BLUE RIDGE ENVIRONMENTAL DEFENSE LEAGUE

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CITIZENS CHARGE THAT STERICYCLE INCINERATOR IS UNECESSARY

Today the Blue Ridge Environmental Defense League released a national report which presents safe alternatives for solving the problems of hospital and infectious waste, making dangerous medical waste incinerators like Stericycle in Haw River, NC unnecessary. The report *Non-Incineration Medical Waste Treatment Technologies* was produced by the national Health Care Without Harm campaign.

The report states that medical waste incinerators emit toxic air pollutants and are a major source of dioxin. Rising costs and tighter regulations for incinerators are making alternative technologies more attractive to hospital administrators. Non-incineration technologies include both older methods of steam autoclaving and newer techniques such as electron beams which destroy disease causing organisms.

"The people in Alamance County are justifiably concerned about what Stericycle is doing," said David Mickey, community organizer for BREDL. "Since there are alternatives to burning 40 tons of waste every day in this community, the state of North Carolina should investigate those alternatives. This report is the place to start that investigation."

Today BREDL also released an October 9 letter to the NC Division of Air Quality which

-MOREoutlines their questions and concerns about the validity of Stericycle's stack tests from last October. The letter to Alan Klimek points out that the stack tests completely omitted one of the two incinerators and that the results for dioxins and furans are not credible.

"The people of Haw River must be able to rely on North Carolina regulators to protect their health and environment from dangerous air pollution," said Lou Zeller, BREDL's Clean Air Campaign Coordinator. "The state must step in and oversee a real stack test at Stericycle and ensure that the waste feed during the test is a typical batch of medical waste."

Stericycle has applied for a Title V permit which would consolidate all federal and state permits and require a compliance assurance plan. The NC DAQ will hold a public hearing in the affected community when the permitting process moves forward.

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Executive Summary

Medical waste incinerators emit toxic air pollutants and are a major source of dioxins in the environment. They also generate ash that is potentially hazardous. In 1997, the EPA promulgated regulations for new and existing medical waste incinerators. The EPA requirements in effect increase the cost of incineration. Faced with increasing public opposition to incinerators, many health care facilities are searching for alternatives. This resource book provides information regarding non-incineration treatment technologies.

In order to maximize the benefits of non-incineration technologies, a strategic framework is presented of which the underlying elements are waste minimization and segregation. By implementing a program that includes segregation, source reduction, recycling, and other pollution prevention techniques, one can reduce the amount of infectious waste that needs to be decontaminated. A strategic framework also entails the implementation of an effective waste collection, transport, and storage system; development of waste management and contingency plans; occupational safety and health considerations; and proper siting of the non-incineration technology.

Analysis of the medical waste stream is an important first step in selecting a non-incineration technology. Hospitals generate between 8 to 45 pounds of waste per bed per day in the form of general trash, infectious (red bag) waste, hazardous waste, and low-level radioactive waste. Infectious waste is estimated to be about 15% or less of the overall waste. The following categories are commonly used in describing the components of infectious waste: cultures and stocks, pathological wastes, blood and blood products, sharps, animal wastes, and isolation wastes. A medical waste audit is a useful tool to find out the sources of waste in a health care facility, their compositions, and rates of generation. An audit may also provide information on waste minimization and handling practices, segregation efficiency, "overclassification," regulatory compliance, and costs. After an analysis of the hospital's waste is completed, the facility is in a better position to determine what kind and what size of non-incineration treatment technology would best meet their needs.

Four basic processes are used in medical waste treatment: thermal, chemical, irradiative, and biological. Thermal processes rely on heat to destroy pathogens (disease-causing microorganisms). They can be further classified as low-heat thermal processes (operating below 350°F or 177°C), medium-heat thermal processes (between 350 to about 700°F), and high-heat thermal processes (operating from around 1000°F to over 15,000°F). The low-heat processes utilize moist heat (usually steam) or dry heat. High-heat processes involve major chemical and physical changes that result in the total destruction of the waste. Chemical processes employ disinfectants to destroy pathogens or chemicals to react with the waste. Irradiation involves ionizing radiation to destroy microorganisms while biological processes use enzymes to decompose organic matter. Mechanical processes, such as shredders, mixing arms, or compactors, are added as supplementary processes to render the waste unrecognizable, improve heat or mass transfer, or reduce the volume of treated waste.

