead-based paints were applied to housing in this country before it was banned in the 1970's. It was considered the highest quality paint because it did not crack or peel and kept its color well. Many federal and state regulations required use of paint in public housing and other buildings.

Lead from different sources such as from lead-paint, gasoline, and solder may enter the body through air, food, water, dust and soil. Lead-based paint is still available for industrial, military and marine use and occasionally ends up being used in homes. Paint with high content is estimated to be in 74 percent of all housing built before 1980. [7] Those housing units containing deteriorating lead-based paint on surfaces broken, sanded, or scraped, it breaks into tiny, sometimes invisible, pieces that children may swallow or inhale.

Pica, a craving for unnatural food, is one way children are exposed to lead when they eat tiny pieces of peeling or chipping lead-base paint. A child does not have to eat paint chips, however, to become poisoned. More commonly, children ingest dust and soil contaminated with lead from paint that reenter that flakes or chalks as it ages. Lead-contaminated house dust can settle on floors, walls, and furniture. Settled lead dust

can reenter the air through cleaning, such as vacuuming or sweeping, or by movement of people throughout the house. Lead-contaminated house dust, ingested via normal repetitive hand-to-mouth activity, is now recognized as a major contributor to lead poisoning in children. Adults can also be exposed to lead in the same ways.

The risk of lead poisoning is related to both the presence and the condition of the paint. The risks of lead poisoning are greater when lead-paint has deteriorated or when lead-based paint (even intact paint) is located on surfaces accessible to children. Lead-based paint on interior and exterior windows is a major concern because it is abraded into dust by repeated opening and closing of the windows.

As many as 60% of all housing units in Massachusetts (up to 85% in urban areas) contain lead paint. This is approximately 1.2 million dwellings in Massachusetts alone. [8] Conditions such as deteriorating paint, dwellings undergoing interior or exterior uncontrolled renovation without proper precautions taken, lead paint in places where children visit, lead contaminated soils, and lead paint in common areas of apartments all can contribute to a child's exposure to lead paint. Paints used in industry on equipment or in playgrounds or parks may still contain lead. But, a variety of other substances contribute to lead poisoning. The normal activity that children engage in by putting their hands, fingers, and other objects in their mouth transfer lead containing dust into their bodies. The above factors contribute to the fact that the number of children exposed to lead paint is greater than the number who live in housing that contains lead paint and any child may be subject to exposure to lead from paints.

Lead allowed in paint now is still potentially a problem because at all levels of exposure, lead poisoning causes severe adverse health effects in both children and adults, affecting their ability to learn and thrive, their productivity, and their global competitiveness (U.S. National Academy of Sciences, 1993).

Lead in Homes

Exposure of children can also be the result of lead in household dust while there are obvious sources of lead in homes, such as peeling and other non-intact lead paint, there are also some not so obvious sources as well. Dust in homes can contain lead from lead painted surfaces that rub against each other. Windows and doors are a large source of this type of lead dust. This dust has been danger to children who play in the dust and put things in their mouth. Other lead exposure can result from sources such as toys, furniture, and older linoleum. It may be found in tableware as diverse as: ceramic dishes, bean pots, crystal, pewter, brass and enamel metal-ware. certain types of glazed and pewter dinnerware, and lead paint decorated drinking glasses. The Food and Drug Administration (FDA) set strict limits for the lead content on products made or sold in the United States. China and lead crystal can leach dangerous amounts of lead into food. [9]

Lead in Food

Exposure may result from individuals eating foods contaminated with lead. This lead can come from foods grown in soils with a high lead content. Lead compounds were also once used as insecticides for certain fruits and vegetables. Lead has also contaminated foods from improper canning procedures, cooking foods in cans with soldered seams, and serving foods in plates or containers that contain lead or have lead containing coatings on their surfaces. Occasional servings of food from these products are acceptable, food storage is unsafe. Food can also be contaminated with lead when it is grown in soil with a high lead content or when plants are sprayed with insecticides containing lead. It may be in the paint on your walls, or in the water. Lead can be found in some soldered canned goods from other countries. Some home remedies also contain lead compounds that can be the cause of lead poisoning. As many as 5% of children have high enough lead intake

through water and food to cause health risks. [10]

Lead in Soils

Lead in soils and dust in the environment has been, and will continue to be, a source of lead poisoning. The sources include flaking, chipping, or weathering paint: improper renovation of buildings and disposal of building materials; lead by the side of roads that has settled out from burned leaded gasoline; settled dust from industrial sources and lead around houses from lead paint that has been scraped off during the continuing repainting of the house.

