Green Birthdays

Important information every healthcare provider should know about the environmental safety of the birth place and practical steps to reduce their own and their patients exposure to toxic chemicals

Health Care Without Harm

American College of Nurse-Midwives

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Introduction

In every birth setting[1], in every city and state, every baby born today will have toxic industrial chemicals in their body. No matter how hard mothers and clinicians work to insure the birth of a healthy child, every pregnant woman has ingested, inhaled and absorbed mercury, dioxin, and phthalates and will pass these and other industrial chemicals through the placenta to the developing child.

Every mother's breast milk is also contaminated with toxic chemicals. Because human beings eat at the top of the food chain, and because some of the most toxic chemicals, like dioxin and polychlorinated biphenyls (PCBs) are long lasting and lipophilic, the human breast accumulates these dangerous substances over many years.

What can obstetric care providers tell pregnant women and new mothers when they ask about the chemical contamination of babies and their breast milk? What can clinicians do to ensure that the problems created by the chemical industry don't cause additional problems like a decrease in breastfeeding or a fear of important nutritional sources like fish and yogurt because they may be contaminated with mercury and dioxin?

How do providers address these concerns? There are no individual therapeutic solutions a provider can prescribe that will detoxify a father's sperm or remove the dioxins from a mother's body. Providers can recommend that pregnant women stay away from solvents and phthalates and eat fish and seafood like shrimp and salmon which have much lower levels of mercury than tuna and swordfish. But since most fetal and breast milk contaminants have been bioaccumulating in the mother's body for seven or more years, personal actions during pregnancy and lactation won't remove our patients' body burden of industrial chemicals.

Healthcare providers don't possess the power to remove toxic chemicals from their patients. But they can demonstrate the political and consumer power that will, over time, reduce exposure to toxic chemicals. That's why healthcare Without Harm and the American College of Nurse Midwives have collaboratively produced *Green Birthdays*. The goal of this booklet is to provide obstetric care providers with information they can use to reduce the levels of industrial chemicals in birth settings. If clinicians across the country will convince the institutions in which they work to take the practical steps outlined in *Green Birthdays*, the result will be safer products, lower levels of exposure to toxic chemicals and more hope that the future will be less contaminated than the present.

This booklet describes the toxic exposures that result from products and practices in healthcare settings: mercury, polyvinyl chloride (PVC), pesticides and cleaning products, green building techniques, waste management, and occupational safety. For each of these topics, the booklet provides a brief overview of the problem and a summary of the solutions that healthcare institutions have found to address the problem. At the end of each chapter, we have included a list of resources for more information on that topic area. The final chapter is on what parents can do in their homes to reduce toxic exposure and protect their children.

All of the recommendations in *Green Birthdays* are based on the experience of healthcare institutions that are already focusing on providing environmentally sustainable healthcare. In each of these healthcare settings, the creation of healthier and safer policies and practices came from the hard work of a relatively small but highly dedicated group of people. Sitting through long meetings, making phone calls, drafting purchasing policies, arguing about wall and floor coverings and recycling waste may not seem like heroic acts. But they are when the result is cleaner breast milk and babies with fewer mercury-induced neurological problems. We hope that *Green Birthdays* will motivate you to become another hero for environmental health.

Notes

1. Birth setting refers to any space in which the birth occurs. This terminology includes hospitals, Birth Centers, and homes. The information contained in this booklet can be applied to each of these settings.

Mercury

The Problem

Mercury is a neurotoxic, heavy metal that is linked to numerous health effects in wildlife and people. When released into the environment, it is deposited onto land and surface waters where it remains indefinitely, either as elemental mercury (the inorganic form) or as methylmercury (the organic form). Microorganisms can convert elemental mercury to methylmercury, making it more biologically available or more able to interact with cells and damage them. Methylmercury accumulates in the tissues of animals, especially fish, and through consumption of mercury-contaminated foods, it bioaccumulates in humans.

Mercury exposure can cause tremors, impaired vision and hearing, paralysis, insomnia, emotional instability, developmental deficits during fetal development, and attention deficit and developmental delays during childhood. Recent studies suggest that mercury may have no threshold below which adverse effects do not occur. As a neurotoxin, mercury attacks the body's central nervous system. It can also harm the brain, kidneys and lungs. Methylmercury from contaminated fish easily crosses the placenta and enters the brain of the developing fetus. The critical effect from prenatal exposure to methylmercury is mental retardation. Children of women who consume large amounts of fish and seafood during pregnancy are at highest risk. A recent report issued by the National Academy of Sciences National Research Council estimated that every year an estimated 60,000 children are born in the United States with neurological problems that could lead to poor school performance because of exposure to methylmercury in utero.[1]

Fish consumption advisories due to mercury contamination are in place across the United States. The neurotoxic risks to developing fetuses and young children are the primary reason for these advisories, which aim to discourage pregnant women, women of childbearing age, and young children from eating too much potentially contaminated fish. A recent study by the Centers for Disease Control estimated that 1 in 10 women have mercury levels high enough to cause neurological effects.[2] Studies done on women who eat methylmercury-contaminated fish or grain show that even when the mothers show few effects of exposure, their infants demonstrate nervous system damage.

Through medical waste incineration, healthcare facilities are recognized as the fourth largest source of mercury to the atmosphere.[3] Hospitals also contribute approximately 4-5% of the total wastewater mercury load.[4] Mercury can be found throughout a hospital in various products including thermometers, sphygmomanometers, dilation and feeding tubes, batteries, and fluorescent lamps. Because of its toxicity, legislation banning the sale of mercury thermometers has been passed in Duluth, Ann Arbor, San Francisco, and Boston. The American Hospital Association and over 600 hospitals, including the National Institutes of Health, have taken pledges or signed agreements to voluntarily eliminate mercury-containing devices in their facilities. The following is a table of mercury-containing products found in birth settings and their alternative:

Mercury-Containing Products	Alternatives
Thermometers	Digital Thermometers
Sphygmomanometers	Aneroid/electronic sphygmomanometers
Thermostats	Electronic thermostats
Fluorescent lamps	Low mercury/recycle
Batteries	Recycle
Switches	Electronic switches
Austin, Clorox Bleach	R.W. Crown Bleach
Bac-Down Soap	Calgon-Vestal Soap
Effect II	Wex-Cide

The Solution

A variety of hospitals around the country have already demonstrated that it is possible to practice mercury-free healthcare. Dana Farber Cancer Institute, in Boston and St. Mary's Medical Center, Duluth, Minnesota are two examples. Here are the steps these and other institutions have taken towards mercury elimination:

- Eliminate the distribution of mercury thermometers to new parents.
- Eliminate the purchase of any new mercury-containing equipment.
- Provide yearly training on mercury pollution prevention.
- Replace all mercury-containing equipment (sphygmomanometers, laboratory and patient thermometers, gastrointestinal equipment).
- Eliminate the use of mercury-containing fixatives and reagents.
- Introduce purchasing procedures that preferentially select lowest mercury-containing compounds for all hospital purchases with background mercury contamination, like bleach and other cleaning products.
- Eliminate the incineration of waste.
- Replace all mercury-containing pressure gauges on mechanical equipment.
- Replace or power wash the plumbing system.
- Establish fluorescent bulb and battery collection programs.
- Support legislation which prohibits the sale of mercury-containing equipment.

Implementation

A mercury reduction plan should be initiated by an announcement of institutional support, and an invitation for interested employees to be part of a mercury pollution prevention taskforce. A task force that meets regularly and takes action can remove a larger volume of mercury, and will provide the most lasting and measurable impacts. A senior decision maker can make a positive impact on mercury reduction scenarios by providing management support for regular meetings and financial support for actions that require funding. Timing and order of any action steps should be guided by the taskforce, but in addition to the above should include:

- Holding a mercury thermometer roundup,
- Providing annual mercury training/spill/labeling programs,
- Creating replacement plans and budgets for the elimination of mercury-containing equipment,
- Collecting all wastes from processes involving the fixative B5 and designate a team to investigate the use of mercury-free alternatives,
- Establishing a waste trap cleaning/replacement plan,
- Establishing a labeling and replacement plan for other mercury-containing devices like mechanical equipment.

First Steps: Create a Mercury Reduction Team

A first step for a mercury reduction team might include the identification of available educational resources both internal and external to the hospital. Internally, this might include health professionals and environmental services personnel. Externally, state and industry waste management resources are plentiful. Some mercury reduction teams have had early successes by prioritizing where to begin their initiatives. Mercury sphygmomanometers frequently break and spill, incurring substantial clean-up costs. These might be a priority at one institution, while in another where there may be a risk for wastewater fines, laboratory mercury reductions might be their priority. There is not "one" strategic list, but prioritization may be a means to achieve early successes.

Using your Group Purchasing Organization (GPO)

Purchasing is one of the most important departments in any hospital mercury reduction initiative. It is where the decisions are made as to what does, or does not, come into a facility. So, the adoption of a mercury-free purchasing policy is one of the first places to begin implementation of a mercury elimination policy (with requisite education and training on mercury-free healthcare). Yet, the role of purchasing in mercury-free healthcare may frequently be subservient to the role of the individual institution's Group Purchasing Organization (GPO). It is the GPO that offers the products that a hospital purchases. If that GPO offers mercury-containing equipment, or mercury products without disclosure of mercury con-

centrations, it may be contractually difficult to meet the objectives of an institutional mercury-free policy.

The GPO therefore plays an important role in mercury-free healthcare. It is important to recognize this role and use this knowledge to empower hospital management. Hospital management must support the Purchasing Department during GPO contract negotiations, and demand mercury-free products and products that disclose mercury concentrations. Hospital management may also have to work with the other hospitals in their GPO and together create a voice for mercury-free products. Such leadership will lend support to the GPO to call on manufacturers to disclose mercury concentrations.

Conclusion

Because mercury-free healthcare exists in several hospitals across the country, we know it is technically feasible. That these experiences have helped to identify obstacles and means to circumvent them, should make the course that much easier for other hospitals and birthing centers to achieve the same goal.

Notes

1. National Academy of Sciences National Research Council, July 2000. "Toxicological Effects of Methylmercury."
2. CDC Morbidity and Mortality Weekly Report. "Blood and Hair Mercury Levels in Young Children and Women of Childbearing Age —- United States." 1999 Vol 50, No 08;140 03/02/2001.
3. USEPA 1997, "Mercury Report to Congress."
4. Personnel Communication, Western Lake Superior Sanitary District, Duluth, MN

Resources

Eliminating Mercury Use in Hospital Laboratories: A Step toward Zero Discharge: Public Health Reports, July/August 1999 Volume 114 p353-358

Healing the Harm: Eliminating the Pollution from Health Care Practices.

Mercury Thermometers and Your Family's Health

How to Plan and Hold a Mercury Fever Thermometer Exchange

Making Medicine Mercury Free

Health Care Without Harm, P.O. Box 6806, Falls Church, VA 22042, (703) 237-2249; www,noharm.org

20-minute video and guidebook Mercury Use in Hospitals and Clinics. Minnesota Office of Environmental Assistance, 520 Lafayette Road N., 2nd Floor, St. Paul, MN 55155; (612) 296-3417; (800) 657-3843.

The case against mercury: Rx for pollution prevention. U.S. Environmental Protection Agency, Region 5, Chicago, IL. 1995.

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Personnel Communication, Western Lake Superior Sanitary District, Duluth, MN

P V C

The Problem

Polyvinyl chloride (PVC) is a chlorinated plastic made ready for various uses by the addition of fillers, stabilizers, lubricants, plasticizers, pigments, and flame retardants. In 1996, PVC accounted for 27% of all plastic used in durable and disposable plastic medical products in the US. Flexible PVC medical products contain a plasticizer called DEHP (di-2-ethylhexyl phthalate) which is added to enhance strength and flexibility. Most PVC medical devices contain 20-40% DEHP by weight, but PVC tubing may contain up to 80% DEHP.

PVC poses two major hazards during its lifecycle.

- Its manufacture and incineration produce dioxin and;
- Its plasticizer DEHP can leach from PVC medical products into patients.

Dioxin is the common name referring to a group of 75 chemicals that are extremely potent, persistent, and bioaccumulative environmental toxicants. They are unintentionally formed during a variety of industrial processes, including the manufacture and incineration of PVC. The primary source of dioxins from the healthcare sector is the incineration of PVC medical devices like IV and blood bags, tubing, catheters and examination gloves.

Once dioxins are released into the environment, they attach to dust particles and raindrops and fall back to the surface where they coat vegetation. Dioxin enters the food chain when animals consume it and it eventually concentrates in the fatty tissues of animals and human beings. Human exposure to dioxin is primarily through food, with major sources including beef, dairy products, fish and pork. Infants absorb dioxins across the placenta and through their mother's milk.

