Environmental Health in Child Care Training Module version 4

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NOTE TO TRAINER

This Module presents information about many areas of environmental health as it relates to children in child care. Please note that the material on lead in the child care environment has been removed from this Module and may be found in a separate Module, *Environmental Health in Child Care: Lead,* which is part of a Trainer's Toolkit on the topic. The Toolkit on lead contains learning activities, a Trainer's Guide to leading training sessions, PowerPoint slides, and materials for participants' packets. Additional activities relating to the other topics in this Module are included in the *Environmental Health in Child Care* Trainer's Toolkit.

For more information about using the NTI materials, please read "Guidelines for Using the NTI Curriculum Materials," available in the "Curriculum" section of the NTI Resources Website (accessed by entering your NTI username and password at http://sakai.unc.edu).

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LEARNING OBJECTIVES

After reading this Module, Trainers will be able to:

- Describe why children are uniquely vulnerable to environmental hazards
- Identify the leading environmental health risks to children
- Describe the effects of exposure to environmental hazards on children's health
- List ways to prevent and manage exposure to environmental hazards
- Develop an environmental health assessment tool for use in a child care setting
- Identify preventive actions and resources in the child care setting
- Describe how child care health consultants can promote a healthy child care environment through program policy, health education and community advocacy

INTRODUCTION

Trends in Environmental Health

Over the past century, chronic diseases have replaced infectious diseases as the leading cause of sickness and death for children. Asthma is now the leading cause of hospitalization, and cancer is the leading cause of death among children (Landrigan, 2001). Evidence suggests that environmental factors, such as exposure to toxic substances and pollution, may play an influential role in the emergence of these new risks (GBPSR, 2000; Crain, 2000; Moyers, 2001). Consider the following figures:

- Asthma rates for children under age 5 increased slightly from 5.7 to 6 percent in the period from 2001-2011 (CDC, 2011).
- Childhood cancer rates increased from 11.5 to 14.8 cases per 100,000 over the last 20 years (National Cancer Institute, 2008).
- Rates of infants born with low birth weight since the 1980s continue to rise, despite prevention efforts (CDC, 2012).
- Rates of infants born with serious heart defects and urinary tract obstructions increased in the last decade (CDC, 2012).
- Rates of disruptive behavior, hyperactivity, slowness to learn, learning disabilities, and autism among school age children rose significantly over the last two decades (Greater Boston Physicians for Social Responsibility [GBPSR], 2000).

Only about 25% of the thousands of newly-developed chemicals receive thorough testing for harm to human health and even fewer chemicals are tested for toxicity to the child's developing brain. Many have never been tested at all (Moyers, 2001). The EPA estimates over a quarter of all chemicals have neurotoxic potential (GBPSR, 2000). Of particular concern are environmental contaminants such as lead, mercury, and synthetic chemicals like pesticides (Crain, 2000; Monks, 1997; Moyers, 2001).

Low levels of exposure to many chemicals are unavoidable, but we know little about the risks of such exposures. Scientists are frequently unable to distinguish which chemicals might be dangerous because people are exposed to so many simultaneously. Moreover, chemicals in the environment may interact synergistically such that their combined effect is greater than the sum of effects of individual chemicals.

Environmental Concepts

Most often people think of the environment in terms of the natural environment, which includes features such as soil, water, air, plant and animal wildlife, and the weather. However, the environment also encompasses the human-made or built environment, which includes features such as housing, workplaces, school and child care facilities, transportation, industry, and agriculture. Environmental health concerns demand an awareness of indoor air quality, pest control (insects, mildew, rodents, weeds), and building construction materials (Sattler et al., 2001).

The principal factors influencing the effect of environmental toxins on human health are:

- The amount or degree of exposure to the toxin (dose)
- The duration of the exposure
- The toxicity or strength of the toxin itself
- Organism factors, such as the age, sex, and health status of the person exposed

These concepts are important for understanding children's special vulnerability to environmental toxins because a number of child (organism) factors influence both the amount and duration of toxins to which a child is exposed.

The Role of the CCHC

The child care health consultant (CCHC) can play an important role in mitigating child and staff exposure to environmental hazards in the child care environment. The CCHC should be well-grounded in preventive actions, well acquainted with the *Caring For Our Children* standards (see the following section for a list of relevant standards) and state regulations regarding environmental health in child care, and up to date with changes in Environmental Protection Agency (EPA) federal regulations.

In the field of environmental science, where information develops rapidly and highly technical expertise is often required, an important role of the CCHC is to mediate communication between child care staff and environmental health specialists. Child care issues must be highlighted for environmental health specialists, and environmental health information may need interpretation and clarification for child care staff. One excellent tool that CCHCs can use in their education efforts is a teaching guide and accompanying slide presentation about reducing environmental risks in child care settings created by Healthy Indoor Air for America's Homes. These materials are available online at: http://www.healthyindoorair.org/

To accomplish the task of communicating to caregivers/teachers about environmental health risks, the CCHC must:

- Learn about the environmental risks and resources for his/her area, including environmental health experts willing to work with child care caregivers/teachers
- Understand and be able to communicate key environmental health concepts
- Remain sensitive to the perspective and needs of the child care staff regarding environmental issues, standards, and action items.

The sheer volume and ever-changing nature of environmental risk information can be overwhelming. The CCHC's role is to assist the child care caregivers/teachers to:

- Identify and prioritize the most critical environmental hazards that child care programs should address (this includes how to evaluate media information about environmental risks, see Thompson, 2000)
- Establish policies for managing these hazards
- Develop strategies for implementing the policies

Assessment of Environmental Health Risks

A major role of the CCHC is to help the staff assess actual and potential environmental risks in the child care setting. In addition to adequate knowledge of the risks, strong observational and interviewing skills are critical for this task. The following sources may provide a starting point for completing an environmental health risk assessment:

- Early Childhood Environmental Rating Scale – Revised: http://ers.fpg.unc.edu/
- National Association of the Education of Young Children's Accreditation Review: http://www.naeyc.org/accreditation/
- EPA's Indoor Air Quality Tools for Schools Action Kit: http://www.epa.gov/iaq/schools/actionkit.html
- Sample Pest Management Survey in the report Poisoned Schools: Invisible Threats, Visible Actions (Center for Health, Environment, and Justice, 2001): http://www.beyondpesticides.org/schools/publications/Poisoned_Schools.pdf
- Help Yourself to a Healthy Home: http://www.hud.gov/offices/lead/library/hhi/HYHH_Booklet.pdf
- How Asthma-Friendly is Your Child Care Setting? Checklist: http://www.nhlbi.nih.gov/health/public/lung/asthma/chc_chk.htm

Advocacy

CCHCs are well positioned to encourage and support good environmental practices in child care facilities, the community, and the state. Just a few examples are presented below.

In the child care facility, the CCHC can:

- Incorporate environmental themes into presentations for caregivers/teachers and parents/guardians.
- Work with child care staff to make child care facilities models of effective Integrated Pest Management techniques.

In the community, the CCHC can:

- Advocate for a healthier community water supply.
- Ask the local school board about pest control policies in schools and encourage the adoption of Integrated Pest Management techniques.
- Work with local authorities to restrict/reduce community sanctioned spraying of pesticides both within the community and in surrounding areas.

In the state, the CCHC can:

- Petition state pesticide officials to create a state-wide pesticide sensitivity list.
- Petition for removal or management of lead paint in lower income neighborhoods.
- Monitor legislation on environmental issues that affect children. Develop mechanisms (e.g., advocacy groups) for actively supporting legislation that protects children and opposes legislation that may incur harm.

CARING FOR OUR CHILDREN NATIONAL STANDARDS (3rd ed., 2011)

Caring for Our Children: National Health and Safety Performance Standards: Guidelines for Early Care and Education Programs (*CFOC*) is a set of 686 attainable standards that are intended for use by health care professionals, trainers, regulators, caregivers/teachers, academics and researchers, parents/guardians, and others "who work toward the goal of ensuring that all children from day one have the opportunity to grow and develop appropriately, to thrive in healthy and safe environments, and to develop healthy and safe behaviors that will last a lifetime" (*CFOC* 3rd ed., 2011, p. xxi). These standards, supported by the Maternal and Child Health Bureau, were developed by the American Academy of Pediatrics, the American Public Health Association, and the National Resource Center for Health and Safety in Child Care and Early Education.

The following is a list of the standards relating to environmental health in the child care environment, along with a short description and the page number in *CFOC* on which the standards can be found. All listed standards are referenced throughout this Module.

3.1.3.2 – Playing Outdoors, p.93
States that all children should play outdoors when conditions do not pose a safety or health risk.

3.4.1.1 - Use of Tobacco, Alcohol and Illegal Drugs, p.118
Prohibits the use of tobacco, alcohol or illegal drugs on the premise of the facility or during paid time, including break time.

5.1.1.5 - Environmental Audit of Site Location, p. 200
States that an environmental audit should be conducted before construction of a new building, renovation or occupation of an older building, or after a natural disaster. Also lists several topics which should be included in the environmental audit.

5.2.1.1 – Fresh Air, p.211
States that as much fresh air as possible should be provided in room occupied by children.

5.2.1.2 - Indoor Temperature, p.212
Lists the temperature ranges that should be maintained during either summer or winter months.

5.2.1.3 - Heating and Ventilation Equipment Inspection and Maintenance, p.212
States that all heating and ventilating equipment should be cleaned and inspected before each heating and cooling season. Also states that systems should be used according to operating instructions and be certified to comply with local building codes.

5.2.1.4 - Ventilation When Using Art Materials, p.213
States that areas where art activities are conducted should be ventilated and that materials which can create toxic fumes should not be used in the facility.

5.2.1.6 – Ventilation to Control Odors, p.213
States that specific odors should be controlled by ventilation and appropriate cleaning and disinfecting.

5.2.1.8 - Maintenance of Air Filters, p.214
States that filters in forced-air heating and cooling system equipment should be checked and cleaned and replaced according to the manufacturer's instructions.

5.2.1.10 - Gas, Oil or Kerosene Heaters, Generators, Portable Gas Stoves and Charcoal and Gas Grills, p.214
States that gas cooking appliances and charcoal grills should not be used for heating purposes; portable open-flame space heaters should be prohibited.

5.2.1.13 – Barriers/Guards for Heating Equipment and Units, p.216
Specifies what type of equipment should be made inaccessible to children by using barriers/guards.

5.2.1.15 - Maintenance of Humidifiers and Dehumidifiers, p.216
States that humidifiers and dehumidifiers used in the facility should follow the manufacturer's cleaning, drainage and maintenance instructions to avoid the growth of mold and bacteria.

5.2.2.3 - High Intensity Discharge Lamps, Multi-Vapor and Mercury Lamps, p.218
States that high intensity discharge lamp, multi-vapor and mercury lamps should not be used for lighting the interior of buildings unless provided with special bulbs that self-extinguish if the outer glass envelope is broken.

5.2.6.1 - Water Supply, p.221
Highlights need for facility to provide an adequate supply of water for cooking, cleaning, drinking, toilets and outside uses.

5.2.6.3 – Testing for Lead and Copper Levels in Drinking Water , p.222
States that drinking water should be tested and evaluated in accordance with the assistance of the local health authority or state drinking water program to determine whether lead and copper levels are safe.

5.2.6.5 - Emergency Safe Drinking Water and Bottled Water, p.223
Highlights the importance of providing emergency safe drinking water during interruption of the regular approved water supply.

5.2.6.6 - Water Handling and Treatment Equipment, p.223
States that newly installed water handling, treatment, filtering or softening equipment should meet applicable National Sanitation Foundation (NSF) standards.

5.2.6.7 – Cross-Connections, p.224
Lists three situations the facility must avoid in order to prevent contamination of the potable water supply.

5.2.6.8 - Installation of Pipes and Plumbing Fixtures, p.224
Highlights that each gas pipe, water pipe, gas-burning fixture, plumbing fixture and apparatus should be properly installed and free from defects or obstructions.

5.2.8.1 - Integrated Pest Management, p.226
Outlines components of an integrated pest management plan, including pest monitoring, pesticide use and record keeping.

5.2.9.1 - Use and Storage of Toxic Substances, p.228
Outlines eight categories of toxic substances and examples of their use and storage.

5.2.9.3 - Informing Staff Regarding Presence of Toxic Substances, p.229
Outlines materials that employers should provide staff regarding toxic substances and labeling for hazardous substances.

5.2.9.4 - Radon Concentrations, p.230
States that radon concentrations inside a home or building used for child care must be less than four picocuries per liter of air.

5.2.9.6 - Preventing Exposure to Asbestos and Other Friable Materials, p.231
States that any asbestos, fiberglass or other friable material or any material that is in a dangerous condition found within a facility or on the grounds of the facility should be repaired or removed by a certified contractor.

5.2.9.7 - Proper Use of Art and Craft Materials, p.231
States that only art and craft materials that are approved by the Art and Creative Materials Institute (ACMI) should be used in the child care facility.

5.2.9.9 – Plastic Containers and Toys, p.232
States that facilities should not use infant bottles, plastics containers, and toys that contain Polyvinyl chloride (PVC), Bisphenol A (BPA), or phthalates.

5.3.1.6 - Floors, Walls and Ceilings, p.240
States that floors, walls and ceilings should be in good repair and easy to clean when soiled.