Lead in Water

Drinking water can also have dangerously high levels of lead. As many as one in five Americans are exposed to dangerously high levels of lead in water. Lead rarely found in water at its source. The water becomes contaminated as it moves through the water distribution system. The lead can come from lead pipes or connectors; lead solder used to connect pipes and fumes; brass fixtures; and lead lined tanks in water coolers. The most serious problems come when the water is acidic. The acidic water will greatly increase the amount of lead that will leech from lead plumbing. In 1986, the federal government has made it illegal to use lead solder (greater than 2% lead in solder) or nine (9) waterlines. [11] Newer pipes may pose more of a hazard than older pipes. In older pipes, a mineral scale develops on the interior of the pipe, preventing the lead from leaching into the water. Newer pipes do not have this scale.

Components causing lead contamination include lead pipes, lead-based copper piping solders and brass fixtures. **Lead pipes** for conveying drinking water has been used for centuries because of its flexibility, durability and long life. Lead pipes are used in the United States, however, lead concentrations exceeding the regulation levels owing to lead pipe were reported in a number of cities. **Lead Solder** have been identified as a significance source of lead contamination. **Brass Faucet** fixtures have been identified as a major lead source in tap water. Levels of lead contamination found in natural raw waters, treatment plants or in distribution mains are typically low and rarely exceed drinking water regulations. However, high lead levels are usually found at consumer’s taps. Tap water can be contaminated by lead pipes, copper pipes with lead solder or bronze and brass faucets contaminating lead.

Contamination of lead in groundwater origin from the dissolution of lead from soil and earth crust. Lead particulate from the combustion of leaded gasoline, fossil and ore smelting can contaminate local surface water by surface runoff. . Lead itself has minor content in the earth crust. A widely distribution in of lead sedimentary rock and soils are reported an average lead content of 10 mg in 1 kg (10ppm) soil usually found in upper ground soil and lead in a range of 7 to 12.5 ppm is found in sedimentary rock.(U.S..EPA, 1987). [12]

This means that lead generally present in a form of carbonates and hydroxide complex in soil. The solubility of lead control the lead dissolution into surrounding water. Strongly absorption by soil and complexion by humus can further limit the lead concentrations in surface waters and groundwater.

Children are more affected by the same amount of lead from these and other sources than adults. Foods such as baby formula may pose a significant lead poisoning hazard if lead contaminated water is used in its preparation. As many as 5% of children have high enough lead intake through water and foods to cause health risks. [13]

Lead in the Air

Lead in the air has come from a variety of sources. One of the largest contributors has been from leaded gasoline. Millions of tons of lead were added to gas before use was limited by EPA regulations restricting the use of lead in gasoline. Much of this lead is still present in the environment as lead in soils and lead in dust. Aside from lead paints, lead is emitted into the air from industrial emissions. These industrial sources included smelters, refineries, incinerators, power plants, manufacturing operations, recycling efforts, and hundreds of other sources.

Technologies That Concentrate Lead and Disperse It

Leaded gasoline is the major source of dispersing lead into the human environment. When leaded gasoline is burned, it emits small particles of lead into the air, where they remain for extended periods of time. These lead particles will eventually fall out into soil and dust, creating a large amount of lead to continue to poison generations unless covered or removed. The dispersive nature of leaded gasoline and its long-term effects, the ease with which lead enters the body after it is emitted by motor vehicles, and the vulnerability of at-risk urban populations, especially children, combine to make elimination of leaded gasoline.

There are some jobs that can cause lead to be taken into the body. Lead poisoning in the workplace is entirely preventable and it still occurs. A variety of work and hobby environments expose people to lead and may result in lead exposures to the family. You may unknowingly bring lead into your home on your hands or clothes. Precautions are needed if you work construction, demolition or painting; with batteries; in a radiator repair shop or lead factory; or if your occupation or hobby involves furniture refinishing or making stained glass.