Dioxin is a known human carcinogen according to the International Agency for Research on Cancer. Dioxin also has widespread effects on reproduction and development, as shown in animal and human studies. A nanogram to microgram/kg body weight dose of dioxin on a single day during pregnancy has been shown to cause permanent disruption of male sexual development in rodents, including delayed testicular descent, lower sperm counts, and feminized sexual behavior. In primates, small dietary exposures to dioxin are associated with an increased risk and severity of endometriosis. A study in humans also shows higher levels of dioxin in women with endometriosis than in a control population.

Dioxin is particularly toxic to the developing immune system. Animal tests show that nanogram/kg doses given 1-4 times during pregnancy can cause permanent alterations in the immune system of offspring. Human studies also show an increased susceptibility to infection and changes in immune system parameters as a result of in utero exposure to ambient environmental levels of dioxin and dioxin-like compounds. Low levels of exposure during pregnancy also alter thyroid hormone levels in mothers and offspring, perhaps explaining neurological effects, including learning disabilities, that are seen in carefully conducted primate studies.

According to the United States Environmental Protection Agency (USEPA), adults eating an average diet are consuming 300 to 500 times the daily "safe" dose of dioxin. Through ordinary dietary exposures, the general public carries a current body burden of dioxin that is near or above the levels that cause adverse effects in animal tests. Moreover, breast milk contamination is such that the nursing infant, during vulnerable periods of development, is exposed to dietary levels of dioxin as much as 60-100 times more than the typical adult. Nonetheless, breast-feeding remains far superior to formula feeding for a variety of reasons, and reducing breast-feeding is not the appropriate public health response to a contaminated food supply. Rather, all possible steps should be taken to reduce breast milk levels of this contaminant by eliminating releases of dioxin to the environment.

Paralleling the effects of dioxin exposure is the risk of DEHP leaching from PVC medical products. DEHP has been shown to be a reproductive and developmental toxicant in laboratory animal testing. In rodents, developmental DEHP exposure causes general adverse effects on the structure and function of the male reproductive tract. There is also evidence that it can adversely affect the liver and lungs. Neonates and infants who receive medical care that includes the use of plasticized PVC products may easily be exposed to DEHP at levels that are in excess of the "no observed adverse effect level" (NOAEL) in animal tests.

An expert panel convened by the National Toxicology Program's Center for Evaluation of Risks to Human Reproduction concluded that: " [for DEHP] the available reproductive and developmental toxicity data and limited but suggestive human exposure data indicate that exposures of intensively-treated infants and children can approach toxic doses in rodents, which causes the panel serious concern that exposure may adversely affect male reproductive tract development." The panel also expressed "concern that ambient oral DEHP exposures [primarily from general dietary contamination] to pregnant or lactating women may adversely affect the development of their offspring."[1] DEHP exposures from medical therapy would, of course, add to ambient dietary exposures.

The Solution

Because of the obvious negative health effects of dioxin and DEHP associated with PVC plastic, every effort should be made to make the birth place PVC-free. This transition should be made not only because of the risks to mother and infant of DEHP exposure, but also because of the long-term effects of dioxin to environmental and human health. Some steps to becoming PVC-free include:

- Establishing a PVC reduction policy,
- educating staff on the lifecycle hazards of PVC and the toxicity of DEHP,
- collecting data on PVC use in the birth place through audits and letters to vendors,
- identifying PVC-free and DEHP-free alternatives, and
- developing and implementing a PVC reduction plan.

Implementation

Establish and Implement a PVC Reduction Policy

The most systematic way for birth settings to reduce the use of PVC is to put in place an organization-wide PVC reduction policy. Reducing PVC use in the birth place will involve educating staff on the need for change, gathering data, planning, assessing alternatives, and changing procurement policy. (See the example of PVC reduction policy language on the next page.)

Develop and Implement a PVC Reduction Plan

Disposable PVC healthcare products should be the first priority because of the potential for significant patient exposure to DEHP and because they may be incinerated at the end of their useful life. DEHP exposure is critical to consider, especially for fetuses, newborns, and toddlers who may be exposed to levels of DEHP known to cause harm in relevant animal models. Since DEHP is a reproductive and developmental toxicant, DEHP use in birthing suites, maternity departments, NICUs, and pediatric units is of particular concern. For those departments, healthcare providers may decide that eliminating DEHP exposures in their particularly vulnerable patients justifies the higher cost for polyethylene, polyurethane, or silicone tubing. While purchasing DEHP-free PVC products is an option for reducing DEHP exposure, it should only be considered an interim solution because it does not address the lifecycle impacts of PVC.

Office supplies are another priority for elimination because they may be incinerated upon disposal. Cost-competitive alternatives are widely available, and hospitals usually can replace them easily under existing contracts.

PVC furnishings, furniture products, and construction products should be eliminated from new purchases, building renovations, and new building construction. For most of these products, cost-competitive, PVC-free alternatives are widely available.

Durable medical products pose the greatest challenge to reduction due to the lack of knowledge of their PVC content and availability of PVC-free devices. The primary use for PVC in durable medical products is as the housing — the rigid, outer plastic covering — for testing and diagnostic equipment. Since durable medical products have a longer use life than disposable medical products (such as IV bags) and result in little DEHP exposure, they are a secondary target for reduction. A first step in reducing PVC use in these applications would be to require vendors to disclose the PVC content in their equipment.

Educate Staff

Educational programs raise staff awareness of the hazards associated with PVC and DEHP-containing products and establish the reasons why staff should be concerned with the use of these products. Workshops, grand rounds, and conferences are all appropriate forums for promoting awareness of the lifecycle hazards of PVC and toxicity of DEHP.

Collect Data

Data collection through audits and letters to vendors is a critical step, because reducing PVC requires knowledge of its use and the availability of alternatives. Catholic Healthcare West, for example, requires its group purchasing organization (GPO) to identify products that contain PVC.

Universal Health Services, Memorandum of Understanding with Shareholders

Universal Health Services ("UHS") is committed to conducting its business in a socially responsible and ethical manner, which protects patient and employee safety and the environment. UHS recognizes that polyvinyl chloride ("PVC") plastic, a component in various medical products, may result in damage to the environment. In light of these factors and in conjunction with a proposed shareholder resolution filed with the Company on December 21, 1998, UHS plans to investigate the utilization of PVC containing items in their operations through the following measures:

- The Company will investigate the availability and utility of PVC-free products available in the marketplace and will periodically continue its investigation as technological advances provide cost effective and high quality products. To aid in this process, Health Care Without Harm will provide UHS a list of items potentially containing PVC. Utilizing this information, the company will review its current supplies and request PVC-free alternatives from its suppliers, where appropriate.
- To the extent that it is consistent with high quality and cost effective healthcare delivery, UHS will continue to explore the use of PVC-free products and utilize such products to the extent they are available. UHS agrees to formally request PVC-free alternatives from its suppliers to aid in the development of further advancements in PVC-free products.
- The Company agrees to meet with representatives of the filing shareholders and Health Care Without Harm prior to June 30, 1999 in order to establish the timetable and benchmarks for the items listed above. UHS agrees to meet with the filing shareholders and other mutually agreed upon parties prior to October 31, 1999 to assess the Company's progress.

The Company and the filing shareholders agree to announce this agreement through a mutually agreed upon joint press release to be distributed on May 19, 1999 in conjunction with the UHS Annual Meeting. The Company's willingness to enter into this agreement furnishes the filing shareholders the sufficient evidence of goodwill on the Company's behalf to allow the removal of the shareholder resolution from the Company's proxy for the upcoming Annual Meeting. The filing shareholders hereby withdraw the shareholder resolution from the company's proxy.

UNIVERSAL HEALTH SERVICES, INC.		CITIZENS FUNDS On Behalf of Filing Shareholders	
By:	_____	By:	_____
Name:	Kirk E. Gorman	Name:	Samuel Pierce
Title:	Senior Vice President, Chief Financial Officer and Treasure	Title:	Senior Social Research Analyst
Date:	April 19, 1999	Date:	April 19, 1999

Identify PVC- and DEHP-free Alternatives

Disposable PVC healthcare products divide into five broad categories: bags, tubes, gloves, trays, and catheters. Bags (42.5%), tubes (43.0%), and gloves (12.5%) account for 98% of disposable PVC healthcare products.

A rigid plastic by nature, manufacturers add DEHP to make PVC flexible. DEHP-free PVC medical devices contain alternative softening agents (plasticizers). Non-PVC plastics used in medical devices, such as silicone, polyethylene, or polypropylene, are inherently flexible and do not contain plasticizers. Thus potential risks from plasticizer leaching are avoided.

PVC bags package IV products, total parenteral nutrition (TPN) and enteral feeding formulas, and blood products and collect some bodily fluids. DEHP-containing PVC medical bags first became a matter of concern in the 1970s because of DEHP exposures from the use of blood and TPN bags. This concern led to the development of PVC-free platelet rich plasma bags, fresh frozen plasma bags, and TPN bags as well as a DEHP-free packed red blood cell bag.

Today, PVC-free bags are on the US market for all but one product, packed red blood cells. The PVC-free bags are cost- and technically-competitive with the PVC bags. For the packed red blood cells, a DEHP-free bag is on the market

at a slightly higher cost than the PVC, DEHP bag. An unintended consequence of DEHP leaching from PVC bags is that it acts as a preservative of red blood cells. DEHP extends the shelf-life of stored red blood cells by stabilizing the red blood cell membrane. The Food and Drug Administration does not regulate DEHP as an additive to red blood cells. The alternative plasticizer used in red blood cell bags is a citrate. Citrates, in fact, have a long history of use as a blood preservative. The shelf-life of blood in citrate-plasticized bags is similar to that of DEHP-plasticized bags.

PVC tubing conveys liquids- such as IV solutions and enteral formula - and gases - usually oxygen - to and from patients. PVC-free or DEHP-free tubing is on the U.S. market for most medical applications. Silicone, polyethylene, and polyurethane are three alternative polymers frequently used in tubing applications. In most applications, at least one of these polymers can compete with PVC in terms of technical performance.

In terms of economic performance, PVC-free tubing generally costs more than PVC tubing. In the next few years, however, plastics industry analysts expect metallocene polyolefins (polyethylene and polypropylene are polyolefins) to become cost-competitive with flexible PVC medical products.

Alternatives for disposable PVC gloves are also readily available. PVC is used primarily in the manufacture of examination gloves and has little market share in the surgical glove market. Latex is the other dominant material used in the manufacture of examination gloves. However, concerns with latex allergies have led hospitals and manufacturers to consider gloves made of different materials. For example, Kaiser Permanente decided to phase out the use of latex gloves and ultimately settled on gloves made of nitrile. While these are more expensive than latex and PVC gloves, Kaiser received a cost-competitive bid due the size of its contract. Reflecting growing demand, a diversity of latex- and PVC-free gloves are on the market today, although costs are slightly higher. Please refer to the table on page 12 for a list of PVC/DEHP alternatives.

PVC-free construction and furnishing products are widely available and are often cost-competitive. For example, PVC-free mattress covers and shower curtains are widely available and are cost-competitive with the PVC products. During renovations and new building construction, hospitals should specify PVC-free products. Construction productions, furnishings, and furniture products account for approximately 75% of all PVC end uses.

Barriers to PVC Reduction

Lack of Knowledge

Most hospital staff are unfamiliar with the lifecycle hazards of PVC, the extent to which they use PVC and DEHP-containing products, and the availability of those that are PVC-free, limiting demand for alternatives

Contracts

To achieve lower per unit product costs, most hospitals purchase medical products through group purchasing organizations (GPOs). GPOs enjoy economies of scale because they make large volume purchases, commit to buy for the long-term (up to eight years), and occasionally agree to "bundled" contracts.

Purchasing through GPOs, however, may reduce purchasing flexibility and create impediments to innovation. By locking into long-term contracts with one vendor, GPOs — and the hospitals they represent — cannot change to another vendor before a contract expires without incurring a significant monetary penalty.

The options available to healthcare organizations locked into long-term contracts include clearly stating their desire for PVC-free products to both their GPO and current vendors and finding individual departments within the hospital where product change is possible, such as NICUs. When contracts expire, healthcare organizations need to voice their desire to GPOs that they want a) single source contracts with manufacturers of PVC-free products or dual source contracts that include a vendor of PVC-free products and b) a clause added to new contracts that allows them to switch to products with better environmental performance.

Limited Number of PVC-Free Vendors

PVC-free products are on the US market in many product categories. However, the number of vendors of PVC-free products within each category may be limited. The scarcity of vendors selling PVC-free products in the US is in sharp contrast to Europe. For example, at least seven corporations manufacture PVC-free IV bags in Europe, whereas only one manufactures PVC-free IV bags in the US. At least four corporations manufacture PVC-free IV tubing in Europe, whereas none manufacture it in the US.