5.7.0.10 - Cleaning of Humidifiers and Related Equipment, p.261
Highlights that humidifiers, dehumidifiers and air-handling equipment that involve water should be cleaned and disinfected according to manufacturer's instructions.

9.2.3.9 – Written Policy on Use of Medications, p.358
Details the components that a facility should include in their written policy for administration of any prescription or non-prescription medication.

9.2.3.15 - Policies Prohibiting Smoking, Tobacco, Alcohol, Illegal Drugs and Toxic Substances, p.363
States that facilities should have written policies addressing the use and possession of tobacco products, alcohol, illegal drugs and other toxic substances. Also specifies key pieces of information that should be contained in these policies.

Appendix K - Guide for Cleaning, Sanitizing and Disinfecting, p.442

Provides timeline, in grid format, for cleaning, sanitizing and disinfecting surfaces, equipment and utensils associated with food; child care; toileting and diapering; and sleeping areas.

WHAT THE CCHC SHOULD KNOW: CHILDREN'S UNIQUE VULNERABILITY TO ENVIRONMENTAL HAZARDS

Scientists are just beginning to discover how dangerous some environmental hazards are to human health, but one finding appears clear: children are far more susceptible to the effects of environmental hazards than most adults.

Like adults, children take in environmental toxins by ingesting them, inhaling them, or through skin exposure. For example, children ingest the residue of pesticides, mercury, or other toxic agents in their food or drinking water; they breathe air pollutants such as asbestos or lead dust into their lungs, and they absorb solvents and cleaning solutions through their skin. However, unlike adults, certain characteristics of infants and young children increase the amount and duration of their exposure to the same toxins.

The understanding of children's unique vulnerabilities provides a powerful tool for change. The role of the CCHC is to encourage and support this understanding among child care staff.

Factors that Increase Children's Exposure to Environmental Toxins

Children's Developmental Characteristics and Lifestyles

More Contact with the Ground: Because of their physiological immaturity and the type of developmental activities in which they engage, infants and young children spend a large portion of their time closer to the ground than adults. Before they can walk, infants are often placed on floors/carpeting or grass to encourage movement and exploration. Many of the activities of crawlers take place on the floor, carpeting, grass, and playground surfaces. As a result, they have more exposure to toxins that are applied to or settle on these surfaces, such as formaldehyde and volatile organic chemical (VOC) vapors from carpets, lead-based paint dust, cleaning product residues, fertilizers, herbicides, and pesticides. Gitterman and Bearer (2001) points out young children are also at greater risk than adults because their breathing zones (the area in space where individuals breathe) are closer to the ground. Adult breathing zones are typically four to six feet from the ground. For children, however, the breathing zone is often within the one to two foot range.

More Time Outdoors: Although the amount of time children spend outdoors may have decreased in recent years, they still spend relatively more time outdoors than adults, and the time spent is more likely to be active, which requires deeper breathing. Children also breathe frequently through their mouths, bypassing nasal filtering. All of these characteristics make children more susceptible to any air pollutants in the environment than adults.

More Hand to Mouth Activity: Young children explore the world orally by putting things in their mouths. This developmentally appropriate behavior significantly increases their opportunity for direct ingestion of pollutants. This could include lead-based paint dust and pesticide residue.

Less Varied Diet: A child's diet is less varied than that of an adult. For example, the early diet of infants is generally limited to breast milk or formula. The average one-year-old drinks twenty-one times more apple juice, eleven times more grape juice, and nearly five times more orange juice per unit of body weight than the average adult. Infants and children also drink two and a half times more water daily than adults as a percentage of their body weights (Sly & Flack, 2008). If these foods, including breast milk and formula, contain contaminants, children will have greater exposure than adults because the foods constitute a larger proportion of their diet.

Children's Biological Immaturity

Higher Metabolic Rate: Because children are physically smaller than adults, their metabolic rate is higher. As a result, they breathe more rapidly and take in proportionally more oxygen. They also consume more food and water relative to their size than adults; thus, they obtain a greater proportionate dose of any pollutants available in air, food, or water than adults. Infants who receive formula, for example, consume far more water for their body weight than adults making any contaminants, such as lead, in tap water a particular concern for formula-fed infants (Gitterman and Bearer, 2001).

Higher Rate of Absorption: Children absorb the pollutants they breathe and consume at a higher than that of adults. Often this is advantageous. For example children need more calcium than adults to support bone growth, and they also absorb more calcium than adults do from the same food sources. However, as Gitterman and Bearer (2001) points out, this enhanced absorption can also significantly increase their intake of contaminants:

> Lead, because it is absorbed in place of calcium when it is present, is absorbed to a greater extent in children than in adults. An adult will absorb 10% of ingested lead, whereas a one- to two-year-old child will absorb 50% of ingested lead. (p. 20)

Less Able to Excrete Toxins: Children's metabolic systems are still developing so they are less capable of counteracting toxic effects than adults. For example, infants are unable to excrete toxins or store them in fatty tissues as well as adults, which may increase the length of exposure to toxins. In adults the blood-brain barrier protects the brain from potentially toxic chemicals circulating through the body. This barrier is not fully developed in infants until 6 months of age. Finally, children's respiratory passages are narrower than adults, meaning that irritation caused by air pollution can result in more airway obstruction.

Children's Sensitive Periods of Rapid Organ Development

The period of infancy and early childhood is characterized by rapid organ development. Exposures to toxins during the time an organ is undergoing development may have drastic effects on the outcome of that development. For example, animal tests of pesticides show that even small, single doses during a critical 24 hour period of brain development can cause hyperactivity and permanent changes in the brain (GPBSR, 2000).

Gitterman and Bearer (2001) summarizes the environmental risk factors for children at different stages of development in Table 1 on the following page.

Table 1: Environmental Risk Factors for Children at Different Stages of Development, adapted from Gitterman and Bearer (2001)

Developmental Stage	Developmental Characteristics	Exposure Pathways	Biological Vulnerabilities
Newborn (0 to 2 months)	Nonambulatory Restricted environment High calorie/water intake High air intake Highly permeable skin Alkaline gastric secretions (Low gastric acidity)	Breast milk Infant formula Food Indoor air Tap/well water in home	Brain Cell migration Neuron myelination Creation of neuron synapses Lungs Developing alveoli Rapid bone growth and hardening
Infant/Toddler (2 months to 2 years)	Beginning to walk Oral exploration Restricted environment Increased time away from parents/guardians Minimal variation in diet Increased outdoor time	Food Baby food Milk and milk products Indoor air Layering effects Tap/well water in home and child care facility Surfaces Rugs Floors Lawns	Brain Creation of synapses Lungs Developing alveoli
Preschool Child (2 to 6 years)	Language acquisition Group and individual play Growing independence Increased intake of fruits and vegetables Active outdoor play	Food Fruits, vegetables Milk and milk products Indoor/outdoor air Child care/preschool Water Tap/well Water fountains	Brain Dendritic trimming Lungs Developing alveoli Increasing lung volume

WHAT THE CCHC SHOULD KNOW: SIGNIFICANT ENVIRONMENTAL HEALTH RISKS FOR CHILDREN

Children are exposed to environmental contaminants every day, all day. Some risks, such as exposure to tobacco smoke, are relatively clear cut; whereas others, such as long term, low level exposures to many chemicals simultaneously, are more complex, difficult to demonstrate and, therefore, relatively untested.

When tested and regulated, chemical exposure risks are estimated for only one chemical at a given a time. However, exposure to multiple chemicals at the same time may increase the effects of these toxins. Children are exposed to many toxicants in complex mixtures throughout development (GBPSR, 2000).

New information regarding environmental hazards appears almost daily in the media. In assessing such information, the CCHC should keep the following cautions in mind:

- Where is the information coming from and is the source trustworthy?
- How many studies back up a finding of an association between an environmental substance and a harmful effect?
- How strong is the association between the apparently harmful substance and the effect created?
- Does increasing the "dose" or exposure of the toxin increase the chance of harmful effects?
- Does the harmful effect produced make sense given what we know about human biology?

With respect to preventing environmental risks in child care settings, Fiene (2002) summarizes current thinking in the following statement:

> "Risk cannot be entirely eliminated in any environment, but it can be significantly reduced…The prevention and management of environmental hazards in the child care center is possible with attention to the following: knowing the composition of building materials and products used within the center, watching for and eliminating hazards regularly, being familiar with the local health department, finding out who can answer questions and asking them frequently, and using common sense (p. 93)."

Among the hundreds of potential environmental risks present in today's world, the scientific community tends to agree with Sly & Flack (2008) that the most significant environmental health hazards for preschool age children are: lead, air pollution, environmental tobacco smoke, pesticides, and drinking water contamination (Crain, 2000; Gratz and Boulton, 1993; Landrigan, 2001). The risks involved with these substances are presented in more detail below.

For each risk, the section will address:

- The source(s) of the pollutant in the child care environment
- Routes of exposure
- Health effects of exposure for preschool-age children
- Detection of the pollutant in the child care environment
- Actions for prevention and management

The next three sections of this Module will address key environmental hazards for young children: air pollution, including environmental tobacco smoke; pesticides; and drinking water contamination. For detailed information about lead poisoning, please see the *Environmental Health: Lead* Module and Trainer's Toolkit. This can be accessed from the NTI Resources Website (accessed by NTI graduates at http://sakai.unc.edu).

AIR POLLUTION

Sources of Air Pollution in the Child Care Environment

Typically, multiple pollutants are involved in any given measure of indoor or outdoor air quality.

Outdoor Air

Outdoor air quality is influenced by chemicals and particles from sources such as factories, power plants, dry cleaners, cars, buses, trucks, agricultural activities, and even windblown dust. The proximity of the child care facility to industrial or agricultural sites and/or highways and the ambient air quality for the respective geographical region present the major hazards for outdoor air pollution. Ambient air quality has improved since the enactment of the Clean Air Act in 1970 and the Clean Air Act Amendments in 1990. Yet as recently as 2009, 59 percent of American children lived in areas that did not meet at least one of the Primary National Ambient Air Quality Standards (America's Children, 2011). Emission standards were developed for 189 known air pollutants, most notably: ozone (smog), breathable particulate matter, lead, sulfur dioxide, carbon monoxide and nitrogen oxides. However, only a few air pollutants are regularly monitored in assessments of air quality (AAP, 1999).

Indoor Air

Indoor air quality drew increased attention in recent years due in large part to improvements in housing construction. Improvements to reduce energy costs also reduced airflow between inside and outside. As a result, indoor air pollutants are more likely to become trapped and accumulate to unhealthy levels. Also, new synthetic materials used in furnishings, building construction, and everyday household products introduce additional contaminants into the indoor environment. For example, durable press fabrics used in draperies, carpets, and pressed wood and fiberboard furnishings (shelving, cabinets, furniture) can be sources of formaldehyde in the home.

The EPA and the U.S. Consumer Product Safety Commission (1995) warn that air within homes and other buildings is often more seriously polluted than the outdoor air in even the largest industrialized cities. This information, coupled with evidence that children spend as much as 90% of their time indoors means that children's exposure to indoor air pollutants may be 2-5 times higher, and sometimes 100 times higher, than their exposure to outdoor air pollutants (U.S. Department of Health and Human Services, 2000; EPA, 2002a).

Relatively few studies of indoor air quality have been conducted in child care centers, but those that have confirm this estimate. UC Berkeley researcher Asa Bradman recently led a groundbreaking study on environmental quality in early childhood education environments. Bradman's team used a variety of sampling and analytical methods to test the indoor air and floor dust of 40 child care facilities, including centers and home-based programs, in California's Alameda and Monterey counties. Their report (Bradman et al., 2012) is the first and only of its kind to measure and analyze a broad spectrum of pollutants inside U.S. child care centers.

Bradman's report builds on a limited body of work that offers some additional insight. The

first large-scale effort came in 2003 from the EPA, in a report fittingly titled *First National Health Survey of Child Care Centers* (Marker et al.). The study examined 168 child care centers across the country to calculate the prevalence of lead-based paint (estimated at 28%) and other lead hazards in child care centers nationwide. In 2004 came another report, *Measuring Environmental Hazards in the Childcare Industry: Pesticides, Lead, and Indoor Air Quality* (Boise et al.). The study hinged on a survey administered to 748 child care providers in three Central California counties. It identified a number of areas of concern, especially around pesticide use, asthma triggers, and lead paint.

The indoor air pollutants of greatest concern for children and the potential sources of the pollutants in the child care environment are summarized in Table 2 on the following page. For more complete information on specific indoor air pollutants, see the EPA's guide to typical indoor air pollutants, located online at: http://www.epa.gov/iaq/schools/tfs/guidee.html.