For example, a demolition worker who uses a torch to cut up a lead-paint storage tank, a smelter worker who breaks up old lead batteries for recycling, a house painter who sands and scrapes lead-based paint, a foundry worker who pours molten metal to make brass fittings, an electronics worker who solders printed circuit boards, a pottery worker who uses a glaze that contains lead and a radiator repair worker who solders radiators. contribute to sources of lead contamination in our environment. Lead can be also brought into the house from outside soil. Other places to be aware of lead exposure include: clothes from anybody who work with lead or lead paint, from lead soldered pipes, drapery and window weights, fishing sinkers, some folk medicines and some imported pottery.

A review of the regulation, incidence, and prevention of lead poisoning in the construction industry was presented. Of the one million construction workers estimated to be occupationally exposed to lead, 78% are employed in remodeling. [14] High risk work associated with remodeling includes abrasive blasting, welding, cutting and touch burning of surfaces with lead based coatings. Bridge and structural beam workers are also considered to be at risk for exposure.

Lead Toxicity and Exposure

Lead, a toxic chemical pose a vast range of dangers to children's health. Pure lead is very toxic to people. Children of all races and ethnic origins are at risk of lead poisoning throughout the United States. In addition to renal disease, cardiovascular effects, and reproductive toxicity, lead may cause irreversible neurologic damage. Blood lead levels once considered safe are now considered hazardous, with no known threshold. Lead poisoning is a wholly preventable disease.

For a variety of reasons, children are more susceptible to the effects of chemical exposures than adults. Children live closer to the ground, maximizing their contact with toxic substances that collect indoors. The world outdoors also appear also appears considerably more poisonous when looked at from the perspective of childhood.

Children come into greater contact with dangerous chemicals simply because they eat more than adults in proportion to their body weight including more pesticides residues from fresh vegetables, fruits, and juices. The EPA classifies as possible carcinogens over

65 percent of the 560 millions pounds of herbicides and fungicides sprayed annually on the U.S. crops. The average child consumes four times the amount of these suspect chemicals than an adult (Setterberg and Shavelson, 1993). [15]

Children prove more likely to encounter lead, an extremely dangerous element on a daily basis. This naturally occurring element is plentiful in our environment and virtually no one escape some exposure to it. Reducing lead exposure among infants, toddlers, and preschool children is particularly important because the developing nervous system is sensitive to lead toxicity. Although there has been a very dramatic decline in lead exposure among children, nearly 1.7 million children ages 1 to 5 have blood levels equal to or greater than 10'g/dL and cognitive development may be affected at levels about 10'g/dL. which makes it difficult to detect. Irritability, colic, distractibility and lethargy are all symptoms of progressive lead accumulation. [16]

Higher levels or chronic exposure results in more severe symptoms such as kidney and nervous system damage. Lead accumulate primarily in the bones and other organs. There is currently no lead level believed to be safe for infants and young children. The Center for Disease Control (CDC) define blood lead levels of 10 mcg/dL as toxic. The previous level, set in 1985, was 25 mcg/dL. The federal definition was established in 1991 as evidence accumulated indicating that serious consequences occur in infants and young children at levels greater than 10 mcg/dL. In lead poisoning, there is a silent progression of nonspecific symptoms.

In 1988 a report to Congress from the Agency for toxic Substances and Disease Registry, a branch of the United States Public Health Service for Toxic Substances and Disease Registry, a branch of the United States Public Health Service indicated that more than three million children in the United States have levels of lead in their blood high enough to cause significant impairment of their neurological development. [17]

According to the recently released lead toxicological profile for lead from Agency from Toxic Substances and Disease Registry (ATSDR), the adverse health effects of lead is indicated by blood-levels ranging from change in blood pressure at 10ug/dl to severe retardation and even death at very high blood-lead levels of 100 ug/dL. For example lead will interfere with synthesis necessary for information of red blood cells, anemia, kidney damage, impaired reproduction function, interference with vitamin D metabolism, and

delayed neurological and physical development. For adult men, high blood lead can cause elevated blood pressure, hypertension, strokes, and heart attack. Pregnant women exposed to lead are at risk of complications in their pregnancies, shorter gestational period, and damage to the fetuses. [18]

Since even low levels of lead can damage hearing and interfere with a child's developing system, it is not surprising that children exposed to lead at an early age prove seven times more likely to exhibit learning disabilities. Lead poisoning in children has also been linked to convulsions, brain degeneration, and death. Centers for Disease Control asserts that "lead poisoning is the number one environmental problem facing America's children. Exposing children to excessive levels of pesticides is impairing their health, eroding their mental abilities, and shortening their lives."