Corporations that sell in both the European and US markets often choose not to market PVC-free products in the U.S. For example, Baxter International, and Fresenius sell certain PVC-free products in Europe, but not in the US. The combination of limited numbers of PVC-free vendors and long-term contracts can limit opportunities for a hospital to purchase a PVC-free product in the US (without incurring a monetary penalty for breaking a contract).

Costs

The potential monetary costs of product change come in two forms: transition costs for employees and potentially higher costs for alternative products. For some products, switching vendors requires training in the use of new

equipment. The costs for some PVC-free products may be higher in the short-term but decline in the long-term, as costs of alternatives decrease with improved efficiency in production and through economies of scale.

Market Opposition

Transitioning away from PVC products is made more difficult by the vocal opposition of vested economic interests and their allies. Manufacturers with direct economic interests in continued PVC use include DEHP manufacturers, manufacturers involved in any stage of PVC production, and medical device manufacturers. Trade associations that have expressed support for continued PVC and DEHP use in healthcare include the American Chemistry Council (trade association of the chemical industry), AdvaMed (trade association for medical device manufacturers), and the Vinyl Institute. Think tanks that have expressed support for continued PVC and DEHP use in healthcare include the American Council on Science and Health, Competitive Enterprise Institute, and Reason Public Policy Institute.

DEHP advocates rely on reports by the American Council on Science and Health (the "Koop Report"), Competitive Enterprise Institute, and Reason Public Policy Institute to support their claim that DEHP is safe for use in medical products. These reports conclude, as succinctly stated in the Koop Report, that "DEHP in medical devices is not harmful to even highly exposed people" (p. 2). The basis for this conclusion, as Schettler revealed in a letter-to-the-editor of Medscape, is a selective review of the scientific literature.

When all the scientific literature relevant to DEHP toxicity and exposure was evaluated by the independent Expert Panel on Phthalate Esters from the National Toxicology Program's Center for the Evaluation of Risks to Human Reproduction, the panel expressed "serious concern that exposure [to critically ill infants from medical devices] may adversely affect male reproductive tract development."

Conclusion

PVC products pose two potentially significant hazards to humans across their lifecycle. First, the use of PVC products in medical treatments may result in patient exposure to DEHP, a reproductive and developmental toxicant. Concerns about other potential health effects remain unresolved. Second, the production of PVC and its disposal in incinerators contribute to the formation and emission of dioxins, extremely toxic and potent environmental toxicants.

Healthcare providers can change the material composition of products and can reduce the use of PVC by demanding safer and cleaner products. The availability of PVC-free umbilical vessel catheters, TPN bags, platelet rich plasma bags, and fresh frozen plasma bags, and DEHP-free packed red blood cell bags are all examples of how the market shifted when healthcare providers voiced concerns in the 1970s. The medical product market is shifting once again, especially in Europe where PVC-free bags and tubing are widely available. The US market shows signs of incremental change, as indicated by Baxter's decision to market PVC-free IV bags in the near future. However, without a clear signal from healthcare providers that they want PVC-free products, manufacturers will continue to delay the introduction of these products in the US.

Notes

1. NTP-CERHR Expert Panel Report on Di(2-ethylhexyl)phthalate, National Toxicology Program, U.S. Department of Health and Human Services, Center for the Evaluation of Risks to Human Reproduction, October 2000.

Resources

European Commission. 2000. Green Paper on Environmental Issues of PVC. **www.europa.eu.int/comm/environment/pvc/index.htm**

European Commission. 2000. Five PVC studies:
1. The Influence of PVC on the Quantity and Hazardousness of Flue Gas Residues from Incineration
2. Economic Evaluation of PVC Waste Management
3. The Behaviour of PVC in Landfill
4. Chemical Recycling of Plastics Waste (PVC and Other Resins)
5. Mechanical Recycling of PVC Wastes

www.europa.eu.int/comm/environment/waste/facts_en.htm

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NON-POLYVINYL CHLORIDE (PVC) AND NON-DI-2-ETHYLHEXYL PHTHALATE (DEHP) MEDICAL DEVICES[1]

Products	Manufacturer	Telephone	Webage	Material[2]	Comments
Blood Bags	Baxter Healthcare, Fenwal Division	800.766.1077	www.baxter.com	Polyolefin Non-DEHP PVC	bags for platelets, platelet rich plasma, and fresh frozen plasma bags for packed red blood cells
Intravenous (IV) Bags and Tubing	B. Braun McGaw	800.227.2862	www.bbraunusa.com	PP/PE copolymer, polyester, elastomer laminate	IV bags
	Budget Medical Products	800.569.1620	www.icumed.com	Non-DEHP PVC	IV tubing
Respiratory Therapy Products	Bivona Medical Technologies	800.348.6064	www.bivona.com	Silicone	endotracheal tubes
	DHD Healthcare	800.847.8000	www.dhd.com	Silicone	aerosol mask
	Rhsch	800.553.5214	www.ruschinc.com	Red rubber or silicone	reusable endotracheal tubes
	Vital Signs	800.932.0760	www.vital-signs.com	Polyester	oxygen or aerosol applications - Aero2Mask
Bedding Products	Precision Dynamics Corp.	800.847.0670	www.pdcorp.com	Polyethylene	Disposable mattress and pillow covers, draw sheets
Office Supplies: 3-ring binders	Available from standard office supply houses				Polyethylene, cardboard

Products	Manufacturer	Telephone	Webage	Material[2]	Comments
Gloves, Examination	Allegiance Healthcare Corp.	800.964.5227	www.allegiance.net	Nitrile	
	Ansell-Perry	800.321.9752	www.ansellhealthcare.com	Nitrile	
	Best Manufacturing Co.	800.241.0323	www.bestglove.com	Nitrile	
	ECI Medical Technologies	902.543.6655	www.ecimedical.com	Styrene butadiene	
	Maxxim Medical	800.727.7951	www.maxximmedical.com	Polyurethane	
	Safeskin Corporation	800.462.9993	www.safeskin.com	Nitrile	
	SmartCare Inc.	800.822.8956	www.smartcare.com	Nitrile	
	Tillotson Healthcare Corp	800.445.6830	www.thcnet.com	Nitrile	
Patient ID Bracelets	Precision Dynamics Corp	800.847.0670	www.pdcorp.com	Tyvek®	Appropriate for short stays.
	Wristband & Medical Specialty Products	800.940.3993	wristbandsupply.com	Tyvek®	Appropriate for short stays.
Sequential Compression Device	Kendall Health Care	800.962.9888	www.kendallhq.com	Polyolefins	
Shower Curtains	Brookstone	800.846.3000	brookstone.com	Tyvek®	
	Many manufacturers			nylon	

1. Health Care Without Harm does not endorse any of these products and has not tested them for safety or efficacy. Listing here is based solely on information provided by the manufacturer. Products that contain latex and chlorine are excluded from this table: latex products because of concerns over latex allergies and chlorine containing products because of concerns over lifecycle hazards.
2. Abbreviations for materials: EVA = ethylene vinyl acetate; EVOH = ethylene vinyl alcohol; PE = polyethylene; and PP = polypropylene; SEBS = styrene ethylene butadiene styrene.

Sources: Sustainable Hospitals Project, 2000, "Alternative Products," see http://sustainablehospitals.org/ (Lowell: Sustainable Hospitals Project, UMass Lowell); and Tickner, Joel, et al, 1999, *The Use of Di-2-Ethylhexyl Phthalate in PVC Medical Devices: Exposure, Toxicity, and Alternatives* (Lowell: Lowell Center for Sustainable Production, UMass Lowell).

Toxic Chemicals

Pesticides and Cleaning Products

The word toxic is defined as the ability of a substance to cause adverse health effects in living organisms. Unfortunately, many commonly used pesticides and cleaning products fall into this category. Many of these chemicals contribute to indoor air pollution, are poisonous if ingested, and can be harmful if inhaled or if they come into contact with the skin.

Hospitals, with their kitchens and cafeterias, patient rooms, public areas and offices, are regularly cleaned and treated with a variety of pesticides. People may be exposed to the toxic chemicals in cleaners and pesticides without the opportunity to take precautions to avoid unwanted exposure. The use of hazardous chemicals in hospitals may be of particular concern because exposure is potentially more dangerous for children, the elderly and those whose immune systems are already impacted.

The fetus and infant are especially vulnerable to toxic chemicals in cleaners and pesticides due to their rapid development. This vulnerable population is more susceptible to health effects, even from seemingly small exposures. Proper development of the immune system, nervous system, lungs, and reproductive organs is easily disrupted by exposure to toxic substances. Fetal and newborn neurologic development is particularly susceptible to the negative effects of toxic exposure.

But even after infancy, children's size, and normal behaviors can cause them to be at higher risk of exposure to toxic chemicals than adults. They are smaller and therefore closer to pesticide and cleaner residues on and near the ground. They also play in the dirt, on the grass, and on carpet more, and they put their hands and objects that may have residues on them in their mouths more often than adults do.

Cleaners

The Problem

Though it is necessary for a hospital to maintain sanitary conditions, often the cleaners used can be hazardous to the health of patients and workers who are exposed to them. Hundreds of highly specialized chemical products have been designed to combat grease, dirt, mold, mildew, dust, and bacteria in every conceivable location of a hospital. More than 70,000 chemicals are registered with the EPA for use in cleaning products, including a number of suspected hormone disruptors and carcinogens.

Toxic cleaners used in hospitals contribute to poor air quality and have been implicated in the increase of worker respiratory ailments such as asthma. On the contrary, good air quality results in an environment where workers feel healthy and comfortable. Worker productivity increases, and cost and liability surrounding health and safety issues decreases. By carefully choosing less toxic cleaning chemicals, cleaning methods and cleaning equipment, US businesses could realize a productivity gain of $30 to $150 billion annually, and a 0.5% to 5% increase in worker performance by improving indoor environments through improved ventilation and quality cleaning.

Some common cleaners found in a hospital or maternity center include:

- glass cleaner
- drain cleaner
- dish detergent
- dishwasher detergent
- all purpose cleaners
- furniture polish
- toilet bowl cleaner
- ammonia (also an ingredient of many cleaners)
- bleach
- carpet cleaner

These cleaning products can be grouped into three major categories: disinfectants, floor stripping and polishing chemicals, and scented cleaning chemicals.

- Disinfectant Chemicals

Disinfectants used in hospitals, such as quaternium ammonia compounds, phenols, and bleach, are registered with the EPA as pesticides. These toxic chemicals are used for routine cleaning on every surface in the hospital envi-

ronment. These chemicals are toxic and cause irritation to skin and to the respiratory and nervous systems. They are known to induce asthma as well as aggravate pre-existing asthma in those exposed.[1] In addition to occupational asthma, hypersensitivity syndrome results from long-term exposure to quaternium ammonia compounds.[2]

- Floor stripping and polishing chemicals

Floor strippers contain chemicals that can seriously harm the user and may also affect the building occupants. Chemicals in these products include diethylene glycol ethyl ether, aliphatic petroleum distillates, and nonyl-phenol ethoxylate,ethanolamine (a known sensitizer), butoxyethanol, and sodium hydroxide (lye). Healthcare workers and others exposed to floor stripping and floor polishing chemicals experience headaches, eye irritation, dizziness, nausea, difficulty concentrating, fatigue, wheezing, coughing, asthma attacks, respiratory infections, pneumonia, and nose, throat, and skin irritation. If exposure continues, irreversible lung damage and the formation of fibrosis tissue may occur.[3]

- Scented cleaning chemicals

Inadequate ventilation, reducing the frequency and volume of air exchanges, or climate controls designed to save energy, increase the concentration of scented cleaning chemicals in indoor air. They are further concentrated in tight buildings with little or no natural ventilation and windows that do not open to allow fresh air intake to dilute these chemicals. Improperly located air intake vents may contribute to poor air quality by allowing diesel fuel exhaust from ambulances, rescue vehicles, or delivery trucks on loading docks to circulate throughout the building. According to the California Office of Environmental Health Hazard Assessment, building occupants exposed to diesel exhaust experience eye, nose and throat irritation, respiratory problems such as increased cough, labored breathing, chest tightness and wheezing. It can also cause an inflammatory response in the airways and lungs. Exposure to diesel exhaust may also cause increased sensitivity to allergens. [4]

Often scented cleaning chemicals are purchased in a concentrated form. This requires mixing and/or dilution by the employee who is responsible for application. Adverse health effects are suffered by workers when the concentration or mixtures of these products is incorrect. This may represent a problem with training, language skills or worker supervision. When certain scented cleaning chemicals are mixed together a synergistic effect occurs. This means the interaction of two or more of these chemicals produces a health effect greater than that of the individual chemical effects. For example if a quaternium ammonia compound is use in combination with bleach cleaner, a toxic gas called chloramine gas forms and is released into the air.