Table 2: Sources of Indoor and Outdoor Air Pollution in the Child Care Environment[1]

Pollutant	Description	Sources
Environmental Tobacco Smoke	The mixture of smoke given off by the burning end of a cigarette, pipe, or cigar, and the smoke that is exhaled by the smoker	Cigarette, pipe and cigar smoke
Radon	Naturally occurring radioactive colorless and odorless gas produced by the decay of uranium	Earth and rock beneath buildings; well water; building materials. Radon is more prevalent in mountainous and rocky regions. It seeps into buildings from the soil beneath and is usually found in highest concentrations in basements
Biological Contaminants	Mold, dust mites, pet dander (skin flakes), cockroaches, rodents and other pests or insects	Found most often in areas associated with food and moisture or water (e.g., kitchens, humidifiers, unvented bathrooms); areas where dust collects (e.g., draperies, bedding, carpet)
Combustion By-Products	Gases (such as carbon monoxide, nitrogen oxides, sulfur dioxide) and particles generated from burning materials	Gas or wood ranges, stoves, furnaces and space heaters that are not vented to the outside, as well as auto, truck or bus exhaust from attached garages, nearby roads, factories and power plants, and idling vehicles in parking areas
Volatile Organic Compounds (VOCs)	Liquids or solid chemicals that contain carbon and vaporize at normal room temperatures	Gasoline, household cleaning products (rug and oven cleaners), air fresheners, adhesives, paints and lacquers, paint strippers, dry-cleaning fluids, building insulation, pressed wood products used in building and furniture construction, and graphics and craft supplies such as glues and permanent markers
Particulate Matter	Smoke, soot and dust particles suspended in the air. Dust particles may contain lead, pesticide residues, asbestos, or other toxic materials. When inhaled, these fibers are often small enough to be breathed deep into the lungs where they can attach and accumulate	Soil, fleecy surfaces, pollen, lead-based paint, burning wood, oil, or coal, automobile exhaust, factories

[1] Material adapted from: U.S. Environmental Protection Agency, Indoor Air – Schools. IAQ tools for schools kit – IAQ reference guide. 2009. Available from: http://www.epa.gov/iaq/schools/tfs/refguide_toc.html.

Routes of Exposure
Children and adults are exposed to air pollutants principally by inhaling them.

Health Effects of Air Pollution Exposure

Acute Effects
Most often, the immediate effects of exposure are associated with respiratory disorders. The principal symptoms are: watery eyes, burning sensations in the eyes, nose and throat, nasal congestion, chest tightness, difficulty breathing, irregular breathing, coughing, and wheezing. Other signs are headaches, dizziness, weakness, fatigue, and chest pain (AAP, 1999).

Recommended Immediate Response to Acute Symptoms of Air Pollution

When children exhibit symptoms commonly associated with air pollutants the following actions should be taken immediately:

- Identify suspected pollutants (see Table 2 on the previous page).
- Remove or decrease exposure to the suspected air pollutants. Either remove suspected polluting agent or remove child(ren) from the environment.
- If pollutant is indoors, increase ventilation. Open windows and doors to the outside.

(AAP, 1999)

Chronic Effects
In addition to the acute effects described above, which are usually temporary, air pollution is associated with the more serious long-term health problems such as asthma, cancer, and respiratory infections. All long-term effects depend upon the amount and length of exposure.

Asthma: Asthma is the leading serious chronic illness of children in the U.S. In 2006, an estimated 6.8 million children under age 18 (almost 1.2 million under age 5) currently had asthma. Many other children have undiagnosed asthma (American Lung Association, 2008)**.** Based on a 2011 NHIS sample (cite), it was estimated that 39.5 million Americans, or 129.1 per 1,000 persons, had been diagnosed with asthma by a health professional within their lifetime; 8.7 million out of this estimate are children between 5-17 years of age.

Children with asthma have sensitive airways in their lungs that are easily inflamed, producing a chain of events that make it difficult to breathe. Often ordinary indoor and outdoor air pollutants such as those listed in Table 2 are "triggers" to the onset of asthma attacks and increase the severity of the asthma inflammation. Illness, such as the common

cold, can also be a trigger for asthma.

The most common triggers for asthma are:

- Dust mites, molds and mildew, animal dander, pets and pests (e.g., cockroaches, mice, rats). These triggers are commonly referred to as allergens: substances capable of causing an allergic reaction because of an individual's sensitivity to that substance.

- Smoke from cigarettes, wood fires, and charcoal grills; fumes from household cleaners, paints, perfumes, gasoline, and art supplies with odors. These triggers are irritants for people in general but are especially hazardous for people with asthma.

(Asthma and Allergy Foundation of America, 2001, 2002; EPA, 2008b)

Outdoor air pollution, such as high ozone, not only may trigger the onset of asthma attacks and/or increase the severity of the attacks (Tzivian, 2011), but outdoor air pollution is also associated with the development of asthma (McConnell, et al., 2002).

Cancer: Exposure to tobacco smoke is considered the leading cause of lung cancer (see the following page). Radon is the second leading cause, accounting for 10% of all cases (EPA, 2002a). Radon is a radioactive substance, and particles breathed into the lungs continue to release radiation as they further decay. Particulate matter from asbestos and combustion activities, such as wood and coal burning, is also associated with lung cancer, along with chest and abdominal cancer. Recent evidence suggests that long-term exposure to even ordinary everyday levels of metropolitan particulate air pollution is associated with increased risk of lung cancer and heart and lung disease (Pope et al., 2002). Some volatile organic compounds such as formaldehyde are also considered potential cancer-causing agents (EPA, and American Lung Association, 2002).

Respiratory Infections: In addition to environmental tobacco smoke, nitrogen dioxide and other fumes and particles from combustion appliances (kerosene heaters and gas or wood stoves) are associated with a higher frequency of respiratory infections in young children (Fuentes-Leonarte et al., 2009).

Cognitive Performance: Myhrvold, Olsen, and Lauridsen (1996) measured 800 students' health symptoms and their ability to concentrate under different levels of classroom air pollution. (Again, CO_2 was used as a general indicator of indoor air pollution.) They found that in classrooms where CO_2 levels were high, students showed significantly poorer concentration and reported more health symptoms. The authors concluded that indoor air quality can have a major impact on students' academic performance.

Environmental Tobacco Smoke:
A Special Case of Indoor Air Pollution

Environmental tobacco smoke (ETS), also known as secondhand smoke, is just one of the major air pollutants, but it is prioritized as an environmental threat due to its potential toxicity to children. ETS contains over 3000 different chemical compounds, 60 of which are known carcinogens and respiratory irritants (National Cancer Institute, 2000). The EPA claims that there is a strong association between ETS and lung cancer and has classified ETS as a Group A carcinogen, designating it one of the most dangerous cancer-causing agents in humans (Boffetta, Tredaniel & Greco, 2000).

ETS is also associated with a higher incidence of bronchitis, pneumonia, otitis media, and respiratory illnesses in young children The EPA estimates that ETS annually causes 150,000 to 300,000 respiratory infections in infants and toddlers alone, which results in 7,500 to 15,000 hospitalizations each year (Cheragi & Salvi, 2009). Children with asthma are especially at risk. For these children, exposure to secondhand smoke results in more frequent asthma episodes and more severe symptoms during attacks. Environmental tobacco smoke is also believed to activate the disease in children who were previously non-asthmatic.

The frequency/severity of ETS-related asthma and respiratory diseases appear to be correlated with the amount of exposure a child receives. Thus, children from homes with two smoking parents/guardians suffer more infections than those from homes with one smoking parent/guardian, and children from either one or two-parent/guardian smoking homes have more infections than children from homes where neither parent/guardian smokes (EPA, 2008).

Detection of Air Pollution in the Child Care Environment

Child Symptoms

Symptoms can provide a useful indicator of air pollution problems (AAP, 1999). As mentioned above, the acute effects of air pollutants are usually irritations to the respiratory system, headaches, nausea, and dizziness. Unfortunately, these manifestations are also the symptoms of common allergies, respiratory infections, and flu. Furthermore, when symptoms occur, multiple pollutants may be involved simultaneously. The key to detection is that symptoms usually abate when the toxic exposure is eliminated. The important step is to note the time and place where symptoms occur and whether a number of children are affected (although some children are much more sensitive to certain pollutants than others). For example, if symptoms like those described above occur in the child care environment only after the carpeting and wall paneling were professionally cleaned, and the symptoms subside when children leave the building, air pollution associated with these cleaning activities may be a cause.

Identifying Outdoor Air Hazards

Ambient outdoor air pollution levels can vary from day to day. The best method for keeping track of such changes depends upon your location.

Metropolitan Areas: In many metropolitan areas, local radio stations, TV news programs, and newspapers provide regular updates on air quality conditions.

Rural Areas: In more rural areas, pollutant levels may require more aggressive information seeking strategies. Two government sources of information about community air quality measurements are state departments of environmental protection and regional EPA offices. A third source is the Environmental Defense Organization Scorecard. Environmental Defense is a public action organization that provides a scorecard of summary information on ambient air pollution by zip code and identifies the major polluters (industrial or agricultural activities, etc.) in each zip code region (Environmental Defense, 2002). However, it does not provide daily updates of ambient air quality conditions.

Location of the child care facility near industrial facilities, highways, or commercial establishments (such as dry cleaners) that are known sources of air pollution is likely to increase significantly levels of outdoor air pollution.

Identifying Indoor Air Hazards

As evident in Table 2, air pollutants are everywhere in the indoor environment, and given our current lifestyle, their complete elimination is not practical. Volatile organic compounds alone are used in common household consumer products such as oven and rug cleaners, air fresheners, water repellents, paints, lacquers, building materials and furnishings. Mobile homes tend to have much higher concentrations of these compounds than other types of homes because they use more pressed wood construction and have smaller enclosed spaces, lower air exchange rates, and many particleboard furnishings. Moreover, since product labels do not always specify the presence of organic compounds, it may be difficult to determine the chemicals contained (AAP, 1999).

Regardless of how daunting the task may appear, reduction and/or management of indoor air pollutants is critical to insure a healthful environment. When symptoms are not noticeable, the first step in this task is identification and awareness of potential hazards in the environment. Some investigations may be easily carried out by the CCHC and/or child care staff (e.g., radon) while others require professional expertise and training (e.g., asbestos). For assistance with, and/or information about, state testing regulations and educational programs for indoor air pollutants, each state provides a radon contact and an indoor air quality coordinator. The list of all state contacts is available from the EPA (EPA, 2002g). Two very different types of informal checklists of indoor air quality that may be useful to the CCHC are presented on the following pages. One is based on observation, the other on an interview with the child care caregiver/teacher.

Checklists for Signs of Possible Indoor Air Quality Problems

Example 1: Observation of a Child Care Facility

In consulting with a child care staff, be alert to the following signs of poor air quality.

Observe:

- The general level of cleanliness
- Presence of mold or mildew
- Dirty or faulty central heating or air conditioning equipment such as dirty air filters or ducts
- Damaged flue pipes or chimneys
- Blocked vents or air intakes
- Unvented combustion air sources for fossil fuel (e.g., gas, wood, or kerosene) appliances
- Tight building construction or evidence of remodeling
- New furniture or carpeting
- Improperly stored chemicals

Smell:

- Unusual and noticeable odors, such as mold, mildew or "chemical" smells
- Stale or stuffy air

Feel:

- Noticeable lack of air movement
- Excessive humidity
- Uncomfortable air temperatures
- Air flowing into and out of vents
- Drafts

Listen for:

- Concerns of staff regarding indoor air quality
- Unusual equipment noises
- Air blowing out of supply vents

(Adapted from EPA, Montana State University Extension Service and U.S. Department of Agriculture. Healthy Indoor Air for America's Homes Program, 2002; and EPA Indoor Air Quality Tools for Schools Kit –Walkthrough Inspection Checklist, 2002).

Example 2: Checklist for Signs of Possible Air Pollution: Questions for the Child Care Caregiver/Teacher

Name, age and symptoms of people experiencing possible air pollution symptoms:

When did symptoms first begin?

When do symptoms occur or worsen?

When do symptoms subside?

Have you consulted a health care provider? YES NO

If yes, what were the outcomes of this consultation?

What do you attribute the symptoms to?

Names of persons with allergies, asthma, upper respiratory problems, etc.

If they have allergies, what are the triggers?

What other air pollutants are staff with symptoms exposed to?

Any roof, wall, window, or pipe leaks? YES NO
Where?

Dehumidifiers or humidifiers used? YES NO
When are they cleaned?

Are air filters used? YES NO
What type?

When were they last changed?

Type of heat used—Major:

Type of heat used—Supplemental:

Are air fresheners used? Candles Spray Stick-ons Plug-ins
Other:

Does anyone smoke in the facility? YES NO

Are pets in the facility? YES NO

Is the facility treated for pests? YES NO
How and when?

What cleaning supplies or chemicals are used?

Type of vacuum cleaner:

Type of carpet cleaning:

Are there new furnishings or carpet? YES NO

Changes in the facility environment (HVAC system, remodeling, etc.) YES NO

Has testing for radon been completed? YES NO

(Adapted and reprinted with permission from Stilley, CS. Indoor air quality investigation. New Bern (NC): Craven County Health Department; 2002.)

Action Items for the CCHC to Prevent and Manage Air Pollution Exposure
In general, Fuentes-Leonarte et al. (2009) specify that the primary methods for preventing and managing indoor air pollution problems are:

- Removal or reduction of the source of pollution
- Increase in ventilation

The EPA states that air filters/cleaners should be used only in addition to and never as a replacement or substitute for the other two methods (source control and ventilation) (Fuentes-Leonarte et al., 2009).

The following lists summarize specific actions for management and prevention of exposures as outlined by the *CFOC* standards (3rd ed., 2011), CDC (1997b), AAP (1999), EPA (2002b), and Vermont Department of Health (1998). The CCHC may not directly be responsible for taking these actions, but she/he can assist with providing the education, policy development, and resource referrals necessary to ensure that air pollution hazards are appropriately managed. See Table 2, above, for details about sources of pollutants listed below.