Human Exposure to Lead Toxicity

Major adverse impacts on public health can be divided into four categories (1) brain and nervous system damage, and particularly mental development impairment in children; (2) reproductive system interference including effects such as premature infant and low births; (3) circulatory system damage such as O2 absorption decrease and increase in blood pressure; and (4) kidneys malfunctioning. [19]

These various health effects have been recognized for several decades in the case of relatively high lead exposure. Lead intoxication is a widespread problem. One of every nine children under six years of age has blood lead levels high enough to be at risk. In 1970, an estimated 3 million children in older, inner-city neighborhoods were likely to be affected, but areas children in suburban and rural areas were at risk too.

The most sensitive target of lead poisoning is the nervous system. In children, neurologic deficits have been documented at exposure levels once thought to cause no harmful effects. Exposure to lead can have a wide range of effects on a child's development and behavior. Even when exposed to small amounts of lead levels, children may appear inattentive, hyperactive and irritable. Children with greater lead levels may also have problems with learning and reading, delayed growth and hearing loss. At high levels, lead can cause permanent brain damage and even death.

Lead inhibits the body's ability to make hemoglobin by interfering with several enzymatic steps in the heme pathway. Ferrochelatase, which catalyzes the insertion of iron into protoporphyrin IX, is sensitive to lead. A decrease in the activity of this enzyme results in an increase of the substrate, erythrocyte (EP), in the red blood cells. Lead can induce two types of anemia. Acute high-level lead poisoning has been associated with hemolytic anemia. In chronic lead poisoning, lead induces anemia by diminishing red blood cell survival. [20]

Lead toxicity has endocrine effects. A strong inverse correlation exists between blood lead levels and levels of vitamin D. Because the vitamin D-endocrine system is responsible in a large part for the maintenance of extra-and intra-cellular calcium homeostasis, it is likely that lead impairs cell growth and maturation and tooth and bone development.

Long-term lead exposure has a direct nephropathy effect on the kidney. Impairment of proximal tubular function manifests a fanconi-like syndrome. There is also evidence of an association between lead exposure and hypertension, an effect that may be mediated through renal mechanisms. Gout may develop as a result of lead-induced hyperuricemia, with selective decreases in the fractional excretion of uric acid before a decline in

creatine clearance. Renal failure accounts for 10% of deaths in patients with gout [21]

An increased frequently of miscarriages and stillbirths among women working in the lead trades are reported. Increasing evidence indicates that lead not only affects viability of fetus, but development as well. Developmental consequences of prenatal exposure to low levels of lead include reduced birth weight and premature birth. However, most studies in humans have failed to show a relationship between lead levels and congenital malformations. [22]

Human Exposure in Disadvantage Communities

According to the Alliance to End Childhood lead Poisoning (1995). Environmental and blood lead levels are higher in urban areas than in suburban and rural areas. Poor and disadvantaged populations are more exposed to lead poisoning because poor nourishment increases the amount of ingested lead that is absorbed by the body. Limited water supplies in the body can impede efforts to wash lead out of living spaces. The poor and disadvantaged are more likely to live in neighbor hoods of lead-polluting industries. However, lead poisoning crosses all racial, geographic, and socioeconomic boundaries.

Lead Poisoning Prevention

Lead can harm anyone who swallow or breaths it. Lead poisoning may occur when excessive amounts accumulate in the human body. It is most likely to enter the body as fumes or dust, when it is easily inhaled, or as contamination on hands or face, where it can be swallowed. Poisoning by mouth may occur if personal hygiene is poor. Lead can be swallowed if food, drinks or tobacco are contaminated. Lead is usually not absorbed through the skin.

To avoid paint and dust if you live in a house before 1950, you can have the paint tested especially if it is peeling, flaking or chipped. Use a wet mop with dishwashing soap to clean floors and woodwork. Wash your hands before eating or fixing food. Do not remove lead paint yourself. Removing lead paint causes dust which can harm people. Stay out of your home while lead paint is being removed. Be sure your home is cleaned after the paint is removed. Children should not play in the dirt around the house.