The Archives of Environmental Health note that some humans exposed to fragrance products might experience some combination of eye, nose and/or throat irritation, respiratory difficulty, possibly broncho-constriction, or asthma-like reactions, and central nervous system reactions (e.g. dizziness, discoordination, confusion, fatigue).[5]

The use of spray bottles, aerosol cans, and mechanized equipment, such as floor burnishers, buffers, and carpet washers, all increase the airborne concentration of scented cleaning chemicals. Spray bottles should be replaced with a pour and wipe application process. Floor burnishers and buffers should have an enclosed system with a filter (scrubber) to capture chemical vapors and particulates from the burnishing process. These changes will contribute to the reduction of the aerosol concentration of environmental cleaning chemicals and products.

The Solution

To avoid the adverse effects of many conventional cleaners, the least toxic and most effective cleaning product should be chosen. There have been at least four municipal and state pilot programs to reduce the purchasing and use of toxic cleaners. As a part of their Sustainable City Program, the City of Santa Monica, CA addressed the environmentally preferable cleaners issue. In an effort to purchase less harmful products, the program evaluated cleaners for their environmental and health effects. As a result, they reduced the use of hazardous products, saved money, and reduced worker complaints. In a similar program initiated by the Saint Paul Neighborhood Energy Consortium, the custodial staff of the Saint Paul City Annex preferred the least toxic alternative for every product tested. The products were praised for their efficacy and relative pleasantness to use.[6]

Many alternatives are available for both industrial and home use. Some common manufacturers of less toxic products include Seventh Generation, EarthRite, Aubrey Organics, Auro, Biofa, Dr. Bronner's, Livos, AFM, and Ecover. Industrial strength products used in Minnesota include Chemco Enviro-Chem (cleaning compound, solvent-detergent), Cooke Easy Job (all purpose cleaner), PCI Hurrisafe 9010 (all purpose cleaner), and Sunshine Simple Green (cleaning compound, solvent-detergent).[7]

In general, least toxic alternatives should not contain:

- ammonia
- chlorine
- phosphates
- alkylphenol ethoxylates(APEs)
- volatile organic compounds (VOCs)
- propellants
- petroleum solvents

Also, they would not be caustic or corrosive. Alternatives should not cause skin irritation, should not bioaccumulate, should not contain unnecessary dyes or fragrances, and should have reduced packaging.

Pesticides

The Problem

Pesticides are chemicals designed to kill a variety of pests, such as weeds, insects, rodents, and fungi. Many pesticides are considered to be persistent organic pollutants (POPs). These chemicals persist in the environment for long periods of time, they tend to bioaccumulate, they are easily transported globally through natural circulation systems, and they are linked to serious health effects in humans and other wildlife.[8]

On March 21st, the Centers for Disease Control and Prevention (CDC) released the first annual "National Report on Human Exposure to Environmental Chemicals." The report came from a survey of thousands of people from 12 communities around the US. Significant pesticide byproducts were found in the urine of a large portion of the sample.[9] The finding of the CDC is not surprising considering that as of 1991, Americans were using approximately one billion pounds of pesticides a year, twice what was used in 1964. Today, approximately 25,000 pesticide products, containing more than 600 different active ingredients, are on the market in the United States.[10]

Acute health effects of pesticides include respiratory problems, nervous system disorders, and aggravation of pre-existing conditions such as asthma. Symptoms include irritation of the eyes, nose, throat, and skin, nausea, vomiting, diarrhea, coughing, wheezing, headache and general malaise. Effects of chronic exposure include cancer, reproductive and developmental dysfunction, endocrine disruption, immunological and neurological dysfunction, respiratory disease, behavioral impairment, and skin conditions.[11] In 1997, 88,255 pesticide exposure emergencies were reported to the national network of poison control centers. Fourteen fatalities were attributed to pesticide poisoning during the same period. Over 50% of all reported pesticide poisoning cases involved children under six years of age.[12]

In December of 1995, the office of New York State Attorney General Eliot Spitzer prepared "Pest Management in New York State Hospitals: Risk Reduction and Health Promotion." They surveyed the Hospitals of New York state and found that all but three used pesticides. The survey found that there were over 30 different pesticide active ingredients in the pesticides used in NY hospitals. Of these active ingredients, more than one third were classified as Restricted Use Pesticides by EPA, the New York State Department of Environmental Conservation (DEC) or by both agencies. The usual health effects of these pesticides may be compounded in a hospital when exposure coincides with the administration of therapeutic drugs. A variety of pesticide-drug interactions are known.[13]

Solution

Because of the obvious negative health effects, pesticide use should be eliminated wherever possible. But hospitals may not be willing to consider eliminating pesticide use entirely. In its report, the Office of the New York State Attorney General offers four recommendations for hospitals faced with the reality of needed pest control.

Hospitals should adopt least toxic pest management policies and practices in order to reduce or eliminate pesticide use, and should select the least toxic pesticides in situations where pesticide use is deemed to be essential.
If pesticides are used, hospitals should notify all members of the hospital community in advance. Before and after pesticides are applied, warning signs should be posted around the treated area.

All hospitals should maintain detailed information about what pesticides are being applied, where, how, why and by whom. Hospitals should put their pest management policies in writing and make these policies public.

An Integrated Pest Management (IPM) approach is the safest way to control pests. IPM is a sequential process based on monitoring, prevention, mechanical and biological controls. In IPM you start with the least toxic step and proceed to the next step only if the first doesn't control the pest problem. There are five basic sequential steps to follow in an IPM system:

1. Monitor the situation. Identify the causes of the problem. Determine what pests eat, where they are coming from, and what kind of organism you are trying to control.
2. Preventative medicine. The best way to get rid of pests is to not attract them in the first place.
3. Mechanical controls. If preventative medicine alone isn't enough, then try using mechanical traps to capture pests.
4. Biological controls. If the pests still won't give in, try to attract beneficial insects that eat pest insects.
5. Least Toxic Chemical Controls. When all else fails, it is useful to turn to least toxic chemical controls. These chemicals can include boric acid, sticky traps, diatomaceous earth, soaps, oils, and growth regulators.[14]

By choosing the least toxic pesticides and cleaners, hospitals can improve indoor air quality and reduce the risk of adverse effects on patients and staff. Quality alternative products are on the market and may be preferable choices to conventional chemical products.

Notes

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3. American Lung Association, "Occupational Hazards," 2000, p.3. http://www.lungusa.org/air/air00_occupation.html
4. California Office of Environmental Health Hazard Assessment Fact Sheet, "Health Effects of Diesel Exhaust August 2000." http://www.oehha.ca.gov/air/diesel_exhaust/factsheet.html
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8. "Nowhere to Hide: Persistent Toxic Chemicals in the U.S. Food Supply." Pesticide Action Network North America and Commonweal. March 2001.
9. Gina Solomon -NRDC
10. http://www.oag.state.ny.us/environment/hospital95.html#introduction
11. "Pesticides and Human Health: A Resource for Health Care Professionals." Physicians for Social Responsibility. 2000.
12. "Pesticides and Human Health: A Resource for Health Care Professionals." Physicians for Social Responsibility. 2000.
13. http://www.oag.state.ny.us/environment/hospital95.html#discussion
14. http://www.checnet.org/chec/index.html

Resources on the World Wide Web

www.watoxics.org

www.oag.state.ny.us

www.checnet.org

www.seventhgen.com

www.panna.org

Green and Healthy Buildings

Room and building design can be significant causes of human illness and environmental degradation. According to the US Environmental Protection Agency (EPA) and its Science Advisory Board (SAB), indoor air pollution is one of the top five environmental risks to public health. Other studies have found that in the US, people spend on average 90% of their time indoors, and that many common materials in widespread use emit dangerous compounds and harbor infectious molds, fungi and bacteria.

Buildings can also have a significant impact on the natural environment. Building-related activities are responsible for 35% to 45% of CO_2 released into the atmosphere, contributing to global climate change. Buildings contribute to the thinning of the stratospheric ozone layer by using refrigerants and other products, including some insulation materials manufactured with ozone depleting compounds. Buildings use about 40% of energy resources and 16% of water supplies, while building construction and demolition generates about 25% of municipal solid wastes. Each of these impacts has consequences on human health, the extent of which is becoming better understood as the interconnections between buildings, human health and environmental quality are subjected to rigorous analysis.

A shift in practice towards green and healthy buildings is fundamentally consistent with a core value of healthcare professionals – first, do no harm. The Hippocratic Oath is put into practice when healthcare professionals initiate environmentally safe design, operation, and maintenance practices in their facilities. Two excellent examples of this shift in practice include the St. Mary's Hospital (NHS) and the Swindon Hospital, both in Great Britain. The St. Mary's Hospital is a 398 bed facility that opened in 1991. It was designed to be highly energy-efficient, and after nine years of operation the hospital's recorded energy consumption in 2000 was 50% less than other hospitals of comparable size in the UK. The design of the Swindon Hospital, currently under construction in the UK, utilizes the sustainable design principles of the Swedish organization, The Natural Step. Information on the new Swindon Hospital can be obtained on their website (www.carillionplc.com).

The Problem

Unique Characteristics of Healthcare Facilities

Healthcare facilities, averaging between 70 and 75 million square feet of construction per year, have unique programming criteria that guide design decisions and material, product and equipment specifications. Understanding the complexity of human health implications of these decisions is critical. For example, the Academy of Architecture and Health cites research indicating that natural lighting, indoor landscaping, rooftop gardens, solariums, and small atria have a health impact on hospital staff and can improve the feeling of well-being and medical outcomes in patients. They recommend maximizing views of nature and landscaping from all patient environments, and increasing the use of skylights, interior transom windows, and natural light. Healthcare providers can contribute to this health benefit by opening curtains and windows allowing fresh air and sunlight into patients' rooms. Consumers can actively seek out facilities and birth settings that allow for such healthy options.

Representing a substantial share of annual design and construction activities in the US, the healthcare sector is well positioned to highlight the potential that buildings have to reverse environmental decline and to create surroundings for people that enhance health, patient outcomes, and workplace performance. The purchasing power represented by the healthcare industry can lead to industry partnerships to improve the health and environmental profiles of buildings throughout their life cycle.

Recognizing this shared responsibility among designers, manufacturers, building owners, facility managers and public policymakers sets an agenda that will yield important outcomes, as manufacturers are encouraged to shift their practices in response to a growing demand for environmentally safe products and practices, and the allied building professionals are directed to implement green and healthy building practices.

Similarly, it is appropriate and timely to establish partnerships between the regulating and the regulated communities. Guidelines and regulations overseeing hospital design and construction should be evaluated based on their impacts on environmental quality and human health and revised so that they reflect these as priority considerations. Consumers, both patients and clinicians, can do much to influence the facility environment and policies by actively seeking out institutions which establish environmentally safe policies and are compliant with such regulations.

Indoor Environmental Quality

While poor air quality is commonly associated with the outdoors, the air inside buildings is often worse. As buildings were constructed to meet tighter energy efficiency standards in the 1970's, the materials and compounds used to manufacture common building supplies were found to have harmful emissions, with direct effects on the public's health. In response, improved ventilation standards were established. Numerous common building materials and products continue to be sources of indoor air pollution, however. Both improved ventilation rates and source elimination are necessary to achieve and maintain good indoor air quality.

According to the US EPA, most sources of indoor air pollution come from building materials and products such as adhesives, carpeting, upholstery, and manufactured wood products that emit volatile organic compounds (VOCs), including formaldehyde, a probable human carcinogen. Indeed, the construction industry is the primary end-user of formaldehyde-based products, representing 70% of its use. Health effects of poor indoor air quality include asthma, cancer, and reproductive and development effects.

PVC (polyvinyl chloride) is another material manufactured into numerous common building products including wall coverings, flooring and plumbing pipe. Concerns about its effects on human health and environmental quality have been raised by many green building proponents as well as health practitioners. Health Care Without Harm recommends that hospitals specify building materials made without PVC. Care should be taken not to substitute PVC with other products that also contaminate indoor air, such as goods manufactured with formaldehyde. Please refer to the previous chapter on PVC for more information.

By adopting and implementing green building guidelines and establishing health and environmental performance parameters for all planning, design, specification, operations, maintenance, and post-use decisions, healthcare decision makers can extend and enhance the environmental performance of their buildings.

Implementation

Short-Term Actions (Year 1)

1. Incorporate the goal of green and healthy buildings into the strategic plan and create corporate commitment through:
   - establishing an in-house "green team" to review existing building-related policies and procedures, augmented by consultants as appropriate
   - developing green specifications
   - developing green housekeeping guidelines for building superintendent and custodial staff
   - engaging in legislative advocacy
   - establishing accountability protocols
2. Require architects, engineers and contractors to specify commercially available, cost-competitive materials and products as substitutes for products that compromise environmental quality and human health. Example substitutes are:
   - PVC-free products, e.g., flooring, wall covering, carpet backing, ceiling tile, plumbing pipe, roof membrane
   - formaldehyde-free engineered wood products, e.g., oriented strand board, medium density fiberboard, plywood, furnishings
   - no/low VOC products, e.g., paints, adhesives, stains, finishes, floor coverings
   - acoustical ceiling tiles that do not support growth of fungi and bacteria
   - materials and products manufactured without ozone depleting compounds (chlorinated fluorocarbons [CFCs], halogenated chlorofluorocarbons [HCFCs] and halons), e.g., insulation, refrigerants, fire suppressants
   - treated wood manufactured without chromium or arsenic
   - certified sustainably harvested wood products (as per Forest Stewardship Council), and

- highest available recycled content steel and concrete to fulfill performance requirements.