Environmental Tobacco Smoke

- Policies should specify that smoking is prohibited at all times and in all areas used by the children in the program. 9.2.3.15
- If caregivers/teachers take smoking breaks, only allow them to smoke outdoors, well away from any doors or open windows, and have them smoke while wearing a jacket that is removed before re-entering the child care facility.

Radon

- Contact the radon office in your state environmental health department for maps of radon prone areas in your state.
- Radon concentrations inside a home or building used for child care must be less than four picocuries per liter of air. 5.2.9.4 Low-cost "do-it-yourself" radon test kits are readily available from hardware stores or through mail order.
- For more information on radon testing and radon educational programs, get in touch with your state radon contact at http://www.epa.gov/iaq/whereyoulive.html

Biological Contaminants

- Limit the use of carpeting. It provides an easy site for biological contaminants to collect and grow. If some soft surfacing is desired, replace carpeting with small, washable area rugs.
- Vacuum carpeting daily. When vacuuming, use a High Efficiency Particulate Air (HEPA) filter.
- Restrict pets from carpeted and sleeping areas of the facility.
- Launder bed sheets and pillow cases weekly or before they are used by another child, and blankets at least monthly. Appendix K
- Have children, staff, and visitors leave shoes by the entry door.
- Regularly clean the drip pan under the refrigerator.

From mold and mildew:

- As much fresh air as possible should be provided in rooms occupied by children.[5.2.1.1] Open windows and doors to provide fresh air from the outside.
- If an air filtering system is installed make sure it is properly maintained.
- Vent the clothes dryer to the outside of the house.
- Install exhaust fans in bathrooms and kitchens.[5.2.1.6]
- If humidifiers are used occasionally, follow the manufacturer's cleaning, drainage, and maintenance instructions to avoid growth of bacteria and mold.[5.2.1.15, 5.7.0.10]
- Use a dehumidifier in high moisture areas such as basements.
- Do not use carpeting directly on cement floors or in damp areas like the basement.
- Promptly repair roof, pipe, and basement leaks.
- Discard water damaged porous items (sheetrock, paneling, carpets, furniture, etc.) especially if repeatedly dampened or wet for more than 24 hours.
- Maintain a draft-free temperature that maintains thirty to fifty percent relative humidity (temperature ranges differ according to the season). [5.2.1.2]

Combustion By-Products

From fuel-burning appliances/heating sources:

- Make sure all gas, oil, or wood-burning appliances or heating sources are vented to the outside and installed according to the manufacturer's instructions.
- Keep all gas appliances properly adjusted. Monitor the flame to insure that it burns "blue." This indicates that all of the fuel is being burned.
- Install a carbon monoxide detector and use as a back-up only. Detectors should never be used as a replacement for proper use and maintenance of fuel burning appliances.
- Make sure wood stoves meet EPA emission standards and that doors fit tightly. Have all heating and ventilating equipment inspected and cleaned before each cooling and heating season by a qualified contractor. [5.2.1.3].
- Unvented gas or oil heaters and portable open-flame kerosene space heaters should be prohibited. .[5.2.1.10]
- Heating equipment and units, including hot water heating pipes and baseboard heaters with a surface temperature hotter than 120^{o}F, should be made inaccessible to children by barriers such as guards, protective screens, or other devices.[5.2.1.13]
- Fireplaces and fireplace inserts must be inaccessible to children.[5.2.1.12]

From nearby highways, factories, or plants:

- Provide outdoor play in areas away from emissions from any nearby industrial sites and away from traffic. Restrict vehicles from idling outside the child care facility

Volatile Organic Compounds

From cleaning products:

- Monitor use of household chemicals. In deciding between two products that produce the same cleaning results, choose the least toxic. Check ingredients on the label, or obtain a Material Safety Data Sheet (MSDS) from the product company.[5.2.9.3] Under "Health Hazard Rating," (with a scale from 0 to 4), choose the lowest number.
- Do not use products containing volatile organic compounds in the presence of food or children.
- Read and follow directions for use on product labels. Do not mix any cleaning products unless directed on the product label. When instructions state, "use with adequate ventilation", the best strategy is to use the product outside the building. If the product is used inside the building, increase ventilation during and after use by opening windows and using exhaust fans.
- Limit or do not use high solvent cleaners when cleaning the carpet.
- Store chemicals in a safe and secure manner in a locked room or cabinet, fitted with a child-resistive opening device, inaccessible to children, and separate from medications and food. [5.2.9.1] Buy only the amount you need and store in original container so that safety information is not lost.
- Schedule cleaning when children are not present.

From formaldehyde:

- Purchase pressed wood products for construction or remodeling that specify lower formaldehyde emission levels.
- Avoid urea-formaldehyde foam insulation.
- Use wood paneling that does not contain formaldehyde.
- Install exhaust fans in bathrooms and kitchens.
- Windows should be opened whenever weather and the outdoor air quality permits or when children are out of the room. [5.2.1.1]
- Purchase furnishings that are laminated or coated.
- Completely seal or coat raw pressed wood or particle board furnishings with a paint, varnish or vinyl material that does not contain formaldehyde.
- Wash durable press fabrics before use.

From art materials:

- Only materials with the “AP” or “CP” Seal of the Art and Creative Materials Institute, Inc. (ACMI) (http://www.acminet.org/) should be used for arts and crafts.
- After using arts and crafts materials clean area thoroughly by damp mopping.
- Areas where arts and crafts are conducted should be well ventilated.[5.2.1.4]
- Materials that create toxic fumes or gases such as spray adhesives and paints should not be used when children are present. [5.2.1.4]
- Children and staff should not eat or drink while engaged in art projects.
- Children and staff should wash their hands thoroughly when finished with art work.
- Staff will supervise all art activities to make sure safer practices are being followed and that all materials are properly cleaned up and stored away.

Particulate Matter

- Keep the child care facility clean. On hard surfaces, use damp mops/dust rags instead of dry dusting or sweeping. The routine and frequency of the cleaning and sanitation of the facility should be posted
- Check and clean or replace air filters according to manufacturer's instructions on a regular basis, at least every three months (and more often if necessary). 5.2.1.8

From asbestos:

- If the child care facility is housed in an older building, the building should be evaluated by a certified professional for the presence and condition of any asbestos.
- Any asbestos, fiberglass, or other friable material or any material that is in a dangerous condition found within a facility or on the grounds of the facility should be repaired or removed. 5.2.9.6
- Any areas of undamaged asbestos should be clearly identified to provent disturbance and/or exposure during remodeling or future activities.5.2.9.6
- If the facility contains any undamaged asbestos, it should be periodically inspected by a certified professional for damage or deterioration.
- No children or staff should be present until the removal and cleanup of the hazardous asbestos condition has been completed.

From ozone (smog):

- Check the air quality index (AQI) each day and use the information to determine whether all or only certain children should be allowed to play outdoors. 3.1.3.3
- On bad air days: restrict the amount of time children spend outside, especially if lots of physical activity is involved and reschedule outdoor physical activity to the early morning when ozone levels are lower

PESTS AND PESTICIDES[2]

Usually we associate pesticides with insecticides—in spray, powder or granule form—that kill insects. The EPA definition, however, is much broader and defines pesticides as "any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any pest. Pests can be insects, mice and other animals, unwanted plants (weeds), fungi, or microorganisms like bacteria and viruses" (EPA, 2002c). The EPA reported that 4.9 billion pounds of pesticide products were used in the United States in 2001, which is equivalent to 4.5 pounds per person. The agriculture industry used about 675 million pounds of pesticide active ingredient (76% of total active ingredients used) and 102 million pounds (11.5%) were used on lawns and gardens by homeowners. (Kiely et al., 2004).

Today, pesticides are everywhere around us: in our food, homes, schools, child care settings, parks, rivers and air. And their toxicity is without question. As the EPA (2002c) states:

> By their very nature, most pesticides create some risk of harm to humans, animals, or the environment because they are designed to kill or otherwise adversely affect living organisms (EPA, 2002c).

Despite high toxicity to organisms, pesticides are generally ineffective in eliminating pests. With the exception of poison baits, as little as 1% of pesticides applied indoors reach the targeted pest (AAP, 1999). The rest may contaminate surfaces and air in the treated building. Outdoor pesticides may fall on non-targeted organisms, plants, animals, and outdoor furniture and play areas. They may contaminate groundwater, rivers, or wells. Biomagnification of long-lasting compounds may result in exposures to animals (including humans) at the top of the food chain at concentrations tens of thousands of times greater than those at the bottom of the food chain.

Pest resurgence occurs when, along with the targeted pest, its predators and pathogens are killed. The remaining pest population then multiplies with fewer restraints, resulting in an infestation worse than the original.

Also, some pesticides, such as the insecticide DDT, can remain in the soil for over 20 years. Although banned in the United States in 1973, children can still be exposed to this chemical through touching contaminated soil, eating foods grown in contaminated soil, or eating fish from contaminated waters. DDT continues to be used in some developing countries, including those exporting food to the United States.

Sources of Pesticides in the Child Care Environment

Pests in and around child care facilities can cause both physical damage to structures and present health threats to children and staff. Common structural pests such as mice, rats, and cockroaches

[2] This section of the *Environmental Health in Child Care* Training Module was reviewed and edited by Lyn Garling, Manager of Programs, PA IMP Program, Penn State University and Kathy Seikel, Office of Pesticide Programs, Environmental Protection Agency.

can cause and trigger asthma, carry diseases, and contribute to poor indoor air quality in multiple ways. However, treatments of these pests with chemical pesticides, particularly residual sprays, aerosols, foggers, and pelleted rodent baits, pose additional, potentially more serious, threats to children's health.

Children are exposed to pesticides throughout their environment, indoors and outdoors. They consume water and foods that have pesticide residues, and they breathe pesticide contaminated air, especially indoors if pesticides are used in schools and homes.

The following are just a few examples of how rampant pesticides are in the child care environment:

- In the First National Environmental Health Survey of Childcare Centers, 63% of child care facilities (from a sample that encompassed 48 states) reported pesticide applications (Tulve, et al., 2006).

- Of 39 pesticides tested, at least one showed up in every center in the study. Individual centers reported using anywhere from 1 to 10 pesticide products and the frequency of pesticide applications ranged from 1 to 107 times annually.

- In a pilot study of nine child care centers, Wilson, et al. (2001) detected pesticides and common pesticide chemicals in air and dust, suggesting that exposures in child care environments may constitute a significant portion of total child exposures.

- Recent studies suggest that exposures to several pesticides commonly detected in homes in agricultural areas are associated with adverse neurodevelopment in children (Young, et al., 2005; Eskenazi, et al., 2007).

- Today, pyrethroids (most common home-use pesticides) are frequently being used at places where children spend their time, such as homes and child care centers (Sudakin 2006)#. Pyrethroids are neurotoxins and potential respiratory irritants.

- In one study (Morgan, et al., 2007), results showed that the urinary metabolite of pyrethroids, 3-PBA, was detected in 67% of the preschool age children's urine samples and the authors argue that the children were potentially exposed to pyrethroids at their homes and child care centers.

Routes of Exposure

Children are exposed to pesticides through eating foods with pesticide residues, breathing contaminated air, through skin absorption or unintended poisoning – usually oral. For example, some lice treatments (lindane) and insect repellents (DEET) are absorbed through the skin (AAP, 1999). The latest information from the American Association of Poison Control Centers indicates that, for 2006, there were 124,751 pesticide exposure incidents with 77,669 of those incidents involving children. The highest number of poisonings of children was due to ingestion of rat/mouse poison pellets and insecticides. Additionally, there were 50,003 exposure incidents involving bleach.

Pesticide Exposures in Indoor Environments

Indoor environments are perhaps the most critical places where pesticide exposure in children can and should be minimized. Children spend most of their time inside care/school facilities and their own homes. Pesticides do not break down quickly indoors, nor do wind and rain "wash" pesticides "away". Uses of sprays, aerosols, foggers and some dusts invariably leave surface- and aerial residues that cannot be controlled or contained; yet use of such products is a cultural norm in our society. Aversions to "bugs" and a lack of knowledge about them and the reasons for their presence, leads to routine overuse, improper use, and ineffective use of pesticides. Cockroaches, ants, and mice are the most commonly targeted organisms in schools and homes. Studies in homes in low-income housing show residues of on average 6 pesticides in kitchens and living rooms. (Julien, 2007) Pesticides found included common household formulations, organophosphate neurotoxins, and restricted use and/or pesticides illegal to use indoors.

Research has indicated that permethrin is usually persistent indoors, has low volatility, and tends to adsorb highly onto materials (e.g., dust) in dwellings. This suggests that children would likely have increased exposures to applied pesticides at residences via indirect ingestion (compared to other routes like inhalation). This is especially true for very young children who spend a large part of their time on the floor and who mouth objects in their environment more frequently than older children.

Generally, indoor environments have higher concentrations of pesticides than outdoor environments because some pesticides are used indoors and others are tracked indoors from outside soil on shoes and pets (Robert, Karr et al.). Residue from both indoor and outdoor pesticide treatments have been found in carpet dust days and weeks after the pesticide application (Roberts, Karr et al.). Pesticides persist longer in indoor environments because indoor environments lack exposure to sun and rain which helps to dilute pesticides and break them down.