In the area of foods, never heat or cook food in the can it comes in and avoid store food in a can which has been opened. Lead can be found in pottery and dishes from other countries so do not use dishes you think may have lead. Eat good foods which have plenty of vitamins, especially those with calcium and iron. Avoid fatty foods and make sure regular meals are eaten, since more lead is absorbed on an empty stomach.

It is important to keep drinking water safe. Let the water run for one minute before using it to drink or cook. Do not use warm water for cooking or drinking, start with cold water. Warm water running through pipes breaks down the lead.

Finally, talk with your doctor. Testing is recommended for children 9 months to 4 years of age, and as early as 6 months to 6 years and beyond for high risk children. [23]

Do not allow children to chew or suck on painted surfaces such as woodwork, porches, old toys, cribs and other old furniture.

Everyone must be responsible for following strict rules and procedures to reduce the risk of lead poisoning. Education and lead awareness programs for children and parents are desperately needed to protect children, since they are more at risk. More information and data must become available to educators and others. Emphasis should be on primary prevention efforts (i.e., elimination of lead hazards before children are poisoned. Federal rules and regulations must be adhere to with state-wide effort and community working together to wipe out the problem of lead poisoning.

Lead Regulations and Policy

The US Environmental Protection Agency (USEPA) released its final revised lead and copper rule on June 7, 1991. The more traditional regulating approach of setting a maximum contaminant level (MCL) as NPDWR was replaced with a treatment technique using the highest requirements for controlling the target contaminants. The new rule has more stringent criteria for lead in every respect, including source water control, tap water monitoring, and optimum treatment requirements. [24]

Lead in drinking water has been regulated for decades. A non-enforceable drinking water standard for lead was first regulated by the US Public Health Service in 1925. In 1974, Congress passed the Safe Drinking Water Act (SDWA), which requires US Environmental Protection Agency (EPA) to establish nationwide regulations on primary drinking water contaminants. In 1975, EPA was required to propose revised NPDWRs for both lead and copper under the mandate of SDWA amendment of 1986 [25]

The new amendments of the 1986 Safe Drinking Water Act also banned the use of materials containing lead in public water supplies and in house plumbing systems. The amendment requires the use of “lead-free” pipe solder, or flux in the installation or repair of public water systems or in any plumbing system providing water for human consumption. The term lead-free materials is defined as solder or flux with less than 0,2 percent lead, and pipe, faucet and fittings containing less than 8 percent lead [26]

The final lead and copper rule was promulgated by U.S. EPA on June 7, 1991. The more traditional regulating approach of setting a maximum contaminant level (MCL) as NPDWR was replaced with a treatment technique of the highest requirements in the case of the lead and copper rule. This alternative approach was selected because of several special considerations, including: (1) lead and copper levels at consumer’s tap vary with time and locations, (2) lead and copper do not occur in significant amounts in source water but are introduced as a result of corrosion of plumbing materials; and (3) most lead source materials are privately owned and outside public system’s control. Actions levels (Als) for lead and copper are established in the rule. The action levels are exceeded if the level of contaminant in more than 10 percent of the targeted tap samples is greater than 0.015 mg’L for lead and 1.3 mg/L for copper. EPA are also required by SDWA to establish the Maximum Contamination Level Goals (MCLGs) at concentration levels at which not known or anticipated adverse effects would occur. A MCLG of zero for lead and 1.3 mg/L for copper were set by the new rule for optimal tap targets, however, it is not enforced [27]

Under the lead and copper rule, public water systems are required to (1) implement new or improve existing corrosion control that would minimize lead and copper levels at the tap without causing violation any of other

national primary drinking water regulation (i.e., optimal corrosion control); (2) install treatment, if necessary, to reduce lead and copper levels in source water entering the distribution system; (3) replace lead service lines contributing more than 0.015 mg/L of lead action level defined subsequently, and (4) conduct public education if lead levels are above the action level. Systems that can demonstrate lead and copper levels are already minimized would not required to install additional treatment [28]

According to the Alliance to End Childhood Lead Poisoning (1995), the National governments set national policy; provide leadership and funding; build capacity and infrastructure; and set and enforce minimum program requirements. These national governments reach international agreements and supply information to international institutions, local governments, and NGOs. It is necessary that these national governments serve as the critical link for coordination of action and information exchanges between all stakeholders.