3. Provide and/or require attendance at green and healthy building training seminars for all building related staff and upper management.
4. Expand responsibilities of Environment, Health & Safety Department to include monitoring indoor air quality and ongoing commissioning of major operational systems.
5. Measure energy and water consumption, greenhouse gas emissions, and waste generation and establish efficiency goals according to baseline.
6. Review and modify, as appropriate, US Green Building Council's LEED rating as a preliminary green building evaluative tool.
7. Establish reuse and recycling as prioritized tiers of the facilities' waste management practices.

Mid- to Long-Range Actions (Years 3-5)

1. Establish lifecycle metrics for environmental, human health and natural resource performance to guide design decisions, material and product specifications and construction and operational protocols.
2. Design for the long-term (50-year+ building life expectancy).
3. Merge capital and Operations & Management budgets to optimize lifecycle costing.
4. Establish procurement policies and building material and product specifications consistent with the green and healthy metrics; provide for annual review/revision.
5. Establish partnerships with regulators to review/revise regulations to reflect impacts on human health and environmental quality.
6. Establish an internal green and healthy building rating system, and/or adopt the US Green Building Council's LEED with amendments to reflect particular priorities of healthcare facilities with focus on environmental health criteria and environmental exposures.
7. Establish a permanent position to oversee compliance with green and healthy building standards and create a template for green building design, construction, operation and maintenance.
8. Provide ongoing green building training opportunities (on-site/off-site) for all building-related staff and upper level management.
9. Integrate/balance resource flows (energy, water, materials) to enhance lifecycle efficiency.
10. Design for flexibility to facilitate operational changes, respond to changing user needs and minimize waste generation and labor requirements.

Resources/ Organizations

Architects/Designers/Planners for Social Responsibility (ADPSR)
Northern California Chapter
P.O. Box 9126
Berkeley, CA 94709-0126
510/273-2428
510/841-9060 (f)
aspsr@aol.com
www.adpsr-norcal.org

ADPSR National Office
P.O. Box 18375
Washington, DC 20036-8375
www.adpsr.org

The Center for Health Design
3470 Mt. Diablo Blvd.
Lafayette, CA 94549
925/299-3631
925/299-3642 (f)
admin@healthdesign.org
www.healthdesign.org

Center for Maximum Potential Building Systems
8604 F.M. 969
Austin, TX 78724
512/928-4786
512/926-4418 (f)
center@cmpbs.org
www.cmpbs.org

Center for the Built Environment
Kevin Powell, Executive Director
University of California, Berkeley
390 Wurster Hall, #1839
Berkeley, CA 94720-1839
510/642-4950
510/643-5571 (f)
kpowell@uclink.berkeley.edu
www.cbe.berkeley.edu

Committee on the Environment American Institute of Architects
1735 New York Avenue, NW
Washington, DC 20006
202/626-7300
www.e-architect.com/pia/cote

Environmental Building News
122 Birge Street, Suite 30
Brattleboro, VT 05301
800/861-0954
802/257-7304 (f)
ebn@buildinggreen.com
www.buildinggreen.com

Green Resource Center
2000 Center Street, Suite 120
Berkeley, CA 94704
510/845-0472
510/845-9503 (f)
info@greenresourcecenter.org
www.greenresourcecenter.org

Green Roundtable
Barbra Batshalom
617/374-3740
info@greenroundtable.org
www.greenroundtable.org

HDR Inc.
Bruce Maine, Research Director
8404 Indian Hills Drive
Omaha, NE 68114-4049
402/399-1000
bmaine@hdrinc.com
www.hdrinc.com

Health Care Facility Research Consortium
Judith Yarme, R.M., Director
P.O. Box 151
Barrington, RI 02806
401/245-6212
yarmeco@aol.com

Health Care Without Harm
P.O. Box 6806
Falls Church, VA 22040
703/237-2249
703/237-8389
noharm@iatp.org
www.noharm.org

Healthy Building Network
c/o Institute for Local Self Reliance
Bill Walsh, Coordinator
2425 18th Street, NW
Washington, DC 20001

International Facility Management Association
Healthcare Council
Howard Yarme, Research Chairman
P.O. Box 151
Barrington, RI 02806
401/245-6212
yarmeco@aol.com

The Natural Step
Thoreau Center for Sustainability
P.O. Box 29372
San Francisco, CA 94129
415/561-3344
415/561-3345 (f)
tns@naturalstep.org

Rocky Mountain Institute
1739 Snowmass Creek Road
Snowmass, CO 81654-9199
970/927-3851
970/927-3420 (f)
outreach@rmi.org
www.rmi.org

U.S. Green Building Council
1825 I Street, NW
Washington, DC 20006
202/429-2081
202/429-9574 (f)
info@usgbc.org
www.usgbc.org

Waste Management

The Problem

In the process of delivering healthcare American hospitals generate 4 **billion pounds of waste each year**. The amount of waste per hospital bed has doubled since 1955.

The environmental consequences of this waste include:

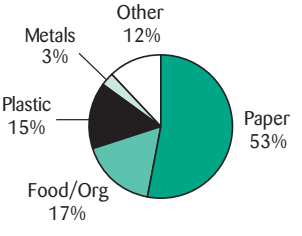
- **Cancer and reproductive effects** caused by the release of toxins, notably dioxins and mercury, from medical and solid waste incinerators.
- **Global warming** caused in part by the emission of greenhouse gases from the combustion of waste.
- Explosion and **human health hazards** caused by the generation of methane gas from the decomposition of organic materials in landfills.

There is a direct link between the health of the environment and the health of the women and babies to whom clinicians provide healthcare. Reducing the amount and toxicity of our waste is the critical foundation for the promotion of environmental health. Waste is commonly treated as an operational issue not requiring the attention of healthcare professionals. But there are compelling reasons for clinicians to become involved in the issue of waste management in birth settings:

- **Environmental impacts are reduced.** By reducing the toxicity and volume of waste, we reduce the toxicity and volume of air and water pollutants
- **Employee safety is improved.** By reducing the amount of waste that has to be collected and treated as hazardous or infectious waste, you reduce the risk of exposure to employees handling these materials.
- **Patient safety is increased.** Through improved segregation and management of waste streams, and reduction in the number of potentially harmful materials present in the care environment, the risks to patients are reduced. Additionally, educating patients about proper disposal of waste generated from patient-administered treatment in the home (e.g., syringes used for insulin injections) can improve patient safety and the safety of municipal trash collectors.
- **Confidentiality is better protected.** Secured waste management and recycling systems and processes can prevent sensitive documents from being mishandled or misused.
- **Operating costs are decreased.** It is conservatively estimated that operating costs can be reduced by up to 20% by minimizing the volume of solid waste sent to landfills. This savings can be redirected to providing healthcare services.
- **Additional benefits** include: contributions to licensure and accreditation requirements including Joint Commission on Accreditation of Healthcare Organizations (JCAHO) Environment of Care standards; enhanced public image for healthcare; and improved employee morale.

About Waste

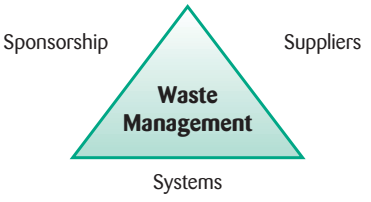
In 1998, the Environmental Protection Agency (EPA) and the American Hospital Association (AHA) signed a Memorandum of Understanding to reduce total waste volumes in the healthcare industry by 33% by 2005 and 50% by 2010. This voluntary initiative is intended to drive change toward more responsible waste management.



More than half of the solid waste at healthcare facilities is paper and cardboard.

The Solution

For waste management and minimization to be successful and sustainable, program sponsorship, appropriate systems, and a connection to suppliers are required.



"Sponsorship" includes top management leadership, supportive policy statements, assigned resources including designated staff to lead waste management initiatives, labor union support, meaningful performance measures that are tracked, and a clear message to staff that waste management and minimization is an expectation for everyone at the healthcare facility. Sponsors also ensure that clear and effective procedures are implemented. Ultimately, sponsorship also means that each employee and clinician takes responsibility and ownership in the success of the program.

"Systems" means managing waste as a resource, evaluating technology for maximum operational benefit and minimum environmental impact, having the necessary facility space and equipment, creating reuse and donation programs, establishing tracking and reporting mechanisms, and exploring opportunities in recycling markets.

"Suppliers" refers to educating targeted suppliers about waste minimization, and asking them to contribute to the effort through offering reusable options, redesigning for product material reduction, packaging reduction and providing recycled materials. "Suppliers" also refers to working with waste haulers and recyclers in alignment with the center's environmental policies.

Implementation

1. **Understand your organization's waste streams.** Ask for a report that establishes a baseline of the volume and disposal costs of these categories, by facility:
   - regulated medical waste (biohazardous waste)
   - hazardous waste (e.g., chemicals, mercury)
   - solid waste (trash)
   - recyclables (especially paper and cardboard)
   - construction and demolition debris
   - industrial waste water (for water conservation purposes)

2. **Know where your waste is going.** Are you sending medical waste to an incinerator or an autoclave? What are the community health and environmental concerns about that facility? Where is the landfill, and are there health/community issues related to that operation?

3. **Assign responsibility for waste minimization.** This assignment can be accomplished without adding staff if savings from waste minimization are returned to the program. Assigning performance-based accountability at all levels is also critical to sustaining gains. Many healthcare institutions establish a "green team" made up of a diverse cross section of front-line and administrative staff members.

4. **Establish performance metrics** for waste management that drive reduction in toxicity and volume. Make the metrics specific, achievable, meaningful and measurable. For example, the amount of packaging, the use of reusable products, and the levels of recycling are three important measurables for waste volume reduction.

5. **Do not tolerate wasteful practices.** Change expectations about material use. For example, senior managers can reduce paper use by letting staff know that they expect to receive double-sided materials, and that they support practices that reduce paper use overall. Said another way, it should not be an acceptable business practice to waste materials. Wasteful practices, including single-sided copies and over-production of reports, should be viewed as an irresponsible use of the organization's resources, with corresponding outcomes.

6. **Establish policies for handling construction and demolition debris.** In California, 28% of the volume of landfill waste is from construction/demolition debris. Much of this waste can be diverted from landfills by reusing salvageable items, and by recycling materials. Also in California, 800 hospital-buildings will be replaced, retrofitted, demolished or discontinued as hospitals by 2008 to comply with seismic regulations. The potential volume of waste from this activity is staggering.

7. **Build waste minimization infrastructure into new buildings.** Ensure that architects allow room for waste segregation and recycling within units and at the loading dock.

8. **Analyze the issues surrounding disposables versus reusables** in the birth setting. Most of these decisions are made by a variety of departments, and it is rare that management looks at the impact of these decisions on the overall waste volumes and toxicity. By establishing policies to evaluate how disposables are used, the facility-wide impact of departmental decisions can be assessed.

9. As a supporter or sponsor of the waste management effort, **ask questions, stay involved,** and establish attainable goals. Recognize and award accomplishments for achieving these goals.

Steps Clinicians can Take to Drive Change

1. **Establish Standards for Waste Management:** Comprehensive standards for appropriate waste management in the healthcare industry do not exist today. There are numerous laws, regulations, and accreditation guidelines, but the industry lacks comprehensive performance standards that focus on toxicity and volume reduction. The ISO 14001 (International Standardization Organization) series of international standards requires the implementation of Environmental Management Systems (EMS). EMS includes establishing and publicizing an environmental policy, determining impacts, setting targets, and taking action to meet targets. In addition to ISO, another organization that promotes environmental standards is CERES (Coalition for Environmentally Responsible Economies). CERES, through the Global Reporting Initiative, aims to measure and report environmental, social, and economic performance. Stakeholders (including waste generators, regulators, waste haulers, and public health advocates) should evaluate the appropriateness of encouraging haulers and generators to join CERES, apply for ISO 14000/14001 certification, or at least establish EMS-like systems.

   An entity that establishes standards for healthcare is the Joint Commission on Accreditation of Healthcare Organizations (JCAHO). In the Environment of Care standards, there may be an opportunity to enhance the waste management protocols to promote minimization and reduce environmental impact.

   Finally, individual healthcare organizations (waste generators) should adopt standards within their organizations to reduce the volume and toxicity of their waste streams.