Household Products: In addition to insecticides, common indoor pesticides include cleaning products such as disinfectants (for germs) and fungicides (for mold and mildew).

Common household pesticides include:

- Cockroach sprays and baits
- Rat and other rodent poisons
- Flea and tick sprays, powders, and pet collars
- Kitchen, laundry, and bath disinfectants and sanitizers
- Products that kill mold and mildew
- Head lice shampoos
- Insect repellents

(Adapted from EPA, 2002c)

Urban residents in substandard housing are plagued by pests and in desperation, routinely "bomb" with an excessive number of "bug bombs", use aerosol sprays while chasing pests around the house, crush and lay out mothballs along walls, put down pelleted mouse baits that are moved about by mice and picked up by children, use illegal pesticides purchased in local corner stores or on the street and more. Even in less difficult environments, most homes contain on average 6 pesticide products and 98% of homeowners use pesticides at least once during the year. The rise of certain pests in recent years, such as bed bugs, is making this "self-medication" problem worse. Child care practitioners should be alert to such a possibility when confronted with certain symptoms in children – think to ask about what is going on at home, especially if the child has head lice or bites from bed bugs or fleas.

Insect Repellents: Insect repellents are designed for application to human skin to repel insects rather than kill them. DEET is the active ingredient in most insect repellents. DEET is toxic when ingested, and high concentrations applied to the skin can cause blistering. However, after extensive testing, the EPA concluded that if "consumers follow label directions and take proper precautions, insect repellents containing DEET do not present a health concern" (EPA, 1998). For children, the CDC (2008) recommends using repellents containing up to 50% DEET, and suggests that DEET can be used on children over 2 months of age. DEET repellents should be used very sparingly on children, and insect repellents should not be applied to children's hands to avoid ingestion. Infants under two months of age should be protected from mosquitoes by using netting securely fitted over an infant carrier (CDC, 2008).

More natural insecticides, such as citronella (e.g., Avon's Skin-So-Soft® bath oil) and soybean oil, are not as effective as DEET in preventing insect bites and also require more frequent reapplication. The safety of repeated applications of natural insect repellents on children has not been determined, and facilities should not confuse the term "natural" with "safe" when using these products on children (Schneider and Freeman, 2000).

Products that combine insect repellents with sun block agents should be avoided. Such "dual-purpose" mixtures may act synergistically in unforeseen ways. They also encourage use of the repellent during sun events, when a repellent may not be needed, thus increasing the risk of unnecessary exposure. Similarly, use of "Buzz-Off" or other clothing products impregnated with pesticides is also not recommended for children for a number of reasons. The active ingredient in these products is still under scrutiny as an endocrine disrupter, posing specific concerns for use on children. Clothing has constant contact with the skin, increasing unnecessary exposure, and the pesticides may wash off into the laundry water, thereby contaminating other clothing.

Pesticides on Pets: Children who play with pets treated for fleas, ticks, and other pests can be exposed to pesticides. Flea collars, shampoos, soaps, sprays, dusts, powders, and dips usually contain an insecticide. Some of these products contain relatively non-toxic active ingredients, such as the insect growth regulators methoprene and hydroprene. These chemicals interfere with the molting process in fleas so they cannot complete their life cycle.

Pesticides in Food: The AAP (1999) notes that, worldwide, pesticides are not only used extensively during crop production, but also during the shipping and storage of foods. Foods are also likely to bear more than one pesticide. Even processed baby foods can contain some pesticide residues (AAP, 1999). The EPA sets standards for allowable levels of pesticides in foods, and the Food and Drug Administration and the USDA Food Safety Inspection Service monitor pesticide residues in the food supply. In 1996 the Food Quality Protection Act was passed which provided additional assurances of pesticide safe food for infants and young children. This act "codifies the most explicit and stringent protection of children ever adopted in a federal environmental law" (Sly & Flack, 2008). It requires the EPA to consider cumulative risk of pesticide exposure from all sources (food, water, air) when evaluating pesticide safety.

Pesticides in Drinking Water: Drinking water is vulnerable to pollution by agricultural, lawn and household chemicals insecticides, herbicides, and fungicides. Child care facilities that rely on wells for drinking water are especially at risk of herbicide contamination in agricultural areas due to the large amounts of these chemicals used in the spring and fall. These chemicals can leach through the soil and/or run off into streams when it rains. Most drinking water is not routinely tested for pesticide residues. In agricultural areas, you can find out if contamination of ground water has been a problem from the County Extension Office. They will be able to direct you as to how to have the water tested for the problem pesticides in question.

Outdoor Sources of Pesticides

Commercial Spraying: Due to commercial spraying, children who live and play in or near agricultural sites, golf courses, power lines, etc. are at higher risk of exposure to pesticides in the air, dust, and soil. In A 2005 study published by JAMA (Calvert, et al., 2005), the researchers found that, in California, 40% of pesticide exposure incidents involving children in schools were the result of pesticide drift. The authors stated that, given increasing suburban sprawl, this trend among children might be related to an increased number of schools situated next to farmland. Golf courses use herbicides to keep weeds from invading their grass surfaces. Power companies often spray herbicides under transmission and distribution power lines to keep unwanted vegetation from interfering with the company's ability to maintain the lines.

Residential/Community Spraying: In 1995, homeowners used nearly 133 million pounds of pesticides, herbicides and fertilizers on their lawns and gardens alone (Hayhurst, 1999). Young children are at greater risk for exposure to lawn and garden pesticides because their crawling and play behaviors increase their contact with grass and ground surfaces, and hand-to-mouth behaviors make it more likely they will ingest pesticide residues from their hands.

A number of pesticides and herbicides commonly used in lawn and garden care such as, 2,4-D, permethrin, and glyphosate are classified as probable or possible carcinogens by the EPA (National Pesticide Information Center, 2002). Not only are child care facilities at risk when they apply these pesticides on their own lawns and gardens, but inadvertent exposure can occur when pesticides are applied without notice on neighboring properties.

To limit the likelihood of inadvertent exposure, some states (New York is one example) have established regulations authorizing counties to adopt 'neighbor notification' laws for commercial and residential lawn applications (Office of New York State Attorney General, 2000). Some states have a state pesticide sensitivity list whereby vulnerable residents are notified of impending pesticide applications in their area. Child care staff should contact their state pesticide office and request that their child care facility be added to the state pesticide sensitivity list, in states where such a list exists.[5.2.8.1]

Some states have also enacted laws regulating pesticide applications and requiring notification of pesticide use. California has a good model law (Law AB 2865) stipulating that private licensed child care centers are required to notify parents/guardians about pesticide applications, and post notices in areas treated with pesticides. The law also requires that all child care staff have access to information and trainings on least-toxic Integrated Pest Management (IPM) techniques.

Pesticides on Playgrounds: Most wooden playground structures, picnic tables, and decks are made of treated wood that has been injected with chromated copper arsenate [CCA] a wood-preserving pesticide composed of arsenic, copper, and chromium (Jahn and Payne, 2002). This preservative protects the lumber against termites, beetles and rot. However, arsenic is a known human carcinogen. Over time, investigations show that CCA steadily leaches from the treated wood into the surrounding soil. Children can absorb the arsenic preservatives through their skin when they touch the wood or nearby contaminated dirt or sand. They ingest it when they then put their hands in their mouths. Moreover, pressure treated wood poses a great hazard when it is burned and releases the treatment chemicals into the air. In February, 2002, the EPA announced that the lumber industry had voluntarily decided to shift from CCA preservatives in favor of preservatives that do not contain arsenic for all residential uses by December 31, 2003. 'Residential uses' would include wood used for playground equipment, decks, picnic tables, landscaping timbers, residential fencing, patios, and walkways, etc. As of January 2004, the use of CCA products was restricted from residential use by federal law.

However, older structures built with CCA treated wood (including those in child care settings) are not affected by this action. Moreover, the EPA does not recommend that CCA treated playground equipment and other residential uses of this wood should be automatically replaced because it has not yet determined that CCA treated wood poses an unreasonable risk to the public or the environment (Jahn and Payne, 2002).

Jahn and Payne (2002) suggest some alternatives to replacement of CCA treated wood. They note that three types of wood coatings were very effective in reducing the leaching of CCA from treated wood to levels well below the EPA's drinking water standard for arsenic. They were: (1) latex primer followed by one coat of outdoor latex paint, (2) oil-based primer followed by one coat of oil-based paint, or (3) two coats of a penetrating oil semi-transparent deck stain. However, the tests made on these coatings consisted of rain simulation only and did not include tests of normal wear and tear deterioration.

Health Effects of Pesticide Exposure

Acute

Acute effects of pesticides range from irritation of the eyes, nose and throat, mild dizziness, nausea, and vomiting, diarrhea, headaches, skin rashes, to severe illness and death (AAP, 1999). More severe reactions usually result from massive doses in unintended poisoning, chemical spills, inappropriate application, or prolonged exposure. For more information on the management and treatment of poisonings, see the Poisoning section of the *Injury Prevention in Child Care, Part B* Module.

Chronic

Damage to nervous system, reproductive system, endocrine system, immune system; cancer; chronic injury to the lungs, liver and kidneys; and birth defects have all been associated with pesticide exposure. For children specifically, pesticides have been associated with brain cancers and childhood leukemia (AAP, 1999). Long term effects of pesticides depend upon toxicity of the pesticide itself, the length of exposure, and/or the amount of exposure.

Detection of Pesticide Problems in the Child Care Environment

Symptoms of pesticide exposure, both acute and chronic, are usually too non-specific to be useful for the detection of pesticide problems. They can be easily missed because they are so similar to those of common conditions such as influenza or seasonal allergies. The AAP (1999) reports that even laboratory tests are often not diagnostically useful. In lieu of clear symptoms, the following series of questions may prove helpful in detecting and preventing pesticide problems in the child care environment.

Checklist for Signs of Possible Pesticide Problems: Questions for the Child Care Staff

Does the facility have pests? YES NO

If so, what kind? _____ Is the infestation: Heavy Moderate Light? Seasonal or Chronic?

Where are the pests located? _____

Other than visible pests, list other signs of infestation, e.g., body parts, feces, rub marks on walls, gnaw marks, burrows, tracks, evidence that stored food has been broken into: _____

Have there been incidents involving bug bites or stings? YES NO Head lice? YES NO

What pesticides are used inside or outside the child care facility? (Examples: insecticides (bug sprays), herbicides (weed killers), mold or mildew sprays, mouse or rat poisons)
Inside:_____
Outside: _____

Are pesticides used on a regularly scheduled basis? YES NO

Have they been used recently? YES NO

Does the facility post signs in areas where pesticides have been applied? YES NO

Is there a policy in place to provide notification to parents/guardians and building personnel about proposed pesticide applications? YES NO

Does the facility use reduced risk pesticides and/or devices, e.g., gels, baits, boric acid, traps? YES NO

Are pesticide sprays, bombs or foggers used? YES NO

Do people/ businesses in the neighborhood routinely use pesticides for their lawns or facilities? YES NO

Is the facility in or near an agricultural community? Golf courses? YES NO

Does the facility always wash fruits and vegetables or peel them before using? YES NO

If well water is used in the facility, has the water been checked for contamination? YES NO

How are pesticides and hazardous products stored in the facility?
_____

How are they disposed of?
_____

Does the facility follow Integrated Pest Management techniques? YES NO

(Adapted from Children's Environmental Health Project, 2000)

Action Items for the CCHC to Prevent and Manage Pesticide Exposure

The best way to reduce risk from pesticides is to avoid them altogether. The CCHC can help child care caregivers/teachers control the use of pesticides in the facility and help them learn how to choose the less risky alternatives.

Integrated Pest Management (IPM): An Alternative Approach

Integrated Pest Management (IPM) is a simple, common-sense approach to pest management that eliminates the root causes of pest problems, providing safe and effective control of insects, weeds, rodents, and other pests while minimizing risks to human health and the environment. [5.2.8.1] It relies on both chemical and non-chemical methods. The goal of IPM is to utilize the pest control alternatives that are least toxic to people and the environment, and to use the least amount of treatment necessary in the management of any given pest problem. IPM involves understanding the pests' needs and life cycles and monitoring for pest presence. This allows control tactics to be targeted at the most effective time, place and amounts to prevent pest build up.

With this approach, instead of regular and/or automatic spraying or bug bombs to manage indoor insect problems, other strategies are to:

- Repair screens and caulking around windows to prevent pests from entering
- Vacuum up the eggs of fleas before they hatch
- Keep foods cleaned up in the kitchen
- Regularly monitor sticky traps to find new infestations quickly
- Whenever possible, use physical means to control pests, such as fly swatters

Outdoor pest control strategies include:

- Avoid lawn care practices that rely on herbicides and insecticides
- Choose plants suited to the soil and climate of the site so that fungicides, herbicides, and insecticides are less necessary
- Avoid applying pesticides (sprays, granules) around the perimeter of building

Another feature of IPM is that regularly scheduled pesticide treatments (e.g., every 3 months) are replaced by treatments given only as needed and as a last resort when less toxic treatments have been ineffective. Spot treatment with pesticides replaces broadcast applications. Treatments are also chosen and timed to be least hazardous to non-target organisms. Pesticide formulations, i.e. gels and baits in lieu of sprays, are used to reduce exposure to children.