Environmental Justice

Environmental Justice is the right to a safe, healthy, productive, and sustainable environment for all, where environment is considered in its totality to include the ecological (biological), physical (natural and built), social, political, aesthetic, and economic environments. Environmental justice refers to the conditions in which such a right can be freely exercised, whereby individual and group identities, needs, and dignities are preserved, fulfilled and respected in a way that provides for self-actualization and personal and community empowerment. This term acknowledges environmental injustice as the past and present state of affairs and expresses the socio-political objectives needed to address them.

Everybody has a right to clean water and clean air, and nobody has a right to degrade and destroy the environment. People deserve healthy communities where children can go out to play, where they can live knowing that everybody must do their part in using and disposing of toxic chemicals properly.

Environmental justice means the pursuit of equal justice, and protection under the law for all environmental statues and regulations without discrimination based on race, ethnicity, and or socioeconomic status. This concept applies to governmental actions at all levels—local, state and federal—as well as private industry activities. There are actually three categories of environmental equity issues. Providing environmental justice includes a guarantee of equal access to relief and meaningful community participation with government and industry decision-makers.

Communities of color in the United States have begun to question the lack of equity that plague their environments. These communities ask why people of color and the poor breathe dirtier air, have high blood lead levels, and have undesirable landfills and incinerators. Very often, the same people perform jobs with the highest environmental risks.

The demands for answers to these questions started the environmental movement. The Principles of Environmental Justice at the People of Color Environmental Leadership Summit on October 27, 1991, in Washington, D.C. indicates that environmental justice affirms the sacredness of “Mother Earth”, ecological unity and the interdependence of all species, and the right to be free from ecological destruction. Environmental justice demands that public policy be based on mutual respect and justice for all peoples, free from any form of discrimination or bias. Environmental justice mandates the right to ethical, balanced and responsible uses of land and renewable resources in the interest of a sustainable planet for humans and other

living things. Environmental justice calls for universal protection from nuclear testing, extraction, production and disposal of toxic/hazardous wastes and poisons and nuclear testing that threaten the fundamental right to clean air, land, water, and food [29]

Environmental justice affirms the fundamental right to political, economic, cultural and environmental self-determination of all peoples. Environmental justice demands the cessation of the production of all toxins, hazardous wastes, and radioactive materials, and that all past and current producers be held strictly accountable to the people for detoxification and the containment at the point of production. Environmental justice demands the right to participate as equal partners at every level of decision-making including need assessment, planning, implementation, enforcement and evaluation. Environmental justice affirms the right of all workers to a safe and healthy work environment, without being forced to choose between an unsafe livelihood and unemployment. It also affirms the right of those who work at home to be free from environmental hazards [30]

Environmental justice protects the right of victims of environmental injustice to receive full compensation and reparations for damages as well as quality health care. Environmental justice considers governmental acts of environmental injustice as violation of international law, the Universal Declaration on Human Rights, and the United Nations Convention on Genocide. Environmental justice must recognize a special legal and natural relationship of Native Peoples to the U.S. government through treaties, agreements, compacts, and covenants affirming sovereignty and self-determination [31]

Environmental justice affirms the need for urban and rural ecological policies to clean

up and rebuild our cities our cities and rural areas in balance with nature, honoring the culture integrity of all our communities, and providing fair access for all to the full range of resources. Environmental justice calls for the strict enforcement of principles of informed consent, and a halt to the testing of experimental reproductive and medical procedures and vaccinations on people of color [32]

Environmental justice opposes the destructive operations of multi-national corporations. Environmental justice opposes military occupation, repression and exploitation of lands, peoples and cultures, and other life forms. Environmental justice calls for the education of present and future generations which emphasizes social and environmental issues, based on our experience and an appreciation of our diverse cultural perspectives [33]

Environmental justice requires that people, as individuals, make personal and consumer choices to consume as little of “Mother Earth’s resources and to produce as little waste as possible; and make the conscious decision to challenge and reprioritize our lifestyles to insure the health of the natural world for present and future generations [34]

Three Categories of Environmental Equity Issues

Procedural Inequity : This issue addresses questions of fair treatment to the extent that governing rules, regulations, and evaluation criteria are applied uniformly. Examples of procedural inequality are stacking boards and commissions with pro-business interests, holding hearings in remote locations to minimize public participation, and using English-only material to communicate to non-English speaking communities.