2. **Enhance Performance:** Many healthcare institutions have not embraced waste minimization and toxicity reduction. This is evidenced by the small number of organizations that have assigned responsibility for environmental stewardship, including waste management, to specific personnel. Assigning responsibility for waste minimization is a critical step in enhancing performance. This assignment can be accomplished without adding staff if savings from waste minimization are returned to the program. Assigning performance-based accountability at all levels is also critical to sustaining gains.

   Another way to enhance performance is for stakeholders to share information and resources among hospitals or systems. Encouraging "green teams" to communicate with each other, sharing return-on-investment and volume/cost reduction data, and reporting on transferable local initiatives will raise the national level of performance.

3. **Develop Continuing Education Modules:** Continuing education programs offer opportunities to educate the medical community on waste minimization. Certification will be feasible if the training modules clearly demonstrate the connection waste minimization has to patient care and patient safety.

4. **End Incineration:** Only a very small portion of medical waste is required by law to be incinerated. Public health advocates and environmental experts hope to eliminate those requirements and end incineration of medical wastes. This outcome can succeed if state laws which require incineration are changed and through education of medical waste generators and the portion of the public who now prefers the aesthetics of incineration for medical waste.

5. **Build Partnerships:** Waste minimization involves many stakeholders, including state and metropolitan hospital associations, HMOs, regulators, labor unions, group purchasing organizations, professional societies, and manufacturers of medical supplies. Utilizing the information and tools available now, these stakeholders can be engaged to support the opportunities listed above.

Resources

The actual implementation of waste minimization and management programs can be delegated to operational staff, and is best supported by "green teams" or other groups that represent a cross section of staff. There are numerous resources for waste management:

Web Sites

http://www.epa.gov/epaoswer/non-hw/reduce/wstewise/main.htm
EPA's WasteWise site offers links and information to help organizations reduce solid waste. They have an on line fact sheet specific to hospital waste reduction.

http://www.noharm.org
Health Care Without Harm is a campaign working to reduce pollution in healthcare without compromising safety or quality.

http://www.papercoalition.org
The Recycled Paper Coalition strives to conserve natural resources and reduce waste by purchasing environmentally-preferred paper products and by using paper more efficiently.

http://www.ciwmb.ca.gov/
California's Integrated Waste Management Board web page offers hyperlinks to the State's waste reduction programs that aim to divert 50% of waste from landfills.

http://www.stopwaste.org
Alameda County Waste Management Authority & Source Reduction and Recycling Board is an agency that promotes source reduction and recycling. They have tools applicable nationally.

Publications/Guidebooks

American Hospital Association, *An Ounce of Prevention: Waste Reduction Strategies for Health Care Facilities.* Cost: $29.95 (member), $50 (nonmember); order number 057-007. To order call (800) AHA-2626. For more information contact: American Society for Healthcare Environmental Services, (312) 280-4458.

Kaiser Permanente, *Waste Minimization Starter Kit.* Cost $150. Tool kit including instructions, poster, fact sheet, training slides, and tent cards. To order call 510-987- 4737.

Worker Health and Safety

Healthcare is rapidly becoming one of the most dangerous industries in the United States. The rate of occupational injury and illness to healthcare workers surpassed all other industries combined in 1991.[1] While the rate of injury to all workers has declined since 1991, the rate of injuries to healthcare workers continued to climb. It is now more dangerous to work in a hospital than in construction and more dangerous to work in a nursing home than in a mine.[2]

Healthcare has lagged behind other industries in progress towards protecting workers. The first federal Occupational Safety and Health Administration (OSHA) Standard aimed specifically at protecting healthcare workers was the 1991 Bloodborne Pathogens Standard.[3] The second standard to protect healthcare workers, the OSHA Tuberculosis Standard, remains bogged down by politics after 8 years in progress.[4] Reasons for this lack of attention to healthcare worker health and safety may include the focus on curative rather than preventive health in the hospital environment, the focus on patient safety over worker safety, and the focus within the field of occupational health on traditionally male occupational hazards rather than those impacting female workers.[5]

The Problem

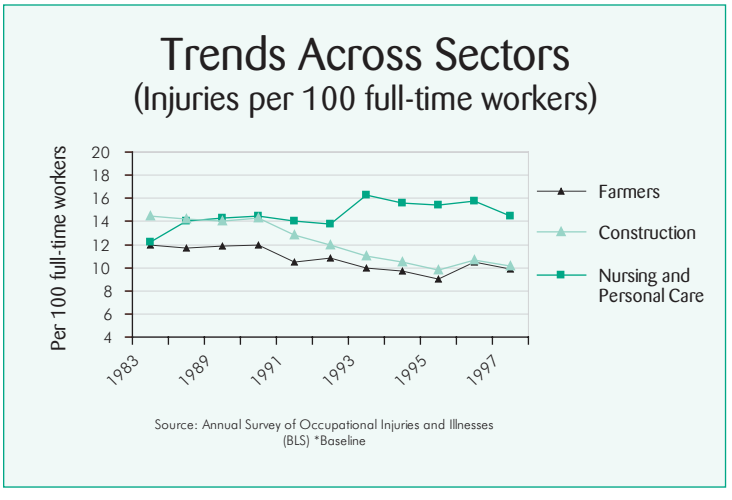
In birth settings, workers face a variety of occupational hazards, classified in the following five categories:[6]

- Biological/infectious hazards (bacteria such as tuberculosis, and viruses such as HIV, Hepatitis B and Hepatitis C can be transmitted by contact with infected patients or contaminated body secretions/fluids)
- Chemical hazards (medications, solutions, or gases such as ethylene oxide, formaldehyde, glutaraldehyde, waste anesthetic gases, nitrous oxide, chemotherapeutic agents, laser smoke and aerosolized medications)
- Physical hazards (ionizing radiation, lasers, noise and electricity)
- Ergonomic/Biomechanical hazards (such as patient transfers and lifting)
- Psychosocial hazards (short staffing, stress, mandatory overtime and shift work)

Hierarchy of Controls

It is possible to prevent or reduce healthcare workers' exposure to these hazards. The industrial hygiene hierarchy of controls is a recognized method to apply control measures for primary prevention of occupational injury and disease.[7] The following hierarchy is listed in order from most to least effective:

- Elimination of hazardous materials and dangerous activities - using needleless IV systems, ending lifting by only one staff member
- Substitution of Less Hazardous Materials and Systems - choosing oxidizing chemicals such as paracetic acid for glutaraldehyde, substituting nitrile gloves for latex or vinyl gloves



- Engineering Controls – using technical means to isolate or remove hazards (lifting devices, safer needle devices such as those that retract or self-sheaf after use; ventilation)
- Administrative Controls – creating policies and programs that limit workers' exposure to hazards (appropriate allocation of resources to prioritize health and safety, safe staffing, education programs and equipment)
- Work Practice Controls – eliminating recapping of needles, and implementing lifting teams and a no-lift policy
- Personal Protective Equipment (PPE) – providing barriers and filters between the worker and the hazard (gloves, respirators and masks, goggles, gowns, etc.)

Serious Hazards

• Back Injuries and Musculoskeletal Disorders (MSDs)

Low back injuries are the leading occupational health problem affecting healthcare workers and are increasing among nurses and nurses' assistants. Hospitals and nursing homes are the top two workplaces for days away from work due to back injuries. The primary risk factor for low back disorders among nursing personnel is lifting and transferring of patients. The National Institute of Occupational Safety and Health (NIOSH) lifting equation indicates that the average worker can routinely lift no more than 51 pounds.[8] Healthcare workers are routinely asked to lift beyond safe loads without adequate staffing support and without access to lifting devices.[9]

According to research conducted at the University of Wisconsin, of the 38% of nurses with back injuries, 12 % are considering leaving the profession thus contributing to the current nursing shortage.[10] The 1996 Institute of Medicine Report: *Nurse Staffing in Hospitals and Nursing Homes: Is it adequate?* discusses the relationship between staffing and back injuries and recommends lifting devices and teams.[11] In addition, implementing a "no-lift" policy will help decrease the incidence of work related lower back injuries.

• Latex Allergy

Latex gloves have been used to prevent transmission of many infectious diseases to healthcare workers. However, latex is hazardous to some healthcare workers, resulting in a range of health effects from a minor dermatitis to asthma, life-threatening anaphylaxis and respiratory arrest.[12] Data indicate that 8-12% of the healthcare worker population that use gloves are sensitized to natural rubber latex compared with 1-6% of the general population.[13] The FDA has reported five healthcare worker deaths related to latex glove use.[14]

Powdered latex gloves present an additional hazard because the latex proteins in the glove attach to the glove donning powder and become aerosolized.[15] A latex allergic patient or sensitive worker cannot be safe in a powdered latex environment.

Because the only effective treatment for latex allergy is the complete avoidance of contact with latex containing products and powder, alternative glove barrier materials are needed. Finding adequate barrier protection without harming the worker, the patient or the environment is a challenge that lies at the intersection between environmental and occupational health. Vinyl gloves are the most common and least expensive substitute for latex exam gloves. According to the CDC, vinyl is an adequate barrier if the glove is intact; however vinyl gloves break down easily and are environmentally toxic.[16] Other synthetic alternatives include nitrile, polyurethane, neoprene and tactylon. Although latex has been considered the "gold standard," other synthetic materials provide superior chemical barriers for handling chemotherapeutic agents and other chemicals such as glutaraldehyde.[17]

• Needlestick Injuries

An estimated 600,000-800,000 needlestick injuries (nsi) occur annually in the United States.[18] About half of these injuries go unreported. An average hospital incurs approximately 30 worker nsi per 100 beds per year.[19] Most reported nsi involve nursing staff, but lab staff, physicians, housekeepers, and other healthcare workers are also injured.[20] Some of these injuries expose workers to blood borne pathogens, including Hepatitis B, Hepatitis C, and HIV. Infection with any of these pathogens is potentially life threatening.

The risk of infection from hepatitis is much greater than the risk from HIV and while there is an immunization to prevent Hepatitis B, and post-exposure prophylaxis and treatment for HIV, there is currently no recommended prophylaxis or effective treatment for Hepatitis C. The only solution is to prevent exposure.[21] Safer devices have been shown to reduce needlestick injuries by 80%.[22] Frontline healthcare worker involvement is essential for a comprehensive analysis of injury hazard, the selection of clinically appropriate devices and for the successful implementation of a change to safer products.[23]

• Chemical Hazards

Glutaraldehyde, one of many chemical hazards in the healthcare workplace, is a potent sensitizer that causes occupational asthma.[24] Ethylene oxide, a cold sterilizing agent is a carcinogen and a reproductive toxin causing miscarriage.[25] Cleaning agents and materials and their methods of use are increasingly implicated in asthma. Despite the existence of OSHA chemical hazard communications, most healthcare workers are unaware of the risks of these agents and appropriate control measures.

• Organization of Work

Changes in work organization resulting from restructuring, downsizing, and layoffs within the healthcare industry

are resulting in decreased staffing levels, increased work loads and time pressures, and longer hours of work.[26] Because of the nature of their work, healthcare workers also face unique stressors including: exposure to illness and death; the need to provide adequate patient care; and shift work. Exposure to such stressors has been found to be related to numerous health problems including headaches, digestive problems, heart disease, injuries (including back and nsi), fatigue and depression.[27]

The Solution

Recommendations for a Safe and Healthy Work Environment

The participants at the October 2000 Setting Healthcare's Environmental Agenda Conference adopted the following principles and goals for worker health and safety recognizing that a cultural shift may be necessary. This shift should be towards a culture that values the health and safety of healthcare workers equally with patient safety and quality of care. A systematic occupational safety and health program must be in place in order for an organization to successfully recognize and control occupational hazards.

The overriding issue for healthcare worker health and safety is the same as for patient safety: sufficient and appropriate levels of staffing. Inadequate staffing became a major problem in the 1990s as cost containment drove decision-making. Inadequate staffing results in an increased risk of medical errors as well as injury to workers.

1. **Adopt the principles from the World Health Organization Safe Injection Global Network (SIGN):**[28] "a safe injection does no harm to the recipient, does not expose the healthcare worker to any risk and does not result in waste that is dangerous for the community" and expand them to safe healthcare practices:
"A safe healthcare practice does no harm to the recipient, does not expose the healthcare worker to any risk and does not result in waste that is dangerous for the community."

2. **Management Leadership** - Visible top management leadership provides the motivating force for an effective health and safety program. "The most significant finding in terms of enhancing compliance and reducing exposure incidents was the importance of the perception that senior management was supportive of the blood borne pathogen safety program. When employee safety is considered and valued, employees feel valued."[29] An organization's commitment to health and safety is demonstrated by the assignment of responsibility and allocation of appropriate resources for the health and safety program. Adequate staffing (patient care and occupational health program staff), and materials for hazard controls are essential tools for safety. It is important to recognize that the business of providing quality healthcare to patients requires safe and healthy employees and that what is unsafe for workers is probably unsafe for patients.