As part of its continuing effort to protect children from unnecessary exposure to pesticides, the EPA (2002d) encourages school officials (and presumably child care facilities) to adopt IPM practices. Implementing IPM preventative protocols in these environments, as well as favoring less-risky pesticide formulations such as gels, baits and traps can reduce both risks from pests and pesticides.

Some specific steps for the CCHC to help enact IPM in the child care setting include:

- Have the director designate a person as Integrated Pest Management coordinator
- Develop protocol for staff and faculty to report pest problems
- Develop a policy for monitoring key areas to inspect for pests (roaches, mice, fleas)
- Educate all building occupants of IPM protocols in place and their individual roles in pest management
- Understand state laws. In most states, it is illegal for caregivers/teachers or other non-licensed personnel to apply pesticides of any kind in a school or child care facility
- Encourage the facility to monitor for the presence of pests by using sticky traps
- Encourage measures to deny pests access to the facility, e.g., ensure window screens are in good repair, sweep under doors, remove trees, shrubs, and wood piles in close proximity to the building, repair any openings in the foundation, siding, roof, etc.
- Educate staff about steps they can take to reduce conditions that might attract pests, e.g., no standing water, no foods stored in classroom, clean-up spills and crumbs, etc.
- Encourage staff to keep trash receptacles clean with snug-fitting covers, and to place dumpsters away from the building
- Encourage the caregiver/teacher to only hire pest-control contractors who use IPM techniques (often these pest management professionals have been IPM trained and certified through programs such as Green Shield Certified, Eco-Wise and Quality Pro Green)

How to Reduce Risks Associated with Pesticide Exposure

In the event that a caregiver/teacher decides to use pesticides, the CCHC can help them make choices to reduce toxicity of the product used and/or reduce children's exposure to the product. Generally speaking, the way to reduce risk to children when considering a pesticide is to pay attention to certain key characteristics of the product.

Choose a pesticide with the least toxic active ingredients.

Regardless of the "toxin" in a pesticide, pesticides are sold in many forms. Risk should be considered in relation to controlling likelihood of exposure. Aerosols and foggers are inherently more risky due to the likelihood they will be used frequently, may be inhaled, leave residues, and may be accidentally handled by children. Boric acid dust puffed into wall voids or gel baits for cockroaches are much less risky, regardless of the chemical components.

The following is a list of common pesticides in relative order from most risky to least risky to children:

1. Aerosols and foggers
2. Pelleted rodent baits
3. Candy look-alikes such as mothballs
4. Concentrated liquids
5. Liquids
6. Pump sprays
7. Granules
8. Some inert dusts
9. Gels
10. Enclosed baits

Most risky

Least risky

Choose products least likely to be breathed, ingested, and/or touched.

Some types of pesticides are more dangerous to humans because of the similarity of our physiological pathways to other living things. In general, from most risky to humans to less risky are:

1. Rodenticides
2. Insecticides
3. Fungicides
4. Herbicides

Most risky

Least risky

Rodenticides are usually mammalian blood thinners. Many insecticides are nerve toxins. Some herbicides are endocrine disruptors. Although not inherently the most dangerous, common disinfectants such as bleach represent the highest incidence of injury to children because of their ubiquity, sloppy storage patterns, and caustic nature.

How can people choose less toxic products? The lethal potential of a product is very roughly expressed on a pesticide container with one of three signal words: Caution (least toxic/hazardous), Warning, or Danger (most toxic/hazardous). Most commercial products for sale to the general public are diluted to the point that the signal word on the label is Caution. The signal words are sometimes more related to hazards other than toxicity, such as flammability. In any case, paying attention to the signal words allows one to avoid products labeled Warning and Danger.

If non-chemical methods have been exhausted and pesticide products are considered necessary, facility managers should ensure that targeted, rather than broadcast applications of pesticides are made, beginning with the eproducts that pose least exposure hazard first, and

always using a pesticide applicator that has the licenses or certifications required by state and local laws. [5.2.8.1] Any person who uses a pesticide product must read and follow all label instructions, including instructions regarding the proper purpose of the pesticide product, the time and location for application, the quantity to be applied, the frequency of application, the method of application, and the time-delay prior to reentry of treated areas. In addition, the facility should maintain a chemical application file whenever any pesticides are applied at child care facilities. This file will contain, at the minimum, the application date, diagram of treatment location, copy of the product consumer information sheet or MSDS, copy of the letter of notification to parents/guardians, and description and date of all non-chemical means of remediation used prior to using chemical remediation. This information should be kept in the chemical application file for 2 years.

Recent discoveries of endocrine disruption and other reproductive effects of certain pesticides are disturbing, and EPA is only just beginning to test new chemicals for such effects. Effects of mixtures of multiple pesticides are not tested and, in fact, may be impossible to test. Using a common-sense, precautionary approach, it is a good idea to limit children's exposures to industrial chemicals of all kinds. Within the various classes of pesticides, it is best to avoid certain classes of compounds—most notably, anticoagulants, nerve poisons, stomach poisons and endocrine disruptors. The best way to find out if a pesticide has this mode of action is to look up the active ingredient listed on the product on a pesticide database, such as:

- The Extension Toxicology Network: http://extoxnet.orst.edu/
- National Pesticide Information Center: http://npic.orst.edu/
- PAN Pesticides Database: http://www.pesticideinfo.org/

These databases also provide information on acute and chronic toxicity and symptoms of poisoning. Compare and contrast product characteristics before deciding if it can be safely used around children.

The following list provides some additional tips for the management and prevention of exposures as outlined by the *CFOC* standards (3rd ed., 2011), AAP (1999), EPA (2001, 2002e), AAP Pennsylvania Chapter (1999), Sly & Flack (2008) Environmental Media Services (2002), and MACCHE (2008).

- Make sure that staff are not bringing household products to the child care facility and using them at their own discretion.
- Make sure items and surfaces that only require cleaning are not also being disinfected.
- Remove children, food, dishes, toys and other objects from vicinity before application of any chemical product.
- Store pesticide products in their original containers and in a locked room or cabinet accessible only to authorized staff.[5.2.8.1,]
- Strongly discourage any use of spray formulations and foggers indoors and all pesticide use outdoors.
- Notification should be given to parents/guardians and staff before using pesticides, to determine if any child or staff member is sensitive to the product.[5.2.8.1]

- Consider having children remove outdoor shoes at the door.
- If pesticides are used outdoors, or if pesticides are used in neighboring areas, keep children inside and cover playthings or bring them inside during and after the application.
- Buy organically grown and in-season foods. Whether buying organic or not, always try to purchase foods that are in season. Fruits and vegetables sold out-of-season are often imported from other countries where pesticide laws are less stringent than in the United States.
- Scrub fruits and vegetables under running water and peel and trim where appropriate. This can remove some pesticide residues on the surface of the food.
- Avoid use of flea collars, dips, and insecticide shampoos on pets. Instead, use a flea comb and shampoo pet occasionally.
- If pet must be treated for fleas, restrict children from playing with pet for a few days after treatment.
- Try to restrict pets to outdoor areas or at least to non-carpeted indoor areas of the facility.
- The use of the following should be prohibited:
  - EPA banned pesticides
  - Incense
  - Moth crystals or moth balls
  - Chemical air fresheners that contain ingredients on the EPA toxic chemicals list

DRINKING WATER CONTAMINATION

The United States has one of the safest water supplies in the world (EPA, 1999). It is safe to drink water from virtually every public water system in the country. However, the quality of drinking water may vary in different sections of the country depending upon the state or municipality regulating the water supply. While the EPA has set minimum requirements for water quality, pollution levels above this minimum depend upon the condition of the water source and the quality of the treatment facility (EPA, 1999a). Under the Safe Drinking Water Act of 1974, public water suppliers must monitor their water to make sure it complies with public health standards set by the EPA. Water suppliers are bound by law to notify customers immediately if contamination poses an urgent health threat (EPA, 2006). These federal standards apply to all water suppliers serving 25 or more consumers, but not to smaller suppliers or to private wells. However, some states and municipalities have standards that apply to wells. Otherwise, people receiving water from private wells are responsible for making sure their own drinking water is safe.

Drinking water contamination is a multi-faceted problem. Following are details about key aspects of drinking water contamination that pertain to child care health consultation.

Sources of Drinking Water Contamination in the Child Care Environment

Hundreds of biological agents (bacteria, viruses, parasites) and thousands of chemicals are found in fresh water supplies. The EPA has established standards for only 90 water contaminants, seven of which were established in January, 2002.

Public Water Supplies

In most cases, contaminants in public water supplies are at levels that do not pose immediate threats to public health. Serious drinking water contaminations do occur, but they are infrequent and usually of short duration. Most often, serious contamination is caused by treatment problems or extreme weather events. For example, if a public water system obtains water from a highly contaminated river, lake, or ground water well, it may have difficulty treating the water to meet safety standards.

Well Water

As mentioned earlier, private wells are not federally regulated and must be maintained by the homeowner. The AAP (1999) notes that "contamination of well water may occur if the well is shallow, in porous soil, old, poorly maintained, near a leaky septic tank or downhill from agricultural fields or intensive livestock operation.

Routes of Exposure

Children are exposed to water pollutants through drinking contaminated water; eating raw foods (carrots, tomatoes) irrigated or rinsed with contaminated water, eating fish or shellfish from polluted water, or through skin exposure from swimming/wading in polluted water (AAP, 1999).

Health Effects of Exposure to Contaminated Drinking Water

Acute reactions to water pollutants are usually due to microbial contaminants (e.g., bacteria and viruses) and may include vomiting or diarrhea. Long-term exposure to some pollutants, such as pesticides, minerals, and solvents, may cause gastrointestinal problems, skin irritations, cancer,

reproductive and developmental problems, and other chronic health effects (AAP, 1999). For most water pollutants little is known of long-term health effects.

Detection of Drinking Water Contamination in the Child Care Environment

Child Symptoms

Even with state of the art water treatment systems, sporadic and epidemic waterborne illnesses can occur. The AAP (1999) reports the most prominent symptoms of such illnesses are mild gastroenteritis with diarrhea. While these symptoms are often nonspecific as to source, an outbreak of such symptoms in the child care center may indicate water contamination.

Identification

Accurate detection of water contamination requires professional expertise. Public water quality is monitored by the municipal water supplier as required by the EPA and state environmental agencies. Any indication of public water contamination should be directed to the state health and environmental agencies and to the water supplier. Although the testing of private wells is the responsibility of the homeowner, states may provide this service at no cost. Private well water should be tested at least annually (AAP, 1999). To determine if their well water should be tested and to locate professional for testing, facilities should contact local health and environmental departments.

Action Items to Prevent Exposure to Contaminated Drinking Water

The following is a list of specific water pollution hazards to look for in the child care environment and specific actions for management and prevention of exposures as outlined by the *CFOC* (3rd ed.,2011), AAP (1999), EPA (2006), and Sly & Flack (2008).

Public Water Supply

Read the Consumer Confidence Report to learn whether the water system meets all drinking water standards. This report is available from the local water supplier, and is also available online at: http://www.epa.gov/safewater/dwinfo.htm.

Well Water

- Water supplied by a well or other private source should meet all applicable health and safety federal, state, and local public health standards and should be approved by the local regulatory health authority. Contact the local regulatory health authority for more information on testing private well water.[5.2.6.1, 5.2.6.2]
- Urge programs to consider using a water filter certified by an independent, nonprofit, health and safety product certifier, such as NSF International. Contact NSF at http://www.nsf.org or call 1-800-NSF-MARK. To be effective, filters must be maintained according to the manufacturer's directions.

Water Piping and Joint Seals

- Each gas pipe, water pipe, gas-burning fixture, plumbing fixture and apparatus, or any other similar fixture and all connections to water, sewer, or gas lines should be installed and free from defects, leaks, and obstructions in accordance with the requirements of

the state and/or local regulatory agency for buildings.[5.2.6.8]

Make sure water and plumbing systems meet state and local regulations for buildings.

- ***Other Water Concerns***
- Emergency safe drinking water should be supplied during interruption of the regular approved water supply.[5.2.6.5]
- Check with the EPA (http://www.epa.gov/waterscience/fish/), and state health, environmental, and conservation departments regarding any fish advisories related to water pollutants such as polychlorinated biphenyls (PCBs) or mercury in fish in the local area.
- Encourage programs and all community members to take used motor oil to a recycling center. If motor oil drains into a storm sewer or is placed in the trash, it can leak into lakes, rivers and wells. Just one pint of used motor oil can expand over great distances and cause adverse effects to human health and the environment.
- Draft a policy that provides for proper disposal of toxic trash. For example, batteries contain lead and mercury. Some common cleaners also contain substances that contaminate water. Many communities have special collection sites for these items.
- Prohibit disposal of chemicals into septic systems, dry wells, storm water drainage wells, or other shallow disposal systems that discharge to ground water.
- Find out what the local community is doing to protect its water source and get involved. Work with schools, civic groups and others to start a protection program.