For each of these processes, an overview and principles of operation are presented along with information on the types of waste treated, emissions and waste residues, microbial inactivation efficacy, advantages, disadvantages, and other issues. Specific examples of technologies are provided. Technology descriptions are based on vendor data, independent evaluations, and other non-proprietary sources where available. Many technologies are fully commercialized, while others are still under development or newly commercialized. Since technologies change quickly in a dynamic market, facilities should contact vendors to get the latest and most accurate data on the technologies when conducting their technical and economic evaluation of any technology. ***Health Care Without Harm does not endorse any technology, company, or brand name, and does not claim to present a comprehensive list of technologies.***

Steam disinfection, a standard process in hospitals, is done in autoclaves and retorts. The following steam treatment systems are described as examples: Bondtech, ETC, Mark-Costello, Sierra Industries, SteriTech, and Tuttnauer. More recent designs have incorporated vacuuming, continuous feeding, shredding, mixing, fragmenting, drying, chemical treatment, and/or compaction to modify the basic autoclave system. Examples of these so-called advanced autoclaves are: San-I-Pak, Tempico Rotoclave, STI

Chem-Clav, Antaeus SSM, Ecolotec, Hydroclave, Aegis Bio-Systems, and LogMed. Microwave technology is essentially a steam-based low-heat thermal process since disinfection occurs through the action of moist heat and steam. Sanitec and Sintion are examples of large and small microwave units, respectively. Dry-heat processes do not use of water or steam. Some heat the waste by forced convection, circulating heated air around the waste or using radiant heaters. KC MediWaste and TWT Demolizer are examples of large and small dry-heat systems, respectively. EWI and CWT depolymerize the waste and are examples of medium-heat thermal processes.

High-heat thermal processes operate at or above the temperatures achieved in incineration. As such, they can handle the full range of medical waste. In most of these technologies, pyrolysis (not combustion or burning) is the dominant process. Pyrolysis involves a set of chemical reactions different from incineration and hence, different gaseous products and waste residues are produced. In many cases, pollutant emissions from pyrolysis units are at levels lower than those from incinerators. Waste residues may be in the form of a glassy aggregate, recoverable metals, or carbon black. The high heat needed for pyrolysis can be provided by resistance heating (Bio-Oxidation), plasma energy (e.g., Anara, Daystar, EPI/Svedala, HI Disposal PBPV, MSE, Plasma Pyrolysis Systems, Startech, Unitel, Vance IDS, and VRI), induction heating (Vanish), natural gas (Balboa Pacific), or a combination of plasma, resistance heating, and superheated steam (IET). Superheated steam reforming (Duratek) is another high-heat thermal process. An advanced burn technology (NCE TurboClean) is included because of its unique features and low emissions. Pyrolysis systems are a relatively new technology and require careful evaluation.

Chemical technologies use disinfecting agents in a process that integrates internal shredding or mixing to ensure sufficient exposure to the chemical. Until recently, chlorine-based technologies (sodium hypochlorite and chloride dioxide) were the most commonly used; examples include Circle Medical Products, MedWaste Technologies Corporation, and Encore. Some controversy exists regarding possible long-term environmental effects especially of hypochlorite and its byproducts in wastewater. Non-chlorine technologies are quite varied in the way they operate and the chemical agents employed. Some use peroxyacetic acid (Steris EcoCycle 10), ozone gas (Lynntech), lime-based dry powder (MMT, Premier Medical Technology), acid and metal catalysts (Delphi MEDETOX and CerOx), or biodegradable proprietary disinfectants (MCM). The alkaline hydrolysis technology (WR2) is designed for tissue and animal wastes as well as fixatives, cytotoxic agents, and other specific chemicals. Safety and occupational exposures should be monitored when using any chemical technology.