3. **Employee Participation** - Involve frontline workers and an interdisciplinary process for the evaluation of hazards and the selection and implementation of control measures. Joint labor-management health and safety committees are effective vehicles provided they have the support and authority to implement decisions. Utilizing the considerable expertise of frontline workers increases the probability that the most appropriate safety devices and work practice controls will be selected, and increases the likelihood that staff will be more accepting of new devices and practices. For further information on how to involve frontline workers see "Setting Healthcare's Environmental Agenda," May 2001.

4. **Encourage reporting and recording of work-related symptoms, injuries and "near misses."** Address issues that contribute to under-reporting by eliminating blame for injuries and other disincentives. Ensure prompt and immediate response to reported injuries and identify and address needs for institutional change. Utilize illness and injury data as a corrective feedback loop.

5. **Prioritize prevention by utilizing the industrial hygiene hierarchy of controls.** Focus on eliminating hazards and implementing engineering and work practice controls to prevent exposure to hazards.

6. **Advocate for research on prevention and enforceable standards.**

7. **Incorporate an analysis of the impact on worker health and safety** prior to the implementation of job changes, restructuring, new technology, new procedures, products, chemicals and medications. Request a NIOSH Health Hazard Evaluation when unknown products and procedures are initiated. Pay attention to the "canaries." Healthcare workers with work-related illness and injury may be the harbinger of risk for all healthcare workers and an indication of an unsafe environment for patients and/or the community.

8. **Some specific interventions can include:**
   - implementing a no-lift policy;
   - eliminating latex and vinyl exam gloves – eliminate powdered latex gloves and provide synthetic alternatives for sterile glove uses. (Dietary workers should never wear latex gloves, only synthetic

gloves should be utilized in food preparation); and

- establishing a needlestick injury prevention committee with frontline healthcare worker involvement in the evaluation, selection and implementation of safer needle devices.

Notes

1. Bureau of Labor Statistics, 1994
2. Buckler, G, 1995
3. Federal Register, 1991
4. American Health Consultants, 1999
5. Lipscomb, 1997; Yassi, 1997
6. Rogers, 1998; Lipscomb, 1997; OSHA, 1993
7. NIOSH, 1988; OSHA, 1993; Rogers, 1998; Olishifski, 1988
8. NIOSH, 1994
9. Owen, 1998
10. Owen, 1998
11. Wunderlich, 1996
12. NIOSH, 1997; ACAAI, 1995; Granady, 1995
13. Kelly, 1996; Sussman, 1995
14. Jacobson, 1999
15. Swanson, 1994; NIOSH, 1997
16. CDC, 1989; Korniewicz, 1995; Korniewicz, 1989
17. Rego, 1999; Hamann, 1993
18. NIOSH, 1999
19. EPINet, 1999
20. NIOSH, 1999
21. CDC, 1998a; CDC, 1998b
22. CDC, 1997; Jagger, 1996
23. Fisher, 1999
24. Chaney, 1990
25. Danielson, 1998
26. Pindus, 1998
27. NIOSH, 1999b; Shogren, 1996
28. WHO, 1999
29. Gershon, 1995

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Resources on the World Wide Web

Bloodborne Pathogens (Safer Medical/Needle Devices)

Bloodborne Facts, fact sheets provided by OSHA entitled,

- Repeating Exposure Incidents
- Protect Yourself When Handling Sharps
- Hepatitis B Vaccination -Protection For You
- Personal Protective Equipment Cuts Risk

www.osha-slc.gov/OshDoc/data_BloodborneFacts/

Occupational Safety and Health Administration (OSHA). Needlestick Injuries. Includes final text of the 2000 amendments to the Bloodborne Pathogens Standard (29 CFR 1910.1030) **www.osha-slc.gov/SLTC/ needlestick/index.html**

Food and Drug Administration (FDA) Safety Alert: Needlestick and Other Risks from Hypodermic Needles on Secondary I.V. Administration Sets-Piggyback and Intermittent I.V. **www.osha-slc.gov/SLTC/needlestick/fdaletter.html**

NIOSH Alert - Preventing Needlestick Injuries in Health Care Settings Publication No. 2000-108. Publication Date: 11/99 **www.cdc.gov/niosh/2000-108.html**

NIOSH Guidelines for Selecting, Evaluating, and Using Sharps Disposal Containers. Publication No. 97-111, 1998. (To order, call 1-800-35NIOSH). **www.cdc.gov/niosh/2000-108.html**

California OSHA Sharps Injury Control Program. Include a listing of safer needle devices available on the market. **www.ohb.org/sharps.htm**

Training for the Development of Innovative Control Technologies (TDICT) Project. Includes needlestick device safety feature evaluation forms. **www.tdict.org/criteria.html**

ECRI: evaluation of needlestick devices. **http://healthcare.ecri.org/site/whatsnew/press.releases/980723hdneedle.html**

Exposure Prevention Information Network (EPINet) epidemiologic system for recording needlestick injuries developed by the Dr. Janine Jagger at the International Healthcare Worker Safety Center at the University of Virginia-Charlottesville. www.med.virginia.edu/~epinet

Ergonomics

Working Safely with Video Display Terminals. U.S. Department of Labor Occupational Safety and Health Administration. (OSHA 3092). 1997 (Revised) www.osha-slc.gov/SLTC/ergonomics/index.html

OSHA Ergonomic Standard - Effective 2001 www.osha-slc.gov/ergonomics-standard/index.html

Hazardous Chemicals/Gases

Managing Hazardous Materials Incidents Volume I & II Emergency Medical, Services and Hospital Emergency Departments U.S. Department of Human Services, Public Health Service, Agency for Toxic Substance and Disease Registry. Volume I and II Publication Date: 1/1/92 http://aepo-xdv-www.epo.cdc.gov/wonder/prevguid/p0000018/0000018.htm http://aepo-xdv-www.epo.cdc.gov/wonder/prevguid/p0000019/0000019.htm

Formaldehyde

CPL 2.2-52- Enforcement Procedure for Occupational Exposure to Formaldehyde (Information Date: 11/20/90) This instruction provides uniform inspection procedures and guidelines to be followed when conducting inspections and issuing citations for workers potentially exposed to formaldehyde. www.osha-slc.gov/OshDoc/Directive_data/CPL_2- 2_52.html

Nitrous Oxide

NIOSH Hazard Controls (HC29) - Control of Nitrous Oxide During Cryosurgery., Publication No. 99-105. Publication Date: 1/99. U.S. Department of Health and Human Services. NIOSH. www.cdc.gov/niosh/hc29.html

NIOSH Alert: Controlling Exposures to Nitrous Oxide During Anesthetic Administration. Publication. No. 94-100. Publication Date: 1994. U.S. Department of Health and Human Services. NIOSH. www.cdc.gov/niosh/noxidalr.html

Hazardous Drugs

Controlling Occupational Exposure to Hazardous Drugs.\OSHA Technical Manual (TED 1-0.15A), Section VI, Chapter 2, (1999, January 20), 35 pages. Describes medical surveillance, handling, transporting, storing, and disposal of hazardous drugs. Appendix VI:2-1, contains common drugs considered hazardous. Appendix VI:2-2, contains aerosolized drugs considered to be hazardous. www.osha-slc.gov/dts/osta/otm/otm_vi/otm_vi_2.html

Hospital Investigations: Health Hazards OSHA Technical Manual (TED 1-0.15A), Section IV, Chapter 1, (1999, January 20), 11 pages. Deals briefly with the hazards of anesthetic agents and antineoplastic drug exposures in the hospital setting. www.osha-slc.gov/dts/osta/otm/otm_vi/otm_vi_1.html

Hazardous Waste

OSHA Compliance Directive: CPL 2-2.59A — Inspection Procedures for the Hazardous Waste Operations and Emergency Response Standard (Hazwoper), 29 CFR 1910.120 and 1926.65, Paragraph (q) : Emergency Response to Hazardous Substance Releases (Information Date: 4/24/98) www.osha-slc.gov/OshDoc/Directive_data/CPL_2-2_59A.html

Hepatitis

Recommendations for Prevention and Control of Hepatitis C Virus (HCV) Infection and HCV-Related Chronic Disease.@Morbidity and Mortality Weekly Report, 46(26), 603-606. Publication Date. 10/16/98 www.cdc.gov/epo/mmwr/preview/mmwrhtml/00055154.htm

Human-Immunodeficiency Virus (HIV)

First-Line Drugs for HIV Postexposure Prophylaxis (PEP).@ (Appendix). Morbidity and Mortality Weekly Report, 47(RR-7);29-30. May 15, 1998 www.cdc.gov/epo/mmwr/preview/mmwrhtml/00052801.htm

"Public Health Service Guidelines for the Management of Health-Care Worker Exposures to HIV and Recommendations for Postexposure Prophylaxis." CDC *MMWR Recommendations and Reports*. May 15, 1998, 47 (RR-7); 1-28. www.cdc.gov/epo/Mmwr/preview/mmwrhtml/00052722.htm

Infection Control/Injury Control

Bolyard, E. A. Tablan, O.C. Williams, W.W., Pearson, M.L., Shapiro, C.N., Deitchman, S.D. and The Hospital Infection Control Practices Advisory Committee. 1998. *Guideline for Infection Control in Health Care Personnel. Centers for Disease Control and Prevention.* www.cdc.gov/ncidod/hip/guide/infectcontrol98.pdf

Laser Plume

Hospital Investigations: Health Hazards. OSHA Technical Manual (TED-0.15A), Section VI-Chapter 1. Describes lasers as a potential hazard in the hospital environment and identifies areas to investigate. January 20, 1999. www.osha-slc.gov/SLTC/laserhazards/index.html

NIOSH Hazard Controls (HC11) - Control of Smoke from Laser/Electric Surgical Procedures Publication No. 96-128. www.cdc.gov/niosh/hc11.html

Latex Allergies/Sensitivities

Latex Allergy. NIOSH Facts. June 1997. www.cdc.gov/niosh/latexfs.html

Preventing Allergic Reactions to Rubber Latex in the Workplace. NIOSH Alert. Publication No. 97-135. June 1, 1997. Describes and defines types of latex reactions occurring in people using or working with latex products. It also describes how the allergy occurs. www.osha-slc.gov/SLTC/latexallergy/index.html

OSHA Technical Information Bulletin-Potential for Allergy to Natural Rubber Latex Gloves and Other Natural Rubber Products. April 12,1999. OSHA www.osha-slc.gov/html/hotfoias/tib/TIB19990412.html

American College of Allergy, Asthma, and Immunology. Latex Allergy home page includes Guidelines for the Management of Latex Allergy and Safe Latex Use in Health Care Facilities.
http://allergy.mch.edu/physicians/ltxhome.html

Latex Allergy links
www.netcom.com/~nam1latex_allergy.html

Methicillin Resistant Staphylococcus Aureus (MRSA)

Methicillin Resistant Staphylococcus Aureus: Facts for Health Care Workers. 1999.
www.cdc.gov/ncidod/hip/aresist/mrsahcw.htm

Stress

NIOSH Stress at Work.
www.cdc.gov/niosh/99-101pd.html

Tuberculosis

Guidelines for Preventing the Transmission of Mycobacterium Tuberculosis in Health-Care Facilities. October 28, 1994. *Morbidity and Mortality Weekly Report*, 43(RR-13); 1-132. U.S. Department of Health and Human Services. Centers for Disease Control and Prevention.
http://aepo-xdv-www.cdc.gov/wonder/prevguid/m0035909/m0035909.htm

TB: Respiratory Protection Program in Health Care Facilities - Administrator's Guide. Publication No. 99-143. Publication Date: 9/99.
www.cdc.gov/niosh/99-143

OSHA Compliance Directive (CPL)
CPL 2.106 — Enforcement Procedures and Scheduling for Occupational Exposure to Tuberculosis (Information Date: 2/9/1996).
www.osha-slc.gov/OshDoc/Directive_data/CPL_2_106.html

Miscellaneous

American Nurses Association (ANA)
www.nursingworld.org

Occupational Safety and Health
www.nursingworld.org/dlrwa/osh

Needlestick Injury Prevention
www.needlestick.org

Pollution Prevention
www.nursingworld.org/rnnoharm

National Institute for Occupational Safety and Health (NIOSH) Guidelines for Protecting the Safety and Health of Health Care Workers.
www.cdc.gov/niosh/pdfs/88-119.pdf

OSHA. Worker Rights Under the Occupational Safety and Health Act of 1970.
www.odhs.gov/as/opa/worker/rights.html

OSHA. Employer Responsibility.
www.osh.gov/as/opa/worker/employer-responsibility.html

OSHA. Nursing Home Electronic Compliance Assistance Tool (eCAT). AA virtual nursing home walk-through for health and safety@.
www.osha-slc.gov/SLTC/nursinghome_ecat/index.html

American College of Occupational and Environmental Medicine (ACOEM) Guidelines for Employee Health Services in Health Care Facilities.
www.occenvmed.net

Sustainable Hospitals Project (SHP)
The Sustainable Hospitals Project at the University of Massachusetts - Lowell has a web-based clearinghouse for selecting products and work practices that eliminate or reduce occupational and environmental hazards, maintain quality patient care, and contain costs. Information about latex-free medical gloves, safer needle devices, alternatives to polyvinyl chloride products (PVC), and mercury-free products are included at:
www.uml.edu/centers/LCSP/hospitals/

Health Care Without Harm (HCWH).
www.noharm.org

Proceedings from Setting Healthcare's Environmental Agenda.
www.cehca.org/shea

Creating a Green Nursery

The table appearing on the following pages was prepared by Health Care Without Harm and the American College of Nurse Midwives as a guide for new parents who want to create a safe nursery for their baby. It offers safer alternatives to the basic components of most nurseries. The most important thing to remember when designing a "green" nursery is to choose minimally-treated, organic, natural, non-PVC, VOC-free products as much as possible. It is also important to avoid old lead paint and mercury in thermometers and light bulbs. PVC plastic contributes to dioxin production when it is produced and incinerated. PVC also contains phthalate plasticizers used to increase the flexibility of the plastic. Phthalates easily vaporize out of PVC, causing a number of negative health effects.