ENVIRONMENTAL TOPICS OF SPECIAL INTEREST TO CHILD STAFF: KEY POINTS & PREVENTIVE ACTIONS

In addition to the environmental risks for children reviewed thus far, child care staff may have special concerns about seven additional environmental risks: art materials, cleaning products, compact fluorescent light bulbs, noise, plastics, sun exposure, and extreme weather conditions. Additional information on the risks of art materials and cleaning products can be found in the *Injury Prevention in Child Care, Part B: Common Injury Risks* Module.

Art Materials

Key Points

- Art activities are a key component of any child care program, allowing children to express themselves creatively.

- Some art materials contain chemicals such as metals (e.g., lead), solvents (e.g., turpentine), and dusts or fibers (e.g., asbestos) that are hazardous if inhaled, absorbed, or swallowed. Lead may be found in artist's paints. Lead and other toxic metals can also be found in pastels, pigments, inks, glazes, enamels, and solder (AAP, 1999).

- Most risks from art materials can be eliminated by carefully selecting materials that are safe for use by children. The product label provides key information.

- When products are labeled nontoxic it means that the product has passed the short-term toxicity test required by the U.S. Department of Environmental Protection Federal Hazardous Substance Act (FHSA) but does not mean it passes a long- term toxicity test.

- The Labeling of Hazardous Art Materials Act (LHAMA) supplements the FHSA requiring manufacturers of hazardous art materials to: 1) determine the potential for chronic long-term health hazards and, 2) place appropriate warning labels on those products found to pose such chronic long-term effects.

- Arts and crafts materials imported or sold in the United States are required by the LHAMA to meet the ASTM International (ASTM) D-4236 regulations for chronic long-term health hazards. It is illegal to sell an art product in the US that does not have this statement on its label. It is important to note that this statement does not mean the product is safe, rather it has been certified by a toxicologist that the label information provides adequate information for safe use (Arts, Crafts, and Theatre Safety [ACTS], 2000).

- Product seals are not required by law. These seals identify a company or group such as the Arts and Creative Materials Institute (ACMI) whose toxicologist certified the product (ACTS, 2000). The ACMI seals are AP (approved product – nontoxic even if ingested), CP (certified product – are nontoxic even if ingested and meet or exceed quality standards of material, workmanship, working qualities, and color), and Health Label (no health labeling required) [AAP, 1999].

Preventive Actions

- Choose products that are:
  - Nontoxic
  - Conforming to ASTM D4236 statement
  - Clearly marketed for children
  - Without hazards or precautionary statements.

- Certified or approved product seals indicate the company ACMI has tested the product and it contains no materials in sufficient quantities to be toxic or injurious even if ingested.

- Obtain and read the latest Material Safety Data Sheet (MSDS) by contacting the product manufacturer and check for toxic ingredients. For more information, contact a toxicologist, or the US Poison Control Center at (800) 222-1222, which will route the call to the nearest poison center.

- Make sure art and craft materials are properly used, cleaned up, and stored in original containers that are fully labeled.[5.2.9.7]

- Choose materials designed not to create dusts, sprays, vapors, or fumes which can be inhaled, or which result in excessive skin contact. For example, it may be safer to buy supplies in premixed or liquid formulations instead of powder forms to reduce exposure to dusts. Use water-based products instead of oil-based, keeping in mind to read the label and look for materials identified as safe for children.

- Equip craft areas appropriately:
  - Use work surfaces that are hard and smooth for easy and thorough cleaning
  - Ventilate areas where arts and crafts activities are conducted [5.2.1.4]
  - Store materials safely.
  - Protect against exposure (e.g., wear aprons, don't allow food and drink in the art area, and have children wash their hands after doing arts and crafts)
  - Use age-appropriate materials [5.2.9.7]

- Supervise children closely.

- Staff should be educated to the possibility that some children may have special vulnerabilities to certain art materials (such as children with asthma or allergies). [5.2.1.4]

Cleaning Products

Key Points

- Many common cleaning products and household products contain volatile organic compounds (VOCs), organic solvents that easily evaporate into the air. Furniture cleaners and polishes, floor cleaners and polishes, oven cleaners, household cleansers, carpet shampoos and disinfectants are a few examples.

- Short-term effects include eye, nose and throat irritation, and headaches. Long-term

exposure can cause loss of coordination; nausea, and damage to liver, kidneys and the central nervous system. Some VOCs can cause cancer in animals and are suspected of causing cancer in humans.

Preventive Actions

- Buy the least harmful product available. Choose products labeled "warning" or "caution" since these are less harmful than those labeled "poison" or "danger."

- Always use household products only for their intended purpose and according to the manufacturer's instructions. Don't mix up "extra-strength" batches.

- Cleaning, sanitizing, and disinfecting products should not be used in close proximity to children, and adequate ventilation should be maintained during any cleaning, sanitizing, or disinfecting procedure to prevent children and caregivers/teachers from inhaling potentially toxic fumes. 3.3.0.1

- When not in active use, all chemicals used inside or outside should be stored in a safe and secure manner in a locked room or cabinet, fitted with a child-resistive opening devise, inaccessible to children, and separate from stored medications and food. 5.2.9.1

- Keep household products in their original containers so that safety information and directions for use are always with the product.5.2.9.1

- Avoid excessive use.

- Keep storage of cleaning agents separate from food. When not in active use, all chemicals used inside or outside should be stored in a safe and secure manner in a locked room or cabinet, fitted with a child-resistive opening device, inaccessible to children, and separate from stored medications and food. 5.2.9.1

- Reduce the need for these products by:
  - Quickly attending to spills and stains, and removing food wastes promptly.
  - Using alternative (ingredients such as vegetable-based liquid soap, baking soda, and vinegar) or less toxic products. Remember while alternative or less toxic products are safer, they are not all non-toxic. Use the same precautions as with other cleaners. An important consideration when making your own cleaners is to store them in unused, store-bought containers (never put them in old food containers) and label them carefully. List each ingredient amount, directions, intended use and date made.
  - Using a multi-purpose cleaner so that you do not need to have a different product to clean each surface in your house. Choose a cleaner without antimicrobial agents. By keeping sanitizers and disinfectants out of cleaners reduces their toxicity as well as reduces the amount of disinfectant chemical used (Dvorak, 2008).

Compact Florescent Light Bulbs (CFLs)

Key Points

- CFLs use about 75% less energy than regular light bulbs. They are available in different sizes, shapes, wattages, fitting almost any fixtures indoors or outdoors (Center for ReSource Conservation).

- A CFL bulb contains about 3-5 milligrams of mercury; covering about the tip of a ballpoint pen (Center for ReSource Conservation).

- Mercury vapor from broken bulbs can escape into the air affecting the central and peripheral nervous systems, human eyes, kidneys lungs, skin, and spinal cord.

- Mercury is tasteless and odorless; you won't know if you are being contaminated.

- No mercury is released when the bulbs are intact or in use.

Preventive Actions

- Make an emergency Mercury Exposure Kit prior to buying CFLs:
  - Phone number of your local, county or state health department
  - U.S. Poison Control Center number: (800) 222-1222
  - Phone number for local professional help to clean-up mercury
  - Eye droppers
  - Index cards
  - Duct tape
  - Single use disposable gloves
  - Paper towels
  - Bottled water
  - Plastic bags: (4-5 Ziploc-type and trash bags that are 2-6 mm. thick)
  - Flashlight
  - Scissors or carpet cutting device with safety cover
  - Labels for hazardous materials in accordance with state regulations

- High intensity discharge lamps, multi-vapor, and mercury lamps should not be used for lighting in the interior of buildings unless provided with special bulbs that self-extinguish if the outer glass envelope is broken.[5.2.2.3]

- CFLs can be used in open fixtures allowing airflow around outdoor fixtures.

- Always screw or unscrew the bulb by its base (not the glass). Never forcibly twist the CFL into a light socket.

- ENERGY STAR® qualified CFLs have a warranty. If the bulb fails within the warranty period, return it to your retailer.

Clean-up After a Mercury Spill:

- Immediately remove children and pets from the area.
- Open a window and leave the room for 15 minutes or more.
- Call your local/county health department. Inform them of the mercury exposure.
- Contact professional help if the spill is more than a thermometer's worth of mercury.

- Do not vacuum or use a broom to clean up the broken bulb on any surfaces.
- Do not wear gold jewelry while cleaning up. The mercury can permanently discolor it.
- Put on the single-use disposable gloves. Do not use bare hands.
- Double (plastic) bag all clean-up and mercury contaminated materials for proper disposal.
- *Hard Surfaces:* Collect mercury beads using an eyedropper or index cards. Duct tape will collect small pieces. Wipe the area with damp paper towels and place in the plastic bag. Remove gloves. Wash your hands.
- *Soft Surfaces (rugs, upholstery, bedding):* Do not try to soak up mercury with a towel or rag. Cut out or remove the affected area since mercury can split into tiny beads and never be detected.
- Take used/broken bulbs and mercury contaminated materials to a household hazardous waste drop-off location.

(EPA, 2008c)

Noise

Key Points

- Although few studies have been done to estimate children's exposure to noise, noise affects hearing and can result in physiologic effects such as sleep deprivation and undesirable cardiovascular effects, and psychological effects such annoyance, interference with activity, and headaches, tiredness, and irritability (AAP, 1999).

- It is likely that children are routinely exposed to more than the noise exposure of 70dBA (dBA is the measure of sound pressure) recommended as an upper limit by the EPA. Examples of sounds at 70dBA include vacuum cleaner, nearby freeway traffic, noisy party, and TV audio (AAP, 1999).

Preventive Actions

- Block noise from the outside: use double windows, weather stripping on doors and windows, and seal air leaks. Dampen the sound around the building with landscaping such as a dense barrier of trees and shrubs.

- Reduce a room's "echoing" qualities by adding absorbent surfaces and by varying ceiling and furniture heights.

- Reduce sources of loud noises (e.g., toys that make loud noises; lower the volume on computers and radio/tape/CD player when in use; use headphones with caution – set the volume level so that normal conversation can still be heard).

- Separate quiet and noisy areas when designing play areas.

- Introduce a pleasing background sound to help offset noise and make the direct sounds from children and activities less noticeable.

- Introduce acoustic pleasure (e.g., hang wind chimes) inside as well as outside an open

window.
(Adapted from Olds [2001] and AAP [1999].)

Plastics

Key Points

- Phthalates (pronounced "tha-lates") are a class of oily chemical compounds used in plastic to improve flexibility and durability, and they are widely used in plastic children's toys (California Childcare Health Program, 2008).

- Polyvinyl chloride (PVC), commonly known as vinyl, is a soft, flexible vinyl used in many products, such as toys, shower curtains, and pipes. PVC can be softened with phthalates. Phthalates plasticizers account for more than half the weight of some flexible PVC products. About 95% of phthalates produced are used in PVC.

- Objects that may contain phthalates include teething rings, rubber squeeze toys, rattles, bibs, or soft plastic books. They are also used in plastic food-storage containers (including bottles and sippy cups) and in personal care products, such as shampoos and baby powders and lotions, as well as medical equipment (Turner Toys, 2005).

- Studies on animals link phthalates to cancer, hormonal disruption, and birth defects (AAP, 2003).

- Exposure to the toxic additives in PVC plastics can occur through chewing or sucking, normal hand-to-mouth behaviors, and through the release of these chemicals into air and dust as the products age (Alliance for a Healthy Tomorrow). Children also risk exposure to the dangerous chemicals in plastics through baby care products applied to their skin.

- PVC products also commonly contain lead (and other metals such as cadmium and organotins) which acts as a stabilizer but can break down over time and migrate to the surface of used toys and other vinyl products (Healthy Child Healthy World, 2008). Lead damages the nervous system, leading to decreased learning ability and behavioral deficits. It is also a reproductive toxin and a carcinogen.

- Polycarbonate (Lexan) is used extensively in food-contact utensils, including baby bottles, sports water bottles, food containers, and tableware. It is commonly known as "Bisphenol A" or "BPA".

- Bisphenol A (BPA) is a chemical compound that has been shown to impair brain function, disrupt the endocrine system, and may cause cancer (Healthy Child Healthy World, 2008). It is found in most baby bottles and sippy cups and in the plastic lining of baby formula cans (Center for Health, Environment, and Justice, 2008).

- BPA leaching is considerably greater in polycarbonate that is scratched, cloudy, or exhibits wear of any sort. Heating also accelerates the leaching process, so carrying hot

water in a polycarbonate bottle is not advised.

Preventive Measures

- Look for products that state "No phthalates" or "No bisphenol A (BPA)" on the packaging. Plastics marked with #1, #2, #4, and #5 are the least toxic, and plastics that are not identified should be avoided.[5.2.9.9]

- Avoid vinyl products marked with a "V" or "3". Wash these products often if they can't be eliminated from the environment (Healthy Child Healthy World, 2008).

- Choose baby care products that have been tested and are free of phthalates.

- Consider alternatives to plastic: use toys made of natural products such as wood or cloth, and store food in glass, ceramic, or stainless steel containers.

- Use glass or phthalate-free baby bottles, and use powdered formula rather than canned liquid formula (Environmental Working Group, 2007).

- To reduce exposure to phthalates, consumers should wash the top layers of packaged cheeses and meats with hot water, because these foods attract the phthalates in PVC plastics. Bags or containers marked as "polypropylene" or "polyethylene" are safer plastics for packaged food (Turner Toys, 2005).

- Do not heat food or drinks in plastic containers. Use glass or ceramic instead.