Electron beam technology bombards medical waste with ionizing radiation, causing damage to the cells of microorganisms. Examples of e-beam technologies designed for medical waste treatment include BioSterile Technology, Biosiris and the University of Miami's Laboratories for Pollution Control Technologies. Unlike cobalt-60 irradiation, electron beam technology does not have residual radiation after the beam is turned off. However, shields and safety interlocks are necessary to prevent worker exposure to the ionizing radiation.

Biological processes, such as the Bio-Converter, use enzymes to decompose organic waste. Several examples of small-scale sharps treatment technologies are also presented in this resource book.

Health care facilities should consider the following factors when selecting an non-incineration technology: throughput capacity, types of waste treated, microbial inactivation efficacy, environmental emissions and waste residues, regulatory acceptance, space requirements, utility and other installation requirements, waste reduction, occupational safety and health, noise, odor, automation, reliability, level of commercialization, background of the technology manufacturer or vendor, cost, and community and staff acceptance. Some common techniques for comparing costs of non-incineration technologies include annual cash flow projections, net present value, and life-cycle cost methods. Where available, capital cost estimates of non-incineration technologies are provided along with other comparative data. Various general approaches to acquiring a technology, including financing options, are also presented.

No one technology offers a panacea to the problem of medical waste disposal. Each technology has its advantages and disadvantages. Facilities have to determine which non-incineration technology best meets their needs while minimizing the impact on the environment, enhancing occupational safety, and demonstrating a commitment to public health. This resource book provides general information to assist hospital administrators, facility managers, health care professionals, environmental advocates, and community members towards achieving those goals.

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October 9, 2001

Alan Klimek, Director
Division of Air Quality
1641 Mail Service Center
Raleigh, NC 27699-1641

Re: Stericycle Inc., Haw River, Alamance County, Air Permit No. 05896R13

Dear Mr. Klimek:

I write to request that the Division of Air Quality repeat the October 2000 tests done for dioxins and furans on the Stericycle medical waste incinerator. The tests are not sufficient to assure public health protection for the people in Haw River and nearby communities.

Both hexachlorodibenzo-P-dioxin and tetrachlorodibenzo-P-dioxin were reported as "not detected at detection limit of instrument" for both compounds. However, hydrogen chloride testing showed average emissions of .51 pounds per hour. Although the HCl value is within permit limits, it reveals that significant levels of chlorine are routinely emitted from the incinerator, as would be expected. What we find problematic is that dioxin emissions were not also detected.

The Stericycle incinerator has two units, but the October tests were performed on one unit. According to the Winston-Salem Regional office memo of February 9, 2001, "Since only incinerator A was tested, compliance is demonstrated for the Toxic Air Pollutants is demonstrated by assuming that incinerator B has the same emission rate as incinerator A."

The questions we have center on the reliability of tests done by Custom Stack Analysis:
1. What type of waste was being burned at the time the tests were performed?
2. Did under-sampling of the stack gases result in lower air emission test levels?
3. Were air pollution control devices operated at above normal rates? and
4. Why were tests not performed on both incinerators?

As you know, typical medical waste feeds when incinerated do emit significant levels of dioxins and furans. Our specific requests are:
1. The NC Division of Air Quality must assure credible stack testing at Stericycle by direct oversight of follow-up tests on both stacks at the facility.
2. Although Stericycle maintains that their operators do not know what specific medical wastes are in any particular waste package, NC DAQ must demonstrate that typical medical wastes are incinerated during stack tests.

Thank you for your consideration of our concerns and requests.

Sincerely,

Louis Zeller

Louis Zeller, Clean Air Campaign Coordinator

DIOXIN FACT SHEET

WHAT IS DIOXIN?