Besides PVC, many nursery components are treated with or contain VOCs and heavy metals. Like phthalates, VOCs also offgas, decreasing the quality of indoor air. Heavy metals like mercury, lead, and chromium pose serious environmental contamination problems, and are especially hazardous for young children whose nervous systems are still developing. In all cases, reusable products should be used whenever possible to decrease solid waste and cut down on the production of dioxin and other toxic chemicals. Ultimately, what is good for the environment is good for your baby. Providing your child with a safe home environment inevitably contributes to a safer outside environment.

Nursery Component	Hazards	Health Effects	Solution	Other Considerations
Wall Coverings: Paints and Wallpaper	• VOCs (volatile organic compounds)[1] and biocides[2] offgas (evaporate) from paints. • Surfaces that were painted before 1978 may contain lead. • Phthalates[3] and VOCs offgas from vinyl "paper," chemicals used to treat the vinyl, and the paste used to adhere it. • Dioxin production is associated with vinyl products.[4]	• Many VOCs are carcinogenic. VOCs and biocides may also cause: headaches, nausea, dizziness, nerve damage, liver and kidney disease, ear, nose, throat and upper respiratory tract irritation, and convulsions. • Lead exposure can cause brain and kidney damage, joint weakness, anemia, memory impairment, and increased blood pressure. Lead is especially harmful to young children as it affects their developing nervous systems. Specific effects on children include learning disabilities, attention deficits, stunted growth, and lower intelligence scores. • Phthalates can interfere with normal reproduction and development. • The health effects of dioxin include: cancer, compromised immune systems, decreased thyroid hormone levels, congenital malformations, endometriosis, decreased psychomotor ability, hearing deficits, cognitive defects and behavioral alterations in infants.	• Choose biocide-free, VOC-free, and low-VOC paints. • Choose VOC-free paint over wallpaper. • Choose low-VOC , non-vinyl wallpapers and adhesives. • Opt for alternative wall coverings, like quilts.	• Women should not paint while pregnant. • Allow sufficient ventilation over a long period of time (prior to the birth of a baby) to maximize chemical offgassing before use in the nursery.

Nursery Component	Hazards	Health Effects	Solution	Other Considerations
Carpeting and Flooring (Hardwood, Linoleum, Ceramic tile, etc…)	• Dust mites thrive in carpeting. • VOC offgasses from carpet adhesive, carpet underlay, and chemical surface treatments[5] to carpet and wood flooring. • Dioxin production is associated with vinyl (PVC) tiles. • Phthalate offgassing is associated with vinyl (PVC) tiles .	• Dust mites trigger and worsen allergies and asthma. • Please refer to the above effects of VOC offgassing, dioxin, and phthalates.	• Opt for throw rugs instead of wall-to-wall carpeting. • Avoid chemically treated carpet made of synthetic fibers. • Choose untreated (or naturally treated) hardwood, true linoleum (not made of vinyl), cork, or ceramic tiled flooring.	• Small children are naturally lower to the ground and will come into much closer contact with the flooring than an adult would. • Allow sufficient ventilation over a long period of time to maximize VOC offgassing before use.
Furniture and Baby Equipment (car seats, carriers, strollers, walkers, etc…)	• Formaldehyde and other VOC offgassing is associated with laminated wood, pressed wood, chipboard, plywood, particleboard, synthetic veneers, sealants, upholstery and mattresses. • Dioxin production is associated with PVC furniture, equipment and coatings. • Dust mites and other biological contaminants like dander, pollen, mold and mildew can live in mattresses.	• Please refer to the above effects of VOC offgassing and dioxin. • Please refer to the above effects of dust mites.	• Choose solid hardwood furniture with less-toxic, low-VOC finishes. • Avoid heavily chemically treated mattresses filled with polyurethane foam.[6] • Use products made with minimally treated materials. • Avoid PVC products.	• Furniture from before 1978 may have been painted with lead paint. • Although solid wood is the safest material from which to make nursery furniture, wood products must be chosen carefully.[7] Only wood harvested in a sustainable way should be purchased. Look for certified "green" wood labels.[8] • Equipment such as car seats are required by law, yet totally "green" alternatives may not yet exist. In this case, the best purchasing decision must be made based on safety. The most environmentally sound decision may be a hard PVC seat with a non-vinyl upholstery like terry cloth.

Nursery Component	Hazards	Health Effects	Solution	Other Considerations
Bedding and Clothing	• VOC offgassing from chemical treatments[9] to natural and synthetic fabric. • Chlorine used in bleaching is a highly toxic chemical.	• Please refer to the above effects of dust mites and VOC offgassing.	• Choose natural, organic, undyed and untreated fabrics like cotton and wool, silk or cashmere. • Choose products with "fiber-reactive dyes" and "cold pad batch dyeing" labels.	• Besides its tendency to be bleached white, cotton is one of the most pesticide-intensive crops in the world. Look for unbleached "certified organic cotton" and "green" cotton when purchasing nursery linens. • Toxic heavy metals like chromium and copper are used to "fix" dark colors. These metals easily contaminate soil and water around the area of use. • Avoid overly soft or bulky linens like sheepskin or fluffy comforters as they are associated with Sudden Infant Death Syndrome (SIDS).
Window Treatments	• Dust mites live in drapes and shades. • VOCs offgas from fabric, PVC blinds and shades, and wood finishes. • Dioxin is associated with PVC blinds and shades. • Heavy metal contamination is associated with PVC blinds (lead and cadmium). • Biocides are used to treat shades made from natural plant materials.	• Please refer to the above effects of dust mites, VOC and biocide offgassing, dioxin, and heavy metal contamination.	• Choose natural, untreated, organic fabrics for drapes. • Choose wood blinds with a non-toxic finish.	

Nursery Component	Hazards	Health Effects	Solution	Other Considerations
Lighting	• Mercury is contained in fluorescent bulbs. • Poor ventilation can result in a concentration of air pollutants like VOCs.	• Mercury exposure can cause tremors, impaired vision and hearing, paralysis, insomnia, emotional instability, developmental deficits during fetal development, attention deficit, and developmental delays during childhood. • Please see the above effects of VOCs.	• Avoid fluorescent bulbs, but if necessary, use compact fluorescent lamps (light bulbs) that use one-fourth the energy of standard incandescent bulbs.[10] • Choose a nursery room with as many windows as possible to utilize natural light and increase ventilation.	• Coal-fired electricity production is the greatest source of mercury releases to the environment. The reduction of electricity use contributes to the reduction of mercury in the environment.[11] • Natural light is preferable to artificial light sources because it protects babies from jaundice. • Fluorescent bulbs must be recycled after use due to their mercury content.
Cleaners (laundry detergents, soaps, all purpose cleaners, etc…)	• Many common household cleaners contain VOCs, pesticides and other toxic chemicals.[12]	• Cleaners can cause headaches, eye irritation, dizziness, nausea, difficulty concentrating, fatigue, wheezing, coughing, asthma attacks, respiratory infections, pneumonia, and nose, throat and skin irritation. If exposure continues, irreversible lung damage and the formation of fibrosis tissue may occur, making breathing more difficult.	• Use non-toxic cleaners whenever possible. These cleaners should not contain hazardous ingredients like petroleum solvents, chlorine, ammonia, phosphates, VOCs, alkylphenol ethoxylates(APEs)[13], or propellants.	• Babies are more sensitive to the harsh ingredients of conventional cleaners. Beware of washing baby clothes or bedding in anything that may irritate the baby's skin or cause other health effects.
Other Essential Items (thermometers, bottles, diapers)	• Mercury is contained in fever thermometers. • Dioxin production is associated with the bleaching of wood pulp for disposable diapers.	• Please see the above effects of mercury and dioxin.	• Use reusable products whenever possible. This includes reusable cloth diapers and bottles.	• Americans use eighteen billion diapers a year and disposable diapers are the third largest source of solid waste in landfills. Choosing cloth diapers is not only better for a baby, but better for the environment as well.

Notes

1. Common VOCs found in paint and finishes include: ammonia, ethanol, glycols, kerosene, toluene, trichloroethylene, xylene, benzene, and styrene. VOCs readily evaporate out of solid or liquid form into the air.
2. Biocides refer to fungicides and pesticides added to paint to prevent the growth of mold.
3. Phthalates are plasticizers added to many plastics to make them stronger and more flexible.
4. Dioxin refers to a group of carcinogenic and hormone-disrupting chemicals that are produced as a byproduct of the production and incineration of chlorinated products like PVC.
5. Carpets are treated with a number of chemicals to stainproof and mothproof them before they are sold.
6. Polyurethane foam offgasses VOCs, especially toluene.
7. Environmental hazards associated with unsustainable forest development include biodiversity loss, increased carbon dioxide emissions, and the smog created when forests are cleared by burning. Excess carbon dioxide and smog both contribute to global climate change.
8. Certified "green" wood labels include: The Forest Stewardship Council's "Certified Well-Managed Forest" label, the Smart Wood program of the Rainforest Alliance, and Scientific Certification Systems.
9. Chemical Treatments associated with fabric include chemical dyes and finishes to improve appearance, reduce the need for ironing, and retard flammability.
10. Even energy-efficient compact fluorescent lamps contain a small amount of mercury.
11. Electricity production contributes to acid rain, increased particulate matter in air, and other gaseous air pollution. It is a major contributor to global climate change.
12. These toxic chemicals include ammonia, butyl cellosolve, chlorine, ethoxylated alcohols, formaldehyde, hydrochloric, phosphoric, and hydrofluoric acids, kerosene, lye, naphthalene, paradichorobenzenes, perchloroethylene and tetrachloroethylene, petroleum distillates, phosphoric acid, sodium bisulfate, toluene, triethanolamine, trisodium nitilotriacetate, and trichloroethylene.
13. APEs are hormone disruptors and carcinogens. They are found in many cleaners, hair dyes, surfactants, regular soap, laundry detergent and shampoo.

Resources

Pennybacker, Mindy and Ikramuddin, Aisha. 1999. *Mothers & Others for a Livable Planet Guide to Natural Baby Care: Nontoxic and Environmentally Friendly Ways to Take Care of Your New Child.* John Wiley & Sons. USA.

Checklist for a Green Birthday

The greenest birth setting has:

Reusable cutlery and dishware

Reusable linens and diapers

Reusable, mercury-free batteries

Supplies with minimum packaging in reusable tubs

Recycling bins for paper, plastic, cans

A red bag or other regulated medical waste container that will be disposed of without incineration

Mercury-free thermometers and sphygmomanometers

Mercury-free lighting or low-mercury fluorescents that are recycled

Mercury-free fixatives and cleaning products

Integrated pest management instead of pesticides

Cleaning products that are the least toxic alternatives

PVC-free IV bags, tubing, wristbands, mattress covers, shower curtains, upholstery and binders

Low VOC, PVC-free wall coverings and flooring

Design that maximizes use of natural light

Mercury-free thermostats and switches

Rooms that are well ventilated

Adequate staffing levels

Needleless IV sets and other devices designed to prevent needle sticks

Gloves that do not contain latex or vinyl

A no-lift or team-lift policy

A set of policies, practices and educational programs that insure greener birth days for future generations.

HEALTH CARE WITHOUT HARM

P.O. Box 6806 • Falls Church, VA 22040
T: 703.237.2249 • F: 703.237.8389
Email: noharm@iatp.org
www.noharm.org

AMERICAN COLLEGE *of* NURSE-MIDWIVES

818 Connecticut Ave. NW Suite 900 • Washington, DC 20006
T: 202.728.9860 • F: 202.728.9897
Email: info@acnm.org
www.midwife.org

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