- Vinyl utensils should not be used for hot foods, particularly infant feeding, since warming increases emissions of phthalates.

Sun Exposure

Key Points

- While some exposure to sunlight can be enjoyable, too much can be dangerous. Overexposure to ultraviolet (UV) radiation in sunlight can result in a painful sunburn. It can also lead to more serious health effects, including skin cancer, premature aging of the skin, and other skin disorders; cataracts and other eye damage; and immune system suppression.

- Children are particularly at risk of overexposure, since most of the average person's lifetime exposure occurs before the age of 18.

- Intense sun exposure in childhood increases the risk of skin cancer in adult life.

- Currently, one in five Americans develops skin cancer during their lifetime. The incidence of melanoma, the most serious type of skin cancer, is increasing faster than almost every other form of cancer.
- Due to the depletion of the ozone layer, increased levels of harmful UV radiation are

likely to reach the Earth.

- Many believe that only lighter-skinned people need to be concerned about the effects of overexposure to the sun. The incidence of skin cancer is lower in dark-skinned people, but it still occurs and is often not detected until later stages when it is more dangerous. The risk of other UV-related health effects, such as cataracts, premature aging of the skin, and immune suppression, is not dependent upon skin type (EPA, 2002f).

Preventive Actions

- The best sun protection is provided when all the sun-safe behaviors are practiced together.

- Limit time in the midday sun. The sun's rays are strongest between 10 a.m. and 4 p.m. Whenever possible, limit exposure to the sun during these hours.

- Seek shade. Staying under cover is one of the best ways to protect your-self from the sun. Remember the shadow rule: Watch Your Shadow. No Shadow, Seek Shade! (American Academy of Dermatology, 1999).

- Always use sunscreen. Apply a broad spectrum (blocks UVA and UVB) sunscreen of a Sun Protection Factor (SPF) of at least 15 or higher liberally on exposed skin and reapply every 2 hours when working or playing outdoors. Even waterproof sunscreen can come off when you towel off, sweat, or spend extended periods of time in the water. Sunscreen should be applied 30 minutes before exposure to the sun and reapplied every 2 hours. "The issue of whether sunscreen is safe for infants under the age of 6 months is controversial"(AAP, 1999 p. 244). Of primary importance in this age group is to avoid high-risk exposure and use adequate protection through the use of clothing, hats and shade. Remember, best practice indicates that the child care program have a written policy for the use of any commonly used non-prescription medication for oral or topical use and that it includes parental/guardian consent. Sunscreen should be included in this policy.[9.2.3.9]

- Wear a hat. A hat with a wide brim offers good sun protection to your eyes, ears, face, and the back of your neck - areas particularly prone to overexposure to the sun.

- Cover up. Wearing tightly woven, loose-fitting, and full-length clothing is a good way to protect your skin from the sun's UV rays.

- Wear sunglasses that block 99-100% of UV radiation. Sunglasses that provide 99-100% UVA and UVB protection will greatly reduce sun exposure that can lead to cataracts and other eye damage. Check the label when buying sunglasses.

- Watch for the UV Index. The UV Index provides important information to help you plan your outdoor activities in ways that prevent overexposure to the sun. Developed by the National Weather Service and EPA, the UV Index is issued daily in selected cities across the United States.

Extreme Weather Conditions

Key Points

- Heat and cold-related injuries are serious problems for children resulting in death, heatstroke, heat exhaustion, frostbite and hypothermia.

- Know your weather terminology:
  - Wind-chill: how cold it feels when air temperature and wind are combined.
  - Heat index: how hot it feels when air temperature and relative humidity combined.
  - For example, a wind-chill factor of 16° (30° F and a wind speed of 10 mph) is cold and a heat index of 95° (90°F and a relative humidity of 45) is uncomfortable.

Preventive Actions

- Play outdoors when it is safe and comfortable for the children. Use a wind-chill factor and heat index chart as a guide.

- Provide cooling off activities such as running through a sprinkler when temperatures are high. Provide an air-conditioned environment when the heat index, both humidity and temperature, is high.

- Keep children hydrated, especially in high temperatures and when they are physically active. Water is best. Before prolonged physical activity in warm weather, children should be well-hydrated and should be encouraged to drink water during the activity.[3.1.3.2]

- Monitor length of time outside based on child's age and weather conditions. Caregivers/teachers should check children's extremities for maintenance of normal color and warmth at least every 15 minutes when children are outside in cold weather.[3.1.3.2]

- Dress children to maintain a comfortable body temperature.

- In warm weather, this should be lightweight cotton protective clothing, including hats.

- In cold weather, this should be loose fitting, lightweight, warm clothing in several layers. The trapped air between the layers serves to insulate. Layers can be removed to avoid perspiration and subsequent chill. Outer garments should be tightly woven, water repellent, and hooded if possible. Since half of all body heat is lost through the top of the head, hats are necessary. Mittens, snug at the wrists are better than gloves. It is important to make sure the children stay dry (Schneider and Freeman, 2000).

WHERE TO FIND MORE INFORMATION

Trends in Environmental Health

Agency for Toxic Substances and Disease Registry
http://www.atsdr.cdc.gov/

Children's Environmental Health Network
Chronology of Children's Environmental Health
http://www.cehn.org/chronology_childrens_environmental_health

The Consumer Product Safety Commission
http://www.cpsc.gov/

Children's Unique Vulnerability to Environmental Hazards

Children's Environmental Health Network
An Introduction to Children's Environmental Health
http://www.cehn.org/education/what_is_ceh

Center for Health, Environment and Justice
Child Proofing our Communities
http://chej.org/2012/04/chej%E2%80%99s-childproofing-our-communities-cpoc-campaign-is-now-called-the-children%E2%80%99s-environmental-health-program-cehp/

U.S. Environmental Protection Agency
Office of Children's Health Protection
http://yosemite.epa.gov/ochp/ochpweb.nsf/content/homepage.htm

Environmental Hazards

Healthy Child Healthy World: Creating Healthy Environments for Children
http://healthychild.org/

Air Pollution

American Academy of Allergy, Asthma, and Immunology
http://www.aaaai.org

Asthma Community Network
http://www.asthmacommunitynetwork.org/

Asthma and Allergy Foundation of America
http://www.aafa.org
This site offers asthma care training for kids, and asthma and allergy essentials for child care caregivers/teachers.

Healthy Indoor Air for America's Homes
http://www.montana.edu/wwwcxair/

Indoor Air Pollutants Affecting Child Health
http://www.acmt.net/_Library/docs/IndoorAirPolution.pdf

Master Home Environmentalist Training Programs
http://www.lungusa.org/associations/states/washington/local-programs/air-quality/master-home-environmentalist/

National Heart, Lung, and Blood Institute
How Asthma-Friendly Is Your Child-Care Setting? Checklist
http://www.nhlbi.nih.gov/health/public/lung/asthma/chc_chk.htm

National Heart, Lung, and Blood Institute
Asthma & Physical Activity in the School: Making a Difference
http://www.nhlbi.nih.gov/health/public/lung/asthma/phy_asth.pdf

National Heart, Lung, and Blood Institute
Guidelines for the Diagnosis and Management of Asthma
http://www.nhlbi.nih.gov/guidelines/asthma/index.htm

National Center for Healthy Housing
http://www.nchh.org/training.aspx

National Safety Council
Air quality problems caused by floods
http://www.nsc.org/news_resources/Resources/Documents/Air_Quality_Problems_Caused_by_Floods.pdf

U.S. Environmental Protection Agency, Indoor Environments Division
Asthma Facts
http://www.epa.gov/asthma/pdfs/asthma_fact_sheet_en.pdf

U.S. Environmental Protection Agency, Indoor Environments Division
Indoor Air Quality: Tools for Schools, IAQ Coordinator's Guide
http://www.epa.gov/iaq/schools/tfs/guidtoc.html

U.S. Environmental Protection Agency
The Inside Story: A Guide to Indoor Air Quality: fact sheets on volatile organic compounds, mold, radon, smoke-free homes, and asthma
http://www.epa.gov/iaq/pubs/insidestory.html

Pests and Pesticides

California Childcare Health Program

The Use of Insect Repellant By Child Care Programs (includes parent/guardian permission form)
http://www.ucsfchildcarehealth.org/pdfs/healthandsafety/InsectRepellantEN091306_adr.pdf

Eartheasy
Non-toxic Home Cleaning (includes a guide to non-toxic alternative cleaners)
http://www.eartheasy.com/live_nontoxic_solutions.htm

IPM Institute of North America
School IPM
http://www.ipminstitute.org/school.htm

Environmental Protection Agency
Household Hazardous Products
http://www.epa.gov/osw/conserve/materials/hhw.htm

Excessive Risk Chemicals
http://www.govlink.org/hazwaste/publications/highrisktable.pdf

Minnesota Department of Health, Environmental Health Division. Facts about chemicals and practical steps you can take to reduce children's exposure. Minneapolis (MN): Minnesota Department of Health; 2000.

National Antimicrobial Information Network (NAIN) helps callers determine permitted uses of products, supplies general information on the regulation of antimicrobials and lists of products registered with the EPA, provides safety, health and environmental information, and takes reports of lack of product efficacy and forwards this information to EPA. NAIN can be contacted at 1-800-447-6349.

National School IPM Information Source
http://schoolipm.ifas.ufl.edu/Florida/list.htm
One of the most complete sources of information on IPM policy, guidance and outreach tools.

National Pesticide Telecommunications Network (NPTN) provides objective, science-based information about a variety of pesticide-related subjects, including pesticide products, recognition and management of pesticide poisonings, toxicology, and environmental chemistry. NPTN also lists state pesticide regulatory agencies, and provides links to their Websites. NPTN can be contacted at: 1-800-858-7378.

Penn State's Pesticide Education Program
http://www.pested.psu.edu/resources/
This site provides lists of fact sheets on pesticide safety, and other applicator and consumer topics.

U.S. Environmental Protection Agency
Chemical Management Resource Guide for School Administrators
http://www.epa.gov/oppt/pubs/chemmgmt/resourceguide.pdf
This guide contains visually accessible information on all classes of chemicals and provides samples of

detailed policies and guidelines for managing chemicals.

U.S. Environmental Protection Agency, Office of Pesticide Programs
Citizen's Guide to Pest Control and Pesticide Safety
http://www.epa.gov/pesticides/health/safely.htm

U.S. Environmental Protection Agency, Office of Pesticide Programs
Protecting Children From Pesticides
http://www.epa.gov/pesticides/factsheets/kidpesticide.htm

U.S. Environmental Protection Agency; Office of Pesticide Programs
How to Use Insect Repellents Safely
http://www.epa.gov/pesticides/insect/safe.htm

U.S. Environmental Protection Agency
Pesticides and Food: What You and Your Family Need to Know
http://www.epa.gov/pesticides/food

Drinking Water Contamination

U.S. Environmental Protection Agency
Children and Drinking Water Standards
http://water.epa.gov/learn/kids/drinkingwater/kidshealth_index.cfm

Special Topics

Art Materials

Arts, and Creative Materials Institute (ACMI)
http://www.acminet.org/

California Office of Environmental Health Hazard Assessment
Guidelines for the safe use of art and craft materials
http://oehha.ca.gov/education/art/artguide.html

US Consumer Product Safety Commission, (CPSC) Hotline at (800) 638-2772 or CPSC's teletypewriter at (800) 638-8270, or visit CPSC's web site at: www.cpsc.gov/talk.html.
Federal Hazardous Substances Act: www.cpsc.gov/businfo/fhsa.pdf

Compact Florescent Light Bulbs

U.S. Environmental Protection Agency
Mercury-Containing Lightbulb Recycling
http://www.epa.gov/bulbrecycling/
This site contains information on recycling compact florescent light bulbs.

Noise

Design of Child Care Centers and Effects of Noise on Young Children
http://www.designshare.com/Research/Lmaxwell/NoiseChildren.htm

Healthy Child Care: Noise and Lighting in Childcare
http://www.healthychild.net/SafetyFirst.php?article_id=432

Quiet Classrooms
Classroom Design for Good Hearing
http://www.quietclassrooms.org/library/goodhearing.htm

Plastics

California Childcare Health Program
Factsheets for Families: Banning Chemicals Called Phthalates in Childhood Products
http://ucsfchildcarehealth.org/pdfs/factsheets/BannedChem_0308.pdf

Environmental Working Group
EWG's Guide to Infant Formula and Baby Bottles: Guide to Baby-Safe Bottles & Formula
http://www.ewg.org/babysafe

Healthy Child Healthy World
Step 5: Be wise with plastics
http://healthychild.org/5steps/5_steps_5/

Z Recommends
The Z Report on BPA in Children's Feeding Products, Third Edition
http://zrecs.blogspot.com/2008/02/z-report-on-bpa-in-infant-care-products.html

Sun Safety

American Academy of Pediatrics
Summer Safety Tip Sheet
http://www.aap.org/en-us/about-the-aap/aap-press-room/news-features-and-safety-tips/pages/Summer-Safety-Tips.aspx?nfstatus=401&nftoken=00000000-0000-0000-0000-000000000000&nfstatusdescription=ERROR%3a+No+local+token

Centers for Disease Control and Prevention
Choose your Cover
http://www.cdc.gov/chooseyourcover/

Sun Safety Alliance
http://www.sunsafetyalliance.org/

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