Geographical Inequity : some neighborhoods, communities, and regions receive direct benefits, such as jobs and tax revenues, from industrial production while the costs, such as the burdens of waste disposal, are sent elsewhere. Communities hosting waste-disposal facilities receive fewer economic benefits than communities generating the waste.

Social Inequity: environmental decisions often mirror the power arrangements of larger society and reflect the still-existing racial bias in the United States. Institutional racism has influenced the siting of noxious facilities and has let many black communities become sacrifice zones.

Summary

In summary, there are several case reports that have implicated lead as a potential renal carcinogen in humans, but the association remains uncertain. Soluble salts, such as lead acetate and lead phosphate, have been reported to cause kidney tumors in rats. Lead affects primarily the peripheral and central nervous systems, the blood cells, and metabolism of vitamin D and calcium. Lead also causes reproductive toxicity. The public must be educated about the dangers of lead. Families must learn how to protect themselves from occupational and environmental sources of lead. Schools have responsibilities in raising public awareness to help prevent lead poisoning. It must also help to build a network of support for developing and sustaining lead poisoning prevention programs.

Since we now know that the neurological damage caused by even low levels of lead is long term and often irreversible, it is no longer acceptable to only identify and attempt to treat already poisoned individuals. The only solution to lead poisoning is to prevent it by controlling lead hazards in the environment before poisoning occurs. Therefore, educators must take an active role in educating the nations teachers and children of the chemically contaminated communities and must warn of the consequences of ignoring the chemical threat of lead in our environment. Schools must structure curriculum that promote a non-toxic environment for all. The role of teachers, parents and communities is to protect its young by having a healthy, safe and orderly environment for all of its children. We must rally around policies, practices and ethics to achieve that end.

Pre-Post Test

Directions: Please write on the blank T if the statement is true, and F and the correct word(s)if the statement is false to make the statement true.

1. Even low levels of exposure to lead can cause long-term effects on learning and behavior in children._____ 2. Only poor or minority populations are in danger of becoming lead-poisoned, especially those in developing countries. _____ 3. Inadequate parental supervision is to blame for the poisoning of poor children. _____ 4. Children are far more likely to be poisoned by the ingestion of dust from lead-based paint than by eating paint chips._____ 5. A successful prevention strategy relies on an interagency, interdisciplinary approach._____ 6. Lead prevention is expensive and unaffordable._____ 7. Lead poisoning will be eliminated when existing sources of lead are eliminated._____ 8. Children under the age of six years are not most susceptible to the harmful effects of lead because their brain/neurological systems are still developing. _____ 9. The

widespread dispersion of lead do not put all populations at risk. _____ 10. Most Cases of lead poisoning go undetected because at lower but still harmful levels only a small percentage of children display obvious symptoms. _____

Answers to Pre-Post Test

1. T, 2. F, No; lead poisoning crosses all racial, geographic, and socioeconomic boundaries, 3. F; Lead, rather than parental behavior, is the case of poisonings. 4. T, 5. T, 6. F; setting priorities and targeting resources make the cost of prevention manageable, 7. T, 8. T, 9. F; The widespread dispersion of lead do put all populations at risk. 10. T

Lesson Plan I: Sources of Lead in Our Environment

Objective: Students will recognize that lead is all around them in the environment

Procedures: Students will be divided into groups of six. Each will represent a source of lead in the environment. For example one will represent lead in the home, another will represent lead in the air, soil, food, etc. Each will give a description of their source and other members of the group will guess that source.

Discussion: After each member presents its description and others discover the source, students will discuss ways of preventing that source in the environment.

Written Assignment : The group will do a written assignment on sources of lead and lead prevention in the environment.

Lesson Plan II: Lead Toxicity

Objective: Students will identify technologies that disperse lead and cause lead poisoning.

Procedures: Students will discuss what it means to be healthy and lead-free. Then they will see a video (Recommendation from Health Department) about affects lead and other chemicals have on the body.

Speaker: A person from the health clinic or another source will come to speak about lead poisoning and lead prevention.

Safe Habits: Students will be introduced to safe habits, such as always wash hands, neck and arms before eating, drinking. Never put soil or chip paint in your mouth. Drink cold water from the faucet.