Dioxin is the name given to a group of persistent, very toxic chemicals. The most toxic form of dioxin is 2,3,7,8-tetrachlorodibenzo-p-dioxin or TCDD. TCDD is more commonly recognized as the toxic contaminant found in Agent Orange and at Times Beach, Missouri. Dioxin is not deliberately manufactured. Rather, it is the unintended by-product of industrial processes that use or burn chlorine. Garbage and medical waste incinerators are two of the largest sources of dioxin identified by the U.S. Environmental Protection Agency (US EPA).

Dioxin is a potent, cancer-causing agent, and causes reproductive harm. It has been called "the most toxic substance known to science" because of its wide array of adverse health effects and its ability to cause harm at very low exposure levels.

A number of chemicals have toxicity similar to TCDD - but are less potent - and are called "dioxin-like". Of the 75 dioxins, seven have TCDD-like toxicity. A number of the 209 polychlorinated biphenyls (PCBs) and 135 dibenzofurans are dioxin-like.

The toxicity of dioxin-like substances is generally measured against TCDD using "toxicity equivalence factors." In this system, compounds are assigned a fractional potency relative to TCDD. In most cases, TCDD contributes a small fraction of the total amount of toxic equivalents found in the environment.

HEALTH EFFECTS

Most of our information about the health effects of dioxin comes from studying laboratory animals. Some effects have also been observed in accidentally exposed people and workers exposed to dioxin. With additional studies of exposed populations, other effects may be demonstrated in humans.

Scientists have identified a series of steps that lead up to most and possibly all of the observed effects of dioxin and related compounds. Once in the body, the molecules of dioxin "attach" to specific receptor molecules in cells, much like a key fitting into a lock. This leads to changes in the regulation of genes and alters cell function. Scientists are trying to figure out how this mechanism leads to toxic effects. Both animals and humans possess the receptor.

Dioxin is a potent cancer-causing agent. In June, 2000, the US EPA released a draft report on dioxin's health effects, which estimated that the levels of dioxin-like compounds found in the general population may cause a lifetime cancer risk between one in 1,000 to one in 100. This is 1,000 to 10,000 times higher than the generally "acceptable" risk level of one in a million. In 1997, the International Agency for Research on Cancer concluded that there was sufficient evidence from studies in people to classify dioxin as a known human carcinogen and in its 2000 draft reassessment the EPA described dioxin as "carcinogenic to humans."

Dioxin causes reproductive and developmental effects in animals at very low doses. Dioxin exposure damages the immune system, leading to increased susceptibility to infectious disease. It can disrupt the proper functioning of hormones - chemical messengers that the body uses for growth and regulation.

The US EPA's report found that non-cancer health effects of dioxin may be quite important for public health. Subtle effects, such as an impact on learning ability, thyroid and liver functions, and increased susceptibility to infections, have been seen in children exposed to "background" levels of dioxin. Therefore, people are close to "full" when it comes to the amount of dioxin that is expected to cause adverse health effects. Prudent policy would reduce exposure to dioxin and dioxin-like compounds.

EXPOSURE

Every person has some amount of dioxin in his or her body. This is because dioxin does not readily break down in the environment. Dioxin is a fat-loving molecule which can accumulate in fat in the bodies of animals and people. Because it is persistent, continual low-level exposure leads to a "build-up" of dioxin in tissues.

According to the EPA, over 96 percent of human exposure occurs through diet, primarily foods derived from animals. Dioxin in air settles onto soil, water, and plant surfaces. It then accumulates in the grazing animals which eat those plants. People then ingest the dioxin contained in meat, dairy products and eggs. Some exposure also comes from eating dioxin- contaminated fish.

Dioxin-like compounds can travel long distances in the atmosphere. As a result, many individual sources may contribute to the dioxin levels deposited onto crops at a particular location. Dioxin exposure of the general population can be thought of as a problem of cumulative emissions from many sources.

SOURCES

Dioxins and furans are unwanted by-products of many chemical, manufacturing and combustion processes. Dioxin is formed during industrial processes involving chlorine or when chlorine and organic (carbon-containing) matter are burned together. Dioxin is produced by combustion and manufacturing processes that involve chlorine.

Garbage and medical waste incinerators are leading sources of dioxin identified by the EPA. Polyvinyl chloride (PVC) plastic is a major source of chlorine in these incinerators. Besides being emitted into the air, dioxins end up in bottom ash and in the fly ash captured by pollution control equipment in incinerators. Other combustion sources of dioxin include cement kilns, hazardous waste incinerators, metal smelters, wood burning, and vehicles running on leaded gasoline.

Manufacturing sources of dioxin include chemical processes that use chlorine in the production of pesticides, plastics, solvents and dyes. Dioxin is also formed in the pulp and paper industry when chlorine and, to a lesser degree, chlorine dioxide are used to bleach pulp and paper.

HEALTH EFFECTS RELATED TO DIOXIN

CANCER
- Lung cancer
- Stomach and liver cancers
- Non-Hodgkins Lymphoma
- Soft and connective tissue cancers

MALE REPRODUCTIVE EFFECTS
- Reduced Sperm Counts
- Abnormal testis
- Reduced size of genital organs
- Lower testosterone levels

FEMALE REPRODUCTIVE EFFECTS
- Decreased fertility
- Ovarian dysfunction
- Endometriosis
- Hormonal changes

DEVELOPMENTAL EFFECTS
- Birth Defects
- Alteration in reproductive systems
- Impacts on learning ability/attention
- Changes in sex ratio (fewer male births)

OTHER EFFECTS
- Chloracne
- Hirsutism
- Hyperpigmentation
- Immune suppression
- Altered fat metabolism
- Diabetes
- Nerve system damage
- Liver, spleen, thymus, and bone marrow damage

HEALTH CARE WITHOUT HARM

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Background Information on Health Care Without Harm's new report: "Non-Incineration Medical Waste Treatment Technologies"

- **No document like this exists**
  - When Health Care Without Harm was formed in 1996, we knew we didn't want medical waste to be burned because of concerns about dioxin emissions and other poisonous pollutants, but we didn't know much about the environmental impacts of the alternatives. We couldn't find a document that gave us the answers, so we had to create our own.
  - Years of research have gone into this impartial report, which is the most comprehensive information available to date on the pros and cons of alternatives to medical waste incineration.
  - Until now, there has not been any single source of current information that allows communities and hospital staff to evaluate options for waste treatment in a way that compares "apples to apples."
- **Health care facilities, regulators and communities have been waiting for this information for a long time.**
  - Many hospitals are seeking information about alternative technologies due to the 1997 U.S. Environmental Protection Agency regulation that sets limits on air emissions of medical waste incinerators. All existing medical waste incinerators must be in full compliance with the EPA regulations by September 2002.
  - The report provides enough data to help hospital engineers and health professionals assess which technologies may be appropriate for their specific facilities, and also provides helpful cost comparison data that shows hospitals can realize a cost savings by replacing incineration with alternative technologies.
- **Health care staff should work with their communities to determine the appropriate technology for their specific situation.**
  - There is no "one size fits all" approach to handling health care waste. The type and size of the health care facility will play a role in both expenditures and cost-savings. By minimizing the amount of waste that requires disinfection, hospitals can significantly reduce their treatment costs, environmental impacts and, thus, liability.
  - Health Care Without Harm does not endorse any specific companies or technologies for medical waste disposal. Facilities have to determine which non-incineration technology best meets their needs while minimizing the impact on the environment, enhancing occupational safety and demonstrating commitment to public health.

Non-Incineration Medical Waste Treatment Technologies, a new report from Health Care Without Harm, is the most comprehensive information available to date on the pros and cons of alternatives to medical waste incineration. The report explores the environmental and economic impacts, among other considerations, of about 50 specific technologies.

To download the HCWH Report, please visit their website at:

http://www.noharm.org