Parents Workshops: (3) will be scheduled to stress the importance of these habits and others.

Lesson Plan III: It's A Matter of Law

Objective: Students will learn how to debate and come up with possible solutions to get rid of lead in a community.

Procedure: Students will be given a scenario about high lead exposure in their community. They have written the EPA and the Food and Drug Administration and OSHA about a toxic chemical that is being dumped in their community. They think that this is injustice is done because there is a high percentage of blacks in the community. Students will develop a plan of action for solving the problem.

Debate Teams: Students will use debate to facilitate the plan of action (community vs. Government or other responsible agencies or individuals coming up with a solution to present to government or other agencies, etc.?)

Lesson Plan IV: Environmental Justice

Objective: students will learn what environmental justice is and how to become more involve in caring for the planet.

Procedure: Discussion of environmental justice will take place through class discussion. Students will be given research projects to find out about environmental justice. Each student will report their findings during project due dates.

Plans: Strategies will be develop to come up with an action plan for the community. Students will practice safe habits on a regular basis at home, community and school.

Lesson Plan V: Field Trip(s)

Objective: students will take several field trips to learn more about lead prevention.

Procedure: Student will visit a hospital, health facility or a community, state, or federal forum on lead to learn more about it. They will write in their journals and read books about the environment.

Homework: Parents and students will come up with a project for Global Environment Day in April.

Teacher Resources

To receive a free copy of the following publications, contact the National Lead Information Center at (800) 424-5323.

Survey of State Lead Laboratory Accreditation Programs , EPA 747-R-96-010, November 1996. This survey of laboratory accreditation issues pertaining to the analysis of paint chips, dust, and soil for lead found that almost fifty percent of the states currently use the EPA National Lead Laboratory Accreditation Program.

Fact Sheet, Identifying Lead Hazards in your Home, EPA-747-F-96-007, November, 1996. This fact sheet summarizes EPA's key messages and recommendations to help the public better address lead hazards in and around their homes.

New Educational Materials

Bright Future: An action guide for families of lead-poisoned children. This is a visual communication too designed by the California Childhood Lead Poisoning Branch to help health professional address the questions and concerns of parents whose children are lead poisoned. ***Bright Futures*** consists of 19 colorful picture cards that illustrate key lead poisoning concepts. On the back of the card, key points in English and Spanish prompt the health professional to discuss lead poisoning topics. For more information, contact Kathryn Ficke at (510) 450-2418.

The New Hamsphire Office of Health Management has developed pamphlets and fact sheets on occupational lead exposure for employers, workers, physicians, and the community. For free copies, contact Lynda Thistle-Elliott at (603) 271-4871 or write to Occupational Disease Surveillance, 6 Hazen Drive, concord, NH. 03301.

NLIC Clearinghouse Material Listing includes all of the materials available free or on loan from the National Lead Information Center. You may obtain the most recent copy of this list by calling (800) 424-LEAD and requesting the NLIC list of distribution materials. This information is also available as an interactive order form on Web site at http://www.nsc.org/ehc/lead.htm

Student Reading List

Sadako and the Thousand Cranes . The true story of a young girl who died of leukemia ten years after being exposed to radiation when the atom bomb was dropped on Hiroshima.

Teacher Reading List

Dumping in Dixie: Race, Class and Environmental Quality. Bullard, R. D. 1990. Westview Press. Boulder CO. Describes connections between environmentalism and social justice. Chronicles the efforts of five African American communities to fight environmental hazards. Provides action strategies.

EPA Journal, 18(1). A special issue addressing environmental justice. Topics include defining the issue, expanding the dialogue between communities of color and mainstream environmental groups and governmental agencies, background research, grassroots environmental movements, and steps taken at EPA.

From Toxic Racism to Environmental Justice. Grossman, Karl, 1992. E: The Environmental Magazine. Vol. 3, No. 3, 1992. Concise, non-academic summary of the history of the environmental justice movement.

Race and the Incidence of Environmental Hazards: A Time for discourse. Bryant, Bunyan & Mohai, Paul. (eds.), 1990. Westview Press, Boulder, C. 16 articles reviewing the differential impacts of environmental insults on people of color. Author illuminate the failure of traditional, political, economic, and environmental institutions to address these life-threatening conditions and advocate new approaches for creating environmental justice.

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